48th World Small Animal Veterinary Association Congress and 29th FECAVA Eurocongress

Lisbon, 27-29 September 2023

Speakers Proceedings

Celebrating the 26th APMVEAC Congress together with the XIX FIAVAC Congress

Lisbon, 27-29 September 2023

WSAVA CONGRESS 2023 | 27-29 September | Lisbon, Portugal

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001

CANCER GLOSSARY AND SURGICAL ONCOLOGY CHECK LIST

Jolle Kirpensteijn

Hill's Pet Nutrition, Cvo, Topeka, United States of America

Qualifications:

Jolle Kirpensteijn, DVM, PhD, Diplomate ACVS & ECVS

Chief Veterinary Officer, Hill's Pet Nutrition US, Home address: 4501 Broadmoor Drive, Lawrence KS 66047, USA; jolle_kirpensteijn@hillspet.com @jollenl @gvetsx @purrpodcast

Jolle Kirpensteijn graduated from the Utrecht University Faculty of Veterinary Medicine, Holland, in 1988 and finished an internship in small animal medicine and surgery at the University of Georgia in the United States of America in 1989. After his internship, he completed his residency training in small animal surgery and a master's degree at Kansas State University, USA. The residency was followed by a fellowship in surgical oncology at the Colorado State University Comparative Oncology Unit, USA. In 1993, Jolle returned to Europe to accept a surgical oncology and soft tissue surgery position at Utrecht University. In February of 2005, he was appointed Professor in Surgery at the University of Copenhagen, and in August 2008, Professor in Soft Tissue Surgery at Utrecht University. Jolle is a Diplomate of the American and European College of Veterinary Surgeons. Jolle received the title Founding Fellow in Surgical Oncology (2012) and Minimally Invasive Surgery (Small Animal Soft Tissue; 2017) of the American College of Veterinary Surgeons (ACVS). In September 2013, Jolle accepted the Chief Professional Relation Officer position at Hills Pet Nutrition in the USA. Here, he played an integral role as the interface between the company and the profession at large. In 2018, he was promoted to the Chief Professional Veterinary Officer position in the US and in 2022 to Global Chief Veterinary Officer. Jolle has published over 125 peer-reviewed articles, given more than 250 lectures worldwide, and has received the prestigious BSAVA Simon Award in 2007, Hills Voorjaarsdagen Excellence in Healthcare Award in 2009, WSAVA President's Award and honorary membership to the Netherlands Association of Companion Animal Medicine (NACAM) in 2017. His main interests are DE&I, professional social media and digital innovation, surgical oncology, and reconstructive surgery. Check out his podcasts at purrpodcast.net and globalveterinarysurgery.net. In 2021, Jolle started the @ArtVetNow movement on Facebook to promote veterinary artists worldwide.

Title: Enhancing Surgical Safety in Veterinary Medicine: The Importance of Surgery Checklists.

Introduction: Surgical procedures in veterinary medicine are intricate processes that demand meticulous coordination among the surgical team. Despite the significant risks involved, using surgery checklists in veterinary surgery remains uncommon. This lecture explores the importance of implementing surgery checklists in veterinary medicine, highlighting their benefits, the role of teamwork, the influence of the World Health Organization (WHO) guidelines, the structure of the checklist, and the impact of checklist implementation on veterinary professionals.

The Value of Surgery Checklists: Surgery is a collaborative effort that involves various professionals, including surgeons, anesthesia specialists, nurses, and technicians. The entire team should embrace surgery checklists to ensure a safe and efficient surgical environment. These checklists offer a systematic approach to enhancing patient safety by reducing the likelihood of errors, complications, and avoidable risks.

The Influence of the World Health Organization: The World Health Organization's "Safe Surgery Saves Lives" initiative has pioneered surgery checklists as a vital tool to improve patient outcomes. While initially developed for human surgery, the principles apply equally to veterinary medicine. This initiative emphasizes the need for adherence to essential safety steps that minimize common and preventable surgical risks.

Structure of the Surgery Checklist: The surgery checklist, designed to be concise and straightforward, divides the surgical procedure into four phases, each corresponding to a specific time period in the surgical workflow:

1. Sign In: Before induction of anesthesia

2. Move-In: Before patient movement in the operating room

3. Time Out: Before surgical incision

4. Sign Out: During or after wound closure but before patient removal from the operating room

Each phase involves a checklist coordinator who verifies the completion of tasks before progressing to the next stage. This structured approach ensures that critical safety steps are consistently followed.

Benefits of Checklist Implementation: A survey of veterinary professionals (VSSO listserve) revealed that a significant percentage (67%, n= 48) already used surgery checklists, while others had not adopted this practice. However, we observed that many of the individual steps in the checklist were already considered routine in facilities globally, albeit often not followed comprehensively. This underscores the need for implementing surgery checklists to ensure consistency and adherence to these vital safety measures.

Impact on Veterinary Professionals: The follow-up survey results provide insights into the impact of checklist implementation on veterinary professionals. The findings suggest that surgery checklists improve communication, reduce work pressure, enhance teamwork, and better training. Most professionals felt comfortable asking questions when something was amiss and believed that patient care information was communicated effectively. However, there were still concerns about missing critical information when needed, indicating room for improvement. Moreover, the survey revealed that teamwork and training improved after checklist implementation, with a substantial percentage feeling that their facility did a good job communicating information affecting patient care. Issues such as feeling rushed while caring for patients, and the adequacy of orientation and refresher training for new staff require attention.

Conclusion: In conclusion, implementing surgery checklists in veterinary medicine ensures patient safety and minimizes avoidable risks. The World Health Organization's emphasis on safe surgery has paved the way for adopting surgery checklists, which offer a structured approach to enhancing communication, teamwork, and training among veterinary professionals. The survey results underscore the benefits of checklist implementation while highlighting areas requiring further attention. As the WSAVA Oncology Working Group prepares to launch the WoW Cancer Surgery Checklist, the veterinary community can enhance surgical safety and patient outcomes through comprehensive surgery checklists.

002

UNDERSTANDING FELINE BODY LANGUAGE AND EMOTIONS; THE FOUNDATIONS OF WORKING WITH CATS.

Gonçalo Da Graça Pereira

Egas Moniz School of Health and Science, Veterinary Medicine Department, Monte de Caparica, Almada, Portugal

Qualifications:

Gonçalo da Graça Pereira

DVM, MsC, PhD, Dip ECAWBM (BM), Dip ECAWBM (AWSEL)

Egas Moniz School of Health and Science, Charneca da Caparica, Portugal

Facebook: https://www.facebook.com/GGPEspecialistaComportamentoAnimal/

Instagram: https://www.instagram.com/goncalo_da_graca_pereira/?hl=pt

LinkedIn: https://pt.linkedin.com/in/gon%C3%A7alo-da-gra%C3%A7a-pereira-9499b245

INTRODUCTION

Understanding cats' body language and the emoticons behind is a fundamental tool for all that work with this species. It's a day one skill that every animal health professional must have to assess adequately the animal and take the proper decisions for the welfare of our patients.

The nature of each behaviour response in cats is strongly related to their natural behavioural responses and to their social and communication systems in the wild. All these facts must be well understood when assessing behavioural responses of this species. Unlike pack living animals (in feline's perspective the maintenance of social relationships is important to ensure its own survival), cats do not display the appeasement behaviours, commonly seen in pack animals, to resolve confrontational encounters.

Cats have very subtle body postures, facial expressions and vocalisations which can be used to diffuse tension and avoid physical conflict. For that reason, once they are engaged in combat they lack the behavioural mechanisms to diffuse the situation. Thus, the identification of the very first signs, very subtle many times, is fundamental to develop a proper consultation, to assess well the animal and to guarantee their welfare.

Emotions and different emotional-motivational systems

In order to be able to understand behaviour it is important that we understand the emotional motivations that are behind a certain behavioural responses. Panksepp described seven different behavioural circuits in the brain. Sarah Heath, a world known EBVS specialist in Behavioural Medicine, adapted these systems to be used in a clinical perspective, as in behavioural medicine, and presented the "*Heath Model*", where using the *sink analogy* explains the motivational bases of a behavioural response, using engaging or protective emotions. All different behavioural responses results from an emotion or motivation. For that reason, when trying to promote a behavioural change we must identify the emotion behind the presented behaviour.

Cat Body Language

Cat body language can only be interpreted when observing the whole body, from whiskers to the tail, but also the facial expressions (well studied in pains cales – Grimace scale). The main propose of body language can be interpreted in a simple way: a) increase distance or b) decrease distance. The distance can be related to another cat or person. For that reason, understanding these different body postures is fundamental for the security of the animal, but also the security of all health professionals and caregivers in the room. After reading the animal, we can take adequate actions to deescalte the cat from protective emotions (for exemple, anxiety/fear, frustration), minimizing possible conflicts; or take the decision of stopping the interaction/consultation.

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003

OVERVIEW OF INFECTIOUS DISEASES IN THE HOME AQUARIUM

Esteban Soto Martinez

University of California - Davis, School of Veterinary Medicine, Medicine And Epidemiology, Davis, California, United States of America

Qualifications:

Esteban Soto

MSc, DVM, PhD, Dipl. ACVM (Bacteriology/Mycology and Immunology), CertAqV

Professor of Aquatic Animal Health

sotomartinez@ucdavis.edu

Ornamental aquarium fish are the most common companion animal in America with over 139 million fish kept in over 11 million households in 2023. Despite this, there is minimal veterinary oversight for pet/ornamental fish, and large numbers of ornamental fish die due to poor husbandry and disease. During the last two decades, a multitude of microorganisms have been identified for the first time as pathogens in US pet fish populations, whereas others have clearly expanded their range and are now considered endemic in different geographical locations. The main objectives of this lecture are to: 1) Provide an overview of the ornamental industry, 2) overview some of the endemic and emerging infectious diseases in the ornamental industry, focusing in piscine erysipeloid and emerging DNA and RNA viruses, and 3) outline the methodology for sample collection and submission for histological, microscopic, microbiological, molecular, and serological analysis.

004

THE LASTING CONSEQUENCES OF PAIN

Conny Mosley

Elanco Animal Health Canada, VCA Canada, Veterinary Consultant For Pain And Orthopedic Health, Uxbridge, Canada

Qualifications:

Conny Mosley

Dr.med.vet., DACVAA, CVA

connymosley@gmail.com

Pain is considered a protective mechanism and considered essential to survival. The transmission and perception of a noxious stimulus, from trauma or surgery, is beneficial throughout the initial healing phase due to its short duration and protective mechanisms. Conversely, with significant injuries or complex surgeries, pain perception can increase in intensity or persist for longer durations of time. If the pain is not treated appropriately and continues to fire nerve signaling via the pain pathway, the pain can become more complex in its pathophysiology and expands from its initial area of injury (secondary hyperalgesia and allodynia). If the pain persists beyond the inflammatory and healing process (by definition at least 12 weeks after the initial trauma), it is considered chronic. But besides this defined duration, other factors, including intensity of pain, individual genetic disposition, will impact the development and characteristics of chronic pain. The pathophysiological changes that happen during this development involve structural and functional alteration in the nervous system leading to peripheral and central sensitization. Picture an inflamed area that has different cytokines and inflammatory mediators released by cells and tissue because of the tissue injury. All of those cytokines and inflammatory mediators will act on their specific pain receptors and subsequently send pain signals to the dorsal horn, where the signal will be modulated in a way that the information can be send to the brain and perceived as pain. Every receptor in that periphery tissue plays a role on the pain pathway and over time with constant and intense firing, (consistent inflammation) will start to upregulate. An upregulated pain receptor means that it doesn't take much for the receptor to get activated or more receptors are becoming active. This means that more signals will end up being send to the dorsal horn. At the level of the dorsal horn is where things get complex due to neuromodulation happening from both the ascending and descending pain pathways. The nervous system is constantly adapting and changing depending on the information it receives. The recruitment of non-pain fibers, microglia, astrocytes as well as upregulation or activation of central pain receptors/ion channel and proteins, are only some aspects of changes that take place. With continuing repeated stimuli, the remodeling of the nervous system and even modifications in gene expression can occur, which can lead to long-term sensitization, that can potentially become permanent.

Considering that the pathophysiology of pain processing incorporates complex sensory, inflammatory, immune, and endocrine interactions at every level of the pain pathway, it is easy to understand the impact this will have on other physiological organs and systems. This can lead to increasing risk factors for developing disease. In human medicine we are aware of the effect on the emotional brain (corticolimbic circuit) of developing chronic pain and the effects chronically painful conditions have on emotions (higher level of anxiety, more prone to depression etc). In veterinary medicine we are starting to recognize similar signs like anxiety, lack of joy or playfulness, disinterested in interaction, or aggression. Besides behavioral alterations we also see changes related to other organ systems: increased levels of stress hormones causing gastrointestinal, cardiovascular or endocrine changes. Pain also plays an essential role in regulating immunity by releasing neuropeptides and neurotransmitters which have potent regulatory effects on innate and adaptive immunity, in particular in the presence of inflammation, but also adding to an overall inflamed state. The link of chronic pain to other diseases has also been established. In addition, chronic pain itself is considered a disease that can have a significant ripple effect on health and mind. Therefore, the importance of adequate pain relief is clear to prevent maladaptive pain development, and systemic changes that negatively impact healing and overall health. Persistent post-surgical pain, a leading cause for chronic pain, can be prevented by adequate acute pain. The reasoning behind here is to interfere with the mechanisms involved in peripheral and central sensitization. Local blocks, opioid and NSAIDs are the most important techniques in the acute pain phase. Identifying cases that have underlying low grade chronic pain (ie dogs with osteoarthritis, previous injuries (cruciate rupture, back pain, otitis, dental disease) require further support to catch other upregulated aspects of the pain pathway. This can be achieved by adding gabapentinoids or ketamine perioperatively, and these cases especially will benefit from local blocks! Recognizing that cases with increased anxiety (very stressed being in the clinic or a kennel) are at risk of being more sensitive to pain or developing chronic pain, it is important to address the anxiety and reduce stress wherever possible (low stress handling with fear free techniques, pre-and post-visit anxiolytic medication, early release from hospital etc).

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005

THE HEALTH, WELFARE AND ETHICS OF SELECTIVE BREEDING.

Heather Bacon

University of Central Lancashire, School Of Veterinary Medicine, Preston, United Kingdom

Qualifications:

Heather Bacon

OBE BSc (Hons) BVSc CertZooMed SFHEA MRCVS

hbacon@uclan.ac.uk

Selective breeding and pet health. What can we do?

Dr Heather Bacon

OBE BSc (Hons) BVSc CertZooMed SFHEA MRCVS

hbacon@uclan.ac.uk

Domestication - the process by which humans alter how an animal looks and behaves – uses the process of selective breeding to modify animal phenotypes and behaviours to benefit humans by selecting for desirable traits.

Cats were originally thought to be domesticated approximately 3,600 years ago in Northern Africa. Skulls of cats identified mainly as the species *Felis sylvestris lybica* (the African wildcat) have been found in Egyptian cat burial grounds. More recent evidence suggests that feline domestication likely occurred around 10,00 years ago in the Middle East. It is likely that feline domestication occurred sympatrically with cats becoming increasingly tolerant of humans as they benefitted from predating rodents found in agricultural grain stores. Whilst the domestic cat was classified as *Felis catus* in 1758 by Carolus Linnaeus, it is actually a subspecies of the African wildcat and may be called *Felis sylvestris catus*.

No one knows exactly when or why the first domestic dogs appeared but it is likely that dog domestication occurred between 20,000 and 40,000 years ago years ago. Domestic dogs are originally descended from the Eurasian grey wolf. The fossil record suggests that dog-like animals have been around for more than 30,000 years. And genetic data suggests that dogs appeared around 15,000 years ago. Debate still exists as to whether dogs were domesticated at one or more locations concurrently. With the first domestic dog remains appearing in the early Neolithic period.

Selective breeding can be used to produce healthy animals by selecting against disease traits and genes, or by increasing the fitness of animals coping with specific environmental challenges. In 1959 Dr, Dmitri Belyayev domesticated wild silver foxes by selecting only for their tameness and responses to humans. Naturally, silver foxes would avoid humans but over 50 generations later, almost all of these foxes seek out human contact. The domestication process also resulted in some unexpected phenotypic changes. Although the foxes were not selected for any physical characteristics, physical changes producing in coat colouring, floppy ears, and rolled tails occurred. It is impossible to be absolutely selective when breeding for a specific trait, as changes in behaviour are linked to the same genes that also affect physical changes. For example white plumage hens show significantly higher aggression than red-brown plumage hens (1).

Because of these gene linkages, selecting for a particular behaviour, or physical characteristic can often have inadvertent consequences. For example, merle coat colouration is expressed by the merle gene and inherited in an autosomal, incomplete dominant manner. It has the effect of deleting pigments in hairs, skin, nose and mucous, iris and tapetum lucidum, and stria vascularis of the inner ear. This depigmentation of the stria vascularis causes early death of sensory hair cells resulting in hearing impairments. Animals with the homozygous merle mutation may demonstrate excessive white coat, pink skin, nose and mucous, light blue irises, and irreversible hearing impairments.

Genetic diversity of domestic dogs was reduced by the domestication process, but more recently, genetic diversity has been severely reduced again by selective breeding for aesthetics (3) which became highly fashionable in the 19th and 20th centuries, a period known as the 'Victorian Explosion'. This resulted in the development of many of the dog breeds we recognise today. Over 400 breeds of dog are recognised, most originating from selective breeding that occurred at this time.

More recently, breed standards have shifted to promote more extreme conformations resulting in an epidemic of health and welfare problems as animal aesthetics are prioritised over animal welfare. Selective breeding for aesthetics is problematic for both cat and dog health and welfare as it results in a spectrum of conformational and genetic defects and diseases with extreme conformation such as brachycephaly, skin folds, chondrodystrophy (such as that seen in Scottish fold cats), hip dysplasia, elbow dysplasia, anal furunculosis, atopy, genetic disease such as urate abnormality in Dalmatians and mitral valve disease in Cavalier King Charles Spaniels. It is important that veterinarians involved in animal breeding are aware of expert guidance and the ethical standards expected globally such as:

"The WSAVA calls on veterinarians and breeders to ensure that criteria used for the selection of breeding animals include the ability to reproduce naturally and exclude anatomical characteristics that predispose to hereditary disease, such as extreme conformations including size, skin folds, angulation and extremely short faces (brachycephaly). If a breed demonstrates a disease-predisposing anatomy then selection should be towards a moderate and less extreme anatomy"

https://wsava.org/global-guidelines/hereditary-disease-guidelines/

Whilst many health schemes exist to reduce hereditary and conformational diseases in dogs and cats, insistence on rigid conformational and aesthetic standards unfortunately limits the impact of these schemes. As a profession we should consider the positions we take on maintaining the status quo of breed standards. Similarly we should also consider the breeds that we may promote and use in marketing our veterinary businesses to ensure that this use of animals aligns with good standards of health and welfare.

Research suggests that breeding strategies incorporating screening schemes can be successful in significantly reducing the prevalence of an inherited disorder and improving the overall health of certain breeds. Screening has significantly reduced the prevalence of patellar luxation in Dutch Kooiker dogs. Conversely a 2 year analysis of the mitral valve disease screening scheme in Cavalier king Charles spaniels in the UK has shown no impact. (3). However a more recent study suggests that the age at which 50% of CKCS female dogs examined by GP veterinary surgeons developed a murmur increased by 0.6 years between 1991-2010, so longer term data analysis may identify greater benefits. Whilst this is promising, we should give consideration as to whether the speed of progress and its impact on animal welfare is sufficient. Dutch Kooiker still have a higher prevalence of patellar luxation than other breeds and CKCS still suffer significant mitral valve diseases as well as a host of other genetic pathologies. How do we set the threshold for acceptable animal welfare? With approximately 400 inherited disorders identified, many of which are complex and polymorphic, it may be that successfully breeding away from susceptible individuals with a breed population is no longer possible due to the prevalence of these disorders within some breeds.

Outcrossing has been shown to improve the health of some breeds whilst having little to no phenotypic impact. For example in 1973 a purebred dalmation (all of whom have mutations of SLC2A9 resulting in abnormal uric acid metabolism) was crossed with a pointer, homozygous for the normal gene variant (4). In 2011 a direct descendant of that dog competed at Crufts, but faced a backlash from breeders and clubs concerned about the purity of the breed. Increasing genetic diversity is

known to reduce the risk of hereditary disease (5), but whilst artificial concepts of breed 'purity' continue to be prioritised over genetic and conformational health, veterinarians are likely to continue to deal with potentially preventable health problems. The social factors driving the continued selection of extreme conformations are complex, and further research in veterinary and social sciences may be helpful in challenging the cognitive dissonance identified in owners of brachycephalic pets for example (6).

Every day, veterinary professionals deal with the health and welfare impacts of selective breeding decision-making. For some breeds, screening and breed health schemes offer hope of a healthier future, but for others, rigid concepts of breed purity and aesthetics may condemn thousands of animals to a lifetime of suffering. The One-Health implications of managing preventable welfare problems in our pets are well documented (7) and so we should be mindful of the impacts on ourselves our students and our colleagues, whilst making efforts to promote responsible breeding and purchasing decisions in breeders, owners, and the general public.

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006

WHAT ARE YOUR PATIENTS TELLING YOU?

Beatriz (Bea) Monteiro

University of Montreal, Clinical Sciences, Saint-Hyacinthe, Canada

Qualifications:

Beatriz Monteiro

DVM, PhD, ISFMAdvCertFB, PgDip

beatrizpmonteiro@gmail.com

Pain evaluation is key and indeed the first step for adequate pain management. However, despite significant advances on the understanding of pain-related behaviors and pain management, pain remains underdiagnosed and undertreated in animals including dogs and cats. There is a clear need for systematic pain assessment in clinical practice for appropriate recognition, assessment and measurement of pain to guide clinical decision making and adequate treatment of pain.

In practice, pain in animals is identified and quantified based on behavior observation by a proxy. Acute pain is assessment by the veterinary health care team including veterinarians and technicians. Chronic pain is assessment mainly by caregivers or by the veterinary team using video-assessment. In this lecture, behaviors indicative of acute and chronic pain in dogs and cats are carefully presented and discussed. The tools/pain scales available to evaluate pain in these species will also be presented. It should be noted, that only validated pain scales should be used in practice. For a pain scale to be validated, several scientific steps are undertaken to show that the scale is actually measuring what is supposed to measure, in this case pain (and not fear or frustration, for example). Also, a validated pain scale should be reliable, meaning that different observers give similar scores between them, and that the same individual gives similar scores across time (for example, when scoring the same video of a painful animal several weeks apart).

Other methods historically used in an attempt to evaluate acute pain in dogs and cats include physiological parameters and other non-validated scales such as visual analog scale, numeral rating scale and/or simple descriptive scale. However, these are not reliable, have several limitations and can be confounded by numerous factors; their use in practice is not recommended. For example, cats and dogs can suffer from 'white coat' syndrome and may present with fear-induced analgesia. Also, they may present with increases in heart rate and blood pressure that might be related to fear and not pain.

Other methods to evaluate chronic pain in dogs and cats are used in research, but their applicability in clinical practice has not been much explored with only a few studies available. For example, evaluation of sensory sensitivity using quantitative sensory testing has provided valid and important knowledge for us to understand mechanisms of pain in animals. It is now clear that dogs and cats with chronic pain such as osteoarthritis have clinical features of central sensitization including widespread sensory sensitivity, pain facilitation and decreased pain inhibition. Accelerometer-based activity monitoring has also been used as a surrogate for pain assessment. Generally, animals with chronic pain increase activity during daytime and decrease activity during nighttime after the provision of analgesia. Force plate analysis has also been used.

Using pain assessment tools in practice

Each veterinary clinic should choose a pain assessment tool to use for acute pain in dogs and one for cats and the entire veterinary team should be trained to use such tools. The chosen tool should be valid, easy and quick to use. Posters, training manuals and/or fact sheets could be placed on the walls with visual and/or written description of pain-related behaviors and their respective scores. This approach will ensure that pain scores can be comparable amongst different observers and over time.

During acute pain assessment, dogs and cats are usually first assessed undisturbed from a distance. Then, interaction with the animal and possibly palpation of a painful area follows. Based on the observations, a pain score is given and recorded. Trends in pain score help to guide analgesic administration. If the animal is sleeping or eating, they should not be disturbed for pain assessment. A schedule of pain assessment time-points before and after surgery should be planned on a case by case basis. Pain assessment before surgery is important to help interpret the animal's behavior and pain scores postoperatively.

For chronic pain, it is also recommended that the team chooses the pain scales to be used for each species. Technicians play a very important role in this case as they can guide caregivers on how to complete such scales. They can also instruct caregivers on how to record videos of their animals in the home environment to allow for a useful assessment by veterinarians.

Videos and images of dogs and cats without pain or those with different painful conditions will be showed in this lecture. The audience will have a chance to score these videos and images through a dynamic interaction with the speaker using validated pain assessment tools.

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007

MAST CELL TUMORS IN DOGS AND CATS.

*Pachi Clemente-Vicario[1], **Antonio Giuliano**[2]*

[1]La Merced Veterinary Specislists, Oncology, Calpe, Spain, [2]Jockey Club College of Veterinary Medicine, City University of Hong Kong, Department Of Veterinary Clinical Sciences,, kowloon, Hong Kong PRC

Qualifications:

Antonio Giuliano DVM, MS, PgCert (CT), GpCert (SAM), ECVIM, MRCVS

agiulian@cityu.edu.hk

Mast cell tumor is the most common malignant skin cancer in dogs that has a very variable outcome. Several prognostic factors are used to predict its behavior but no one works well for every case, so the clinician has to combine all the information in an effort to get accurate prognosis and make treatment decisions.

Histological grade of malignancy[1] has been used as the main prognostic factors since the 80s. However, intermediate grade was controversial for some pathologist and a new classification[2] avoiding intermediate grade was proposed in 2011. Since then many reports include information from both classifications. This new classification uses cytological criteria as mitosis, multinucleation o caryomegaly, that can be identified in cytological samples. So, different studies[3,4] tried to identify the grade of malignancy on cytology with sensitivities and specificities about 90%. Cytological grade do not substitute histological grading but may serve as a preliminary approach to the case in order to know how extensive the staging should be.

The risk of metastasis increases with grade of malignancy, spreading initially to lymph nodes and later to spleen and liver. For lymph node assessment it has been proposed[5] that aggregates of mast cell tumors are suggestive of metastasis. Similar criteria are used for histological[6] assessment of lymph nodes and up to 50% of cases may have lymphatic metastasis at diagnosis[7].

Lymph nodes draining specific skin areas may not be the closer to the tumor and a sentinel lymph node approach should be used. The author uses this study[8] as an initial staging.

Distant metastasis (to spleen and liver) cannot be recognized by diagnostic imaging[9] and cytological examination is needed. Dogs with high-grade or rapidly growing tumor have a higher risk of distant metastasis and should be completely staged (as the prognosis is worse) but cases without these negative predictive values may not need complete staging[10].

Mitotic count has been identified as an independent prognostic factor[11] and tumors with 6 or higher have a worse prognosis and shorter survival times.

Most of the mast cell tumors diagnosed in the clinic are low grade[12] but high grade is more frequent in specific breeds as Shar-Peis[13] and when dogs are getting older.

Again, none of these factors (grade, mitotic count, age, breed or growth) will work in every single case and clinicians should combine all the information to make their recommendations.

Low grade tumors with low mitotic count have a good prognosis and can be treated with proportional surgery, removing the same size of normal skin from the tumor that the tumor diameter[14]. This approach has more than 80% clean margins and local recurrence of only 2%.

Low grade tumors with lymph node metastasis (but not distant metastasis) may benefit from removing the involved lymph node/s but not from adjuvant medical therapy[15].

High grade tumors, high mitotic count (6 or higher) or distant metastasis are treated medically but surgery still can benefit some patients. Medical therapy can include vinblastine (about 50% response rate), Tyrosine Kinase inhibitors (toceranib, masitinib, imatinb) or combinations, and may be combined with support medication as prednisone, antihistamine or gastro-protectant medication.

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008

HOLISTIC APPROACH TO PAIN MANAGEMENT.

Catia Mota E Sa

Centro Veterinário Drª Cátia Mota e Sá, Small Animal Practice, Porto, Portugal

Qualifications:

Cátia Mota e Sá

DVM, MSc, PhD Student, CCRP, Animal Chiropractor and Head of a Referral Service of Small Animal Pain, Rehabilitation and Palliative Care in Oporto City (Portugal) – "Animais Sem Dor".

motaesa.catia@gmail.com

Abstract: This lecture explores the holistic approach to pain management in animals, highlighting the importance of integrating strategies to address pain from a multidimensional perspective. It will be discussed the significance of understanding how pain affects the biological system and how it impairs animal's wellbeing, welfare and quality of life (QoL) in so many different ways. It will also discussed the importance of empathy in the veterinary context and explained how it can provide a better comprehensive perspective and approach to a non-verbal patient that lives with pain.

Introduction: pain is a complex phenomenon that affects animals in various ways, encompassing not only the sensorial and functional aspects but also impairing emotional, cognitive and social dimensions. Recognizing the limitations of traditional pain management approaches, holistic approach has emerged as a comprehensive and compassionate framework to address and manage pain in a non-verbal patient such as animals are. From a medical perspective pain can manifest in a multitude of ways and it is essential for veterinarians teams to be attentive to various signs and indicators. Relying solely on physical signs and objective measurements may not provide a complete understanding of an animal's pain experience. So, it requires an ability to understand the signs that go beyond the most obvious aspects of pain. By asking the owner, observing and evaluating different aspects of an animal's condition, we can gain a valuable insight into their experience. Also, by empathizing with our patients we can put ourselves in their position and gain a better understanding of how they may physically and emotionally be feeling.

Definition of Wellbeing, Welfare and QoL, the main targets of a holistic approach - *Wellbeing* focuses on the overall state of an animal's physical and emotional health. It encompasses factors such as good nutrition, appropriate housing and environment, absence of pain and distress, positive social interactions, and the ability to engage in species-typical behaviors. It also focuses on the animal's subjective experience and aims to promote positive emotions and overall contentment. *Welfare* involves the assessment of an animal's ability to cope with its environment and the absence of suffering. It involves the assessment of an animal's overall living conditions, the fulfillment of its needs, and the absence of unnecessary suffering. Animal welfare considers both the animal's physical and psychological wellbeing and encompasses concepts such as freedom from hunger, thirst, discomfort, pain, injury, fear, and distress. *Quality of Life* evaluates an animal's overall satisfaction and happiness in its life. It encompasses various aspects such as physical health, mental and emotional well-being, ability to perform species-typical behaviors, social interactions, and the absence of significant pain or suffering. QoL is a subjective measure and can vary depending on the individual animal and its specific circumstances.

The holistic approach to assess and manage pain: encompasses a wide range of interventions that address all the dimensions of pain. It involves a multimodal approach that combines a complete assessment (history, owner's questionnaires, physical and functional exam and accessory diagnostic tests) as well as a multimodal approach to pain (pharmacological, non-pharmacological and complementary therapies). Also, pain prevention and anticipation play essential role in a holistic strategy for managing pain in animals. Rather than solely focusing on reactive pain management, a holistic approach aims to proactively prevent pain whenever possible and anticipate potential sources of pain in order to minimize their impact. This comprehensive approach not only focuses on alleviating existing pain but also aims to prevent pain from occurring whenever possible. By identifying risk factors, making lifestyle modifications, engaging caregivers, and utilizing proactive pain management techniques, animals can experience improved overall welfare, wellbeing and a higher QoL. One of the main indications for a holistic approach relates to palliative care. In fact, palliative care, when integrated into a holistic perspective, focuses on providing comprehensive support to animals with serious illnesses or conditions that cannot be cured (osteoarthritis and cancer are some examples of palliative needs where pain promotes several impacts on animal's life).

Type of non-pharmacological therapies that can be provided in a holistic veterinary service: a variety of therapies can be provided to address the physical and emotional and social wellbeing and welfare of animals. These therapies aim to treat the whole animal, covering their individual needs and promoting balance and harmony. In terms of scientific evidence, it is important to note that the level of evidence varies among different therapies used in holistic veterinary care. Some therapies have stronger body of scientific research supporting their efficacy and safety, while others may have limited or preliminary evidence. Veterinarians must apply therapies according to their best knowledge and educational training. Here are some examples:

Physical therapy and rehabilitation: involves the use of laser, electrotherapy, ultrasounds, radiofrequency, hydrotherapy, thermotherapy and several therapeutic exercises, massage and stretches. It reduces pain and improves mobility, strength, and function. It can be beneficial for animals suffering from several painful conditions. There is a growing body of scientific evidence supporting its use in reducing pain, improving mobility, strength and overall function

Acupuncture: can be very effective in managing pain, promoting relaxation, restoring function and supporting overall wellbeing. It has been extensively studied in both human and veterinary medicine and there is a growing body of scientific literature supporting its effectiveness.

Chiropractic Care: it focus on the alignment and function of the musculoskeletal system. By performing manual adjustments chiropractors can help restore proper spinal alignment, relieve pain, and improve mobility. Chiropractic care in veterinary medicine is an area that is gaining attention although the evidence base is still relatively limited. Some studies suggest potential benefits in managing musculoskeletal conditions. By reducing the interferences into to the neurological system caused by nerve root entrapment and cerebrospinal fluid flow impairment caused by biomechanical dysfunction of the vertebral spine, chiropractic seems to be a promising therapy although further search in animals is needed to clarify its mechanisms of action.

Herbal Medicine: consists in using the therapeutic properties of plants to address various health conditions. Different herbs and plant-based preparations can be used to support immune function, reduce inflammation, manage pain, and improve overall organ function. It has a long history of use in traditional medicine systems, but the scientific evidence supporting specific herbal treatments in veterinary medicine is still evolving.

Nutritional Therapy: focuses on providing a balanced and species-appropriate diet to support overall health and prevent or manage specific health conditions. It may involve dietary modifications, supplementation, or personalized feeding plans. Nutritional therapy in veterinary medicine is well-supported by scientific evidence, especially in areas such as therapeutic diets for specific health conditions.

Behavior Therapy: addresses behavioral issues in animals and aims to promote positive behaviors and reduce stress. It can involve training

techniques, environmental modifications and enrichment, and behavioral modification protocols. Studies have demonstrated the positive impact of behavior modification techniques, positive training methods and environmental enrichment on behavior and wellbeing.

The role of empathy in pain management: empathy plays a crucial role in effective pain management for animals because it involves understanding and sharing the animal's emotional and physical experience, which helps veterinarians tailor treatment plans to their individual needs. Therefore it can be said that empathic care plays a crucial role in anticipating, preventing and managing pain in animals. By cultivating empathy towards our patients, we can develop a deeper understanding of their needs, behaviors and individual responses to pain. This understanding allows us to take proactive measures to anticipate and prevent pain, than solely reacting to it after it has already occurred.

Conclusion: Pain can manifest in diverse ways, and it is crucial for veterinarians to adopt a multifaceted and holistic approach to its assessment and management. By considering both objective indicators and subjective aspects veterinarians can ensure a more comprehensive and empathetic approach to pain management leading to improved patient care and wellbeing. Also, a multimodal therapeutic approach to pain has been considered the best way to properly manage pain, a multidimensional disease that affects animals in several ways. .

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009

RESPONSIBLE BREEDING GUIDELINES FOR DOGS AND CATS

Kurt De Cramer

Rant en Dal Animal Hospital, Theriogenology, Mogale City, South Africa

Qualifications:

Kurt De Cramer

BVSc MMedVet (Gyn) PhD

kdcramer@mweb.co.za

1 INTRODUCTION

The responsible breeding guideline project (RBGP) is a collaborative effort with several current WSAVA committees, with leading groups being RCC, HDC, and AWWC and focusses on dog and cat breeding. Breeding practices have engendered among the public and our veterinary profession a negative connotation with accusations of indiscriminate practices, allegations of animal abuse and general exploitation of animals for financial gain with limited concern for animal welfare. The profession recognises that there are significant benefits to owning and caring for companion animals and that this creates a demand for dogs and cats. The RBGP is therefore in full support of the practice of breeding healthy purpose-bred companion animals that meets the need of society and furthermore promotes responsible pet ownership. Poor breeding practices have profoundly detrimental effects on dog and cat welfare and on the well-being of owners (1). The consequences of poor breeding practices may lead to; continued avoidable unnecessary veterinary expenses, a lifetime of suffering brought about through poor health and or poor suitability as pets. Furthermore, it contributes to frequent humane euthanasia, an untimely death, abandonment or relinquishment of affected dogs and cats. Breeders, legislators, regulatory bodies, breeding authorities and registrars, veterinarians, and owners have an ethical responsibility to work together to ensure dogs and cats live a healthy and good life, extending into old age.

2 AIMS OF RESPONSIBLE BREEDING GROUP

Critical appraisal of breeding practices and revising restrictions placed on reproductive capacity of dogs and cats, male and female and ensuring that in this process the reproductive health, knowledge of heritability and animal welfare concerns have all been scientifically considered through broad consultation, attempting to consider the interest of all stake holders.

3 NEED TO BREED PURPOSE BRED ANIMALS

There exist a demand for dogs and cats as companion animals or working animals and the breeding of purpose bred animals is a reality and in some cases a necessity that can be defended (2). This demand for pets can be met by acquiring purpose bred or adopted animals which may be of purebred or mixed bred origins. Successful routine sterilisation policies together with anti-breeding campaigners leading to guilt tripping has led to shortage of purebred animals as pets and have led to sourcing animals from questionable sources.

4 ETHICAL OBJECTIONS TO BREEDING

The RBGG recognises that responsible breeding practices becomes expensive due to genetic testing costs, high standard routine veterinary care, constructing acceptable housing facilities, maintaining hygiene and providing adequate socialisation (3). The RBGG is not opposed to companion animal trade for financial gain provided all the aspects of animal welfare and minimum standards are met. It is acknowledged that large scale commercial breeding may be more challenging and therefore intentional or unintentional breaching of good breeding practices may be more common than in small scale hobbyist breeding. It acknowledges that there are unacceptable uses of dogs such as but not limited to breeding for meat trade or fighting purposes. the fate of animals no longer needed for breeding is also a concern. Responsible pet ownership involves a lifelong commitment to adequate care and meeting all the pet's needs.

RBGG has a firm stance that breeding standards should be challenged and changed if there is scientific evidence that they are in conflict with health and wellbeing of companion animals and advocates opposing extreme phenotypes as well as health focused breeding through participation in health improvement schemes. Health-focused breeding will require the collaborative efforts of the veterinary profession, pet owners, breeders and registering authorities to address the issue of BOAS and chondrodysplasia. Veterinarians are at the forefront of animal welfare and should be adequately trained to guide breeders of purpose bred dogs and cats.

5 RESPONSIBLE BREEDERS

Responsible breeding practices that increase genetic diversity and select for traits that help dogs and cats fill their niche in a changing world should be based on evidence to minimise welfare risk and practice responsible confinement. Furthermore the need for good data and science to improve animal welfare in breeding should be first priority (4).

6 POPULATION CONTROL

RBGP promotes safe population control of dogs and cats is advocated in all circumstances to curb problems associated with free roaming and stray populations. It acknowledges that uncontrolled breeding contributes to pet overpopulation and that lack of a regulatory liability for pet owners and breeders allows the status quo to persist (5).

Animals that end up in shelters may originate from feral, stray populations or originate from owners that abandon them. Animals at shelters may be of mixed breed or purebred heritage (6). Gonadectomy of particularly dogs of large breeds can no longer be routinely recommended because there is a growing body of evidence supporting long term non reproductive health concerns. Other means of reproduction control (sterilisation) than routine gonadectomy of young animals should be considered. Ovary sparing spay (hysterectomy) has been described (7)

7 BREEDING BANS

The RBGG is not in favour of breeding bans for all purpose purebred breeds or hybrids-animals. However, it will consider proposing breed bans on select animals where the there is sufficient and convincing evidence that burden of breed related disease is large and severe or where there is sufficient evidence that an overwhelming proportion of the breed exhibits aggressive temperaments and behaviour posing danger to humans and other animals as have been implemented in some countries (8). Most importantly, more research is required evaluating its efficacy and alternatives before definitive recommendations can be made (9, 10).

8 BREEDING LIMITATIONS AND RESTRICTIONS IMPOSED BY REGISTRARS

The welfare of all animals under human care should have the highest priority. Dog and cat breeding authorities (registering bodies or registrars) seek advice on breeding guidelines. There are currently very many organisations that have established dog and cat breeding guidelines that vary and may contradict each other. Wide consultation and knowledge of the various guidelines is advised in order to avoid erroneous advice in the RBGP proposed guideline or other possible inaccuracies.

Registrars are placing restrictions on minimum age of first breeding, latest age of first breeding, maximum age of breeding. Restrictions are placed on maximum number of litters produced over lifetime, maximum litters per time period, maximum number of caesarean sections allowed, maximum number of annual mating's permitted for male dogs, earliest age of sale of puppies and kittens (11) and inbreeding restrictions.

9 PARENTAGE TESTING (VERIFICATION)

Selection based on open health scheme data bases can only be meaningful when the information in those databases are accurate and therefore parentage verification is strongly advised. Erroneous parentage entries due to human error and fraud is common.

10 RECOMMENDATIONS

• Uncompromising commitment to dog and cat health and welfare as first priority

• Advocating local legislation enforcing all breeders to belong to registry bodies that mandate adoption of minimum standards of practice including participation in health improvement schemes

• Compliance to recommendations made by hereditary disease committee HDC

• Compliance to recommendations made by animal welfare and wellness committee AWWC

• Lobbying for change in the breed standard when there is an overwhelming body of evidence of any particular breed standard being in conflict with health

• It be made compulsory that dog and cat registrars have as members of their committee at least one person each to fill the portfolio of animal welfare representative and concerned pet owner representative

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010

ETHICS ABOUT ARTIFICAL INSEMINATION.

Natali Krekeler

The University of Melbourne, Melbourne Veterinary School, Werribee, Australia

Qualifications:

Natali Krekeler

Dr. med. vet., PhD, GCUT, DACT

krekeler@unimelb.edu.au

Artificial insemination (AI) is a widely used reproductive technology in small animal breeding programs. Its application has significantly contributed to improving genetic traits and increasing reproductive efficiency. However, the use of AI in small animal reproduction raises ethical considerations that must be carefully addressed, weighing up potential benefits and risks, to ensure individual animal welfare as well as welfare for animal populations.

Considerations to ensure individual animal wellbeing

One of the primary ethical concerns regarding AI in animal reproduction is the potential impact on individual animal wellbeing. The procedure should not cause unnecessary harm, discomfort, or distress to the animals. Appropriate training of personnel, and adherence to best practice principles during the AI process are essential, aiming to minimise any adverse effects on the animals' physical and mental health.

The invasiveness of the AI procedure itself can be potentially stressful for small animals. Therefore, the procedure should be conducted with the utmost care by trained professionals in a calm and appropriate setting. Handling practices should be gentle and appropriate for the animal's size and temperament.

In small animals, successful artificial insemination is heavily dependent on proper oestrus timing. Detecting the appropriate stage of the oestrous cycle is crucial to optimize the chances of conception. Misjudging the timing can lead to unsuccessful or unnecessary insemination attempts, causing unnecessary stress to the animal. Accurate oestrus detection methods and careful monitoring can help minimize repeated procedures and maximize the chances of successful conception.

Potential breeding animals should undergo a thorough health examination, and any underlying health conditions should be noted and assessed in light of the risk of heritability. To identify potential hereditary issues genetic screening and testing should also be performed. The health of both the parent animals and their future offspring needs to be prioritised by responsible breeders. The focus should therefore be placed on the animal's overall wellbeing, rather than just specific traits. To ensure this, breeders should adhere to ethical guidelines and best practice principles, which include only breeding animals with good health, sound temperament, and suitable physical traits. Veterinarians need to play an important role in client education in these aspects.

Considerations to ensure collective animal wellbeing

AI can exacerbate issues related to genetic diversity and inbreeding, especially in breeds with a limited gene pool as more females can be inseminated with one ejaculate compared to natural breeding. Furthermore, the animals don't have to be in the same location. Overusing a small number of highly desirable males can lead to a reduction in genetic variation, which makes the breed more susceptible to hereditary diseases and may compromise overall health. AI programs should focus on maintaining genetic diversity and use controlled outcrossing strategies to mitigate these risks.

While AI has proven beneficial in enhancing desirable traits, it is essential to consider the long-term health implications of extensive artificial selection. Propagating specific traits through intentional breeding may inadvertently lead to an increased incidence of certain heritable disorders, which may compromise the animals' overall health and welfare. Therefore, it is important to implement a responsible approach that focusses not only on short-term gains but also on long-term health of individual animals and animal populations.

The question of whether animal breeding in animals that can't breed naturally should be allowed to be facilitated by AI is complex. In some breeds, anatomical differences might prevent successful natural mating. AI allows breeders to bypass these limitations and facilitate successful reproduction. However, this perpetuates the limiting issues in the breed and should therefore be strongly discouraged. In other instances it might be permissible, e.g. in case injury prevents a valuable stud dog from breeding naturally but semen collection can be done humanely.

Considerations around different AI techniques

In the context of ethical considerations of AI, it is important to consider the type of AI method used. The most common methods in small animal practice are vaginal, surgical and transcervical AI. The latter may or may not be endoscope assisted. While the above mentioned aspects are valid for all three techniques, some aspects are unique to the specfic technique employed. Especially the practice of surgical AI is currently undergoing increasing scrutiny. A survey of 83 predominantly European small animal practitioners on the ethics of breeding dogs revealed that the majority of veterinarians view artificial insemination of bitches in general as ethical (79.2%), but specifically oppose surgical artificial insemination (SAI) (62.7%)[1].The invasive nature of surgical deposition of semen into the uetrus, which requires general anaesthesia and laparotomy with all its risks, is one of the strongest arguments against its use. While anmals can usually resume normal activities immediately post-AI, the recovery time after surgical insemination is prolonged and is associated with pain and a risk for post-surgical complications. Many proponents of surgical AI argue with an improved pregnancy rate and or larger litter size. However, TCI has been shown to give comparable results to surgical AI [2]. A ban of surgical AI is being discussed in several countries or has already been implemented, eg. in the United Kingdom[3]. It is argued that a ban of SAI removes the autonomy of breeders and veterinarians. Conversely, a ban removes an unnecessary invasive procedure requiring anaesthetics and surgery, while alternative non-invasive methods exist.

Issues around Consent and Autonomy in Artificial Insemination of Small Animals

The issues around consent and autonomy in artificial insemination of small animals is complex. Small animals, typically living as pets in close proximity to humans, have been domesticated for millennia, which led to significant changes in their natural behavior and reproductive patterns. The concept of consent does not directly apply to small animals. However, ethical considerations surrounding autonomy and wellbeing in the context of artificial insemination in small animals need to be taken into account.

Companion animals do not possess the cognitive capacity to provide informed consent for artificial insemination. Instead, humans largely dictate their reproductive choices. Breeders and veterinarians need to work together determining whether and when artificial insemination is to be pursued. Ethical concerns arise when the interests of humans (such as breeding for profit or for specific traits that maybe detrimental to animal health) take precedence over the wellbeing of the animals involved.

In conclusion, while the use of AI contributes significantly to genetic improvement, there is the need to consider ethics, animal welfare, genetic diversity, and the long-term health of the populations involved to strike a balance between technological advancement and compassionate treatment of animals.

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011

SURGICAL TIPS FOR SKIN TUMORS

Nick Bacon[1], *Jolle Kirpensteijn*[2]

[1]*AURA Veterinary, Surgical Oncology, Guildford, United Kingdom,* [2]*Hill's Pet Nutrition, Cvo, Topeka, United States of America*

Qualifications:

Nicholas James Bacon

MA VetMB CertVR CertSAS DipECVS DACVS FRCVS

nickb@auravet.com

Skin Defects:

Location and size of the future skin defect are of utmost importance when planning reconstructive surgery. The skin is very mobile, and many wounds can be closed without the need for specific mobilization techniques. The trunk, cervical region, and upper extremities offer extensive mobility, whereas around the eyes, ears, anogenital region and distal extremities is more limited.

Specific **"tension lines"** have been described for small animal patients and can help in planning cutaneous surgeries. Tension lines result from gravitational and muscular forces and have a substantial effect on how cutaneous defects are repaired. Incisions made perpendicular to tension lines tend to pull apart, creating tension on the closure and lead to the formation of a wide scar. Ideally, incisions are made parallel to the tension lines to minimize the spreading of wound edges, allowing easier surgical closure, and more cosmetic healing.

Tissue Handling Considerations:

Following basic tissue handling principles when performing cutaneous surgery is important. Careful handling of the skin with surgical instruments during cutaneous repair contributes to greater patient comfort, less self-mutilation, improved wound healing and improved cosmesis. Key points to consider include:

Make a definitive, smooth, single incision when incising skin.

Make incisions perpendicular to the skin surface.

Avoid the use of scissors when incising skin.

Remove devitalized, poorly vascularized, or questionable skin prior to closure.

Minimize handling of skin edges.

Use appropriate instruments when handling skin. (ie. Addson Brown forceps, skin hooks)

Local Skin Mobilization-

Dissection under each skin edge allows the skin to be stretched over the defect. The key to successful undermining is preservation of the cutaneous blood supply (hence the importance to dissect under the panniculus muscle). Many defects can be closed with undermining and the use of appropriate tension-relieving suture patterns alone.

Relaxing Incisions: Multiple parallel stab incisions or individual long relaxing incisions made parallel to the defects' skin edges to relieve tension at the suture line. Relaxing incisions are allowed to heal by ^{2}nd intention. A single long relaxing incision generally provides maximum tension relief as compared to multiple small incisions.

A specific suture "pattern", termed **walking sutures** can be used to distribute tension sutures over a wide surface area when closing large defects. The 3 main functions of walking sutures are:

Provide additional wound/defect coverage.

Decrease tension at the wound edge.

Decrease dead space.

Potential disadvantages associated with the use of walking sutures, however, include disruption of the local blood supply, altered cosmesis in the form of dimples and the trapping of fluid and creation of multiple seromas and abscesses.

Classification of Skin Flaps

Classification by blood supply:

Vascularized skin flaps:

Subdermal plexus flap (random pedicle flap)- a flap that depends upon terminal branches of direct cutaneous arteries in the subcutaneous tissue and panniculus muscle.

Local flaps are commonly used in small animal practice for several reasons. They are technically easy to perform and (in some cases) there is no secondary wound that has to be addressed.

Single Pedicle Advancement Flap

Bipedicle Advancement Flap

Transposition and Rotating Flaps

Axial pattern flap- a flap that is supplied by a named direct cutaneous artery and vein

Subtypes of axial pattern flaps-

Non-vascularized skin grafts

Subtypes

Full thickness

Meshed v non-meshed skin grafts

Classification by composition

Cutaneous flaps- flaps that are composed of skin only

Composite flaps- flaps that are composed of combinations of tissue types may be used in complex reconstructive procedures for defects that involve more that just skin

Myocutaneous flaps are composed of muscle and skin

Osteomyocutaneous flaps are composed of bone, muscle and skin

Classification by location

Local flaps are based on tissue that is adjacent to the defect

Subtypes:

Advancement flaps- subdermal plexus flaps that are elevated and pulled directly over a defect

Rotational flaps- subdermal plexus flaps that involve rotation of a piece of skin that is continuous with one portion of the defect.

Distant flaps are subdermal plexus flaps that are based on tissue that is obtained from a site that is not continuous with the recipient be. This tissue can be tubed and slowly advanced to a distant site. They are rarely used today, due to development of axial pattern flaps and free skin grafts.

Axial Pattern Flaps

Axial pattern flaps have several advantages for use in wound closure. Due to their robust blood supply through a large vascular pedicle, axial pattern

flaps can be much longer than subdermal plexus flaps and still maintain viability. This direct blood supply makes axial pattern flaps preferable for tumor resection sites that may require radiation therapy, which would cause rapid necrosis of a non-vascularized skin graft. Since they are full thickness flaps, axial pattern flaps maintain hair growth and cosmesis and provide relatively durable skin covering. One of the greatest advantages of axial pattern flaps is that they allow instant, complete closure of large defects without the laborious bandage changes required for free skin grafts.

The primary disadvantage of axial pattern flaps is that they do not reach the distal extremities in dogs or cats. Another disadvantage of axial pattern flaps is the large donor site incision which increases surgical time and patient morbidity.

Axial pattern flaps are harvested using described anatomic landmarks and the flaps are named for their nutrient artery and vein. It is important to elevate the flap deep to the subcutis and panniculus muscle to preserve blood supply. Trans-illumination of the flap can be helpful in locating the vascular pedicle. The flap may be elevated and rotated up to 180 degrees to cover the adjacent skin defect if the cutaneous pedicle is divided, leaving only the vascular pedicle attachment (an island flap). Flaps that are not directly adjacent to the recipient site may be tubed (sutured upon themselves) or a bridging incision may be made to connect the donor and recipient sites. Flaps are typically sutured only at the periphery, avoiding placing many sutures to tack down the flap to the underlying tissue due to fear of compromising blood supply to the flap. A closed suction drain might be placed to remove fluid and eliminate dead space.

The two most commonly utilized axial pattern flaps in clinical practice are the thoracodorsal flap and the caudal superficial epigastric flap. Flap viability is often difficult to assess in the postoperative period, as discoloration does not necessarily equate with ischemia and close attention should be paid to subtle changes.

Skin Grafts

Skin grafting is a long utilized technique to provide epithelial coverage to skin defects. In veterinary surgery the term skin graft typically refers to non-vascularized autogenous (from the same animal) tissue. Skin grafts in veterinary medicine are almost always full-thickness. Full thickness grafts are harvested by simply removing a piece of skin from the trunk using a standard scalpel. The subcutaneous tissue is scraped off the deep surface of the graft using scissors so that the dermis will be in direct contact with the wound bed. Full thickness grafts have improved cosmesis and durability, with a potential for hair regrowth and may be performed without specialized equipment. The graft is meshed before application, increasing the area covered by up to 3 times the original size of the graft. The graft is sutured down to the wound bed with simple interrupted sutures at the periphery and throughout the centre of the graft to prevent movement of the graft during healing. The wound is bandaged and the initial bandage is not changed for 3 days after surgery to avoid disruption of the tenuous blood supply to the graft. The recipient site is immobilized for 10-14 days.

Skin grafts become vascularized though a 4 step process:

Adherence: initial fibrin seal followed by fibroblast ingrowth

Plasmatic imbibition: blood vessels in the graft dilate and take up serum-like fluid in the wound bed by capillary action, absorbing nutrients to sustain the graft.

Inosculation: anastomosis of the graft vessels with vessels in the wound bed

Penetration and ingrowth of new vessels: vessels from the wound bed enter the graft tissue

Based on this description, it is clear that application of a non-vascularized skin graft is a race in which the wound bed must establish a delicate blood supply to the graft before necrosis occurs. Because of the requirement for vascular supply from the wound bed, only certain types of tissue are appropriate for application of skin grafts. The ideal wound bed is clean, uninfected and well vascularized such as granulation tissue or muscle. Skin grafts should ideally not be applied over exposed bone, tendon, infected areas, fat, chronic ulcers, or in areas where radiation therapy is planned.

The most commonly used skin graft technique for wounds of the distal extremity is a full thickness, meshed skin graft. Because tendons or bone are often exposed in distal limb wounds, it is necessary to apply wet to dry bandages until a granulation tissue bed is established to nourish the graft.

012

DISCOVERING THE PAIN EXPERT INSIDE YOU

Mike Petty

Arbor Pointe Veterinary Hospital, N/a, Canton, United States of America

Qualifications:

Michael C Petty, DVM

Certified Medical Acupuncture for Veterinarians

Certified Canine Rehabilitation Therapist

Certified Veterinary Pain Practitioner

paindocmike@gmail.com

The team approach.

A team with well-defined roles AND empowerment is essential for the success of any veterinary practice. This is especially true when you are dealing with issues of pain.

My team (listed in order of importance)

The caregiver/owner

The receptionist

The technician/nurse

The animal

The veterinarian

Each member of the team is like the piece of a jigsaw puzzle, the picture is never complete unless everyone participates

The receptionistIt starts with a phone call. What are the people saying?

My cat isn't using the litter box

My pet won't use the stairs unless I help her

My dog won't jump onto (the car, the couch, etc

Sometimes it takes a little detective work

I can't come in for the vaccine until after 3 pm because I need help to lift my dog in the car

All of these conversations are clues that maybe something is wrong beyond the what the client thinks it is: A bladder infection, fear of heights, old and lazy, etc.

The LVT/Nurse

Must listen or read any notes made by the receptionist.

Takes a careful history, including asking questions like

Have you noticed any changes in your dogs play compared to a few years ago?

Does your cat still like to jump on the windowsill to look out, and does she hesitate or use a chair as a step to get up or down?

If any of these are true, then a pain questionnaire should be administered

The caregiver

Engage with the caregiver and explain how changes in behavior are often signs of pain

Find a quick and simple questionnaire…If it is too long or complicated, then the owner simply may not do it and it is an opportunity lost.

I like the pain surveys by Zoetis for this reason

The Animal

In the case of the cat, let it walk around the room as you talk to the owner

Does it move with the grace and fluidity that cats do?

Will it jump up and down on chairs and furniture

Dogs should be observed walking into the exam room or outside the exam in a hall or if that is busy even out doors.

The Veterinarian

Least important person as she/he must depend on everyone else's role

Most important person IF she/he is able to pull all of the pieces of the puzzle together.

Don't be afraid to ask for owner to make videos of the dog or cat in their home environment…many animals will try to hide the pain they are in.

Always ask what they hope to accomplish, in other words the outcome measure

Some people may want their dog to achieve unreasonable athletic tasks. Others may just want their dog to be able to use the steps to get outside without assistance.

Don't forget to look for neurological issues that may mimic pain conditions, for example diabetic neuropathy.

Remember that acute aggravation of a chronic issue can make a chronic issue appear like it just happened. We call this acute on chronic pain.

Therapeutic considerations for chronic OA

Pharmaceuticals: some of these may or may not be available in every country

Anti-NGF/frunevetmab is quickly becoming the gold standard of OA treatment in cats, as is bedinvetmab for dogs

Polysulfated glycosaminoglycan

Gabapentin when there is a neuropathic component

Physical modalities

Laser/photobiomodulation therapy

Rehabilitation therapy

Weight loss

Advanced treatments within the reach of most practitioners

Platelet-rich plasma injections

Stem cell therapy

Synovetin OA

When things don't go as expected: Did you take radiographs for the diagnosis?

Consider a recheck radiograph as something else might be going on. I have had early onset osteosarcoma not show up on a radiograph yet it was there one month later

Remember that OA is a progressive disease…as time goes on treatments often have to be added

Can the owner afford the medications prescribed?

Is the owner able to administer medications or other physical treatments.

013

HOW TO CREATE A CAT FRIENDLY VETERINARY ENVIRONMENT

Sam Taylor

International Society of Feline Medicine, Isfm, Wiltshire, United Kingdom

Qualifications:

Dr Samantha Taylor

BVetMed(Hons) CertSAM DipECVIM-CA MANZCVS FRCVS

sam.taylor@icatcare,org

The Cat Friendly Clinic scheme is now 10 years old and in 2022 new guidelines were published. See: https://journals.sagepub.com/page/jfm/collections/guidelines/index for Cat Friendly Environment and Cat Friendly Interactions Guidelines (veterinary clinic). The scheme was started to improve the experience of cats in the veterinary clinic and has moved on with now evidence based advice on both interactions with cats, and the clinic environment. The 'Cat Friendly Principles' are the foundation of running a clinic that has cats in mind! See https://journals.sagepub.com/doi/10.1177/1098612X221128750?icid=int.sj-full-text.citing-articles.6.

By promoting positive and minimising negative experiences in the veterinary clinic, we can enhance feline wellbeing, improve staff safety, and positively engage caregivers. Each area of the clinic, and the home and transport environment prior to the visit, can be considered with the cat in mind, and hence both the cat's physical health and mental wellbeing optimised.

The AAFP/ISFM Feline Environmental Needs Guidelines' five pillars describe the essential needs for cats in any environment:

Pillar 1: Providing a safe place for cats to hide increases their coping ability. Safe spaces should be provided in all areas of the clinic, including waiting areas, examination rooms, and hospitalisation and boarding areas. The goal is to increase the sensation of safety for the cat, and safe spaces can also function as resting areas. When providing hiding and resting areas, also consider vertical space. This can enable the clinic to increase the overall size and complexity of the environment and increase the cat's ability to perform normal behaviours of jumping, climbing, and monitoring their environment from above.

Pillar 2: Cats housed in the veterinary clinic, especially for more than a short period, need all their essential needs met; food, water, resting areas, perches, scratching areas, litter box/trays, and play opportunities (if appropriate) should be provided. Resources should be appropriately distributed within the available space and the cat's preference to use resources separately respected.

Pillar 3: Object play and predatory behaviour are very important for cats and can be triggered by a positive emotional state. Cues for these behaviors such as toys, food and treats can therefore increase positive emotional bias during examination, diagnostic tests, and hospitalisation. This is particularly important for cats boarding or hospitalised for more than a short period.

Pillar 4: The AAFP/ISFM Cat Friendly Interactions Guidelines address positive, consistent, and predictable human-cat interactions. https://journals.sagepub.com/doi/10.1177/1098612X221128760?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200pubmed.

Pillar 5. The veterinary environment should respect the feline senses including smell, sight and sound, as information gathered during the clinic experience can influence a cat's emotional health.

Stressor stacking: this will be discussed during the lecture - but consider each stress adding up to the cat's behaviour when you, the veterinary professional, go to examine the cat. All negative experiences (carrier at home, the car, the waiting room, consulting room) are additive, meaning the cat we see in clinic is then challenging to handle. If we work to prevent each stress - the cumulative experience can even be positive! A full discussion of feline emotions can be found in the guidelines. Think cat - how does this cat 'feel' that will explain the behaviour we see. There is no such thing as an 'evil', 'spicy', 'nasty' cat - they are frightened and showing behaviour that reflects that! Labelling with these terms is unhelpful. We need to focus on what works, what doesn't and early use of anxiolysis and sedation is reasonable in situations where the cat's protective emotions mean handling causes significant stress - and risk of human injury.

Preparation for a visit to the veterinary clinic

Preparation to reduce stress prior to the visit is important and includes selection of the correct carrier, judicious use of anxiolytics and appropriate transportation. Reception staff play a vital role in obtaining history of the cat's prior experiences and behaviour in the clinic, and advising clients on cat friendly approaches.

Further information about preparation and transport to the clinic for caregivers can be found here: https://journals.sagepub.com/doi/suppl/10.1177/1098612X221128763/suppl_file/sj-pdf-5-jfm-10.1177_1098612X221128763.pdf

Areas of the clinic

Each area of the clinic should be considered from a cat's point of view in terms of their potential to cause stress. This includes:

The waiting room/area

Ideally waiting rooms are separated by species. Also consider the area in front of the reception as caregivers may be tempted to place the carrier on the floor in front of dogs whilst registering or paying.

Mixed species waiting rooms

If segregation is not possible, and multi-species entry/exit points and waiting areas are unavoidable, consider:

Organising cat-specific clinic times, where only feline patients are seen during certain periods, ideally when the clinic is quieter, and the waiting room will not be busy.

If cats need to be seen urgently, inform the veterinary team so the cat can be brought straight into the examination room, or straight through to other clinic areas.

When scheduling or confirming the appointment, and if weather conditions are appropriate, offer caregivers the option to wait in their car with their cat, with the plan to call them in individually when the team is ready to see them. Following the appointment, consider having cats remain in the examination room or (returning cats to cars, prior to paying/re-booking),

Pro-actively offering to reschedule appointments if there are excessive disturbances in the clinic that day (for example, a very loud, distraught dog)

Directing caregivers to an empty examination room in which to wait.

Using clear species-specific signage to direct caregivers to the appropriate area and reinforce this with direction form the reception team. These invite caregivers to give each other space at entry/exit points, or the reception desk.

Arranging furniture and barriers to prevent contact (including visual contact) between all patients which can in some circumstances also serve as information board and ensuring the reception team guides the caregiver to the appropriate section with explanation.

Be creative with unused space as a cats-only waiting area. For example, a blind-ended or long, quiet hallway may be able to support a chair and table for cats-only waiting

Ensure the waiting room is quiet and calm, avoiding loud ringing telephones, dogs barking or loud talking. Cat carriers should be elevated and covered with a blanket/towel. Reception teams should be trained and viewed as part of the Cat Friendly Clinic team advocating for cats in the waiting area.

Consulting room

Ideally rooms are reserved to be cat only – or cat only for proportions of the appointments and cleaned between patients. Movement should be minimised by keeping equipment in the room eg a caddy of lab sampling equipment.

Equipment for the cat friendly consulting room

Two towels/blankets per appointment

Feline pheromones in diffuser format and/or spray for towels/blankets

A high-sided cat bed, basket or other vessel to examine cat in (as carrier style may not facilitate examination)

Towel/blanket warmer or drawer designated for heated grain bags and towels /blankets

Nonslip mats for examination surfaces and scales

A variety of treats, including liquid, soft, and hard treats

Paediatric or small pet scales

Appropriate nail trimmers for cats

Quiet clippers

Stethoscope (appropriate small diaphragm/bell size for cats)

Thermometer and lubricant

Ear kit: otoscope, appropriately sized ear cones, saline, cotton tip swabs, gauze, microscope slides and mineral oil. Note scented ear cleaners should be avoided as the smell can be offensive and may cause pharyngeal irritation.

Eye kit: ophthalmoscope, 30 diopter lens, fluorescein stain, sterile eye saline, blue or UV light, Schirmer tear test strips, tonometer, topical anaesthetic for eyes, mydriatic drops

Dermatology kit: microscope slides, scalpel blades or sterile spatulas, adhesive tape, mineral oil, UV light, toothbrushes for fungal assays and collection tubes (Figure 14a)

Lab caddy: sample collection materials, including small gauge needles, syringes, collection systems and butterfly catheters (e.g., 25 gauge), EMLA cream or lidocaine gel plus occlusive dressing, bandaging material, syringes, needles for cystocentesis, appropriate collection tubes (serum, plasma, faeces, urine etc).

Dilute chlorhexidine solution or suitable equivalent for venipuncture and IV catheterisation instead of rubbing alcohol to avoid strong offensive odours

Doppler or high definition oscillometry to measure blood pressure

Necessary vaccines and associated syringes and needles or fridge containing all vaccine options

Pheromones can be used in the consulting room and sprayed on towels to cover the consulting table.

Cats should be examined where they are comfortable, windowsill, floor or caregiver's lap! Often the base of the carrier works well - hence advice to caregivers to use carriers that facilitate this.

Cat ward

Ideally hospitalisation wards are cat only. If not possible, try and avoid contact with noisy dogs and schedule procedures such that species are separated. Cats can be hospitalised in collapsible cages in other areas if needed (cover half of the cage). Noise in the ward should be kept to a minimum. Cages should be furnished with beds to facilitate hiding for each cat as this reduces stress. Multiple examples will be shown in the talk. The provision for a place to hide for cats being hospitalised is important and has been well established. Options of different types of beds that can be easily cleaned, stacked and stored should be stocked. A selection of litter trays (low sided, larger) should be available and litter that is familiar to the cat. Shallow ceramic feeding bowls are generally preferred.

Other clinic areas

Preparation rooms are a noisy and busy area and should be considered from a cat's point of view. Stress perioperatively can result in negative outcomes in human patients and the same is likely true in cats – higher requirements for anaesthesia, increased and sometimes chronic pain. Hence induction of anaesthesia may be better in another, quieter area.

Imaging suites and ICUs are also not exempt from becoming cat friendly! Think about a cat's sights, smells and what they hear.

Useful cat friendly equipment

When looking for cat friendly equipment there are a few key things to take into consideration. Most of this equipment is novel to cats and hence will likely be met with mistrust, so any equipment that needs to be used on a regular basis (e.g. blood pressure monitoring equipment) should be introduced slowly prior to a time that its use becomes essential. Secondly, take into consideration the noise, smell, and sensation the equipment may create when used, and do what you can to minimise these sensations. Finally, consider the emotion(s) that use of the equipment may create. The aim is to create an experience that is neutral or even positive for the cat, prioritising their security and comfort.

Equipment to consider:

Needle gauges: where possible use small needle gauges to reduce pain (23-25G) on injection and blood sampling.

Clippers: consider the noise and choose quieter clippers as these are better tolerated.

Topical local anaesthetic cream: Have EMLA cream or lidocaine gel and occlusive dressings available for application prior to blood sampling and IV catheter placement.

Blood pressure machines: use headphones to minimise noise, it remains unclear of oscillometric or Doppler machines are preferable for conscious cats.

Weighing scales: small, portable baby or cat scales should be available and topped with a blanket to ensure comfort. Scales with slightly elevated sides are often preferred and examination can even be done in the same location. Consider spraying blankets with pheromone sprays 30 minutes before use.

Fluid pumps and syringe drivers: cats are at risk of volume overload if fluid therapy is not monitored and controlled.

Feline pheromones: provision of synthetic feline pheromones to cats in the clinic is likely to have a beneficial effect. Plug ins and sprays can be

used in different areas in the clinic.

Soft Elizabethan collars: preferred over hard collars in almost all situations but also focus on reduction of post-surgical pain to avoid interference and reduce need for collars (or vests etc).

Ultrasound: point of care ultrasound is so useful for cats to allow them to be handled minimally, particularly if dyspnoeic. Also useful for ultrasound guided cystocentesis.

The use of clips for clipnosis, cat bags, gauntlets, muzzles, anaesthetic induction boxes, air muzzles and other types of equipment for heavy restraint is not recommended as likely to be detrimental to the cat's experience causing worsening pain, protective emotions and risk of staff injury. Cat friendly interactions including the use of sedation/anxiolysis is preferred. See 2022 Cat Friendly Interaction Guidelines for further information on handling.

During the talk the clinic journey will be discussed and illustrated to ensure it is cat friendly!

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MYCOBACTERIAL INFECTIONS IN THE AQUARIUM

Esteban Soto Martinez

University of California - Davis, School of Veterinary Medicine, Medicine And Epidemiology, Davis, California, United States of America

Qualifications:

Esteban Soto

MSc, DVM, PhD, Dipl. ACVM (Bacteriology/Mycology and Immunology), CertAqV

Professor of Aquatic Animal Health

sotomartinez@ucdavis.edu

Ornamental aquarium fish are the most common companion animal in America with over 139 million fish kept in over 11 million households in 2023. Despite this, there is minimal veterinary oversight for pet/ornamental fish, and large numbers of ornamental fish die due to poor husbandry and disease. *Mycobacterium* spp. are potentially zoonotic bacterial pathogens associated with disease in both aquatic and terrestrial animals. In poikilotherms, including fish, *M. marinum*, *M. fortuitum* and *M. chelonae* are the most common etiologic agents of mycobacteriosis; however, novels species have been described in the last decade, and some species seem particularly prevalent in some environments. Mycobacteriosis has been reported in a broad range of fresh, marine and brackish water fish and numerous reports have highlighted outbreaks resulting in considerable losses in ornamental fish. Currently there are no vaccines or efficacious treatments for use in aquarium fish, and depopulation of pet fish is often recommended. Lack of fish host specificity poses an additional risk for mixed species aquaria, as well as wild fish in the event the pathogen is released into natural habitats. These factors illustrate that development of effective prophylactic and effective disinfection and treatment protocols are urgently needed. The objectives of this presentation are: 1) to outline the clinical signs, gross changes and histopathological features of mycobacteriosis in fish, 2) to outline the main etiological agents of piscine mycobacteriosis, 3) to outline the diagnostic methods for piscine mycobacteriosis, 4) to outline the therapeutic, prophylactic and disinfection protocols for piscine mycobacteriosis, and 5) to discuss the zoonotic potential of *Mycobacterium* spp.

015

CAT FRIENDLY INTERACTIONS – PRACTICAL TIPS FOR WORKING WITH CATS

Nathalie Dowgray

International Cat Care, International Society Of Feline Medicine (isfm), Salisbury, United Kingdom

Qualifications:

Nathalie Dowgray

BVSc, MRCVS, MANZCVS, PGDip, PhD

Nathalie.Dowgray@icatcare.org

Cats can be challenging to manage in a busy veterinary clinic. This lecture will introduce what cat friendly is according to ISFM's Cat Friendly Principles, discuss understanding a cats needs, the importance of taking a cat centric approach when working with cats and most importantly

In 2022 ISFM published ISFM's Cat Friendly Principles for veterinary professionals (1). These principles were initially developed to articulate the work of International Cat Care (iCatCare), the parent charity of the International Society of Feline Medicine (ISFM) and provide context and definition to what is meant by being 'cat friendly'. The principles and their definitions are presented in Figure 1. ISFM's Cat Friendly Principles for veterinary professionals contextualised these principles specifically for application in the veterinary profession. In addition to this document ISFM collaborated with the American Association of Feline Practitioners to publish two new sets of guidelines, 2022 AAFP/ISFM Cat Friendly Veterinary Interaction Guidelines: Approach and handling techniques (2) which will form the basis of this lecture and 2022 ISFM/AAFP Cat Friendly Veterinary Environment Guidelines (3) which will form the basis of a companion lecture from Dr Sam Taylor in this Symposium. All three documents are free to view, see the link at the end of these proceedings.

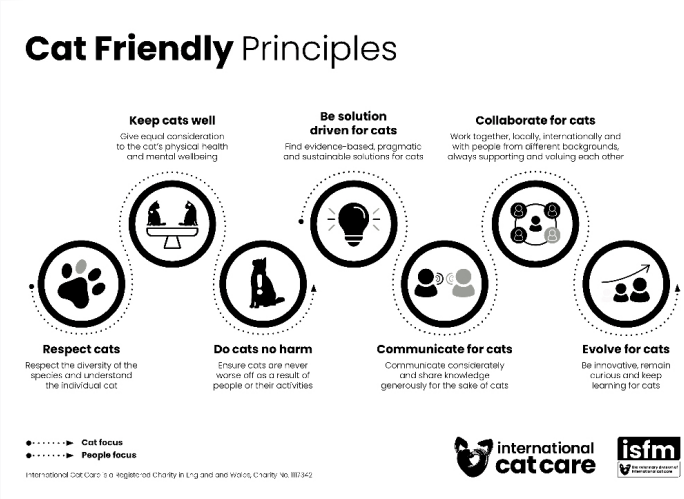

Figure 1: Cat Friendly Principles

To put cat friendly into action we need to have an understanding of cats needs, this includes understand the species-specific behavioural biology of the cat. Cats are socially diverse as a species but fixed as individuals, this includes sociality to people, other cats and other pets such as dogs. They are solitary for survival and do not need to live with other cats, they are obligate carnivore and hence have specific dietary needs but also have an innate drive to hunt. They maintain a core territory but with outside access will also have a wider range. They are highly sensorial with specialism in chemical communication, so see, hear, and scent the environment in a different way to us and most importantly cats are cognitive and emotionally complex.

Cats are learning from their experiences all the time and that learning is influenced by the emotional state they are in. This is why it is very important for us as veterinary professionals to always be working with cats in a way that respects them to ensure we are keeping them well and not inadvertently causing harm though our interactions and management protocols.

The term interaction is being used by ISFM now instead of handling, and this is to recognise that we don't always need to be physically handling cats throughout their examination and assessment in the veterinary clinic. We can gain a lot of information through visual observations before any physical interaction is required. Below summaries the steps advised when interacting with a cat in the veterinary clinic.

Always be working in the room where is safe for the cat to be so the cat has the opportunity to explore the room but also so the veterinary staff do not have to physically restrain the cat at all times.

Be prepared. Review the cats history to understand previous experiences at the veterinary clinic but also have all the equipment available in the room that you are likely to need so you don't have to keep leaving and re-entering the space. Where possible also have additional staff required in the room from the start of the appointment.

Allow the cat time to settle and choose to come out of the carrier before any form of interaction, let them explore or hide depending on what they choose to do.

While the cat is settling take a history with their caregiver, both of you should be talking softly and avoiding any sudden or erratic movements so as not to startle the cat.

At first interaction come down to the same level as the cat, avoid leaning over and cornering and avoid making eye contact (if you do give a slow blink and look away). Extend a soft hand for the cat to sniff. If they engage with you then you can stroke softly around the facial glands. See the following link for further tips on interacting with cats https://youtu.be/UwqG2wLb0KQ

If the cat chooses not to come out of the carrier then try passively offering treats to encourage them to come out. If that is not successful, then remove the top half of the carrier and cover them lightly with a towel or blanket. If required open the top of the carrier and scope the cat out in a towel or blanket and keep them covered with this on the table to give a sense of hiding. If the cat is in a carrier that only has a side opening slide them out on bedding and again cover with a towel or blanket.

When examining a cat always try and work where the cat is comfortable, be this in the bottom of a carrier, under a towel or blanket, on their caregivers knee or on the floor. If you are able to take short breaks to allow the cat time to relax during the examination that can be useful. Always try to leave part of the examination that the cat may find painful or more invasive to the end of the examination e.g. blood sampling. Though you may need to consider how much an individual cat will tolerate and prioritise essential part of your examinations over less essential parts e.g. weighing, blood pressure assessment and blood sampling over an orthopaedic examination in an older cat.

When considering how a cat may need to be held or restrained for a procedure always try the least intense option first.

Hands free > Minimal restraint > Loose towel > Tighter towel > Towel wrap > Purrito

Use of anxiolytics and / or sedation should be considered in all cases where cats show protective behaviours as a result of fear-anxiety. The goal with interacting with cats in the vet clinic should be to give them as positive an experience as you can to ensure they learn that the clinic is not

a place to be fearful of. When working with cats who have already learnt to be fearful of the clinic due to previous experiences the goal should be to use a combination of Cat Friendly Interactions alongside a Cat Friendly environment and appropriate medications to enable them to relearn that the clinic is not always a bad experience.

Links to the JFMs Cat Friendly Special issue and supporting Cat Friendly Clinic guides can be found on the following page, further details referencing points raised in this document are contained in these papers including drug does for anxiolytics and sedation protocols.

https://icatcare.org/cat-friendly-guidelines/

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016

CORRECT SAMPLING AND TESTING IN FISH MEDICINE

Eva Lewisch

University of Veterinary Medicine, Clinical Division Of Fish Health, Vienna, Austria

Qualifications:

Eva Lewisch

DVM, Dipl. ECAAH, PD, National Certified Fish Medicine Specialist

eva.lewisch@vetmeduni.ac.at

CORRECT SAMPLING AND TESTING IN FISH MEDICINE

Ornamental fish trade is a thriving market, with an estimated number of over 1 billion individual fish traded internationally each year[1]. More than 2500 fish species are part of this market[2]. While scientific information on pathogens and diseases affecting these species has markedly increased during the last decade, veterinary perception of this patient group is still limited. Partly, this may be owed to special requirements when examining, sampling and treating aquatic specimens. On the other hand, specialized fish-diagnostic labs are evolving, offering high quality analyses of material originating from aquatic animals. Nevertheless, the reliability of any lab result is based on the quality of the submitted sample. This text will give an overview over the most important considerations when sampling freshwater teleost fish patients.

General considerations

Before starting any sampling, the aim of the examination has to be determined. Is it about an individual sick fish, an entire affected stock? Should the examination target a specific pathogen or should a disease-free status be demonstrated? Are the targeted specimens alive, moribund, deceased, euthanized? The answer of these questions will determine the number of specimens to sample, the choice of organ(s) and the option to pool samples. In any case, these choices shall guarantee the maximum reliability of the results and may require including statistical methods. When dealing with notifiable diseases as laid down by the competent authority, special requirement for sampling and testing may apply.

The next step before starting the sampling is to consider potential storage and transportation of the sample. In most cases, it is advisable to contact the diagnostic laboratory to obtain the specific information.

Samples for parasitological examinations

In live fish, any external site or organ may be sampled, as well as the most caudal part of the intestine, body fluids, feces, cysts, bumps and lumps etc. Depending on parasite species and site, pipettes, cover slips, swabs, forceps or other suitable instruments can be used to collect them. For many protozoan and protist parasites, microscopic slides are prepared with a drop of water from the fish tank. It is crucial to examine these samples immediately after collection. Otherwise, many fish-relevant parasite species may be hard or impossible to find, since they lose their ability to move, burst, or the slide dries out. For short-time storage of skin-, gill- or other wet mounts, a simple wet chamber can be used. If parasites shall be stored for molecular genetic identification, they can be stored in 70% ethanol. For morphological studies of metazoans, sterile water and glycerine (1:1) are used. Such samples can be longtime stored at -20° C.

Samples for hematology and biochemistry

Blood can be drawn from fish of less than 100 g, but the volume taken should be < 0.5- 1% of the total body mass[3]. If any, skin preparation is achieved by flushing with 0.9% NaCl. Fish should be fasted for 24 h and sedated for the procedure. Vacutainer® tubes with different anticoagulants and preservatives may be used like in terrestrial animals. The site of venipuncture is chosen according to fish size, species and specific needs. Needles may be heparinized, but this may cause a dilution-effect, which has to be considered when interpreting results. As an anti-coagulant, most researchers prefer Lithium-Heparin to Di-Sodium EDTA, which may cause hemolysis in some species[4]. To further avoid hemolysis, fish-blood should be handled very gently, transferred to the tubes without a needle, centrifuged only after completed clotting and the serum immediately removed, not get in contact with water/wet materials and whole blood must not be frozen. Blood-smears and determination of PCV can be performed according to terrestrial animals, but for white blood counts a counting chamber is needed, owed to the nucleated erythrocytes. Automated blood counts (flow cytometry) may be available in specializes laboratories, but whole blood can not be shipped for counts. If required, samples can be stored in 10% neutral buffered formalin at 1:5 at room temperature[5]. For the acquisition of serum, blood should clot at room temperature for 5 minutes, be refrigerated for 1-2 h, centrifuged and the serum subsequently removed. Biochemical analyses can be performed with serum or plasma. In any case, rapid separation from cellular components is crucial. Machines need to be able to work with small volumes. When in-house analysis is performed, the machine must be loaded without delay. In case of delays, plasma or serum, respectively, have to be separated and may be frozen until used. When unloading the machine, the sample should be checked for hemolysis. For blood culture, whole blood should be inoculated immediately on suitable media or sent to the laboratory in special media and vials. For the interpretation of results, reference values, environmental factors and a variety of specific individual characteristics must be considered.

Samples for bacteriology

The unambiguous identification of disease-causing bacteria is especially dependent on correct sampling. Only samples from living or “extremely fresh dead” fish (depending on temperature and fish-size, max. 1-2 hours) are reliable. Samples may be collected with suitable sterile instruments, e.g. loops, swabs or forceps. Detection of *Flavobacterium columnare*, an important gram negative pathogen of ornamental fish, is preferably performed on site with native light microscopy, and can be verified by culture on special agar plates or PCR. Gram stains of fresh tissue-imprints may give a first hint towards bacterial infection and Mycobacteria may be detected with an acid-fast stain (Ziehl-Neelsen). Any organ or material may be sampled. Like in other animals, the margin of lesions is the most promising area for obtaining good results. External disinfection of the fish with 70% ethanol prevents contamination when internal organs are sampled. When septicemia is suspected, blood, head kidney and/or spleen are a good choice for pathogen cultivation. In small fish, commercially available swabs may be too large for accurate sampling; in such cases, the tissue in question can be aseptically removed and streaked on a plate or on the swab for transportation to a laboratory. Amies agar gel with charcoal transport swabs are a good choice when samples are shipped. Samples should be transported cooled (max. 8° C) and per express service. It is important to include a thorough history and tentative diagnosis to enable the lab to choose the right temperature, media and broth for inoculation. Some fish-relevant bacteria are fastidious growers, thus being preferably detected and identified by specific or more general PCR- protocols. If PCR diagnosis is required, affected tissues must be removed aseptically and transported either preserved in ethanol or frozen to the diagnostic laboratory.

Samples for Virology

For diagnosis of a viral disease, the sampling and subsequent diagnostic methods are mostly targeted. In case of suspicion of a notifiable disease, rules as laid down by the competent authority must be followed. In accordance with the diagnostic laboratory, submission of whole, freshly dead fish, chilled on ice, may be a good choice. Otherwise, the relevant tissues can be removed aseptically and sent to the lab; in this case, the correct mode of transport is crucial. For detection of DNA-viruses, tissues may be shipped in 80-90% ethanol or frozen, whereas RNA-viruses require a special RNA-preservative. For incubation of tissue homogenates in cell culture, tissues should be shipped in sterile vials with cell culture medium.

For reliable results, tissues should not be stored longer than 24-48 h at 0-4°C[6].

Samples for Histopathology

In fish medicine, histopathology is a highly valuable tool. On the other hand, autolysis of tissues occurs much fast than in terrestrial animals and only fresh dead fish make good samples, while frozen fish are not suitable. The fixative should be chosen according to the specific requirements. Mostly, tissue pieces of 3-4 mm thickness are fixed in neutral buffered formalin (4-10%) or Davidson`s fixative in a ratio of ≤ 1:9. From fish smaller than 5 cm, the operculum is removed, the body cavity opened and the internal organ convolute is everted, before storing the whole fish in the fixative. Brood fish can be fixed as a whole. Rolling and shaking of the sample for half an hour supports a homogenous penetration of the fixative. If immunological methods are anticipated, the sample should not be stored in the fixative for more than 24 hours, but be embedded in paraffin after that time. In some cases, it may be advisable to sample a healthy fish of the same species and same tank for comparison. Tissues for histopathology are chosen according to the case, but for routine sampling, skin, gills, liver/hepatopancreas, spleen, head- and trunk kidney, heart, intestinal tract and the brain are chosen. Additionally, to the most common HE- and Giemsa- stains, different special stains may be requested.

Summarizing, the mode of sampling is a more relevant parameter for diagnostic results than many vets are aware. Following the standards as presented in this paper will help to obtain reliable results of the chosen diagnostic methods.

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017

ORNAMENTAL FISH IN A SMALL ANIMAL PRACTICE: BASIC TOOLS AND SKILLS.

Dusan Palic

Ludwig-Maximilians-University Munich, Faculty of Veterinary Medicine, Chair For Fish Diseases And Fisheries Biology, Munich, Germany

Qualifications:

Dušan Palić

DVM, MVSc, PhD, Dipl ECAAH, Cert AqV

d.palic@lmu.de

ORNAMENTAL FISH IN A SMALL ANIMAL PRACTICE: BASIC TOOLS AND SKILLS

Prof. Dušan Palić, D.V.M., MVSc, Ph.D., CertAqV, Dipl. ECAAH

Chair for Fish Diseases and Fisheries Biology

Faculty of Veterinary Medicine, Ludwig-Maximilians-Universität München

Kaulbachstr 37, 80539 Munich, Germany

d.palic@lmu.de

There are over 30,000 finfish species, and many more other aquatic animals. Such diversity of potential patients can place some headaches on an aquatic veterinarian daily work. Even though the work appears to be rather complex, a self-confidence kicks in at the moment we realize that, as veterinarians, we have been trained in application of common principles of medicine to any animal species, including thousands of species of ornamental fish. There are ecosystem extremes, of course, such as Death Valley pupfish, or Antarctica icefish, and variability in sizes from <1 cm adult killifish to 10+ m of whale shark. Therefore, learning from examples that come from multiple practices that already successfully treat ornamental fish will give you confidence in your own day one skills and competencies, with a twist. Most important step is to overcome an attitude that you can't treat fish. Fish keepers do require the same services as any other pet and, as a veterinarian, you already have 90% of the skills necessary. So, dive in, and learn about few basic tools and skills you will need to start using to help ornamental fish clients.

Almost anything regarding the necessary equipment and facilities is likely already available in your practice. Syringes, needles, surgical tools (forceps, scissors, scalpels), a microscope, glassware/plasticware is all there already. There are a few specific things (tanks, nets, water and air pumps etc.,) to purchase. One potential addition is to invest in a fish anaesthesia setup, depending on do-it-yourself abilities it can cost about 200 EUR (water and air pumps, heater, reservoir tank and customized foam inserts) to several thousand EUR for a real-time computer monitored plug and play model. With a children's paddling pool, heater, and air pump you can set-up your first hospital tank for as little as 150-200 EUR.

It is always a good advice to purchase a textbook (such as Fish Disease: Diagnosis and Treatment by E.J. Noga – 2nd edition, around 120 EUR), join a professional association such as WAVMA (www.wavma.org) or visit the reputable online resources (e.g. University of Florida, http://tal.ifas.ufl.edu/publications.htm).

You will likely need to buy a water quality test kit (costing from tens to hundreds of EUR, or even a couple thousand, if you want to ramp it up to full laboratory level). Altogether, for an investment comparable to some orthopedic implants, you can set up a fully functioning ornamental fish practice. However, there are some differences that need to be mentioned and noted.

Fish show very few specific signs of illness, making it difficult to make a diagnosis by clinical examination alone. Water quality analysis of several basic parameters such as salinity, temperature, pH, dissolved oxygen (DO), nitrogen compounds (ammonia, nitrite and nitrate) can therefore point a clinician in a good direction, especially since over 80% of clinical cases are connected to water quality problems. Therefore, you need to ramp up on water quality parameters that are most commonly causing fish health problems in ornamental fish. Most start-level veterinary ornamental fish practices are satisfied with simple, drop-based colorimetric kits, that are somewhat more reliable than test-strips. Plenty of manufacturers out there, but here you can find help from your local pet store, and ask for a recommendation. This can also serve as introduction of your newly found service package to the community.

Initial exam and first consult

Receptionists or other first call-answering personnel will need to learn and relay a message to clients about how to transport the fish, use of plastic bags, cardboard boxes, any needs for oxygen, bringing in extra tank water (needed for the journey home and recovery from the anaesthetic), and a sample of water to test for water quality even if the client says they do it on regular basis (ask to see the records). Setting up a brief instruction sheet on a practice web site or in a format shareable to communication networks (WhatsApp, Viber, etc.) will help as well.

Initial consultation should be planned for approximately 30 minutes, especially if this is one of your first unsupervised fish cases. This time frame should include taking a history, water quality check, fish sedation followed by taking for skin scrapes, gill snips, faecal samples, and blood collection. Also, includes examination of the samples under the microscope and possible treatment. Of course, as you become more experienced, the time required for these steps will decrease. Regarding the equipment or materials that you would need for the initial consult, it may depend on the purpose of the work. It is acceptable to routinely use hobbyist test kits, however, if you are involved in a legal case or possibly court investigations, better quality control and assurance is needed, therefore, laboratory grade test kits or machines should be used. Where possible, use a test kit different from the hobbyist's kit as the results may well be different.

Follow-up and more detailed diagnostics

A complete set of skin/mucous scrapes gill snips, external bacterial swabs and fecal samples should be examined as fresh as possible. Seeing the odd parasite per field of view should be expected, but if numerous are seen then the fish has a problem. Blood samples can be run through blood biochemistry machines using standardized kits; however, it is always good to check first with your supplier. Blood counts and PCV's should be done manually as fish blood has nucleated erythrocytes and thrombocytes and therefore is "different" than mammalian.

Advanced imaging techniques such as ultrasonography are actually easier to perform, as fish arrive enclosed in the perfect conducting medium of water. Probes designed for ophthalmology use (e.g., 7.5 MHz or higher) are proven to be most useful depending on the size of the fish. The ultrasound is therefore a good choice for collecting "whole body" pictures, retrobulbar abscesses, swim bladder disease and cardiology. X-rays can be carried out under sedation/anaesthesia. When anesthetized, most fish will tolerate several (<10) minutes outside of water as long as they are kept moist. Radiographs are useful to check boney structures, the swim bladder, GI tract (especially for blockages/stoppages) and some tumors. However, most soft tissues and internal organs are usually hard to differentiate.

Surgical procedures

There are some differences to fish surgery compared to mammals, namely fish need to be kept moist. For quick procedures, a damp towel covering the fishes' eyes is suitable (note that towels and handling can damage the fish's mucous layer). Site preparation consists of a gentle wipe with sterile saline swab followed by one wipe of dilute povidone iodine swab. Traditional scrubbing damages the non-keratinised skin. It

is also acceptable to carry out no site preparation (e.g., fin snips) with no detrimental effects. Traditionally, scales should be removed (one or two rows) from the incision site, otherwise delayed healing/post-op infections may occur. This also provides easier placement of sutures so less iatrogenic trauma. However, current thinking is that this is not a necessity. For example, if removing external masses healing will be by secondary intention. To enter the coelomic cavity a ventral midline incision can be made posterior to the pelvic girdle (attachment of pelvic fins) ending anterior to the vent. The pelvic girdle can be incised but may require wiring back together in larger fish. After the skin incision, blunt dissection with scissors of the musculature tends to decrease haemorrhage. If removing abdominal masses then no more than debulking maybe achieved as delineation between tumour and normal tissue is difficult to determine without using CT or MRI scans. If the tumour is within the gonads then complete removal should be undertaken. Fish up to 12" in length can be sutured in a single layer using 4.0 nylon (preferred) or equivalent monofilament with a 12 – 16mm cutting needle. Single interrupted, horizontal mattress or X mattress patterns can be used. Wound healing usually within 21 – 30 days (partly temperature dependent) and suture removal is preferable if possible.

Medications and dispensing

Routinely used chemicals for the treatment of parasites such as potassium permanganate, malachite green and formaldehyde may be better obtained by the client from the local pet store. Table salt (a useful first aid treatment) and chloramine-T can be used either as a disinfectant or antiparasitic. Unlike food fish, several veterinary endo/ectoparasiticides, aquatic disinfectants, antibiotics, NSAIDs can be dispensed in between ~300 medications that are currently used in ornamental fish medicine.

Medications can be applied topically, by short dips, longer term baths, prolonged immersion, injection and in-feed. Medication selection should be compatible with way of administration. Most fish are inappetant when ill although using appetite stimulants can help. To minimize volumes, antibiotics should be given by injection and used as a last resort. As fish are poikilothermic treatment duration and frequency of repeat are affected by water temperature. It is also good practice to include supportive treatments along with the actual medication.

018

HOW TO ENHANCE FRACTURE HEALING. FROM SURGEON'S TECHNIQUE TO BIOACTIVE SYNTHETIC BONE GRAFTS

Jordi Franch

Veterinary School of Barcelona, Surgery Dept., Cerdanyola del Vallés, Spain

Qualifications:

Jordi Franch

DVM PhD Acred AVEPA Traumatología

jordi.franch@uab.cat

This lecture will review different strategies to promote the consolidation of fractures. The correct choice of the surgeon's method of internal fixation and the performance of an appropriate surgical approach, whether opting for the closed reduction, a minimally invasive technique or the traditional open reduction will determine an adequate initial vascular and biological response that will lead to a final successful fracture healing. When the characteristics of the fracture require an strong stimulation of the bone healing, fresh autologous cancellous bone graft is considered the best option since it simultaneously provides osteoconductive, osteoinductive, and osteogenic properties. Therefore, the autologous cancellous bone graft is considered the "gold standard" for fracture healing stimulation. However, this option also has some drawbacks such as increased surgical time and iatrogenic injury to the donor area but above all its limited availability, especially in cats, small dogs, and in second collections. For this reason, a couple of decades ago, alternative options to cancellous bone grafting were developed, such as the use of calcium phosphate-based bioceramics. Probably one of the most widely used bioceramic bone substitutes is β-Tricalcium Phosphate chips. Numerous scientific studies in both human and veterinary medicine demonstrate the effectiveness of these synthetic products, although it must always be borne in mind that they only provide osteoconductive properties so there must be a suitable biologically active microenvironment to ensure successful bone healing. These bioceramics can be used in conjunction with osteoinductive substances such as Platelet Rich Plasma preparations or especially bone morphogenic protein2 (BMP-2). BMP-2 is a potent osteoinductive factor responsible for the differentiation of mesenchymal cells into osteoblasts which will be responsible for new bone formation, and it can be used individually with a collagen sponge as a carrier or in combination with β-TCP scaffolds. More recently, the development of biotechnology has enabled the 3D printing of scaffolds using β-TCP self-setting paste as ink. This technology allows customizing the scaffold to fit it perfectly to the bone defect, quickly favoring its bone consolidation. At present, we can easily obtain stem cells from adipose tissue and, after their differentiation into osteoblasts, seed them in BMP-2-impregnated β-TCP scaffolds. This allows the obtention of a compound graft that provides simultaneously osteoconductive, osteoinductive, and osteogenic properties, closely resembling the fresh autologous cancellous bone graft considered to date the unique "gold standard". In this lecture, clinical cases in which the methods described above (B-TCP chips, BMP-2, 3D-printed bioceramic scaffolds, etc.) have been applied to enhance fracture healing will be presented and discussed.

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019

HOW TO USE INTERNAL FIXATION EFFECTIVELY

Carlos Adrega

AniCura - CHV, Surgery, Porto, Portugal

Qualifications:

CARLOS MANUEL ADREGA TEIXEIRA DA SILVA

DVM (DIPLOMATED IN VETERINARY MEDICINE)

DECVS (DIPLOMATED OF EUROPEAN COLLEGE OF VETERINARY SURGEONS

MRCVS (MEMBER OF ROYAL COLLEGE OF VETERINARY SURGEONS)

CARLOSADREGA@HOTMAIL.FR

How to use internal fixation effectively

Diaphyseal fractures are often consequence of a significant trauma, such as road traffic accidents, dog bite wounds and human abuse, all of which can lead to damage of multiple body systems. Cats might also sustain a long bone fracture because of being stepped on, having something fall on them and falling from a height.

Each fracture must be considered in the context of the entire animal to determine the exact requirements of the ultimately chose for stabilization.

The fracture assessment should constitute a simple system when planning a repair, considering the biological and mechanical factors likely to influence healing potential. It is essential to systematically go through the steps of thinking about each of the variables associated with the case at hand so that the treatment plan is neither insufficient nor excessive.

Mechanical factors: implants are required to resist larger and more numerous forces in an unfavorable mechanical environment, limiting the options available for the clinician.

Mechanical Assessment	
Forces acting on the fracture	· Compression · Bending · Torsion · Shear · Tension
Weight	The weight of the animal will affect implant size and can influence system selection
Bilateral injury	Bilateral injuries will reduce the animal's ability to favor the repaired limb and increases the risk of implant failure
Neurological deficits	Incoordinated movement can increase the forces applied to a repair

Biological factors: Both local and systemic biological factors can have an impact on the healing of factures and therefore need to be considered.

Biological Assessment	
Patient	Age Systemic illness Nutritional state
Fracture environment	Blood supply to fragments Open *vs* closed Foreign material Loss of bone Recent *vs* old fracture Contaminated vs Infected

Diaphyseal fractures of long bones can heal by either direct fracture healing or indirect fracture healing. Understanding how internal fixation techniques affect these courses is essential for choosing the appropriate treatment method for every bone fracture.

During the latter half of the 20th century, however, an emphasis was placed on direct bone healing through anatomic reconstruction and rigid internal fixation. While this can lead to biomechanical advantages, as load applied to the bone during postoperative weightbearing is shared between the implants and the reconstructed bone, it gradually became apparent that there was a biological cost in the reconstruction of more comminuted fractures. However, delayed or nonunion and infection are the common complications of this technique, particularly in comminuted fractures because open anatomic reduction enhances soft tissue damage, fragment devascularization, extension of surgical time and disturbance of the fracture haematoma. The importance of preserving osseous vascularity during internal fixation became evident in comminuted diaphyseal fractures and the concept of biological osteosynthesis - "open but do not touch,"/ completely closed reduction (minimally invasive osteosynthesis) - which less rigid fixation will reduce iatrogenic trauma of the fracture site and encourage early formation of callus with rapid secondary bone healing.

Fracture reduction planning:

Decision-making should be adapted to the patient based on the mechanical and biological factors, biomechanical evaluation of the fracture, patient's age/ general health and clinical factors (temperament and owner compliance).

When deciding whether to emphasize preservation of biology or anatomical reconstruction, the orthopaedic surgeon must determine whether the mechanical advantage gained by reconstruction outweighs the biological cost of fragments manipulation.

- Is anatomical reconstruction possible or desirable?

The ability to achieve load sharing between the implants and reconstructed bone can be very attractive in obtaining early weightbearing and reducing the risk of implant failure. This is particularly true in heavy, active animals or those with bilateral or concurrent neurological injuries, in which the mechanical advantage gained by anatomical reconstruction and load sharing is important.

One consequence of failing to reconstruct the bone is that there is no load sharing between the implants and the bone. Therefore, in the early stages of the healing process, the implants will carry all the load across the fracture site during weightbearing: this can predispose to implant failure. Although a patient's exercise can be restricted to some extent, early use of the fractured limb is essential to minimize fracture disease

(joint stiffness/ muscle atrophy/ osteopenia/ poor limb use), the clinical sequelae of suboptimal fracture treatment. The surgeon must understand the biomechanics of individual fractures in order to place implants in such a fashion that the forces on them are minimized, and also to select stronger implants that maximally resist the disruptive forces.

Comminuted or open fractures that are not suitable for anatomical reconstruction are usually best treated using buttress implants spanning the fracture gap. The emphasis in this situation is on providing a functional limb by aligning the joints proximally and distally to the fracture (avoiding both angular and rotational deformities) and maintaining limb length as accurately as possible.

For long bone fractures, resistance to bending and torsion is of primary importance. With comminuted fractures, the axial collapse of fragments must also be resisted.

- **Strategies to enhance bone healing**

Fractures at high risk of impaired bone healing should be identified according to fracture characteristics and patient's related factors in order to choose the best-suited treatment. In the last decade, a number of therapeutic strategies have been proposed in combination with surgical treatment in complex fractures and impaired union management in which the main elements – mechanical environment, scaffolds, growth factors and cell therapies- could be applied to enhance bone healing. However, despite the lack of evidence of the effectiveness of these treatments in acute fractures, its use is recommended in high-risk patients and in delayed union or non-unions.

Internal fixation systems:

- **Plates and screws**

There are several plate systems available, from the more conventional dynamic compression plate (DCP) to the limited-contact DCP (LC-DCP) and more recently the locking plates (LCP).

Conventional plates depend on friction at the plate-bone and screw-bone interfaces to maintain fracture fixation. It is important to contour the plate accurately to optimize plate-bone frictional forces, and avoid loss of reduction during plate application. Generally, at least six (preferably eight) cortices should engage with screws in each of the two main fragments.

The LCP is a fixed-angle construct that does not rely on friction at the plate-bone and screw-bone interfaces. Rather, the system relies on friction at the threaded screw-plate interface. The locked plate does not need to be precisely contoured.

A bone plate can be applied in a compression, neutralization or bridging fashion depending on the fracture configuration and type of plate used.

Unless there is clear indication, bone plates are not routinely removed as there is no evidence of significant complications associated with plates remaining in situ.

Principles of plate application		
Neutralisation plate	Compression Plate	Bridging (buttress) plate
· simply hold the position of the bone act as resistance to compression and torsional forces protect the intra-fragmentary com-pression achieved with lag screws from rotational/ bending/ shearing forces	specific screw hole geometry that allows axial compression provide absolute fracture stability prevents all interfragmentary motion	· used as an extramedullary splint · must be able to withstand all the weightbearing forces during bone healing · indicated in non-reducible comminuted diaphyseal fractures: prevents axial deformity resulting from shearing/ bending forces · often in combination with an intramedullary pin if additional strength required (plate-rod)

- **Augmentation devices**

Implants such as intramedullary pins or orthopaedics wires are rarely used alone in diaphyseal fractures fixation but can augment one of the systems described above.

Intramedullary pins are good at resisting bending forces due to their position close to the neutral axis of the bone – asymmetrical loading of bone usually results in compression on one side and tension on the other, with the neutral axis in between. However, their lack of resistance to tension, torsion or compression means they are rarely indicated for use alone.

Cerclage wires are always used in group of at least two and can counter shear forces in oblique fractures (the length of the fracture should be at least twice the diameter of bone). Used correctly, they can be extremely advantageous, but they can also significantly disturb the extraosseous blood supply of fracture healing if they become loose.

- **Additional systems**

A few other implant systems are available for internal fixation, including the clamp-rod internal fixator (CRIF), the "string of pearls" internal locking system (SOP) and intramedullary locking nail system (available from several companies), which also resist all forces applied to fractures. Each system has its own advantages when compared to others.

Prognosis

The prognosis following open reduction with internal fixation for fracture repair is very good to excellent for simple fractures in healthy animals and good for complex fractures, and fractures in older patients or those with chronic health problems.

020

HOW TO USE EXTERNAL SKELETAL FIXATION EFFECTIVELY

David Vicente

Egas Moniz School of Health & Science, Veterinary Medicine, Almada, Portugal

Qualifications:

David Vicente

DVM, MVSc, PhD, MRCVS

Assistant Professor in Veterinary Surgery

Egas Moniz School of Health & Science

David.g.vicente@gmail.com

How to use external fixation effectively

External skeletal fixation is a valuable technique in small animal orthopaedics for the management of fractures, angular deformities and ligaments or tendon injuries. It offers numerous advantages, including its versatility in treating various types of fractures, ease of application with minimal trauma, affordability, and the ability to disassemble the frame in stages to facilitate bone healing. Its broad scope of indications has made external skeletal fixation an indispensable tool for veterinary practitioners.

External skeletal fixation was developed in the late 1800s but faced severe drawbacks due to significant complications, which include pin loosening, pin tract sepsis, osteomyelitis, and nonunion. However, in the 1970s, external skeletal fixation saw a resurgence in use and has since become widely employed in veterinary orthopedics. Throughout the last decades several commercial systems have been developed, which can be configurated in numerous options and tailored to the goal of fixation. External fixators can be categorized into three types: linear, circular, and hybrid devices.

The main components of the linear external fixators:

Pins: These are referred to as fixation pins and can be smooth or threaded. The later can be further classified as positive or negative-profile, based on the how the outer diameter of the threaded portion relates to the pin shaft. Positive-profile can be subclassified in cortical or cancellous. Pins can be also categorized into two types: half pins (end threaded portion of the pin) and full pins (centrally threaded portion of the pin).

Clamps: These are responsible for stabilization of the construct by holding the pins to the connecting bar. The clamps are specific to certain connecting bar diameters and can present different configurations.

Connecting bars: These connect the pins and stabilize construct. The bars can present several diameters and made of aluminum, titanium, carbon fiber and acrylic. The use of larger diameter connecting bars results in stiffer constructs.

The frames of the external fixators can assume different configurations:

Type Ia: Unilateral and uniplanar

Type Ib: Unilateral and biplanar

Type I-II hybrid: unilateral uniplanar combined with a bilateral uniplanar and a diagonal connecting bar

Type II modified: bilateral uniplanar with combined full and half pins

Type II: bilateral uniplanar with all full pins

Type III modified: bilateral biplanar

As the frame becomes more complex, its strength and stiffness properties increase, providing enhanced resistance against shear forces, torsional loads, and axial loads. Other methods to enhance frames include using combined frames, where these are combined with other forms of fixation, such as intramedullary pins and interlocking nails.

The acrylic external skeletal fixators present as an alternative to the linear fixation components. These can utilize various acrylic-based compounds, such as methylmethacrylates or epoxy resin, to replace traditional connecting bars and fixation clamps. These free-form external skeletal fixators offer greater flexibility for specific applications. The use of acrylic as a connecting column allows fixation pins to be placed without the restrictions imposed by clamps and connecting bars, providing freedom to position the pins in any plane, angle, or configuration.

Acrylic offers sufficient strength, lightweight properties, and cost-effectiveness. They require minimal inventory and offer several biological and mechanical advantages compared to conventional external skeletal fixation systems.

The circular external skeletal fixator is another alternative to the linear fixation. Instead of using relatively large bone pins, this system utilizes fine tensioned wires to secure the bone segments. The wires passed through the bone like full pins and are supported by specialized bolts attached to rings, acting as clamps, at each end. These rings are connected to each other along the bone's length by connecting rods.

One of the most valuable aspects of a circular external skeletal fixator is its ability to create easily adjustable ring-bone segment constructs in three dimensions. These adjustments serve various purposes, such as correcting angular limb deformities and malunions through angulation and translation. Additionally, transportation is employed to lengthen bones in cases of congenital deformities or to address bone defects, which really on the biological concept of distraction osteogenesis to stimulate the formation of new bone.

In situations where juxta-articular fractures make the placement of standard pins unfeasible due to their size, rings may be utilized. In such instances, they can be integrated with linear frames to create a hybrid setup.

A major advantage of linear and circular external skeletal fixators is that the fixation frame remains accessible and adjustable. Acute adjustments can be made in external skeletal fixator frames to improve initial fracture reduction or to add or remove components of the frame.

On the other hand, a disadvantage of acrylic external skeletal fixators is their lack of adjustability once the acrylic is set and hardened. Should any adjustments be needed, the acrylic must be entirely removed from the pins and subsequently replaced. This characteristic further limits the potential for staged disassembly, which can only be done by extracting a section of pin or connecting bar link between pins to decrease the rigidity of the fixation.

While external skeletal fixation can be useful in some situations, it does come with a range of biologic and mechanical limitations. The fixation pins, for example, are subjected to significant bending forces due to their external and eccentric placement. This method also introduces an increased risk of infection due to its percutaneous nature which disrupts the body's natural defense barriers, a risk that is lower with internal fixation devices.

Considering these mechanical and biologic downsides, it's clear that external skeletal fixation isn't ideal for long-term use, particularly in cases anticipating delayed healing. Over time, the likelihood of complications like premature pin loosening, pin tract inflammation, infection, and potential fixation failure escalates.

In addition to these issues, the tolerance of the patient and compliance of the owner also play key roles when choosing external skeletal fixation as a stabilization method. Understanding these constraints when opting for this type of stabilization is crucial to optimize its repair benefits and minimize postoperative complications.

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021

HAPPINESS STRATEGY: UNDERSTAND AND TACKLE THESE SIX BURNOUT TRIGGERS

Ivan Zakharenkov

Galaxy Vets, Ceo, Saint John, Canada

Qualifications:

Dr. Ivan Zakharenkov

DVM, MBA, CEO at Galaxy Vets

ivanzak@galaxyvets.com

Introduction

Hi, I'm Dr. Ivan Zak. As a veterinarian with over twelve years of experience in emergency, specialty, and general practice, I have witnessed firsthand the devastating effects of burnout in our profession.

My journey began in 2006 when I graduated from the esteemed Atlantic Veterinary College. Over the years, I immersed myself in various veterinary settings across Canada, gaining valuable experience and knowledge. However, after a decade in the field, I found myself facing the harsh reality of burnout.

Driven by my personal experience and a burning desire to make a positive change, I embarked on a new path in 2010 – the path of entrepreneurship. It was during this time that I pursued my MBA in International Healthcare Management, delving deep into the realm of lean methodology and burnout prevention. My dissertation focused on uncovering the secrets of lean methodology and how it could be applied to combat burnout effectively. This research, combined with my vast experience in the field, laid the foundation for what would become the cornerstone of Galaxy Vets.

In 2021, Galaxy Vets was born, emerging as an employee-owned veterinary group dedicated to proactively preventing burnout. We recognized the immense potential for applying best practices from human healthcare and other industries to our field. Drawing insights from our own annual burnout survey and the learnings of twenty-five corporations, we crafted a comprehensive approach to tackle this pressing issue head-on.

We conduct annual burnout studies, which originated as part of my MBA dissertation. These studies enable us to gain valuable insights into the factors contributing to veterinary burnout and, more importantly, develop actionable strategies to eliminate them.

Burnout triggers

Occupational burnout is a psychological syndrome characterized by chronic work-related stress, exhaustion, and a sense of reduced professional efficacy. It typically occurs as a result of prolonged exposure to job demands that exceed an individual's capacity to cope effectively.

The three main dimensions of burnout are: Emotional Exhaustion, Depersonalization (Cynicism), Reduced Personal Accomplishment.

Burnout is not simply feeling tired or stressed occasionally; it is a chronic and pervasive condition that significantly impacts an individual's overall well-being and functioning.

Burnout is taking an especially heavy social and economic toll on the veterinary profession, and it is crucial to address the issue on the systemic level due to several reasons:

1. Staffing Shortages and Employee Retention

2. High Suicide Rates

3. High Costs of Replacing an Employee

4. Resulting limited Access to Care for Pet Owners

This highlights the critical need to develop systemic solutions to address veterinary burnout, and it begins with identifying and eliminating the root causes of burnout.

Despite a common assumption, work overload is not the principal factor causing stress at work. In 1999, Christina Maslach and Michael P. Leiter presented1 a model titled "Six areas of worklife" analyzing the organizational context of burnout and its contributors. The six dimensions – burnout triggers – are: control, workload, reward, community, fairness, and values. These findings suggest that the problem of burnout is far more complex – stemming from team culture, management style and the reward systems in place, and is highly driven by values as a moral compass that guides the organization.

Let's go over each area of worklife in detail and discuss how it can trigger burnout in veterinary professionals.

Lack of control

Control refers to the extent to which individuals have autonomy and influence over their work. Burnout is triggered when an individual has a limited capacity to influence decisions that affect their work or little latitude to organize their tasks at their own discretion.

Examples:

A veterinarian performing services that their experienced support staff can – and should – do. Lack of delegation makes other team members feel undervalued and not trusted to do the work they've been trained to do.

Inefficient scheduling and overbooking

Management imposing top-down changes. When feedback is not collected and ideas for improvement are not sourced from people who do the actual work.

Insufficient reward

Reward relates to the recognition, compensation, and career advancement opportunities available to individuals. Burnout is triggered when there is no proper reward system to balance high job demands and work pressure.

Examples:

Poor work-life balance

Underutilization of support staff

Lack of meaningful goals, monotonous tasks, and few opportunities for professional development or career growth

Lack of respect and esteem from colleagues and clients

Work overload

Workload refers to the quantity and intensity of work demands placed on individuals. It's not just about long hours. Burnout is triggered when there is insufficient time and/or training to complete job tasks.

Examples:

Inefficient workflows, bottlenecks, and redundant processes, large amount of administrative tasks

Misalignment in the team, and under- or misutilization of team members

Lack of predictability, lack of clear policies

A culture that promotes heroism and overwork.

Community breakdown

Community refers to the quality of relationships and social support within the work environment. Burnout is triggered when the is a lack of support and trust, unhealthy competition, or unresolved conflicts.

Examples:

Ineffective leadership and lack of psychological safety

Employees operating in silos, when the team is not involved in planning, are not aware of business goals, and do not understand how their work contributes to the overall success of the hospital.

Lack of sense of belonging, feeling accepted and valued by others

A bonus structure that creates an unhealthy competition instead of fostering a team-based approach to achieving goals.

Unfairness

Fairness relates to the perceived fairness of organizational policies, procedures, and interpersonal interactions. Burnout is triggered when opportunities, recognition, and resources are unfairly distributed among team members.

Examples:

Favoritism

Lack of transparency with compensation and bonuses

Unequal distribution of workload or resources

Conflict of values

Values refer to the alignment between an individual's personal values and the values of the organization. Burnout is triggered when job demands conflict with personal values and impose moral dilemmas.

Examples:

Gold standard of care vs. Client financial abilities

Economic euthanasia due to client having insufficient funds

Lack of opportunities for professional growth

Imagine the future without these triggers

Purpose-driven culture guided by core values

Bottom-up ideas

Open book management

Structured CE with the purpose of continuous improvement

Leadership and business acumen training

Documented processes

Transparent compensation policies

Feedback loops and data-driven employee satisfaction

Workflow optimization

Telehealth

Six components of a healthy foundation

Six key components: Vision, People, Data, Issues, Process, and Traction. These components work together to align the organization and drive results.

Vision: Establishing a clear and compelling vision for the company. This involves defining core values, determining a long-term vision, and setting specific, measurable, and attainable goals. A shared vision helps align everyone in the organization and provides a roadmap for decision-making.

People: The importance of having the right people in the right seats. This involves identifying and placing employees in roles that align with their strengths and skill sets. It also emphasizes building a strong culture and fostering open and honest communication among team members.

Data: Traction encourages organizations to be data-driven in their decision-making. This involves identifying key performance indicators (KPIs) and tracking relevant metrics to monitor progress towards goals. Regularly reviewing and analyzing data helps identify areas for improvement and make informed decisions.

Issues: The Traction methodology focuses on identifying and resolving issues in a proactive and systematic way. This process involves identifying issues, prioritizing them, discussing possible solutions, and implementing action plans to resolve them.

Process: The importance of establishing clear and documented processes for core functions within the business. This includes defining standard operating procedures (SOPs) to ensure consistency and efficiency in operations. Documented processes help streamline workflows, reduce errors, and improve overall productivity.

Traction: Disciplined execution and implementation of the vision and goals. It involves establishing a regular meeting rhythm, including weekly check-ins, quarterly reviews, and annual planning sessions. These meetings ensure accountability, track progress, and keep the organization on track towards its goals.

The Traction methodology provides a structured approach to running a business, focusing on creating alignment, accountability, and results. By implementing the Traction principles and tools, organizations can gain clarity, overcome obstacles, and achieve their long-term vision.

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Title: Six areas of worklife: A model of the organizational context of burnout

Publication: Journal of Health and Human Services Administration

Year: 1999

Volume: 21

Issue: 4

Pages: 472-489

URL: https://www.researchgate.net/publication/12693291_Six_areas_of_worklife_A_model_of_the_organizational_context_of_burnout

022

5 INNOVATIVE STRATEGIES TO ATTRACT AND RETAIN MODERN VETERINARY TALENT

Ivan Zakharenkov

Galaxy Vets, Ceo, Saint John, Canada

Qualifications:

Dr. Ivan Zakharenkov

DVM, MBA, CEO at Galaxy Vets

ivanzak@galaxyvets.com

The modern generation of veterinary professionals

Generational characteristics are generalizations and may not apply to every individual within a specific generation. Nonetheless, here are some common characteristics and attitudes often associated with Baby Boomers, Generation X, Millennials, and Generation Z veterinarians:

Baby Boomers:

Tend to have a "work first" mentality and value long hours and hard work.

Resistant to change or new technologies in the workplace.

Generation X:

Tend to value work-life balance and strive to create harmony between their personal and professional lives.

Often adaptable and open to change, given their experiences with rapid technological advancements.

Millennials:

Seek meaningful work and desire a sense of purpose in their careers. They often value opportunities to make a positive impact on society and prioritize work that aligns with their personal values.

Rather than strictly separating work and personal life, they tend to seek a blend of the two, integrating technology to stay connected and flexible.

Appreciate collaborative work environments and value regular feedback.

Generation Z:

Technologically savvy, prefer digital communication methods

Often possess entrepreneurial aspirations and may be inclined to pursue innovative approaches

Similar to Millennials, Generation Z veterinarians seek flexibility and a healthy work-life integration, valuing remote work options and flexibility in scheduling.

Maslow's Hierarchy of Needs

Understanding Maslow's pyramid in the context of work highlights the importance of addressing employees' diverse needs to promote motivation, satisfaction, and engagement.

Physiological: Physiological needs include basic human survival needs, such as food, water, sleep, clothing, and shelter. A typical veterinary salary adequately covers these needs, which are necessary to move to the next level. Once these needs are met, additional resources (eg, a higher salary) do not necessarily equal more happiness and usually do not serve as strong motivators.

Safety: Physical, mental, health, and financial safety, which provide security, are the next lower-level needs.

Physiological and safety needs are covered by money (compensation and benefits).

Belonging: Relationships with family, friends, and coworkers form the last lower-level need. In practice, veterinarians need to feel a sense of belonging to a "tribe," or people with similar values. As a lower-level need, acceptance is critical to an individual's happiness and motivation.

Sense of belonging is created by the organization's culture and purpose.

Esteem: Higher-level needs are not essential but can provide greater motivation. Esteem needs include self-respect (ie, believing one is valuable and deserves dignity) and self-esteem (ie, confidence in one's potential for personal growth and accomplishments). Esteem is based on respect from others and self-assessment, which can lead to self-confidence and independence.

Esteem needs are met my goal achievement.

Self-actualization: Also referred to as self-fulfillment, the highest motivating factor involves reaching one's full potential. Self-actualization needs include education to refine talents or reach an expert level, caring for others, and expanding one's horizons through ventures such as travel or culture.

Self-actualization can be defined as happiness.

Understanding motivation

There are two types of motivation:

Extrinsic Motivation: Refers to the drive or desire to engage in an activity or behavior based on external rewards, incentives, or pressures. It involves seeking external outcomes or consequences rather than finding inherent satisfaction or enjoyment in the activity itself. Extrinsic motivators can be tangible, such as money, prizes, or recognition, or intangible, such as praise, social approval, or avoiding punishment.

Intrinsic Motivation: Refers to the internal desire, interest, or satisfaction that drives individuals to engage in a particular activity or behavior. It arises from within an individual and is not dependent on external rewards or incentives. When someone is intrinsically motivated, they engage in an activity because they find it inherently enjoyable, challenging, interesting, or personally meaningful.

Extrinsic motivators such as rewards, bonuses, and recognition can be effective in the short term, they are not sustainable drivers of motivation. The key to employee satisfaction and engagement is fueling intrinsic motivation.

Autonomy, mastery and purpose

Daniel Pink, an author and motivational speaker, introduced the concept of autonomy, mastery, and purpose.

Autonomy: Refers to the freedom and independence individuals have in making choices and decisions regarding their work. Autonomy enhances intrinsic motivation by providing individuals with a sense of self-determination and the opportunity to exercise their creativity and problem-solving skills.

Mastery: Involves the desire to continually improve and develop expertise in a particular area. It is the pursuit of becoming better at something and achieving a high level of skill and competence. Mastery contributes to intrinsic motivation by creating a sense of accomplishment, personal

growth, and a deeper engagement with the work itself.

Purpose: Refers to the understanding of how one's work contributes to something larger than oneself. It involves connecting to a meaningful and significant goal or mission. When employees have a clear sense of purpose, they find greater meaning in their work and are motivated to make a positive impact. Purpose-driven work aligns with individuals' values and beliefs, leading to increased intrinsic motivation.

Strategies that effectively fuel extrinsic and intrinsic motivation

Inspired by the book "The Great game of business" by Jack Stack and Bo Burlingham.

Promote a culture of shared responsibility, transparency, and involvement in the financial aspects of a company. Empower employees to think and act like business owners, ultimately driving motivation, improved performance and profitability.

Annual Planning: Involving all employees in the annual planning process to create a sense of ownership and engagement. This includes sharing financial information, such as budgets, sales targets, and costs. By involving employees in the planning process, they gain a better understanding of the company's goals and can contribute their ideas and expertise.

Creating a Stake in the Outcome: Implementing a bonus structure that ties financial rewards to the achievement of company goals. Employees are provided with clear targets and performance metrics that are directly linked to the financial success of the business. This approach aims to align individual and team efforts with the overall objectives of the organization.

Gainsharing: Employees share in the financial gains or savings generated by their efforts. This means that when the company exceeds its targets or improves its financial performance, employees receive a portion of those gains as bonuses or incentives.

Educating Employees: The importance of financial literacy and education for all employees. By teaching employees how to read and understand financial statements, they become more informed and engaged contributors to the company's success.

Ongoing Communication: Regular and transparent communication is vital in this approach. Encourage open and honest discussions about financial performance, challenges, and opportunities. This includes sharing financial updates, progress reports, and involving employees in problem-solving and decision-making processes.

Bottom-up culture

Inspired by the book "Ideas Are Free" by Alan G. Robinson and Dean M. Schroeder.

Idea Management: Creating a systematic and supportive process for managing employee ideas regardless of their position within the organization. Establish an idea management system that captures, evaluates, and implements employee suggestions effectively.

The Power of Small Ideas: Significance of small, incremental improvements as a catalyst for organizational growth. Small ideas, when consistently implemented, can lead to significant improvements in productivity, quality, and client satisfaction. Value and recognize the impact of even the smallest suggestions.

Employee Engagement: Involving employees in the improvement process is crucial for their engagement and motivation. When employees are encouraged to share their ideas and see them implemented, they develop a sense of ownership and pride in their work. This fosters a culture of continuous improvement and encourages a proactive approach to problem-solving.

Creating a Safe Environment: Creating a safe and supportive environment where employees feel comfortable sharing their ideas. This involves establishing trust, providing constructive feedback, and appreciating employees' efforts. When employees feel valued and supported, they are more likely to contribute their ideas and participate in the improvement process.

Leadership and Communication: Leadership plays a critical role in fostering an idea-driven culture. Leaders need to communicate the importance of employee ideas, set clear expectations, and provide resources to support the idea management process. Effective communication channels are crucial for sharing ideas, providing feedback, and celebrating successes.

Recognition and Rewards: Recognizing and rewarding employees for their ideas and contributions is a key aspect highlighted in the book. Implementing a fair and transparent recognition system that acknowledges and appreciates employees' efforts. This recognition can come in various forms, such as monetary rewards, public recognition, or career advancement opportunities.

Recap

Going back to the modern generation of veterinary professionals and what they want:

Innovation and entrepreneurship

Collaboration and feedback

Work-life integration

Technology

Purpose

Effective strategies to retain this talent:

Open-book management and stake in the gains

Business acumen and leadership training

Idea-driven organization

Telehealth and remote work opportunities

CE driven by goals

023

AUGMENTING TRADITIONAL VETERINARY CARE WITH TELEHEALTH AND TELECONSULTING: BUSINESS MODELS AND PRACTICAL APPLICATION

Ivan Zakharenkov

Galaxy Vets, Ceo, Saint John, Canada

Qualifications:

Dr. Ivan Zakharenkov

DVM, MBA, CEO at Galaxy Vets

ivanzak@galaxyvets.com

Unpacking "Telehealth"

Telehealth does not equal telemedicine.

Veterinary telehealth refers to the use of technology and telecommunications to provide remote healthcare services for animals. Here are the commonly recognized categories of veterinary telehealth:

Teletriage: Teletriage involves the initial assessment and determination of the urgency or severity of an animal's condition through remote communication. Veterinary professionals or trained staff evaluate the symptoms, ask relevant questions, and provide recommendations on whether the animal requires immediate attention or if home care and monitoring are appropriate.

Telemedicine: Telemedicine involves the diagnosis and treatment of animals using telecommunication technologies. Through video conferencing or other virtual platforms, veterinarians can remotely examine animals, review medical records, and discuss symptoms with pet owners. Based on the information provided, they can offer a diagnosis, prescribe medications, provide treatment plans, and give follow-up recommendations.

Teleconsulting: Teleconsulting refers to remote consultations between veterinarians, veterinary specialists, or other veterinary professionals. It allows for collaboration and knowledge sharing among professionals from different locations. Teleconsultations can be used for seeking second opinions, discussing complex cases, sharing diagnostic imaging or laboratory results, or receiving specialized advice.

Teleadvice: Teleadvice involves providing remote guidance and advice to pet owners regarding various aspects of animal care. It may include recommendations on nutrition, behavior, preventative care, basic first aid, or general health concerns. Through phone calls, messaging apps, or online platforms, veterinary professionals can address pet owners' questions, offer guidance, and provide information.

Telemonitoring: Telemonitoring enables the remote monitoring of animals' health and well-being through technology. It often involves wearable devices, sensors, or other monitoring equipment that collect and transmit data about an animal's vital signs, activity levels, or specific health parameters. Veterinary professionals can remotely track and analyze this data to assess the animal's health status, detect trends or abnormalities, and make informed decisions regarding their care.

Keeping compliant while conducting telehealth

Out of all types of telehealth, only telemedicine requires a VCPR (diagnosing, treating, prescribing).

Areas to consider

eVCPR

VCPR sharing (individual only / hospital / group) – once established, a VCPR may be able to be maintained between medically necessary examinations via telephone or other types of consultations.

On telemedicine, there are generally 3 buckets:

Jurisdictions where it is impermissible to establish the VCPR remotely

Jurisdictions where it is unclear whether you establish the VCPR (usually the statute/reg is silent on this topic)

Jurisdictions where it is expressly permitted to establish the VCPR remotely

Business models

The power of teletriage

Open up the throughput of the clinic

Teletriage allows veterinary clinics to handle a higher volume of cases by efficiently triaging patients remotely.

Virtual CSRs and technicians/nurses can be hired from anywhere

Increase average check transaction

By offering remote consultations, veterinarians have more time to spend with each patient, allowing for more thorough assessments and discussions. This can result in additional services being recommended, such as diagnostic tests, prescription medications, or preventive care measures. Consequently, the average transaction value per visit tends to increase, benefiting the clinic financially.

Decrease barrier to call a vet (texting)

Veterinary teletriage helps break down these barriers by offering a more accessible and convenient means of seeking professional advice. Instead of having to physically bring their pet to the clinic, pet owners can simply initiate a text-based consultation, making it easier for them to reach out for assistance. This convenience encourages timely communication and may lead to early intervention for potential health issues.

Remote monitoring and follow-up care

In addition to initial consultations, teletriage can also facilitate remote monitoring of patients and follow-up care. For certain conditions or ongoing treatments, remote team can monitor an animal's progress, assess symptoms, adjust medications, or provide guidance on home care. This improves the continuity of care and client loyalty.

Fight burnout

In our study, veterinary professionals who were on call (defined as working weeknights and weekends), reported higher burnout than those who were not on call. Regardless of whether one was on call a few days a week or on most days, those who worked on call reported higher burnout rates than professionals who were not on call.

Work-life balance for the entire team. We asked what kind of work arrangements veterinary professionals would prefer: in-person, hybrid or fully remote.

Most respondents said they would like to treat animals in person but there were large groups who wanted to have some remote shifts:

33% of veterinarians

38% of technicians

61% of practice managers

46% of CSRs

Female and younger practitioners had the strongest desire

The power of texting appointments

Convenience and discomfort of face-to-face interactions

75% of millennials prefer texting over talking

Instead of carving out time for a phone call or in-person conversation, they can simply send a text message whenever and wherever it's most convenient for them. Whether they're at work, running errands, or even in the middle of the night, texting allows them to communicate seamlessly.

Asynchronous communication – time to think

Integration into the daily routines of pet owners. They can send questions and receive responses while going about their regular activities, without the need for dedicated time slots for communication.

Efficiency

Text messages excel in various areas, including appointment reminders, payment options, and digital forms. By using text messaging, you can ensure that your clients receive important updates promptly and reliably.

Text messages have an open rate of 99%, with 97% being read within the first 15 minutes of receipt.

024

PATHOGEN TRANSMISSION TIMES AND NEW STRATEGIES FOR PREVENTION OF CANINE VECTOR-BORNE DISEASES

Domenico Otranto

University of Bari, Veterinary Medicine, Bari, Italy

Qualifications:

Domenico Otranto

DVM, PhD, DipEVPC, EBVS® European Veterinary Specialist in Parasitology, FRES

Professor of Parasitic Diseases

e.mail: domenico.otranto@uniba.it e.mail: domenicotranto@gmail.com

Instagram account: @parasiterranean

Several aspects of the vector-pathogen-host interaction (e.g., pathogen transmission routes, feeding behavior, duration of the vector and pathogen transmission times) may influence the efficacy of parasiticides in reducing vector-borne pathogen (VBP) transmission in dogs and cats. Scientific knowledge of the biology of VBPs and their vectors has increased in recent decades (1, 2), resulting into refined prevention strategies. While the majority of pathogens are inoculated during blood feeding (e.g., *Leishmania* spp., *Rickettsia* spp. and *Babesia* spp.), others are deposited onto the skin and penetrate actively through the bite wound (e.g., *Dirofilaria immitis*). In contrast, other pathogens are transmitted through ingestion of vectors (e.g., *Hepatozoon canis* and *Dipylidium caninum*) or paratenic hosts (e.g., *Hepatozoon americanum*). Exceptions are represented by the transmission by dog bites (e.g., *Babesia gibsoni*), vertical transmission (e.g., *Hepatozoon canis* and *Leishmania infantum*), venereal transmission (e.g., *L. infantum*) and blood transfusion transmission (e.g., *Anaplasma phagocytophilum*, *Babesia* spp. and *L. infantum*).

Overall, feeding behavior of vectors and pathogen transmission times are governed by a number of variables related to i) vectors, ii) pathogens and iii) susceptible hosts (2, 3). The duration of the blood feeding period is shorter in insects (e.g., sand flies, mosquitoes and black flies) as compared to ixodid ticks. Soon after flying (e.g., mosquitoes and sand flies), crawling (e.g., ticks) or jumping (e.g., fleas) arthropod vectors are attracted, locate and approach the host, they start their feeding activities. Therefore, knowing their behavior and biology is fundamental to plan control strategies to reduce their feeding activities on the hosts. For example, while mosquitoes and sand flies have a short-lasting contact with their hosts (i.e., they are mobile and, once landed on the host, they feed rapidly), fleas feed within 1 h of arriving on their host and ixodid ticks are long feeders, assuming blood for several hours or days. As a consequence, transmission time of bacterial and parasitic pathogens is usually shorter for insect vectors (from seconds to minutes) as compared to ticks (from hours to days). Importantly, pathogen transmission goes well beyond their mere inoculation, since it implies several factors, such as their pre-activation in the vectors (2). In fact, some tick-borne pathogens such as *Borrelia* spirochetes causing Lyme disease, require a reactivation period, resulting in a longer time of transmission (within 24-48 h) following the attachment of infected ixodid ticks (4). The ingestion of blood plays a role in pathogen pre-activation times (2, 5). For instance, interrupted feeding may reduce the transmission time of *Rickettsia rickettsii* by *Amblyomma aureolatum* from more than 10 hours to 10 min (6). Though the transmission of VBPs by ticks starts within a few hours after attachment, the establishment of infections may take longer, being apparently dependent on a minimum inoculation dose. Overall, the transmission times and their influencing factors are considered in the design of laboratory studies, though they cannot be easily controlled under field conditions: another example of theoretical vs. practical knowledge. Theoretically, the transmission of VBPs can be prevented either by completely impeding feeding by arthropods or by ensuring that arthropod vectors are killed before they can transmit pathogens. The efficacy of a parasiticide against a given arthropod vector does not imply *per se* a significant reduction of the risk of VBP transmission and therefore specific studies are required in order to pursue label claims. The efficacy requirements for a parasiticide to be registered may vary according to national/regional regulatory authorities. For instance, to be licensed in Europe, a parasiticide should demonstrate an efficacy of >95% and >90% against fleas and ticks, respectively, within a time frame from 24-48 h post-treatment to assess its efficacy to treat an existing infestation (i.e., therapeutic or immediate efficacy), and from 24-48 h post-infestation to assess the persistent (residual) efficacy (capacity to prevent the establishment of a new infestation) (7). In the USA, the product should have an efficacy of >90% against both fleas and ticks (7). However, as neither the evaluation time points nor the required efficacy values at these timepoints are validated for their relevance in the reduction of the VBP transmission risk. Under the above circumstances, the World Association for the Advancement of Veterinary Parasitology (WAAVP) has prepared guidelines for planning and implementation of studies for evaluating the efficacy of parasiticides in reducing transmission of VBPs to dogs and cats (8). As such, the WAAVP guidelines provide recommendations for laboratory or field studies to test the efficacy of parasiticides in reducing VBP transmission, respecting the overall principles of the 3Rs (replacement, reduction and refinement).

At present, the prevention of VBP transmission in companion animals is generally achieved through the administration of products that can repel or rapidly kill arthropods, thus preventing or interrupting feeding before transmission occurs. Insecticides and acaricides are available as topical (i.e. spot-on, spray and collar) or oral (i.e. chewable or hard tablets) formulations. These products may act by killing (i.e. insecticidal and/or acaricidal products, formulated for topical or oral applications) and/or repelling (i.e. repellent products, formulated for topical application only) arthropods. Therefore, these products can reduce arthropod feeding (anti-feeding effect) and/or block the feeding process in its early phases, ultimately reducing the risk of VBP transmission (9,10). A number of pyrethroids (e.g. permethrin, deltamethrin and flumethrin) with repellent effect have been proven efficacious to reduce the risk of transmission of VBDs (e.g. *Babesia canis, Ehrlichia canis, L. infantum*) in both laboratory and field studies. Other chemical compounds, by virtue of their fast killing effect, may also reduce the risk of VBP transmission in dogs and cats. For example, this is the case for macrocyclic lactone (ML) selamectin for the flea-borne pathogen *Bartonella henselae* and isoxazolines (e.g. afoxolaner, fluralaner, lotilaner and sarolaner) for the prevention of the transmission of several tick-borne pathogens (e.g. *Borrelia burgdorferi*, *B. canis* and *A. phagocytophilum*) as well as of dirofilariosis and leishmaniosis.

While laboratory studies are important for assessing the efficacy of a product in reducing the risk of VBP transmission, a spectrum of potential confounding factors (e.g. co-feeding, interrupted feeding and co-infection with multiple pathogens) can occur under field conditions. As such, field studies are pivotal to confirm data obtained in the laboratory. Even if study data generally confirm the efficacy of repellents and fast-killing parasiticides in reducing the risk of VBP transmission, none of the available products can ever ensure a total protection. Therefore, integrated control strategies are advocated for VBP prevention (e.g., the monthly administration of avermectins/milbemycins, for the prevention of heartworm infection in dogs and cats).

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025

VECTOR-BORNE HELMINTHS OF ZOONOTIC CONCERN: ONCHOCERCA LUPI AND THELAZIA CALLIPAEDA EYEWORMS

Domenico Otranto

University of Bari, Veterinary Medicine, Bari, Italy

Qualifications:

Domenico Otranto

DVM, PhD, DipEVPC, EBVS® European Veterinary Specialist in Parasitology, FRES

Professor of Parasitic Diseases

e.mail: domenico.otranto@uniba.ite.mail: domenicotranto@gmail.com

Instagram account: @parasiterranean

Amongst vector-borne helminths (VBH), filarioids such as *Dirofilaria immitis* and *Dirofilaria repens* (Spirurida, Onchocercidae), are probably the best known and prevalent globally, and some of them are of increasing concern due to the significant level of disease they may cause in dogs and humans (1). Nonetheless, other VBH of dogs and cats, such as *Thelazia callipaeda* (Spirurida, Thelaziidae) are emergent zoonotic agents in several European regions (2). *Thelazia callipaeda* nematodes live in the orbital cavities and associated host tissues causing ocular disease in carnivores and represent a potential public health concern, due to its zoonotic nature. Adult worms live in the conjunctival sacs under the nictitating membrane of vertebrate hosts, and mature females release first-stage larvae (L1) into the lachrymal secretions, which are subsequently ingested by males of the zoophilic secretophagous fruit fly *Phortica variegata*, the known vector of this spirurid in Europe (2). Until two decades ago, *T. callipaeda* was exclusively reported in eastern countries, i.e., the former Soviet Republics, India, Thailand, Indonesia, Myanmar, Korea, China, Taiwan, and Japan (2), thus being known as the "Oriental eyeworm". However, in the last two decades, *T. callipaeda* has increasingly been reported in both animals and humans in Europe, initially from Italy and then from several other European countries, such as France, Switzerland, Germany, Belgium, Spain, Bosnia and Herzegovina, Croatia, Serbia, Romania, and Greece (2). The spreading of this parasite in Europe was predicted by an ecological niche model, which was based on the ecology of *P. variegata* (3). More than 30 years after the first detection of *T. callipaeda* in Europe, this parasite is now considered to be endemic in several European countries, making clear the importance of ecological and biological studies also to answer important questions in medical sciences. Until the first autochthonous case reported in a dog from New York in 2020 (4), this parasite was considered exotic to North America. In order to know better the risk for the expansion of eyeworms in United States, the competence of *P. variegata* collected in New York state as an intermediate host of *T. callipaeda* was demonstrated under laboratory conditions (5). Data suggested that a rapid emergence of the infection could have been occurred, as demonstrated by new case reports of thelaziosis by *T. callipaeda*, which are going to be published in the next few months. Overall, the increase in animal and human case reports makes this parasite an emergent vector-borne pathogen in Europe and potentially in the United States. The role of wild animals in general and, particularly, of foxes and coyotes as reservoirs of infection for domestic species needs further investigations (6). Topical administration of ivermectin is an off-label use and may be irritant to the ocular tissues, therefore it is unacceptable in veterinary practice. Milbemycin oxime/praziquantel tablets, at the minimal dose of 0.5 mg/kg milbemycim oxime (7) as well as the imidacloprid 10% and moxidectin 2.5% spot-on formulation (8), have shown to significantly reduce infection rate in naturally infected dogs.

In the last 15 years, *Onchocerca lupi* emerged as a new threat to dogs and humans. Cases of ocular onchocercosis have been reported so far in dogs from southern (Greece, Portugal) and Central Europe (Germany, Hungary, Portugal, Switzerland) and Israel, and in cats from Portugal and Romania (9). As it happened years before in Europe, also in the United States, the first cases of canine onchocercosis recorded in California, as well as all the following cases of canine onchocercosis (i.e., Arizona, California, Nevada) were tentatively reported as an aberrant/occasional localization of parasites of cattle, horse or wild ungulates. Nonetheless, definitive evidence of *O. lupi* as the causative agent of infection was achieved in cats and dogs, with a large case series of *O. lupi* infection confirmed (10). In addition, since 2011, when the first report of human ocular infestation was described in Turkey, up to 10 human cases of *O. lupi* have been identified in patients from Germany, Turkey, Tunisia, Iran, and the US (9). Human cases had usually ocular locations, although cervical central canal and subcutaneous localization have also been described.

Assuming this parasite was not emerging in endemic areas (an assumption that cannot be demonstrated), the reasons why *O. lupi* has been for long time unreported could be linked to the challenges inherent to its diagnosis, which is performed by the detection of microfilariae from skin snips. This diagnostic procedure is time consuming, requires considerable technical skills for the isolation and differential identification of microfilariae, which may give false-negative results in cases of pre-patent infections. In addition, this diagnostic method is invasive and may be hindered by the unwillingness of pet owners in cases of asymptomatic infections (10).

Adult nematodes are generally included in granulomatous nodules located in different ocular regions including the retrobulbar space, orbital fascia, eyelid, third palpebral, conjunctiva, and sclera (10) causing ocular lesions ranging from no apparent clinical sings to conjunctivitis, photophobia, lacrimation, ocular discharge, keratitis, uveitis, exophthalmos and even blindness (10). Finally, there is no clear evidence about the efficacy of any drug for the therapy of canine and feline onchocercosis, which is so far based on protocols against other filarial nematodes (e.g., combination of melarsomine, ivermectin, topical and systemic antibiotics, and prednisone).

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NEW FILARIDS UNDER THE SKIN. LITTLE-KNOWN PARASITES WITH HIGH GLOBAL PREVALENCE

Domenico Otranto

University of Bari, Veterinary Medicine, Bari, Italy

Qualifications:

Domenico Otranto

DVM, PhD, DipEVPC, EBVS® European Veterinary Specialist in Parasitology, FRES

Professor of Parasitic Diseases

e.mail: domenico.otranto@uniba.it e.mail: domenicotranto@gmail.com

Instagram account: @parasiterranean

Filarial nematodes (Spirurida, Onchocercidae), or filarioids (superfamily Filarioidea), are parasitic worms transmitted by bloodsucking arthropods (e.g., lice, fleas, mosquitoes, black flies, and ticks) that infest a wide range of vertebrate hosts around the world. Importantly, some filarioids are of great public health concern as they are common parasites of humans (e.g., *Wuchereria bancrofti* and *Onchocerca volvulus*) in tropical and subtropical regions (1). However, a plethora of other filarial nematodes also parasitize wild and domestic mammals, even though most of them are considered of minor medico-veterinary significance, being clinical disease usually associated with a massive infestation.

In recent years, there has been renewed interest on zoonotic filarioids of dogs, such as *Dirofilaria immitis* and *Dirofilaria repens*, which are the most frequent agents of zoonotic dirofilariosis in the New and Old Worlds, respectively. In addition to these two *Dirofilaria* spp., the majority of canine filarioids colonize subcutaneous tissues, muscular fasciae, retropharyngeal and axillary lymphatics (genera *Acanthocheilonema*, *Brugia*, *Cercopithifilaria* and *Dirofilaria*), and ocular tissues (*Onchocerca lupi*). Overall, with the exception of *D. immitis*, *D. repens* and *Acanthocheilonema reconditum*, all other filarioids of dogs have been little studied and the information on their taxonomy, life history as well as their actual impact on human and veterinary medicine is relatively meagre. The lack of knowledge on most of those parasites spurred us to investigate the role of brown dog ticks (*Rhipicephalus sanguineus sensu lato*), as a potential vector of *A. reconditum*. In 2011, during the study above, we found, by serendipity, dermal microfilariae in the skin of a dog from Sicily, Italy (2). These microfilariae were morphologically described and molecularly characterized as *Cercopithifilaria* sp. I. The genus *Cercopithifilaria* includes 28 species parasitizing primates, ungulates, rodents, carnivores and marsupials (3) with adults usually localized beneath cutaneous tissues, whereas microfilariae are always in the dermis (3). In addition, ixodid ticks (Ixodida, Ixodidae) serve as vectors of *Cercopithifilaria* spp. Within this genus, *Cercopithifilaria grassii* (= *Filaria grassii* Noè, 1907) was described in dogs from central Italy, remaining little studied up to the early 1980s, when infective stage larvae were identified in the brown dog ticks from northern Italy and Switzerland. A second species of canine filarioid presenting dermal microfilariae, *Cercopithifilaria bainae* was found in Brazil but no additional information was available about this filarioid. The microfilariae described in our report from Sicily were extremely short (about 180 µm) presented a body flattened dorso-ventrally, a rounded head, bearing a tiny cephalic hook and were morphologically redescribed as *Cercopithifilaria bainae* (4). A further third undescribed species, named *Cercopithifilaria* sp. II sensu Otranto et al., 2013, is present in the Mediterranean area and is characterized by larger dimensions (i.e., 264.4 ±20.2 µm long) compared to *C. bainae* (5).

We suddenly realized that the paucity of data about this filarioid of dogs was due to the fact that, differently from blood circulating microfilariae of *Dirofilaria* spp., skin-dwelling microfilariae are usually not searched and diagnosed from practitioners and, therefore, they are largely unknown. Indeed, a series of investigations carried out since the studies above demonstrated that the occurrence of *C. bainae* overlaps with the distribution of the brown dog tick vector, and it was retrieved with prevalence rates reaching up to 21.6% in dogs from Spain, Greece and southern Italy (6). Nowadays, *C. bainae* has been detected in dogs and *R. sanguineus* (s.l.) ticks from Australia, Brazil, China, Greece, India, Indonesia, Iran, Italy, Malaysia, Portugal, Romania, South Africa, Spain, Taiwan, The Philippines, Vietnam, and the USA (7), whereas *C. grassii* has a more limited distribution, being reported only in dogs from Switzerland, Italy, Spain, Portugal, and Pakistan (7, 8). Finally, *Cercopithifilaria* sp. II *sensu* Otranto et al., 2013, has been reported in dogs from Italy and Portugal (8).

Larvae of *C. bainae* are distributed unevenly in the superficial dermal tissues of infested dogs, being mostly present on the skin of head, ears, and neck regions (9), which are also among the most common attachment sites of *R. sanguineus* s.l. Recent histological studies showed as microfilariae of *C. bainae* may induce erythematous and papular dermatitis in infested dogs (9). Though, the clinical presentation of the infestation by *Cercopithifilaria* spp. is considered negligible, *C. bainae* has been associated with dermatitis being characterized by erythema, papulae, pruritus, non-healing and ulcerative skin lesions, and subcutaneous nodules (10). In addition, this species has been associated with chronic polyarthritis in a dog from Italy (11). Recently, a single treatment with moxidectin 2.5%/imidacloprid 10% spot-on formulation showed to be efficacious against skin-dwelling mfs of *C. bainae* in dogs (8). Undoubtedly, the implication of *C. bainae* as the primary cause of these lesions remains to be ascertained by additional studies, which should better elucidate the actual pathogenic role of this filarioid. Finally, further research on pharmaceuticals and treatment schemes for preventing and treating this little known but widely distributed tick-borne transmitted nematode of dogs, are needed.

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027

BREAKING THE PARADIGMS OF CANINE LEISHMANIOSIS: LEISHMANIA TARENTOLAE

Domenico Otranto

University of Bari, Veterinary Medicine, Bari, Italy

Qualifications:

Domenico Otranto

DVM, PhD, DipEVPC, EBVS® European Veterinary Specialist in Parasitology, FRES

Professor of Parasitic Diseases

e.mail: domenico.otranto@uniba.it e.mail: domenicotranto@gmail.com

Instagram account: @parasiterranean

Trypanosomatids of the genus *Leishmania* (Kinetoplastida, Trypanosomatidae) are responsible for a significant burden on mammals, including humans, in many tropical, subtropical and temperate regions, affecting mainly people from low-income countries. *Leishmania infantum* is the most important species worldwide, causing zoonotic visceral leishmaniasis which is a neglected disease of medical and veterinary importance transmitted by sand flies of the genera *Phlebotomus* in the Old World and *Lutzomyia* in the New World (1).

However, a group of 21 less studied *Leishmania* spp. belonging to the subgenus *Sauroleishmania* have been considered typical of cold-blooded reptiles, being transmitted primarily by sand flies of the genus *Sergentomyia*. Among them, *Leishmania* (*Sauroleishmania*) *tarentolae*, firstly described from the gecko *Tarentola mauritanica* in Europe, North Africa, and the Middle East has been for long time considered non-pathogenic for its vertebrate hosts. Interestingly, some strains of *L. tarentolae* (e.g., LEM-125) were shown to cause transient infections in mammalian cells under laboratory conditions, differentiating into the amastigote stage. In the past 20 years, *L. tarentolae* has been studied as a model organism in biotechnology due to its high similarity in gene composition with *L. infantum* (i.e., 90%), its apparent absence of pathogenicity to humans and easiness in cultivation, therefore representing a platform for production of recombinant proteins (2).

Thought *Leishmania* (*Sauroleishmania*) spp. sand flies of the genus *Sergentomyia* are generally assumed to feed on reptiles, some species have been reported to bite mammals including humans. At the same time, *L. tarentolae* DNA was detected in *Phlebotomus perfiliewi* (3), *Phlebotomus perniciosus* (4) and, experimentally, in *Phlebotomus papatasi*, *P. perniciosus* and *Phlebotomus sergenti* (5). All the above, suggests that the paradigm of *L. tarentolae* infecting reptiles vs. *L. infantum* infecting mammals is debatable also because many *Phlebotomus* species are opportunistic feeders. Indeed, data suggest that sand flies of the genus *Phlebotomus* may play a role of permissive vectors in the circulation of *L. tarentolae*, and therefore in its transmission to non-reptilian hosts (5). Although *Sergentomyia minuta*, the proven natural vector of *L. tarentolae,* is one of the most abundant sand flies in the Mediterranean, only two studies described the development of *L. tarentolae* in this sand fly species. Meanwhile, in the early years, researchers investigated *T. mauritanica* geckos as possible reservoir of a zoonotic disease called Biskra boil and caused by *Leishmania* spp. and some authors hypothesized that geckoes could be the reservoirs of cutaneous leishmaniasis caused by *Leishmania tropica* and/or *Leishmania major*. In addition, studies confirmed that *Leishmania* (*Sauroleishmania*) *adleri* was the causative agent of cutaneous leishmaniasis in rodents and even in humans. It was hypothesized that interactions between mammalian and reptilian leishmaniae (i.e., *L. tarentolae* in mammals, *L. donovani* in reptiles), could ultimately result in partial dilution of species, thus immunization and protection, within the two sister clades (6).

Additional attempts were made to identify and isolate *Leishmania* (*Sauroleishmania*) spp. from endemic areas of human and canine leishmaniasis. Importantly, *L. tarentolae* is widely distributed and can infect saurian reptiles from the Gekkonidae (i.e., *Mediodactylus kotschyi*, *Tarentola annularis*, *T. mauritanica*) and the Lacertidae (i.e., *Podarcis filfolensis*, *Podarcis siculus*) families in the Mediterranean context where *L. infantum* is endemic. The unexpected detection of *L. tarentolae* in a 300-year-old mummy from Brazil and in human blood (3, 7) triggered further investigations on the role of this trypanosomatid in the context of leishmaniases and their control. The findings above is difficult to be explained, considering that *Sergentomyia* species are not present in that geographical area.

Importantly, the substantial reduction of anti-*L. infantum* antibody titres of more than half of the population of *L. infantum*-seropositive and clinically healthy sheltered dogs, sampled throughout a year (i.e., during the transmission and non-transmission season), raised questions regarding the possibility of dogs being exposed to *L. tarentolae*. Indeed, the seasonal variation of antibody levels in sheltered dogs from southern Italy where canine leishmaniasis is endemic could possibly indicate a positive effect of the exposure to *L. tarentolae*, reducing the clinical manifestation of canine leishmaniasis (4). Moreover, the finding of *S. minuta* as the most abundant species in canine leishmaniasis endemic areas (3, 4, 8), further suggested the possibility of mammalian exposure to *L. tarentolae*, also considering the feeding behavior of this sand fly species on humans and dogs. In the same geographical area of southern Italy, *L. infantum* was molecularly detected in lizards in sympatric occurrence with *L. tarentolae*. These molecular findings suggest the interaction between both species of *Leishmania,* which ultimately leaves us with the "who came first? The egg or the chicken?" kind of question. In this case, who infected who first? *L. infantum* in reptiles or *L. tarentolae* in mammals? The overall picture is useful to understand the implications of the interactions of these sister-clades *Leishmania*, which may be applied to improve diagnostic tools, efficient control, and treatment of a neglected disease with a high burden for our society.

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028

CANINE LYMPHOMA- TYPES AND DIAGNOSIS.

Natalia Ignatenko

Praxis Feldkirchen, Oncologist, Feldkirchen, Germany

Qualifications:

Nataliia Ignatenko

Dr med vet, phD, Dipl.ECVIM-Ca-oncology

natali.ignatenko@gmail.com

B cell neoplasia	T-cell neoplasia
neoplasia from precursors of B - cells: B- acute lymphoblastic leukemia (B- ALL) B- lymphoblastic lymphoma (B-LBL)	**neoplasia from precursors of T - cells:** T- acute lymphoblastic leukemia (T-ALL) T- lymphoblastic lymphoma (T-LBL)
Lymphoma from mature B-cells: *Diffuse large B- cell- lymphoma:* centroblastic, immunnoblastic, anaplastic, T-cell/histyocyte rich *Marginal zone BCL*: nodal, splenic, MALT *follicular cell BCL* *Mantle cell BCL* *B-cll/ small lymphocytic B-cell lymphoma* *Burkitt –like BCL* *Angiocentric BCL – "LYG"* *extramedullary plasmacytoma* *Multiple myeloma*	**Lymphoma from mature T-cells** *Nodal T-Cell lymphoma:* *Peripheral T-cell lymphoma unspecified* *T-Zone TCL* *anaplastic large TCL* *Angioimmunoblastic TCL* *Cutaneous TCL:* *Mucosis fungoides* *Pagetoid reticulosis* *Sezary syndrome* *Peripheral TCL-unspecified* *Extranodal other:* *enteropathy associated TCL* *Hepatocytotrophic TCL* *Hepatospenic TCL* *Peripheral T-cell lymphoma unspecified* *SC "panniculitis –like TCL* *LGL – Leukemia: T-LGL-CLL* *T-LGL-ALL*

Table 1: WHO Lymphoma classification

Table 1: WHO lymphoma classification

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Table 2: Median survival time of different subtypes of canine nodal lymphoma

> 800 days	325-510 days	130 - 250 days	less than 60 days
Follicular lymphoma (FL)	diffuse large B cell lymphoma (DLBCL)	Nodal marginal zone lymphoma (nMZL)	hepatosplenic lymphoma (HS-TCL)
T-Zone lymphoma (TZL)		Peripheral T-cell lymphoma (PTCL)	T-cell leukemia of English bulldogs (TCLEB)
Splenic marginal zone lymphoma (SMZL)		Diffuse small B-cell lymphoma (DSBCL)	Acute leukemia (AL)
Large granular lymphocytic leukemia (LGL)		Cutaneous epitheliotropic T-cell lymphoma (CTCL)	Burkitt like lymphoma (BL)
B-cell chronic lymphocytic leukemia (B-cll)			
Mantle cell lymphoma (MCL)			

Canine lymphoma types and diagnosis N.Ignatenko, M.Soberano. Lymphoma in dogs, on the one hand, is the most studied oncological pathology, in which chemotherapy is most often performed by veterinarians around the world. But, on the other hand, hand on heart, we can answer that when treating our patients in the 21st century, we still often focus only on cytological examination in making a diagnosis and consider the response to chemotherapy to be decisive for the prognosis. Key points: Lymphoma is not a single disease, but a whole group of heterogeneous diseases with different morphological structure, clinical manifestations, response to therapy and prognosis. Veterinary classification There have been multiple attempts to classify lymphomas along the lines of medical classifications (NCI-WF, Kiel, modified Kiel, and others), but none of the classifications had advantages in determining prognostic criteria, which is one of the main goals of the classification. The 2001 updated WHO classification of neoplasms of the hematopoietic system and lymphoid tissues for the first time reached consensus among 20 leading pathologists from Europe, Asia and America with a comparability of more than 80%. Understanding the subtypes of lymphoma allows us as clinicians to choose the best treatment option and have better prognosis information. The WHO classification (simplified) is shown in Table 1 Table 1: WHO Lymphoma classification In Table 2, we can see how life expectancy differs in dogs with different types of lymphoma. Diagnostic: What do we use for diagnosis? Cytological examination of fine-needle aspirates of lymph nodes. The most common form of lymphoma in dogs is multicentric (by anatomical characteristics) diffuse large B-cell (morphologically) form of lymphoma, the cytological diagnosis of which is not difficult for an experienced clinical pathologist. The advantage of the method: fast, inexpensive, in most cases does not require sedation for the selection of material. Disadvantages: not all types of lymphomas can be diagnosed (for example, small cell or intermediate cell lymphomas) Immunocytochemical investigation is an inexpensive minimally invasive diagnostic method, the material can be a fine-needle material taken earlier for cytological diagnostics, which in some cases makes it possible to differentiate B and T-cell lymphomas. However, it is not a method confirming the diagnosis of lymphoma. It is not a test to differentiate a reactive lymph node from a neoplastic lesion. Histological examination: Some types of lymphoma, particularly indolent forms (small or intermediated sized) such as T-zone lymphomas, are best diagnosed by histological examination, although an experienced clinical pathologist may suspect them cytologically. For histological examination, it is better to send the entire lymph node, avoiding transverse core biopsies.

Disadvantages: requires general sedation, more expensive, takes more time to diagnose. It does not allow diagnosing all subtypes of lymphoma. Immunohistochemical examination does not make it possible to make a diagnosis of lymphoma on its own, but, supplementing the histological examination, it allows subclassification of lymphomas. Flow cytometry: This diagnostic method allows not only to diagnose lymphoma, but also to determine its phenotype. Advantages: allows to differentiate many types of lymphoma (small cell, T-zone lymphoma, marginal form of lymphoma). Its results are comparable with the immunohistochemical diagnostic method; Disadvantages: Requires living cells for diagnostic tests. PARR: This method is used to determine whether lymphocytes originate from one cell clone (neoplastic lymphocytes) or from several - polyclonal (in reactive processes) in the case when cytological or histological examination does not give a definite answer. Sensitivity: 70-90% Disadvantages: false positive results in the case of some infectious diseases: leishmaniasis, borreliosis, ehrlichiosis, as well as in histiocytomas, thymomas and hepatitis due to hypersensitivity to drugs. False-negative results in NK-lymphomas with aberrant lymphoid receptors. Circulating nucleosome detection: used as a screening test to detect certain types of cancer in a population of healthy animals. Nucleosome levels are 6.8 times higher in patients with lymphoma than in healthy dogs. Higher in dogs with B cell lymphoma. The sensitivity of modern methods is 80.2%, the specificity is 94%. In the future, this method is also proposed to be used to assess the state of remission in a patient with lymphoma. Disadvantages: severe inflammation, sepsis, acute and chronic enteropathies, trauma, IMHA can also cause an increase in the level of circulating nucleosomes. In addition to morphological classification, anatomical localization also plays a role, for example, with Dogs with multicentric lymphoma respond better to therapy and live longer than dogs with gastrointestinal lymphoma. The substage of the disease is also important: clinically well animals tolerate chemotherapy better and live longer than patients who do not feel well. Although we know that achieving remission is possible in both patients with stage 1 and 4 lymphoma, the authors recommend (if owners agree) that patients with lymphoma be staged. This allows not only to find out if there is involvement of internal organs (most often, the spleen and liver), but also to exclude comorbid conditions (other neoplasms, systemic diseases), the presence of which can affect the general well-being of the patient, response to treatment and prognosis for a dog with lymphoma in general. Therefore, routine tests are useful in patients in whom we suspect lymphoma: a biochemical blood test or complete blood count does not make a diagnosis of lymphomas or suspect cancer, but is very important for assessing the patient's health status in order to choose the optimal protocol, taking into account possible limitations (chronic renal insufficiency or dysfunction of the liver, the presence of thrombocytopenia, anemia or neutropenia are factors limiting the conduct of chemotherapy. The neutrophils lymphocytes ratio in the complete blood count is of prognostic value in patients with lymphoma. Imaging diagnostic methods such as abdominal ultrasound and X-ray of the thorax can be not only additional methods for determining the stage of the disease, but help to exclude comorbid conditions. CT is more accurate, but significantly more expensive imaging modality.

A bone marrow biopsy can rule out stage 5 lymphoma with a poor prognosis. The morphological diagnosis and the stage of the process allow us to choose the best treatment tactics for our patients and have objective information about the prognosis. References: 1. Comazzi S, Marconato L, et al.; European Canine Lymphoma Network. The European canine lymphoma network: a joining initiative to generate consensus guidelines for the diagnosis and therapy in canine lymphoma and research partnership. Vet Comp Oncol. 2015;3(4):494–497. 2. Dolan, C., Miller, T., Jill, J., Terrell, J., Kelly, T., Bygott, T., & Wilson-Robles, H. (2021). Characterizing circulating nucleosomes in the plasma of dogs with lymphoma. BMC Veterinary Research, 17(1). https://doi.org/10.1186/s12917- 021-02991-x 3. Argyle, David, and Evi Pecceu. "Canine and feline lymphoma: challenges and opportunities for creating a paradigm shift." Veterinary and Comparative Oncology 14 (2016): 1-7. 4. Zandvliet, M. "Canine lymphoma: a review." Veterinary Quarterly 36.2 (2016): 76- 104

029

PAIN MANAGEMENT IN TRAUMA PATIENTS.

Adetola Ajadi[1,2]

[1]Federal University of Agriculture, Abeokuta, Department Of Veterinary Surgery And Theriogenology, Abeokuta, Nigeria, [2]Federal University of Agriculture, Abeokuta, Veterinary Surgery And Theriogenology, Abeokuta, Nigeria

Qualifications:

Full Name: AJADI RASHEED ADETOLA

Qualification: DVM; MVSc; PhD

E-mail: ade_vsr@hotmail.com

Introduction

Trauma is one of the most prevalent disorders presented to veterinary practices (1). Traumatic injuries vary in severity from simple soft tissue injury to life-threatening multiple bone and vital organ compromise. Provision of adequate analgesia is a vital component of any trauma management plan and requires adequate assessment of pharmacologic and non-pharmacologic pain management protocols to relieve moderate to severe pain, cognizance of serious adverse drug effects and regularly reassessment of patients to evaluate their response to treatment.

The aim of pain management in trauma patients is to reduce mortality and morbidity, shorten hospital stay, contributing to early mobilization, reduce hospital cost, and enhance patient comfort and quality of life. Patient-centered trauma care will also require having knowledge of barriers to pain management. The ideal method should provide individualized pain management for any patient according to a continuous cycle of plan-treat-evaluate based on the response of the patient to pain intervention protocol.

Trauma and pain in dogs and cats

Pain associated with trauma can be either nociceptive, inflammatory or maladaptive (2). Nociceptive pain occurs when peripheral neural receptors are activated by noxious stimuli. Inflammatory pain results gradually from activation of the immune system in response to injury, while maladaptive pain, occurs when pain is amplified and sustained by molecular, cellular, and micro-anatomic changes, collectively termed peripheral and central hypersensitization (3).

One of the challenges of pain assessment in trauma patients is that their injuries may obscure the behaviors associated with pain species (4). For example, a dog with thoracic wall injury may be presented in a state of shock or coma thus making behavioural assessment of pain difficult. In addition, recognition of pain may be complicated by agitation, fear or excitement. Management of pain in dogs and cats with trauma is also challenging due to the likelihood of organ compromise secondary to the injury, and disturbance in the general homeostasis of the patient. Techniques and medications used for pain control may cause some adverse effects which can threaten the general physiology of the patient (5).

Approach to Pain Management in Trauma Patient

The PLATTER method (6) provides individualized pain management for any patient and is devised not on a static basis but according to a continuous cycle of plan-treat-evaluate, based on the patient's response. The patient's pain management needs should be anticipated where scoring is not possible so that preventive analgesia can either be provided or, in the case of preexisting pain, be initiated as soon as possible. The goal of pain management in trauma patients is to control pain as quick as possible and prevent acute pain from being transformed into chronic (maladaptive pain) (2). This allows the practitioner to determine the patient's basal requirements before starting long-acting medications (7).

Systemic pharmacological techniques are the main stay of therapy during the emergency phase of a trauma case. Administration of rapidly acting intravenous agents in small doses at frequent intervals until pain relief is achieved is recommended for emergency situations (8). Long-acting opioids are usually not recommended in the emergency phase. Current practices for trauma pain management include but are not limited to the following modalities: central regional (neuraxial) opioid analgesia; peripheral regional analgesic procedures, including but not limited to intercostal blocks, inter-pleural catheters, plexus blocks, and local anaesthetic infiltration of incisions (2).

Successful multimodal analgesia (MMA) in dogs and cats with traumatic injury should include NSAIDs, opioids, adjuvant analgesics (tramadol, ketamine, and gabapentin), local and regional analgesia, cognitive modalities, physical modalities and nursing care (9). Non-opioid analgesics should be administered on a scheduled basis. Agents such as ketamine and systemic lidocaine are safe and effective components of an MMA strategy in dogs with traumatic injuries. The choice of drug(s) used to treat pain will depend on the underlying cause of pain, its severity and duration. Knowledge of the drug pharmacology in each species and in patients of different age and physical status is also important.

Non-pharmacologic treatment should be part of a multimodal system for management of pain in trauma patients (3). Although most pain can be managed by simple non-invasive methods, more invasive methods including surgery may be needed in some instances. These may include wound and other soft tissue repair, bone immobilization, drainage of cavities depending on the nature of the injury. This should be done as soon as possible to minimize the use of pharmacologic agents and ensure early control of pain.

Neuromodulating treatments are aimed at stimulating the pain systems should also be considered in the management of dogs and cats with traumatic injury (10). Currently, several neuromodulation methods such as percutaneous nerve electrostimulation (TENS), peripheral nerve stimulation, acupuncture, and vibration are available (8). Neuromodulation supports pain treatment methods by activating the pain inhibitory mechanisms, thus reducing pain and improving the quality of life of patients.

Conclusion

Trauma is one of the most prevalent disorders presented to veterinary practices and a major cause of mortality and morbidity in dogs and cats. Pain in trauma patient increase the stress response with resultant increase in metabolic and energy demands, delayed wound healing, reduced immune function, weight loss, decreased mobility and prolonged recumbency. Thus pain must be recognized and treated promptly in trauma patients.

The ideal pain management method should provide individualized pain management for the traumatized patient. Several modalities are available for management of pain in dogs and cats with traumatic injury, however a protocol that involves multimodal approach taking into account the physiological status of the patient is preferred. The adopted technique should comprise of both pharmacologic and non-pharmacologic modalities

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030

OLD AND NEW PHENOTYPIC SCREENING PROGRAMS FOR IMPROVED GENETIC HEALTH

Åke Hedhammar

Swedish University Agriculture Science, Clinical Science, Uppsala, Sweden

Qualifications:

Åke Hedhammar Dipl. ECVIM- passve

DVM professor em. Internal Medicine '

ake.hedhammar@slu.se

In the era of molecular genetics recent possibilities for molecular genetic screening have been the focus in many breeding programs.

It should then be remembered that phenotypic screening is the basis also for molecular genetic screening and that molecular genetic screening is so far best suited for simple recessively inherited disorders and most of what we have to handle is not that simple. Phenotypic screening is still the most suitable for complex disorders

The aim of phenotypic screening programs

Most phenotypic screening programs are based on an ability to predict at an early age if a dog is going to develop an inherited disorder. Hip dysplasia is a typical example, where first an early palpation and later a standardized radiological procedure was proven to indicate if a dog would develop clinical signs by a deviation from normality regarding laxity and form of the hip joint. It was originally primarily used to predict clinical outcome for dogs to be used for military service. Since the result from these screening procedure was shown to be heritable it is nowadays mostly seen as a tool to select the breeding stock.

By extensive screening not only of potential breeding stock but also of as many relatives as possible it is possible by calculation of breeding indexes to reveal the genotype of an individual intended for breeding much more accurate than by any more sophisticated phenotypic screening procedures

Screening versus diagnosing

Ideally a screening procedure should be standardized and easy and inexpensive to perform and thereby widely used in the selection of breeding stock. Diagnosing is adapted to reveal in a presumed case the true aetiology of clinical symptoms

Screening programs versus breeding programs

To be effective, result from screening programs have to be registered in a fashion that enables their effective usage. That is - linked to ancestral background and open to the public regarding positive as well as negative results.

Registration of results

To serve as an effective breeding program the results have to be accessible in registries open to the public and linked to the ancestral background. The individuals have to be permanently identified.

That calls for collaboration between the veterinary profession and the cynological organisations and makes it possible to account for individual results as well as calculated Breeding Value estimates. In Europe and elsewhere several Kennel Clubs also have arranged for various screening programs in collaboration with the veterinary profession. The extent and who is in charge of the registries do however vary.

In UK the **Canine Health Schemes** (CHS) is established by the British Veterinary Association (BVA) and the Royal Kennel Club and works with expert veterinary surgeons to offer dog health screening schemes for a number of known hereditary conditions in order to improve dog health and welfare. (BVA - Canine Health Schemes) The US The non-profit organisation **Orthopaedic Foundation (OFA)** have created a Canine Health Information Centre (CHIC) by partnering with participating parent clubs to research and maintain information on the health issues prevalent in specific breeds with established recommended protocol for breed-specific health screenings. (CHIC Program | OFA)

Since long time there have been screening performed by the breeders themselves or by veterinarians for neonatal malformations as cleft palate, atresia anus and hernias and for cryptorchidism**.**

Vet checks -Inspection of puppies before delivery to the owner

In a couple of European countries, including Sweden, it is already a mandatory rule by the national kennel clubs that puppies should have a veterinary certificate proving their health status at the time of delivery. Primary focus on these certificates has been to avoid spread of infectious diseases. With increasing attention to exaggerated anatomical features it is now logical to extend these examinations to include also an inspection of clinical signs that can be related to anatomical features.

Dentition, bite, length of skull are changing over time and therefore delicate to evaluate at a 8 week old puppy. The veterinary evaluation might consequently preferably be limited to clinical signs of discomfort.

Deafness In some mainly white coloured breeds it is a routine also to screen for deafness either by simple or more advanced testing.

Since more than half a century and for many breeds formal screening programs for hip dysplasia and hereditary eye defects have been established and widely performed

Hip Dysplasia (HD) in mainly large sized breeds is now widely screened for in many countries. The scheme operated mainly in US by the Orthopaedic Foundation and registered by the i.e the American Kennel Club is almost but not the same as the original scheme by FCI performed in a large number of countries worldwide. In UK a somewhat different scoring is operated by the Royal Kennel club in collaboration with the UK veterinary profession.

In all HD schemes the screening is performed at many clinics but scored centrally by national panellists - radiologists with special training for it- mostly Diplomates in Diagnostic imaging.

In countries belonging to FCI as well as in UK and US regular meetings aim to stand**ardise the hip scoring. A workshop with active panellists from over 20 FCI countries was 2022 arranged to harmonize scoring and update the scoring procedure.**

Hereditary eye defects have been extensively screened for since 1950th.

Although with similar procedures these also somewhat different in US-registered by OFA, in UK registered by the Royal Kennel Club and in Europe registered by the national Kennel Clubs. The Eye screenings are performed by specially trained veterinary ophthalmologist – mostly Diplomates. https://www.ecvo.eu/hereditary-eye-diseases.html

Since 1990th in some breeds also Elbow Dysplasia have been screened by standardised radiographic procedure introduced by the International Elbow Working Group (IEWG)a multi- stakeholder group initiated by a breeder of Bernese Mountain Dogs (http://www.vet-iewg.org/about/)

Somewhat variable schemes for Patellar luxation by palpation have in some countries been in force for mainly small sized breeds

Screening by auscultation and/ or ultrasound for Mitral Valve Disease

(MVD) and various Cardiomyopathies have been in place in some countries since 1990th and 2000th

An example of screening by results from biochemistry testing is lymphocytic Thyroiditis performed in some high risqué breeds and copper toxicities in Bedlington terrier

Radiographic Screening also for Degenerative disc disease is now in place for mainly dachshunds and Chiari Malformation/Syringomyelia in a number of breeds with short skull.

Less widely performed and in specific breed is dermoid sinus in Rhodesian ridgeback, spondylosis in mainly boxer and tracheal hypoplasia in mainly English bulldog.

Examples of some rather registries than screening programs I.e. the ones for clinical signs of **Idiopathic epilepsies** in many breeds and for **Juvenile Renal Conditions** in some breed preferably by post-mortem examinations.

Phenotypic screening and breeding indexes are based on the possibility to evaluate "affected as well as "none affected" individuals and thereby depicture the population. Some registries on inherited disorders are not really based on a screening procedure but rather on just diagnosed cases. For i.e. renal dysplasia, based on histopathological features, it is not possible to screen for absence of it in the rest of the population.

By screening programs it is most commonly possible to identify and register affected as well as non-affected individuals. Besides registries for formal screening programs there are registries that just contain information on verified clinical cases. To identify some hereditary eye defects is actually something in between. Screening for glaucoma and lens luxation is included in screening programs for hereditary eye defects but most cases are identified just by their clinical onset.

There is a difference between registries where "affected" as well as "none affected" individuals are identified compared to those in which only either affected or none affected are registered. Many registries, for good reasons, do contain only identified cases with certain diagnostic criteria, but with small possibilities to identify the status in the rest of an affected population, i.e. Renal Dysplasia that requires a post mortem examination. Registries of just unaffected /clear individuals that have been common in the past have a much more limited value like the ones not open to the public.

Some of the hereditary eye diseases as glaucoma and lens luxation are rather revealed by registration of cases than in regular screening programs.

Handling of **Osteochondritis (OCD) of the Shoulder joint** verified by radiology and **Sebaceous Adenitis by PAD are rather based on registries of cases rather than from screening procedures**

More recently screening procedures for Brachycephalic Obstructive Airway Syndrome have been introduced worldwide.

Among various screening programs for BOAS the one developed at University of Cambridge funded by the Royal Kennel Club in UK is now widely promoted in many countries.

An extensive review of phenotypic screening programs is available in a special issue on hereditary disorders in EJCAP 23(3), Autumn 2013

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031

WOUND RECONSTRUCTION TECHNIQUES - NO MORE TENSION!

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS - SA

amsingh@uoguelph.ca

Considerations in wound closure

The management of large wounds or those in challenging locations has received much attention in the veterinary literature over the years and have been the subject of many research efforts to find innovative new ways to manage these often challenging situations. With so many different options for closure available, it can be confusing to know which technique or combination of techniques to use to maximize the chance of achieving a good outcome. In this presentation an attempt will be made to offer solutions to some examples of challenging wounds that are commonly encountered in veterinary practice with local skin flap techniques that do not necessarily demand specialist training or equipment.

Decision-making

In general, the surgeon should always choose the simplest modality for wound closure that is likely to yield a successful outcome. Many different factors come into play when deciding what technique to use to close a wound. In oncological procedures that require large tissue excisions, certain principles must be adhered to; a larger area of tissue should not be contaminated with neoplastic cells by the use of elaborate flaps if a more simple closure could be successful. Failure to adhere to these principles can make subsequent management with further surgery or adjunctive radiation therapy in the event of an incomplete excision, more challenging. The use of drains in oncological excisions is similarly controversial given the possibility that the drain tract could be seeded with neoplastic cells. Careful use of drains is generally considered reasonable in these situations but drains should always exit adjacent to the primary incision and in an area where complete excision or radiation treatment of the drain tract is possible.

The level of wound contamination is an important factor to consider. Closure of contaminated or dirty wounds is discouraged whether primary closure or a skin flap is planned. The most common contaminated wounds encountered are traumatic (especially degloving injuries) in origin or the result of post-operative wound infections. These wounds are managed open until a healthy granulating bed has formed at which point decisions can be made as to whether closure is reasonable and if so whether any kind of skin flap is necessary.

Many factors both related to the local wound environment as well as systemic or other exogenous influences affect the ability of wounds to close and may influence the reconstructive techniques chosen. Local wound factors such as oxygen tension, blood supply and presence of necrotic or foreign material must be taken into account. Exogenous factors such as systemic disease, corticosteroids, cytotoxic drug use and radiation therapy can have profound effects on normal wound healing. These factors may necessitate the use of techniques that improve blood supply. This could include excision of a pre-existing old granulation bed that no longer has a good blood supply and waiting for a new granulation bed to form that has improved vascularity. Another example might be the choice of a well-vascularized skin flap over a skin graft for reconstruction of a poorly-vascularized radiation ulcer.

Vascular supply to the skin

A knowledge of the blood supply to the skin is important when considering any kind of reconstructive surgery for wound closure. If inappropriately handled local flaps may suffer vascular compromise, which may lead to necrosis.

Direct cutaneous arteries and veins supply the subdermal plexus in dogs and cats. The subdermal plexus lies above and below the panniculus muscle in areas where this muscle is present, which includes most of the head, neck, trunk and abdomen. In the middle and lower parts of the limbs where there is no panniculus muscle present, the subdermal plexus lies in the deep areolar tissue on the deep face of the dermis. It is vital whenever skin is being undermined for primary closure, or elevated for flap development, to dissect in the plane below the subdermal plexus and to avoid any damage to the vascular pedicles of the direct cutaneous arteries. The course of many of the direct cutaneous arteries have been documented in dogs and cats and can be found in most of the surgical texts.[1]

Local flaps

Many different types of local flaps exist. All rely on the availability of readily moveable skin located adjacent to the wound. Local flaps transfer full thickness skin along with varying degrees of the underlying subcutaneous tissue and have the advantage of providing padding and a fairly reliable blood supply.

Local flaps obtain blood supply through the subdermal plexus without known inclusion of a direct cutaneous artery and vein. These flaps can be transposed, rotated or advanced into the wound depending on where the supply of loose skin for closure is located relative to the wound. Unfortunately, there is no direct relationship between flap width and length that guarantees an adequate vascular supply to local flaps and so it is difficult to give exact rules regarding how wide the pedicle should be. As wide a base as possible should be used as this will increase the likelihood of incorporating more direct cutaneous vessels. A loose rule of thumb is to ensure that flap length is no more than twice the width of the base.

One type of local flap that we have used extensively are the skin fold advancement flaps.[2]These flaps take advantage of the abundance of loose skin available in the axillary and inguinal regions. These folds of skin have a medial and lateral attachment to the upper limb and dorsal and ventral attachments to the trunk. Any three of these four attachments can be elevated resulting in a surprisingly large amount of skin that can be rotated into defects of the medial or lateral limb or areas on the trunk or lower abdomen depending on whether the axillary or inguinal folds have been used. They are extremely versatile and can also be elevated bilaterally for closure of large wounds on the ventrum. It has been suggested that in some cases the axillary skin fold is actually an axial pattern flap based on the angiosome of the lateral thoracic artery.[2,3]

Other very user-friendly and simple flaps include the single pedicle advancement flap, the transposition flap and rotational flap. The anatomy of these flaps and areas where the author has found these flaps useful will be discussed in this lecture using case examples in each case.

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FELINE ASTHMA MANAGEMENT.

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM (Small Animal Internal Medicine)

lrjohnson@ucdavis.edu

Feline Asthma Management

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Cough in the cat can be associated with inflammatory, infectious, parasitic, or neoplastic disease, and inflammatory airway disease is likely the most common cause of cough and/or respiratory difficulty. The cause of inflammatory airway disease is not precisely known, although allergy, air pollution, oxidant injury, gastro-esophageal reflux disease, or genetic predisposition have all been proposed to play a role, and the diagnosis of inflammatory airway disease (asthma/bronchitis) is based on exclusion of other causes. All ages of cats are affected, although middle-aged females (2-8 years) seem to be more frequently represented. Siamese cats might have an increased incidence of disease and may suffer from a more chronic, severe form of bronchial disease. A spectrum of disease activity is encountered ranging from the cat that experiences intermittent coughing to the cat presented in life-threatening respiratory distress. The heterogeneous manifestations of disease are all likely due to reduction in airway diameter due to mucus production, epithelial hyperplasia, and airway smooth muscle constriction caused by inflammation. Airway remodelling in the chronic form of disease results in irreversible limitation of airflow.

Coughing or respiratory distress are the most frequently encountered complaints in cats with bronchial disease, and the duration of illness, severity of signs, and presence of other clinical abnormalities are variable. The cough is often described as a dry, 'hacking' cough, and paroxysms of coughing with excessive effort or neck extension may be reported. Owners might also describe audible breathing sounds or wheezes that become progressively worse over time. Exercise intolerance can become evident in the later stages of disease, and the cat may limit its activity to lessen the stress on the respiratory system.

On physical examination, cats with airway disease can appear normal at rest with normal pulmonary auscultation. Many cats will display increased tracheal sensitivity, and post-tussive crackles can sometimes be ausculted. Harsh lung sounds, crackles, or expiratory wheezes are heard intermittently in affected cats, and the expiratory phase of respiration may be prolonged. Air trapping can occur distal to obstructed airways leading to a barrel shaped chest. Auscultation in this area of the lung will be relatively quiet, and increased resonance is found on percussion. Quiet thoracic auscultation in conjunction with tachypnea should also raise concerns about the possibility of pneumothorax. Cats that have undergone extensive airway remodeling can develop emphysematous change that leads to alveolar rupture and pneumothorax. Another complication of bronchial disease with mucus plugging is lung lobe torsion.

While idiopathic inflammation is the most common cause of cough in cats, specific disease processes can result in similar signs, and diagnostic testing should be performed to rule out treatable causes of airway inflammation such as parasitic or *Mycoplasma* infection. A cat with idiopathic inflammatory airway disease is likely to require life long and often daily treatment with glucocorticoids, and although cats generally tolerate steroid therapy well, there can be systemic side effects along with the inconvenience of daily medication. If an inciting cause for inflammation can be identified and successfully treated, it would be more likely that cough and airway inflammation can be resolved.

Infection with the airway parasite *Aelurostrongylus abstrusus* has the potential to incite eosinophilic inflammation and cough. Young cats seem to be affected more commonly than adult cats. A cat can become infected with *Aelurostrongylus* by eating an infected snail, eating a transport host (bird or rodent) that has eaten a snail, or eating or licking dirt that has hosted a snail. Although parasites are shed intermittently, fecal evaluation is a useful diagnostic tool and is particularly recommended in a cat with a history of hunting or eating prey. A fresh, unrefrigerated fecal specimen (~1 teaspoon) should be submitted for Baermann evaluation in order to detect the larval stage of this nematode. Fecal examinations can be falsely negative because of intermittent shedding of the parasite; therefore, trial treatment with fenbendazole (50 mg/kg PO daily for 10-14 days) can be used to treat potential infection in suspect cases. *Troglostrongylus brevior* is an additional cause of parasitic pneumonia in Mediterranean countries.

The signature radiographic finding in idiopathic feline bronchial disease is bronchial thickening, however, normal chest radiographs can also be found. In addition, a variety of interstitial or alveolar infiltrative patterns can be observed varying from mild to severe. Alveolar infiltrates, including atelectasis of the right middle lung lobe, result from mucus plugging of larger airways with resultant collapse of distal alveolar segments. Radiographic signs of the bronchoconstrictive form of feline bronchial disease (asthma) include flattening of the diaphragm and air trapping or hyperlucency.

An eosinophilic tracheal wash specimen should be considered supportive of the diagnosis of feline bronchial disease, however neutrophils predominate in many cases of feline bronchial disease and mixed inflammation is common. Bacterial cultures are submitted to rule out infection, and it is particularly important to rule out *Mycoplasma* infection, which is an important cause of lower respiratory tract infection in cats. Positive aerobic airway cultures should be interpreted in conjunction with cytologic results. Healthy cats can have bacteria isolated from the airways, and detection of aerobic bacterial growth alone on culture is not indicative of bacterial infection. In the dog, true bacterial infection is associated with septic, suppurative inflammation and intracellular bacteria. A similar finding is likely the case in cats. The presence of *Simonsiella* bacteria or squamous cells on cytology suggests oropharyngeal contamination of the sample and confuses the interpretation of culture results.

Chronic management of feline bronchial disease relies on judicious use of steroids to control inflammation. Initially, prednisolone is administered orally at ~1 mg/kg PO BID for 5-14 days. The dosage is decreased to 1 mg/kg daily for approximately 10-28 days if the cat remains free of respiratory signs, and the dosage can be further tapered over time to every other day therapy. Recurrent episodes of coughing or respiratory distress necessitate a return to the original dosage. Discontinuation of medication might be possible in some cats, although it is unclear if resolution of clinical signs correlates with control of airway inflammation and failure to control inflammation adequately can result in irreversible airway remodeling. Cats are relatively resistant to the side effects of corticosteroids; however, an attempt should be made to achieve the lowest dose of the drug that will control signs.

Use of inhaled steroids controls clinical signs in many cats with lower airway inflammatory disease. Current recommendations are to employ a pediatric spacing device with facemask (www.aerokat.com) to optimize pulmonary penetration of drugs. Multiple steroid preparations are available for inhalation in metered dose inhalers. Fluticasone propionate is the most potent steroid available and is generally instituted at a dosage of 1 puff of the 110 µg/actuation twice daily via the spacing chamber. The cat should inhale 8-10 breaths to achieve an adequate amount of drug. In cats with moderate to severe clinical manifestations of disease, oral steroids are recommended during the first two weeks of inhaled therapy for more rapid control of disease, and oral therapy can then be tapered more quickly. With good response, reduction of the fluticasone

to once daily or use of the 44 µg/puff dose can be considered. For cats with concurrent illness such as renal disease, diabetes, or heart disease, inhaled drugs alone are implemented.

Two forms of bronchodilators are sometimes used for feline bronchial disease: beta agonists (terbutaline) and methylxanthine derivatives (extended-release theophylline). Terbutaline is indicated for use in emergency situations because it is a direct-acting bronchodilator. It can be used parenterally at home in cats that suffer asthma attacks. One disadvantage of terbutaline is the possibility of decreased efficacy with long-term use due to down-regulation of beta receptor numbers. Terbutaline is supplied in 2.5 and 5 mg tablets and as an injectable solution (IV, IM, SQ) of 1 mg/ml. Extended-release theophylline can be used as adjunct treatment to improve response to steroids and aid in controlling inflammation. This drug can be given once daily in the evening at a dose of ~15-20 mg/kg PO. This drug does not bronchodilate and is not indicated in the emergency situation.

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TOP 10 TECH INNOVATIONS THAT WILL DEFINE THE NEXT DECADE IN VETMED.

Shawn Wilkie

Talkatoo, Sowtware, Toronto, Canada

Qualifications:

Shawn Scott Wilkie

CEO

Shawn@talkatoo.com

Shawn Wilkie is a serial entrepreneur and technology enthusiast with over twenty years of experience. He has founded six start-ups and was a finalist for Ernest & Young's prestigious Entrepreneur of the Year award **in 2018. He is also the co-host of the Veterinary Inno**vation Podcast, where he has interviewed over 200 trailblazers in the veterinary medicine space.

A passionate supporter of the pet health industry he has created tools that positively impact veterinary professionals both in their day-to-day clinical operations and personal lives. A leader who gets things done, Shawn is the founder and CEO of Talkatoo, a purpose-driven company that gives medical professionals time back in their day.

Veterinary medicine has seen an incredible influx of innovative companies over the past 5 years. In this CE-accredited session, Shawn will discuss 10 companies at the pinnacle of the vet med innovation ecosystem, as well as the products they offer that support practice management growth and productivity efforts, providing insights into the innovative products each company offers and the business challenges they solve.

In this session, attendees will:

Find out about some of the top innovators in vet med and how their products can benefit your practice

Discover new ways of thinking when it comes to old challenges to improve the patient and employee experience at your practice

Get answers to questions about the challenges that exist in veterinary medicine and how technology can solve them

The companies he will cover are:

Vestoria: Vetstoria started as a veterinary appointment scheduling platform that automates the entire scheduling process for practices and have since added on telemedicine to support digitizing the veterinary practice.

PetDesk: a communications management platform designed specifically for veterinary practices, to help bridge the communication gap between vets and their clients.

Digtail: a cloud-based, all-in-one practice management system for veterinary practices and an app for the pet parent.

Instinct Science: a cloud-based operating system for the modern veterinary hospital that offers a full electronic medical records and practice management system (EMR), a stand-alone digital workflow treatment plan (ITP) and an e-prescribing platform (InstinctScripts).

PetsApp: a veterinary client communication, marketing, and patient management platform built by vets for vets.

SignalPET: SignalPET improves pet healthcare and provides instant clinical answers by standardizing radiograph interpretation using artificial intelligence.

Vetsnap: VetSnap controlled logbook provides a simple, secure solution that helps veterinary practices manage controlled substances.

PetDx: PetDx – The liquid biopsy company for pets – is a molecular diagnostics company dedicated to unleashing the power of genomics to improve pet health.

Med Dimensions: Med Dimensions builds educational trainers, pre-operative models, and patient specific surgical cutting guides for education and surgical applications. Taking uncertainty out of medical procedures.

Talkatoo: a dictation software that gives veterinary professionals the power to talk instead of type, cutting documentation time in half.

034

CANINE LEISHMANIOSIS IN EUROPE: NEW RESERVOIRS OF LEISHMANIA.

Luis Cardoso[1], *Henk Schallig*[2], *Maria Flaminia Persichetti*[3], *Maria Grazia Pennisi*[3]

[1]*University of Trás-os-Montes e Alto Douro (UTAD), Department Of Veterinary Sciences, Vila Real, Portugal,* [2]*Amsterdam University Medical Centres, Academic Medical Centre at the University of Amsterdam, Department Of Medical Microbiology & Infection Prevention, Laboratory For Experimental Parasitology, Amsterdam, Netherlands,* [3]*University of Messina, Department Of Veterinary Sciences, Messina, Italy*

Qualifications:

Luís Cardoso

DVM MSc PhD Habil DipEVPC EBVS European veterinary specialist in Parasitology

lcardoso@utad.pt

The zoonotic protozoan parasite *Leishmania infantum* (synonym with *Leishmania chagasi*), the most important etiological agent of canine leishmaniosis (CanL), was described in dogs for the first time in 1908 in Tunisia and is currently endemic in more than 70 countries [1].

In addition to potentially suffering from CanL, dogs are the most important reservoir of *L. infantum*, acting as a source of infection for humans and also other dogs. Moreover, infection with *L. infantum* and animal leishmaniosis are not restricted to dogs, but also involve any other mammalians and even avian and reptile species [2, 3].

These vertebrate hosts are of great veterinary and public health importance as they may represent patients and also a wide reservoir of the pathogen, which needs to be considered when developing control measures for zoonotic leishmaniosis. From a veterinary medical point of view, it is important that veterinarians are aware of leishmaniosis in animals other than dogs and trained in its management.

The main mode for transmission of *Leishmania* is by the bite of infected phlebotomine sand fly insects, which are the only proven vectors of these protozoa. In the tropics and subtropics their life cycle is completed year-round, but in the Mediterranean region the vector populations have a typically seasonal pattern from spring to fall [4].

Apart from serving as a source of infection to humans and other hosts, a reservoir host is an individual or a population chronically infected with the causative agent of a disease. Reservoirs of *Leishmania* should be abundant, infected at a high proportion, attractive and infectious to the sand fly vectors, and able to maintain infection year-round [5]. Due to their high density, dogs seem to be the only domestic animal species that naturally maintain zoonotic populations of *Leishmania* parasites, but infections have also been reported in many other domestic and wild animals [2, 3].

This presentation reviews currently available information on animal leishmaniosis in vertebrates in Europe, other than dogs and humans, and provides a list of mammals, birds and reptiles in which infections with or exposure to *Leishmania*/*L. infantum* parasites have been detected in European countries [6-8]. Most cases are reported from the Mediterranean region. Uncited references can be found in the review by Cardoso et al. [2].

Subclinical infection in domestic cats has been recorded in some regions of southern Europe where zoonotic visceral leishmaniosis is endemic, but cases of disease have also been described. The categorization of cats as primary, secondary or accidental reservoir hosts is still unclear and the role of these animals in the epidemiology of *L. infantum* needs further attention [9, 10].

In the past decades, some confirmed cases of cutaneous leishmaniosis caused by *L. infantum* in horses have been reported in Central and southern Europe. Humoral and celular immunity tests have shown that exposure is much more frequent than disease in domestic equines.

Among the wide range of wild carnivores found infected with *L. infantum*, the frequency of reports highlights the red fox (*Vulpes vulpes*) in southern Europe. Carnivores such as gray wolves (*Canis lupus*), golden jackals (*Canis aureus*), Iberian lynxes (*Lynx pardinus*), genets (*Genetta genetta*), Egyptian mongooses (*Herpestes ichneumon*) and several species within the family Mustelidade have also been found infected with *L. infantum*.

Clinical leishmaniosis has been reported for the gray wolf in Croatia. Other reports of disease in mammals include a seal (*Monachus monachus*) in the Mediterranean. Bennett's or red-necked wallabies (*Macropus rufogriseus rufogriseus*) and northwest Bornean orangutans (*Pongo pygmaeus pygmaeus*) housed in Madrid, Barbary lions (*Panthera leo leo*) in Montpellier and a tiger (*Panthera tigris*) from southern Italy were found clinically affected with leishmaniosis due to *L. infantum*. It is assumed that sylvatic canids may be additional sources for animal and human, but the existence of a sylvatic cycle independent from infected domestic dogs it questionable.

Subclinical infections in rodents from southern Europe have been reported mainly for the black rat (*Rattus rattus*), but also for the brown rat (*Rattus norvegicus*) and house mouse (*Mus musculus*). Since 2009, more than 400 human cases of zoonotic visceral leishmaniosis have occurred in the southwest part of Madrid, Spain, along with the identification of a new reservoir, the Iberian hare (*Lepus granatensis*). A high prevalence of *Leishmania* DNA has been found in European brown hares (*Lepus europaeus*) from Greece. A notable feature of studies in domestic and wild hosts other than the domestic dog is the low proportion of infections with clinical expression.

The transmission of *L. infantum* by domestic dogs represents the main contribution for zoonotic infection in most endemic areas. In addition to dogs, infectiousness to vectors has been confirmed by xenodiagnosis in humans, black rats, domestic cats, Iberian hares and wild European rabbits (*Oryctolagus cuniculis*), which have the potential to act as reservoirs of *L. infantum*. These hosts can act as a source of infection to sand flies, but their role as primary or secondary reservoirs requires further study at the population rather than individual level.

Infection and disease caused by *L. infantum* must be considered in non-human animals other than dogs. Surveillance and monitoring programs should assess infection in domestic and wildlife populations and also diagnose disease in clinically suspected animals. To elucidate the epidemiological role of non-human animals other than dogs, further research should investigate the genetic diversity of *L. infantum* that may be shared among domestic and wild animals.

There is accumulating evidence that infections with *L. infantum* are not restricted to dogs and, among domestic mammals, cats can be considered the most important additional reservoir species. However, many more mammals can be infected and a potentially huge reservoir may exist. Many infections in wild animals are likely to be accidental, attributed to the opportunistic hematophagous behaviour of sand flies, but they deserve attention, as in some cases they have overt disease or sustain an outbreak of zoonotic leishmaniosis.

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035

CANINE LYMPHOMA - TREATMENT AND PROGNOSIS

Pachi Clemente-Vicario, *Ann Hohenhaus*

La Merced Veterinary Specislists, Oncology, Calpe, Spain

Qualifications:

DVM, MSc, Diplomate American College of Veterinary Internal Medine (Oncology)

Canine lymphomas are a group of approximately 25 different diseases commonly diagnosed in dogs; each form of lymphoma has its own treatment and prognosis. Lymphoma can be classified by anatomic location, immunophenotype, histological subtype or grade, all of these being important for prognosis and treatment.

In this review we will discuss the most important prognostic factors and treatment options for each type of the most common anatomic forms of lymphoma. If there are unfamiliar terms in this document, such as median survival, the WSAVA Oncology Working Group has prepared an Oncology Glossary available in 16 languages and can be found at wsava.org.

Multicentric lymphoma.

This is the most common anatomical presentation of lymphoma in dogs. Stages I to IV seem to have similar prognosis and only stage V has been associated to worse outcome in some studies and substage-b has been associated with a worse prognosis[1].

Multicentric lymphoma with better prognosis

Immunophenotype (B versus T cell lymphoma) has also been traditionally linked to prognosis[2] with a better prognosis for B-cell lymphoma compared to T cell lymphoma; although this is not strictly correct. There is a subtype of T-cell lymphomas, called indolent or low grade lymphomas with better outcome[4]. The most common indolent lymphoma is T-zone lymphoma (T-cells) which in the USA is very common in Golden retrievers. In dogs with high grade multicentric B cell lymphoma, low expression of Ki67 was not associated with a better prognosis[7].

Multicentric lymphoma with a poor prognosis

Multicentric T cell lymphoma is associated with a survival time of approximately 6 months likely due to a less robust response of T-cell lymphomas to doxorubicin. [3] A histologic subtype that seems to have a poor prognosis is the diffuse small B-cell lymphoma[5]. The reported median survival in dogs with diffuse small B-cell lymphoma is 140 days. Within this subtype, proliferation markers as Ki67 can help to recognize dogs with better prognosis[6].

Treatment of multicentric lymphoma

Regarding treatment, multicentric B cell lymphomas are usually treated with CHOP (cyclophosphamide, doxorubicin, vincristine and prednisone) based protocols. One method to optimize response to CHOP is to adjust the protocol during treatment to improve response and survival. [8] In Stage V lymphoma (cases with bone marrow involvement), addition of cytarabine can improve the response and prognosis[9]. High grade T-cell lymphomas seem to have a better outcome when treated with protocols that include lomustine and different studies[10,11] have shown a good response rate (90% complete remission) and median survivals similar to B-cell lymphomas treated with CHOP. Lomustine containing protocols are considered by some as first line therapy for this type of lymphoma. Finally, if indolent T-cell lymphomas require treatment, prednisone and chlorambucil are commonly used[4].

New treatments for B-cell lymphoma include rabacfosadine[12] or verdinexor[13] but these may not be widely available yet.

Mediastinal lymphoma

Mediastinal lymphoma is almost exclusively of T phenotype and may produce pleural effusion or paraneoplastic hypercalcemia. It has a poor prognosis with a median survival time of six months[14]. However, including of lomustine in the treatment protocol could potentially improve the response or survival, but more studies are needed to confirm this. Control of hypercalcemia may require adjunctive treatments such as zoledronate.

Gastrointestinal lymphoma

Intestinal lymphoma is an uncommon presentation in dogs compared to cats. Most of the cases in dogs are diagnosed as high-grade and have a median survival of 62 days[16]. Less than 10% of dogs with intestinal lymphoma live more than one year, even with treatment. Lomustine chemotherapy may result in longer survival than CHOP based protocols although the difference was not statistically significant. Dogs with rectal[17]or colorectal[18] lymphoma have a good response to therapy and good prognosis and a median survival of over 4 years. Unlike cats, low-grade gastrointestinal canine lymphomas are rare but have a fair prognosis with median survival times from 14 to 20 months[19,20].

Cutaneous lymphoma

The prognosis of cutaneous lymphoma is generally good with long survivals but depends on the extension of the disease and treatment response[21]. Cases diagnosed with localized lesions, specially mucocutaneous lymphoma, have a better prognosis (median survival 850 days) compared with cases with multiple lesions or lesions of the haired skin (median survival 240 days). When treated, cases achieving a complete remission live longer (median survival 400 days) than cases without response (110 days). Treatment is usually based on lomustine, but for cases that do not respond isotretinoin can be used also[22] with a response rate of 58%. Oclacitinib has been used as a treatment for this form of lymphoma. In dogs with localized lymphoma lesions, radiation therapy maybe of benefit to control clinical signs.

Splenic lymphoma

Occasionally the spleen is the only organ involved. Splenic marginal zone lymphoma is an indolent type of B-cell lymphoma with a good prognosis even when are treated only with surgery. A study with 34 dogs[23] showed a median survival time of 383 days. Cases that were asymptomatic lived longer (1,153 days) that those with clinical signs secondary to the lymphoma (309 days). Other factors as lymph node involvement, hemoabdomen or the use of chemotherapy did not have an impact on prognosis.

Hepatosplenic lymphoma

This uncommon presentation of T-cell lymphomas has a poor prognosis with most cases having a survival of only days to weeks[24,25]. It has two different clinical presentations but prognosis is poor for both[26]. No effective treatments have been reported to date.

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SMALL ANIMALS, BIG RELIEF: NAVIGATING CANCER PAIN MANAGEMENT

Nameeta Nadkarni

The Cancer Vet, Oncology Service, Mumbai, India

Qualifications:

Nameeta Nadkarni

Qualifications: B.V.Sc. and A.H., M.V.Sc. (Surgery)

Email: nameeta.nadkarni@gmail.com

Small Animals, Big Relief: Navigating Cancer Pain Management

Cancer pain in humans and animals often remains undiagnosed and undertreated, leading to a significant reduction in the quality of life. Studies in human literature estimate that the prevalence of pain that goes untreated in human cancer patients is as high as 50%[1], and it is reasonable to extrapolate similar figures in veterinary medicine, if not worse. Proper management of cancer pain is not only crucial to ensure a good quality of life for these patients but is also an ethical obligation for veterinarians.

Cancer pain is multifactorial and can have several sources, including stretching of tissues, inflammation, bone lysis, and necrosis due to the tumour, as well as the effects of various treatment modalities such as surgery, radiation, and chemotherapy. Pain can also arise from paraneoplastic syndromes, metastasis, and nerve compression by the tumour. Due to the complex nature of cancer pain, it is more accurately termed 'cancer-associated pain.'

Classification of Cancer Pain:

Cancer patients can experience both acute and chronic pain, often accompanied by episodes of 'breakthrough pain' which is acute pain experienced during phases of chronic pain.

Cancer pain can be classified as adaptive or maladaptive based on its duration and underlying mechanisms. Adaptive pain is a normal response to tissue damage, involves an inflammatory component, and is reversible. In contrast, maladaptive pain is of longer duration and results from changes in the spinal cord and brain, leading to abnormal sensory processing. Central and peripheral sensitization occurs in cancer patients due to repeated noxious stimuli from the tumour, leading to an increase in and activation of NMDA receptors in the spinal cord. Clinical cancer pain is often a combination of central and peripheral hypersensitivity, making early intervention crucial to prevent cellular wind-up and central sensitization.

Furthermore, cancer pain can be categorized as nociceptive or neuropathic based on its source[2]. Nociceptive pain results from the stimulation of afferent pathways in either visceral or somatic tissues. Somatic pain arises from damage to joints, bones, muscles, or skin, while visceral pain results from stretching, distension, or obstruction of organs. On the other hand, neuropathic pain originates from pathology beyond the nociceptors, either centrally or peripherally, and is less responsive to opioids, especially in the advanced stages of the disease.

Assessment of Cancer Pain:

Early pain assessment is imperative, aiming to comprehensively characterize the pain in terms of its location, intensity, and likely underlying cause. To assess the source and nature of cancer-associated pain in small animals, a thorough history and physical examination are essential. Changes in behaviour, lethargy, inappetence, and guarding of the abdomen, may also provide clues to the presence of pain. However, behaviour-related assessments may not always be reliable, as certain cancer diseases and treatments can also lead to lethargy and inappetence. Educating caregivers to identify and assess pain is crucial, and tools like the Canine Brief Pain Inventory can aid in evaluating the animal's quality of life regularly.

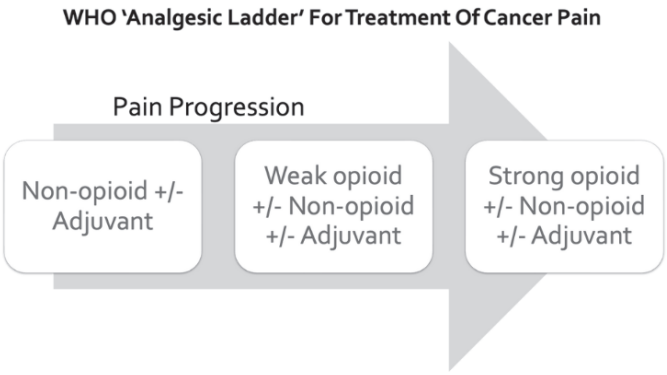
Treatment Options For Cancer Pain:

1. Treat primary cause

Treating the primary tumour through surgical intervention, radiation, or chemotherapy is often the preferred approach to controlling cancer pain. For instance, amputation of a painful limb in a dog with osteosarcoma may significantly reduce the pain experienced.

2. Pharmacological options

The World Health Organization (WHO) analgesic ladder can be used for decision-making while providing analgesia for cancer patients. It is a three-tier system starting with NSAIDs (non-opioids) and adjuvant drugs for mild pain, with the addition of opioids as pain intensity increases[3]. In veterinary medicine, a multimodal approach may be necessary as most of our patients present in the advanced stages of the disease.



Non-steroidal anti-inflammatory drugs (NSAIDs): NSAIDs, such as meloxicam, carprofen, piroxicam, and firocoxib, are commonly used to control malignant pain in small animals. Paracetamol (dogs only) can serve as an alternative analgesic in situations where NSAIDs are contraindicated. Recent research has extensively explored the expression of COX-2 in various epithelial and non-epithelial tumors, including canine urothelial tumors, prostatic and renal carcinoma, osteosarcoma, oral and cutaneous squamous cell carcinomas, oral melanoma, and colorectal adenocarcinomas, suggesting that NSAIDs may exhibit antineoplastic activity alongside their anti-inflammatory properties[4].

Opioids: Opioids, including morphine, hydromorphone, oxymorphone, butorphanol, buprenorphine, and fentanyl, are the primary class of analgesics used to manage moderate to severe cancer pain. Full mu-agonists such as morphine, oxymorphone, fentanyl, codeine, and meperidine offer superior analgesia in a dose-dependent manner, without a ceiling effect, and are considered potent opioids. Transdermal patches, which bypass hepatic metabolism, may also be considered as a delivery option for some opioids. Transmucosal buprenorphine has been shown to be effective in cats and can be used to manage breakthrough pain.

Adjuvants: In addition to NSAIDs and opioids, adjuvant drugs can play a vital role in managing chronic and neuropathic pain in small animals. Anticonvulsants like gabapentin have demonstrated efficacy in alleviating chronic and neuropathic pain. Tricyclic antidepressants, such as amitriptyline, are also valuable in these conditions as they

alter serotonin and noradrenaline reuptake in the central nervous system. NMDA antagonists, like amantadine, prove useful in managing central sensitization and preventing pain wind-up[5]. Furthermore, bisphosphonates, such as zoledronate and pamidronate, have shown analgesic activity in animals with osteosarcoma by inhibiting osteoclast activity[6].

Nerve blocks:

Local anaesthetics like lidocaine can be used for local nerve blocks to provide pain relief. Epidural anaesthesia or pain diffusion catheters can also be part of the multimodal analgesic approach. Neuroablation may be explored in cases refractory to all other analgesic modalities. In humans, neuroablation involves using chemical neurolytic agents, cryoneurolysis, or radiofrequency blockade to induce analgesia at a limited anatomical location. However, this approach is limited in veterinary patients due to the challenge of pinpointing the exact location of pain and requires further research. Surgical neuroablative techniques are considered a last resort in pain treatment for animals.

3. Non-Pharmacological Options

To complement analgesic treatments and reduce side effects, non-pharmacological options such as neutraceuticals, acupuncture, massage, hot and cold therapy, palliative radiation, and environmental enrichment can be used. Omega-3 fatty acids have shown promise in aiding analgesia and pain control in cancer patients[7]. Acupuncture has been used in oncology for acute and chronic pain relief, anti-nausea effects, and other therapeutic benefits[8]. Massage can increase circulation, decrease muscle spasms, and aid relaxation, while manual lymphatic drainage can be beneficial for patients with lymphedema[9]. Palliative radiation reduces tumour burden and osteolysis and causes the release of anti-inflammatory cytokines, thus contributing to pain relief[10].

Cancer pain in humans and small animals is a complex and often under-addressed condition that significantly affects the quality of life. Analgesia should be provided even if the patient does not show any obvious signs of pain, on the assumption that there is subclinical pain. Understanding the pathophysiology, classification, and assessment methods of cancer-associated pain is crucial for its effective management. Constant monitoring and re-evaluation are necessary. Further research is required to identify unique neurological signatures for more targeted and effective pain treatments.

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HOW TO USE DIFFERENT TYPES OF GENETIC TESTS TO IMPROVE THE HEALTH OF DOGS & CATS

Cathryn Mellersh

University of Cambridge, Veterinary Medicine, CAMBRIDGE, United Kingdom

Qualifications:

Cathryn Mellersh

BSc, PhD

email: cm935@cam.ac.uk

How to use different types of genetic tests to improve the health of dogs & cats

Genetic testing refers to the process of examining the DNA sequence of an individual to reveal genetic changes that may cause illness or disease. Genetic testing has an undisputed role to play in the diagnosis, control and elimination of many inherited diseases in cats and dogs.

Basic Genetic Terminology

A genetic variant is a specific position in the genome where the DNA sequence is known to vary between different individuals. Variants are not necessarily harmful, with their potential pathogenicity depending on many factors, including where they lie realtive to genes and the effect they have on the protein that the gene codes for. Deleterious variants typically result in changes to the structure of a protein, or result in changes to the amount of protein that is produced via alterations to gene expression. In contrast, some variants do not change the expression or structure of a protein and are consequently benign. Strictly speaking, a mutation is an error that occurs during DNA replication, that gives rise to a genetic variant. However, the term mutation is widely used to describe variants that directly causes a specific disease or trait (by causing a protein change, for example). Variants that can be demonstrated to be directly, and largely responsible for monogenic, single gene or Mendelian diseases are referred to as causal variants.

Disease-associated variants are those that are observed in affected individuals more often than would be expected by chance, as demonstrated by an appropriate statistical test, but for which demonstrable evidence of direct causality is weak or hasn't been obtained. Associated variants, sometimes also referred to as genetic risk factors, often play a role in complex disease development, in combination with other genetic or environmental factors, but are not solely responsible for whether an individual develops the associated condition or not.

Linked variants (also referred to as linked markers) are those that are located physically close to a causal variant/mutation and are therefore usually co-inherited with the linked causal variant. The degree to which the linked and causal variants are co-inherited depends on the rate of genetic recombination that occurs between them, which is usually dictated by the physical distance between them.

Types of Genetic Test

Genetic tests can be based on any of the above forms of variants, and understanding the basis of a genetic test is necessary for test results to be interpreted correctly. Genetic tests that screen DNA directly for specific causal variants can be diagnostic. Linkage tests, that screen for linked variants (rather than for causal variants), are also broadly diagnostic, depending on the rate of genetic recombination between the linked and causal variants. However, genetic tests that are based on associated variants, as opposed to causal variants, should be considered predictive. In human medicine polygenic risk scores exist, that are calculated by aggregating the effect of many common variants associated with a clinical condition. Polygenic risk scores are not currently widely available for non-human species, although this situation will undoubtably change as the genetics of complex diseases are increasingly teased apart.

How to Use Genetic Tests

Genetic tests are used for the following purposes in companion animals:

Diagnostic tests. A genetic test can help confirm a suspected diagnosis and can help differentiate between disorders with overlapping clinical signs.

Selective breeding tests. Most genetic testing for companion animals is done prior to breeding, to identify animals that carry variants that are causal for or associated with breed-specific inherited disorders, to enable breeders to plan matings that minimise the risk of producing clinically affected offspring.

Predictive testing. For a small number of complex disorders, genetic testing for associated variants might enable lifestyle modifications to reduce the risk of an individual developing disease later in life, such as variants associated with intervertebral disc disease or obesity (1-2).

Pharmacogenetics. Genetic testing can be used to identify medications that might be particularly harmful, or effective for an individual to take, such as genetic testing dogs for a variant in the ABCB1 gene (formerly known as the MDR1 gene). This variant, carried by many herding breeds, can place dogs at risk of severe or life-threatening complications after taking particular medications at specific doses (3).

Using Genetic Tests to Improve the Health of Dogs and Cats.

As stated above, most genetic tests are done to inform breeding decisions. Genetic tests for causal variants, with a known mode of inheritance, are a very effective means with which to reduce the frequency of the causal variant and disease incidence within populations (4).

For recessive causal variants, that only cause clinical disease in homozygous animals (that carry two copies of the variant), all dogs can be safely bred with provided at least one of the mating pair is clear of (does not carry) the disease variant. The priority for all conscientious breeders should be to produce healthy dogs, and eliminating a causal variant from a breed should be the long-term goal. But choosing solely clear dogs to breed from may not always be a sensible choice. If heterozygous carriers, that carry a single copy of a causal variant, are prevented from breeding the opportunity to pass the rest of their genetic material to the next generation is also lost alongside the genetic diversity of the remaining population. Carriers should therefore be included in at least the first one to two generations that follow the launch of a genetic test, regardless of the frequency of the variant, to give breeders the opportunity to capture desirable traits before they start to select for dogs that are clear of the variant. Specific breeding policy for future generations should be breed-dependent and consider the frequency of the disease variant.

Care must be taken to ensure that a genetic test is based on a variant that is causal for or associated with disease in the breed being tested. Different genetic forms of the same disease can exist, between and even within breeds, so breed-specificity is essential. For example, five different variants have been identified in the ADAMTS17 gene that cause primary lens luxation and/or primary open angle glaucoma in multiple breeds of dogs; it is essential to test dogs for the variant that segregates in their breed (5-10).

Genetic tests for disease-associated variants, as distinct from causal variants, are becoming increasingly available, as the resources which researchers use to tease apart the genetics of complex disorders become more accessible and affordable. Breeding advice for associated variants is not as straightforward as for causal variants and should consider the level of disease association and the frequency of the variant within the

relevant population. Some variants that are associated with complex diseases are very common within populations and selecting too rigorously against them from them could reduce genetic diversity too dramatically.

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5-9.

038

CANINE CYSTOTOMY - LEAVE NO STONES BEHIND!

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

amsingh@uoguelph.ca

Cystotomy is most commonly performed for retrieval of cystic calculi, with other indications including ureteral evaluation and biopsy/removal of masses. Several key principles should be followed when performing cystotomy in dogs and cats. For example, the urethra should be included in diagnostic imaging prior to surgery and should urethral calculi be present, they should be hydropulsed back into the urinary bladder. There is no reason to perform a dorsal cystotomy despite concerns for urine leakage and/or adhesion formation to a ventral cystotomy incision. A cystotomy incision should be closed using a simple continuous, appositional pattern with a monofilament short-acting suture with FULL-thickness bites of the bladder wall which will ensure the submucosa is captured. Inversion of the urinary bladder as a second layer is not required and contraindicated in cases where there is a thick bladder wall. Post-operative diagnostic imaging is a REQUIREMENT of the procedure to ensure all calculi have been retrieved. Minimally-invasive surgical (MIS) techniques have recently been described for cystic calculi removal.

PREOPERATIVE PREPARATION

A thorough pre-operative evaluation and patient stabilization is performed prior to undertaking surgery of the urogenital tract, especially in cases of urethral obstruction secondary to calculi. The vast majority of animals undergoing cystotomy are healthy and standard protocols for anesthesia will suffice. Caution should be exercised in patients with hyperkalemia and this should be addressed prior to induction of anesthesia

If pre-operative radiographs (performed under general anesthesia) reveal urethral calculi, retropulsion into the urinary bladder must be performed and urethrotomy avoided. It is the authors' experience that urethrotomy can be avoided in the vast majority of cases with urethral calculi by retropulsing them back into the urinary bladder. It is of paramount importance to perform retropulsion with the patient under general anesthesia (+/- epidural anesthesia) to allow for urethral relaxation. A schematic description of retropulsion of urethral stones is shown in Figure 1. Briefly, an assistant should place a gloved finger per rectum and occlude the urethra. An appropriately sized urinary catheter is inserted and flushing commenced. As the assistant feels urethral dilation, the finger is removed from the urethra and the sudden jet of fluid allows for urethral calculi to eventually move into the bladder after several flushing cycles. It is important to realize that, as stated previously, the vast majority of urethral calculi can be retropulsed into the urinary bladder avoiding the need for urethral surgery.

Once all calculi have been retropulsed into the urinary bladder (confirmed radiographically), the ventral abdomen is aseptically prepared for surgery. In female dogs and cats, it is ideal to place a urinary catheter (Foley) prior to surgery. In male dogs, the author recommends preparing the prepuce routinely and keeping the prepuce in the surgical field so that the surgeon is able to place the urinary catheter at the time of surgery in the operating room. This allows the surgeon the ability to perform retrohydropulsion several times at their discretion. If the prepuce is draped outside of the surgical field, a non-sterile assistant is required to perform retrohydropulsion and replacing the urinary catheter is challenging.

OPERATIVE PROCEDURE

A caudal laparotomy is performed; in male dogs the skin incision is created only to the lateral aspect of the prepuce (parapreputial – right hand side for a right handed surgeon). As stated previously, the author routinely leaves the prepuce in the surgical field to facilitate retrograde lavage of the urethra and urinary bladder. Following preputial incision, subcutaneous dissection is performed to the body wall and the linea alba is visualized. Preputial blood vessels will be encountered during the preputial approach and these can be ligated or cauterized. Once the bladder is visualized, a stay suture is placed in the apex of the bladder using a monofilament suture. This is readily apparent as a small, circular, fibrous scar at the cranial aspect of the bladder. The bladder is then exteriorized from the abdomen and then packed off with laparotomy sponges. If operating as a solo surgeon, the stay suture can be attached to the surgical drapes to maintain cranial tension on the urinary bladder.

A ventral cystotomy is recommended as this location provides the best visualization of the trigonal region where calculi are often found and avoids iatrogenic damage to the ureteral openings and neurovascular supply which are located in the dorsal aspect of the urinary bladder. Previous research has shown that ventral cystotomy is not associated with an increased incidence of complications such as body wall adhesions and incisional failure resulting in uroabdomen.

Suction is extremely helpful and valuable in this procedure. The ventral ligament of the bladder attaches on the midline and is sharply detached from the body wall. This attachment can be used as a proposed location for cystotomy. A stab incision is then made into the ventral aspect of the urinary bladder. Immediately following stab incision, the suction tip is inserted to empty the bladder of urine and prevent spillage into the abdomen. The cystotomy is then extended to the desired length using Metzenbaum scissors. Readily apparent calculi are retrieved using an atraumatic instrument (e.g. bladder spoon). In some cases, calculi are not readily apparent upon performing cystotomy. This can be a result of calculi falling into the proximal urethra when positioned for laparotomy and as the bladder is exteriorized. At this point the bladder is emptied of visible calculi.

In male dogs a urinary catheter is passed by the surgeon or assistant surgeon in a retrograde manner and flushing with sterile lavage fluid initiated. Additional stay sutures can be placed in the lateral and caudal aspects of the cystotomy incision to improve visualization especially if operating solo. These stay sutures can be connected to the surgical drapes to free the surgeon's hands for performing lavage and retrieval of calculi. The suction tip is placed in the urinary bladder as suction is being performed to improve visualization by removing lavage fluid. Suction also helps prevent spillage of fluid into the abdomen. The urinary catheter is gradually advanced while flushing with saline and then withdrawn once its visible in the urinary bladder and the procedure repeated several times until the surgeon is confident calculi are not present within the lower urinary tract. The author will routinely perform retrograde flushing several times to be confident calculi are not present in the lower urinary tract.

Prior to closure a crushed calculi or a mucosal biopsy should be obtained and submitted for bacterial culture and sensitivity. It is has previously been shown that antibiotics do not need to be withheld until after the bladder mucosal biopsy is obtained and, therefore, standard protocols for administration of perioperative antibiotic prophylaxis should be performed (within 60 minutes of surgical incision and re-dosed every 90 minutes for cefazolin).

CYSTOTOMY CLOSURE

Several strategies exist for cystotomy closure. The author usually performs a single layer, appositional closure with a monofilament, rapidly absorbable suture material (e.g. polyglecaprone 3-0). A clear advantage of a double layer inverting pattern has not been demonstrated in recent studies. In fact, a double layer inverting closure may be challenging to perform in bladders where marked thickening of the wall exists. In fact, in animals with a thickened bladder wall secondary to cystic calculi, the author believes a second inverting layer is contraindicated as this may

result in additional trauma to the urinary bladder wall, compromising closure integrity. Full thickness bites of the urinary bladder wall should be taken in order to capture the submucosal layer (holding layer). Ideally, the mucosa is not captured so as to prevent suture exposure within the urinary bladder as this could be a potential for suture-associated calculi. However, it is very likely that exposed suture becomes epithelialized and it is more important to ensure the submucosa is captured during cysotomy closure. The urinary bladder is unique compared to other tissues in that 100% of bursting strength following cystotomy is achieved after 3 weeks. Post-operative radiographs should be performed in all cases to ensure complete calculi removal. Three-view radiographs should be performed including two lateral views with the limbs extended and flexed to ensure a complete view of the urethra. Should calculi be present on post-operative imaging it is much easier to return to surgery to remove retained calculi than to continue some type of medical management.

POST OPERATIVE MANAGEMENT

In the authors' institution patients are recovered on intravenous fluids overnight. Non-steroidal anti-inflammatory therapy (pending contra-indications) is highly recommended for urogenital surgery. A urinary catheter is not maintained in most cases. Discharge of the patient is performed 24hrs postoperatively. At that time the animal should be urinating normally and may or may not have hematuria present which the owner should be cautioned about. If the animal has not urinated or is straining to urinate this warrants diagnostic investigation as to the cause (e.g. uroabdomen, incomplete calculi removal).

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EOSINOPHILIC LUNG DISEASE IN DOGS

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM (Small Animal Internal Medicine)

lrjohnson@ucdavis.edu

Eosinophilic Lung Disease in Dogs

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Pulmonary eosinophilia can develop in response to heartworm, lungworm infestation or larval migration. Fungal or neoplastic diseases can also result in eosinophilic infiltration although the most common etiology is idiopathic. This disorder likely results as a hypersensitivity or immunologic response to an unknown trigger, and inciting antigens are rarely recognized. Eosinophilic lung disease in dogs is a heterogenous group of disorders similar to the description used in humans, with disease primarily in the airways or parenchyma, or in both segments of the lung. We recently described a spectrum of clinical diseases defined by airway inflammation (eosinophilic bronchitis, EB), more severe pneumonic disease (eosinophilic bronchopneumopathy, EBP), and intra-luminal eosinophilic granuloma. (EG) Canine eosinophilic pulmonary granulomatosis (EPG) differs from these eosinophil-rich entities by the presence of pulmonary nodules and pulmonary masses composed of eosinophils, macrophages, and various combinations of lymphocytes, plasma cells, neutrophils, and mast cells within fibrous tissue. Some authors have suggested that some cases of EPG might represent an advanced stage of eosinophilic bronchopneumopathy. Historically the disease was considered associated with heartworm infection although more recent cases have not had heartworm detected. Some cases of eosinophilic lung disease could be associated with exposure to aeroallergens although allergy testing remains challenging in animals.

Dogs with pulmonary eosinophilia tend to be relatively young, ranging from <1 year to 8 years of age and the disease tends to occur in larger or heavier dogs including Huskies, German Shepherds, Golden or Labrador retrievers, and Standard poodles. Fifty to 70% of dogs present with chronic cough (>2 months) while some will present with cough < 1 month duration. Other signs include retching, respiratory distress, or nasal disease. Mild disease (EB) can appear similar to chronic bronchitis, whereas in EBP, EG, and EPG, signs are more severe and the clinical presentation mimics pneumonia or neoplasia. Failure to respond to antimicrobial therapy can be a clue to the existence of eosinophilic lung disease.

Leukocytosis and eosinophilia are common, particularly in EBP and EG, and the disease is confirmed by detecting eosinophilia in an airway wash. Normal dogs have 5-8% eosinophils in BAL fluid, and the level of BAL eosinophilia at which clinicians diagnose airway eosinophilia varies in the literature from 10 to 14 up to 25%, which makes it challenging to compare findings among different studies. Dogs clinically diagnosed with eosinophilic lung disease usually have >30% and up to 90% BAL eosinophils. Parasitism must be ruled out in these dogs by performing heartworm tests and fecal analysis, including fecal Baermann. In dogs with enlarged pulmonary arteries, a heat treated heartworm antigen test should also be performed if the standard heartworm is negative.

Radiographic abnormalities in the mild form of disease can be absent or can be confined to a bronchial pattern. In the more severe forms of disease, alveolar infiltrates and bronchiectasis are common, and dogs with EG or EPG have mass lesions reported, either within airways or within the lung. Diagnostic imaging in these cases often resembles a fungal or neoplastic process, and early reports suggested that this was the most common form of eosinophilic lung disease, with a guarded prognosis for recovery.

Bronchoscopic changes in eosinophilic bronchitis are primarily airway hyperemia and sometimes yellow to white flecks of mucus. In EBP, yellow-green mucus accumulation predominates and there is often a polypoid appearance to the airways. In one study, the lack of visualization of bronchial nodules during bronchoscopy was suggested to rule out eosinophilic lung disease and this might be particularly true in a young large dog, which is more likely to be affected by this disease. Visible bronchiectasis and airway collapse is commonly encountered.

Treatment for eosinophilic lung disease relies on therapy with prednisolone or prednisone, often at 1-2 mg/kg PO BID initially. If signs diminish in the first 10-14 days, a gradual decrease in corticosteroid dose and lengthening of the dosing interval are recommended. Long-term treatment (4-6 months) should be considered in these dogs because of the tendency for relapses to occur if drugs are tapered too quickly. In one study of dogs treated for a median duration of 4 months, the relapse rate was 26%, suggesting that longer therapies might be required. For dogs that are poorly tolerant of oral steroids, inhaled steroids (fluticasone propionate) can be used with a facemask and spacing chamber, although some studies have suggested poor response to use of inhaled steroids alone. This might reflect the variable nature of the severity of the disease process and the lack of prospective, controlled trials. I have found that nebulization can be helpful in mobilizing secretions, even in dogs with granulomatous lesions, and that N-acetylcysteine appears to be helpful in select cases. Theophylline might be considered in select cases with airway collapse although use is anecdotal at best. Antibiotics are not necessary unless concurrent bacterial infection is documented, which can occur in some cases.in some cases.

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040

BIG DATA IN THE VETERINARY FIELD.

Shawn Wilkie

Talkatoo, Sowtware, Toronto, Canada

Qualifications:

Shawn Scott Wilkie

CEO

Talkatoo

In his insightful talk, Shawn covers a wide range of topics to showcase the current and potential applications of AI in veterinary medicine. He begins by defining AI and providing practical examples of its utilization across various industries. Shawn then introduces AI in the Veterinary Field, highlighting the benefits and challenges faced when adopting AI.

One key aspect of his talk is the demonstration of ChatGPT, a powerful tool that can assist veterinarians in answering client questions, improving medical documentation, diagnosing diseases, and providing treatment recommendations. Shawn also explains the role of natural language processing (NLP) and the impact of large language models (LLMs) in enhancing communication between veterinarians and clients. Furthermore, he discusses the benefits and limitations of speech recognition technology, specifically highlighting the potential for AI as a solution.

Throughout his presentation, Shawn addresses the limitations, ethical considerations, and potential risks associated with AI adoption, emphasizing the need for human oversight and data integrity. He emphasizes the ongoing research and development in AI, as well as the responsible integration of AI in veterinary practices.

041

FELINE LYMPHOMA- FREQUENTLY ASKED QUESTIONS.

Ann Hohenhaus[1,2]

[1]*Animal Medical Center, Oncology, New York City, United States of America,* [2]*Animal Medical Center, Oncology, New York, United States of America*

Qualifications:

Ann Hohenhaus, DVM

Diplomate, ACVIM (Oncology & Small Animal Internal Medicine)

ann.hohenhaus@amcny.org

Feline Lymphoma: Frequently Asked Questions – not all have answers

Dr. Antonio Giuliano, *DVM*

MS, PgCert(CT), GpCert(SAM) Dip. ECVIM(Oncology), MRCVS

Ann Hohenhaus, DVM

Diplomate, ACVIM (Oncology and Small Animal Internal Medicine)

How has lymphoma changed over the last three decades

Since the mid-1980s, the major change especially in USA and EU a has been the decline of FeLV+ cases of lymphoma which was associated with many cases of multicentric and mediastinal lymphoma.[1] However in other countries like Brazil FeLV related lymphoma is still high[2]. Opposite of the decline of FeLV+ lymphoma, FeLV- lymphoma of the gastrointestinal tract has dramatically increased. The indolent small cell gastrointestinal lymphoma was described in the early 2000s as a separate entity from the rapidly progressive large cell gastrointestinal lymphoma.[3]

What hasn't changed in feline lymphoma?

The chemotherapy drugs used in the treatment of feline lymphoma have not changed much since chemotherapy protocols were first reported 30 years ago. Cyclophosphamide, vincristine, glucocorticoids and later doxorubicin was added to chemotherapy protocols. Because treatment has not changed, the prognosis and survival time are also unchanged except for cats diagnosed with nasal and small cell gastrointestinal lymphoma.

What is the difference between small cell and large cell lymphoma?

Valli et al described over 600 cases of feline lymphoma and found in the intestinal tract a predominance of lymphoma cells about the same size as a red blood cell.[3] These cells invaded the mucosa and submucosa, but did not typically form a mass like is found in feline large cell intestinal lymphoma. Several clinical papers followed showing prolonged survival of these cats with minimal treatment compared to traditional multiagent chemotherapy protocols.[4]

Is surgery indicated for the treatment of intestinal lymphoma?

This question is difficult to answer. The answer would require a randomized controlled clinical trial where some cats are allocated to a group that receives only chemotherapy and another that has their intestinal mass removed and then receives chemotherapy. Since that is not likely to happen, we rely on retrospective data. Once concern is if chemotherapy is successful and kills the tumor cells, will the intestinal wall perforate? Every oncologist has seen one or two cases perforate following chemotherapy, but in a study compiling cases from three specialty clinics, only 4 cases were identified. Perforation can also occur at presentation, due to the cancer growth and necrosis, before any administration of chemotherapy. Anecdotal reports indicate some cats have longer survivals following resection and anastomosis from intestinal lymphoma, but surgery is not curative.[5]

What is the best treatment for feline lymphoma?

This is the question that has no answer. What is clear from the available studies is single agent doxorubicin is not effective in feline lymphoma like it is in canine lymphoma.[6] The other point that is clear is that small cell gastrointestinal lymphoma needs much less treatment than large cell gastrointestinal lymphoma, but the optimal treatment for small cell gastrointestinal lymphoma has not been defined.[4] Whether COP or CHOP should be the standard of care in cats is unknown.[7,8] Assessment of the data is complicated by the fact that many of the studies analyzing these two protocols have included both small and large cell lymphoma as discussed above, the prognosis of these two forms of lymphoma are vastly different. A limited amount of data suggests radiation therapy may be useful in relapse abdominal lymphoma.

What is the prognosis for large-cell lymphoma?

The main prognostic indicator for large cell lymphoma is the response to treatment. Cats achieving a complete response can enjoy a good quality of life (considering all forms of lymphoma) for an average of 9–12 months, with some cases living longer than 2 years.[7,8] Cats not achieving response and progressive disease live only days to weeks, while cats achieving partial response live only a few months.[7,8] Another important prognostic factor is the type or location of the lymphoma. Cats with nasal tumors can live longer than 2 years, while cats with CNS lymphoma only live for days or weeks.[9,10] However, the location is often influenced by the response rate, and cats with nasal or mediastinal forms tend to live longer but also achieve a high complete response rate compared to other forms. Some specific types of lymphoma, like large granular cell lymphoma, tend to also have a low response rate and poor survival.[11]

How do cat owners feel about chemotherapy in their cats?

Cat owners are generally positive about their experiences with chemotherapy in their cats. Over 80% would give chemotherapy to another cat if needed. About 70% felt chemotherapy improved their cat's quality of life. Owners define a good quality of life as a good appetite during chemotherapy treatment. Over 90% expected toxicity from chemotherapy.[12,13] These last two pieces of information indicate veterinarians must address their plan to manage chemotherapy induced anorexia to meet owner expectations regarding quality of life.

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042

REAL LIFE CLINICAL CASES: ACUTE PAIN.

Jo Murrell

Bristol Veterinary Specialists, Anaesthesia, Bristol, United Kingdom

Qualifications:

Dr Jo Murrell

BVSc. (hons), PhD, DiplECVAA, MRCVS

Jo.Murrell@bristolveterinaryspecialists.co.uk

Managing acute pain in dogs can be challenging. Drug selection is important but may be limited by drug availability depending on where you work and drug availability in your country. This presentation will focus on how to manage acute pain in three different cases, a dog presented for Tibial Plateau Levelling Osteotomy (TPLO), a dog presented for Cholecystectomy and a dog presented for dental procedure including removal of the right canine tooth. Different options will be given for pain management depending on whether potent full μ agonist opioids are available for use. The use of appropriate local anaesthetic blocks will be described.

In all cases the Glasgow Composite Pain Scale-Canine (GCPS-Canine) was used to score pain after surgery and determine ongoing analgesic administration. This is a composite pain scoring tool that aims to capture both the sensory and the emotional component of pain. It relies on the veterinary surgeon, nurse or technician observing the animal from outside of the cage, interacting with the animal, assessing lameness and then applying gentle pressure around the around the painful area to assess for secondary mechanical hyperalgesia (when stimuli that are normally painful cause greater pain than expected). The total possible score of the GCPS-Canine is either 20 (in dogs that cannot be walked and mobility assessed) or 24 (in dogs where assessment of mobility is possible). The intervention level for administration of additional analgesia is either 5 or greater out of 20 or 6 or greater out of 24. The advantage of the GCPS-Canine over other scoring tools (such as the visual analogue scale) is that it has undergone validation and captures the emotional as well as the sensory component of pain.

In all cases a multi-modal analgesia approach was used. This is the principle of using different classes of analgesic drug in combination in order to “attack” the pain pathway at more than one receptor or neurotransmitter. The pain pathway is too complex for uni-modal analgesia regimens to be very effective. Multi-modal analgesia protocols also usually allow for the dose of each individual analgesic drug to be reduced compared with uni-modal protocols, which may reduce the likelihood of drug side effects.

The presentation will include videos of real life pain scoring and options for administration of rescue analgesia when thresholds for intervention are reached. It aims to be accessible to all practitioners irrespective of drug availability where you are practicing veterinary medicine.

043

THE VALIDITY OF COMMERCIAL GENETIC TEST RESULTS FOR INDIVIDUALS AND BREEDS

Leslie Lyons

College of Veterinary Medicine, University of Missouri, Veterinary Medicine & Surgery, Columbia, United States of America

Qualifications:

Leslie A. Lyons

PhD

lyonsla@missouri.edu

The validity of commercial genetic test results for individuals and breeds (ID 127)

Objective 1) Veterinarians should be able to find information on all genetics tests in companion animals.

Objective 2) Veterinarians should be able to find where to obtain genetic testing.

Objective 3) Veterinarians will understand which genetic tests should be monitored in breeds, specifically cat.

Objective 4) Veterinarians should know where to find expertise on a genetic disease.

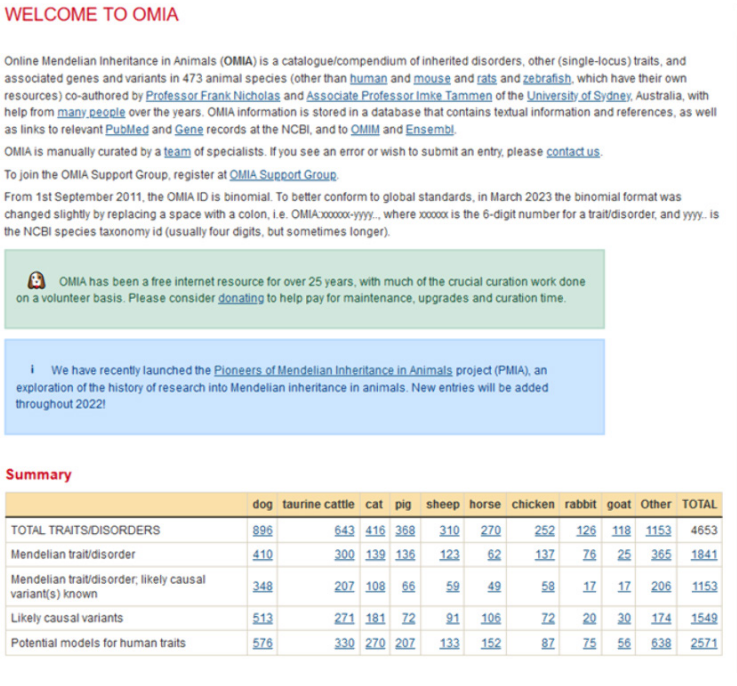
Objective 5) Veterinarians will understand the criteria for releasing a genetic test to the community.

Direct-to-consumer (DTC) genetic testing is a routine opportunity for breeders of companion animals. The data provided by the genetic tests can support the management of their breeding programs via the selection of mating pairs that have reduced probabilities of producing offspring with genetic health conditions. The prevalence of genetic health conditions can also be established to support health monitoring of individuals within a breeding population. When properly employed, genetic testing could highly reduce incidence of disease, with potential eradication of certain diseases from the overall breed population under specific circumstances.

Whole genome and exome sequencing has been extremely supportive for the identification of new casual variants in a variety of species, including companion animals. The low cost of genome sequencing now suggests that whole genome DNA profiles (i.e., Precision Medicine) The Online Mendelian Inheritance in Animals (OMIA) is a website (https://www.omia.org/home/) that catalogs all the identified DNA variants that are published in the scientific literature (Figure 1)[1]. This website provides a one-stop interface to find the DNA variants available for a given species, a breed or population within the species and the links to the scientific literature documenting the discoveries. Figure 1. Online Mendelian Inheritance in Animals (OMIA). OMIA is a website (https://www.omia.org/home/) that catalogs all the identified DNA variants that are published in the scientific literature. Accessed 01 July 2023, 181 DNA variants are documented for the domestic cat and 513 DNA variants for the domestic dog (Table 1). For the domestic cat, nearly 33% of the DNA variants identified in cats have been published since 2020, indicating the rapid growth of genetic information for companion animals. By selecting any one of the given variants, information is provided as to which research team made the discovery with links to the scientific publication. These publications have the contact information for the investigators thus the veterinarian can have direct contact with the researchers who know the most about the disease and the heritable cause of the condition.

Besides the investigator who identified the causal DNA variant for a disease, commercial laboratories provide genetic testing services for companion animals. These commercial, mainly for-profit laboratories, offer the DTC genetic testing for a vast number of genetic tests, regardless of who made the discovery. Hence, the commercial services may have little support and limited knowledge regarding the nature of the condition and the nuances of the genetic test itself (i.e., health and genetic counseling). Different kennel clubs and cat registries may endorse different laboratories to provide DNA profiling for identification and registration purposes and to identify animals with genetic health conditions. The different kennel clubs and cat registries often have information on their websites, including coupon codes and bulk testing deals. Most commercial services can be identified via an internet search, followed by finding their webpage that lists the genetic tests they perform. However, these bulk or panel genetic testing services often offer a plethora of tests for one price, which may or may not be appropriate for your particular species or breed. The inappropriate tests often led to confusion and misinterpretation of the implication of the genetic tests results, causing angst for the breeder, owner, and the veterinarian.

The Hereditary Disease Committee of WSAVA, an *ad hoc* committee for the International Society of Animal Genetics, OMIA, and concerned researchers are working towards the development of standards for genetic testing in companion animals and other species. These standards will include more detailed information as to the pathogenicity of an identified DNA variant, what breeds are indicated for genetic testing, information regarding disease and DNA variant incidence and prevalence in populations, as well as standard nomenclature and reporting of genetic information. These standards will help determine which DNA tests are the most reliable and of the greatest importance to the breeding community and to veterinary health care. Specific examples will be provided of genetic tests that need to be limited to specific breeds as well as the rules used to help determine pathogenicity of a variant.



WELCOME TO OMIA

Online Mendelian Inheritance in Animals (**OMIA**) is a catalogue/compendium of inherited disorders, other (single-locus) traits, and associated genes and variants in 473 animal species (other than human and mouse and rats and zebrafish, which have their own resources) co-authored by Professor Frank Nicholas and Associate Professor Imke Tammen of the University of Sydney, Australia, with help from many people over the years. OMIA information is stored in a database that contains textual information and references, as well as links to relevant PubMed and Gene records at the NCBI, and to OMIM and Ensembl.

OMIA is manually curated by a team of specialists. If you see an error or wish to submit an entry, please contact us.

To join the OMIA Support Group, register at OMIA Support Group.

From 1st September 2011, the OMIA ID is binomial. To better conform to global standards, in March 2023 the binomial format was changed slightly by replacing a space with a colon, i.e. OMIA:xxxxxx-yyyy., where xxxxxx is the 6-digit number for a trait/disorder, and yyyy. is the NCBI species taxonomy id (usually four digits, but sometimes longer).

OMIA has been a free internet resource for over 25 years, with much of the crucial curation work done on a volunteer basis. Please consider donating to help pay for maintenance, upgrades and curation time.

We have recently launched the Pioneers of Mendelian Inheritance in Animals project (PMIA), an exploration of the history of research into Mendelian inheritance in animals. New entries will be added throughout 2022!

Summary

	dog	taurine cattle	cat	pig	sheep	horse	chicken	rabbit	goat	Other	TOTAL
TOTAL TRAITS/DISORDERS	896	643	416	368	310	270	252	126	118	1153	4653
Mendelian trait/disorder	410	300	139	136	123	62	137	76	25	365	1841
Mendelian trait/disorder; likely causal variant(s) known	348	207	108	66	59	49	58	17	17	206	1153
Likely causal variants	513	271	181	72	91	106	72	20	30	174	1549
Potential models for human traits	576	330	270	207	133	152	87	75	56	638	2571

Figure 1. Opening website page for OMIA – a resource for genetic testing in animals.

Table 1. Examples of OMIA genetic entries for the domestic cat.*

OMIA ID	Breed(s)	Variant Phenotype	Gene	Allele	Type of Variant	Deleterious?
1590	Domestic Longhair	Wilson disease	*ATP7B*		missense	yes
1548	Domestic Shorthair	Methaemoglobinaemia	*CYB5R3*		splicing	yes
1531		Becker muscular dystrophy	*DMD*		missense	yes
1544	Domestic Shorthair	Glycogen Storage Disease Type II	*GAA*		missense	yes
1535	Domestic Shorthair	L-2-hydroxyglutaricacidemia	*L2HGDH*		nonsense (stop-gain)	yes
1572	Japanese domestic, Siamese	Niemann-Pick disease, type C2	*NPC2*		missense	unknown
1546	Domestic Shorthair	Sebaceous gland dysplasia	*SOAT1*		missense	yes
1586	Domestic Longhair	Vitamin D-dependent rickets type 2	*VDR*		deletion, small (<=20)	yes
1541	Domestic Shorthair	Xanthinuria, type 1	*XDH*		missense	yes
1573	Domestic Longhair	Myotonia	*CLCN1*		deletion, small (<=20)	yes
1465	Bombay	classical Ehlers-Danlos syndrome	*COL5A1*		nonsense (stop-gain)	yes
1466	Domestic Shorthair	classical Ehlers-Danlos syndrome	*COL5A1*		deletion, small (<=20)	yes
1464	Bengal	classical Ehlers-Danlos syndrome	*COL5A1*		deletion, gross (>20)	yes
1463	British Shorthair	Copper (British recessive wideband)	*CORIN*	wb^BSH	nonsense (stop-gain)	no
1456	Siberian	Extreme sunshine (Siberian recessive extreme wideband)	*CORIN*	wb^eSIB	missense	no
1428	Domestic Shorthair	Osteogenesis imperfecta	*CREB3L1*		deletion, small (<=20)	yes
1517	Domestic Longhair	Pyknodysostosis	*CTSK*		nonsense (stop-gain)	yes
1510	Maine Coon	Muscular dystrophy, Duchenne	*DMD*		nonsense (stop-gain)	yes
1392	Domestic Shorthair	Hair shaft dysplasia	*DSG4*		deletion, small (<=20)	yes
1393	Domestic Shorthair	Hair shaft dysplasia	*DSG4*		deletion, small (<=20)	yes
1472	Maine Coon	Factor XI deficiency	*F11*		missense	yes
1309		Encephalopathy, spongy	*ASPA*		missense	yes
1413		Blood group system AB	*CMAH*		missense	no
1313	Siberian	Sunshine (golden)	*CORIN*	wb^SIB	missense	no
1307	Abyssinian	Ticked	*DKK4*	Ti^A	missense	no
1368	Maine Coon	Long hair	*FGF5*	M5	missense	unknown

*Entries for species – domestic cat, OMIA Phene-Species ID - OMIA 000328-9685. Alleles are provided for genes that cause phenotypic traits. The type of variant would help to identify the type of genetic assay that would be compatible for running a genetic test. Additional information is also provided that focuses on the genetic aspects of the variant, year published and publication links.

044

GI SURGERY - LINEAR FOREIGN BODY REMOVAL - START TO FINISH!

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

amsingh@uoguelph.ca

Gastrointestinal (GI) surgery can vary from very simple to highly complex depending on the state of the patient, the disease process being treated and the expertise of the surgeon. It is critical to understand the general principles of anatomy and physiology in order to achieve good surgical outcomes when intervening in the GI tract.

In general, vascular supply to bowel is still evaluated using very simple clinical parameters as more objective methods have generally failed to translate into practical and reliable "in the clinic" assessment tools. Color, consistency, motility and bleeding/perfusion are still the four principal methods used to assess the vascular integrity of GI tissue. Knowledge of the blood supply to different parts of bowel is important to plan enteric incisions and anastomoses. The jejunum has generally obvious vascular arcades that lend themselves easily to planned ligation. The duodenum receives shared blood supply from the cranial and caudal pancreaticoduodenal arteries, branches of the celiac and cranial mesenteric arteries respectively as well as the gastroduodenal and right gastroepiploic in its most proximal aspect. When the descending portion of the duodenum requires resection it is usually best to seal the duodenal blood supply directly at the antimesenteric margin in order to avoid damage to the pancreatic ductal system and blood supply. If a more extensive disease process dictates the resection of part of the pancreas, consideration should be given to making sure pancreatic tissue is resected in a way that avoids leaving areas of pancreas that are isolated from their ductal drainage system and therefore exocrine drainage mechanism. Care should also be taken in this area to make sure that the common bile duct is not involved in the disease process or is not impacted by the proposed resection. The area around the ileocecocolic junction can also be challenging as it receives a mixed blood supply from the colic and ileocolic arteries. In this area, extensive collateral circulation appears to exists but direct visualization can be obscured by extensive fat deposition and the lymph nodes present within the mesenteric root. Much like in the duodenum, the safest course of action when performing an ileocolic resection is to take down the blood supply close to the mesenteric margin. The large intestine receives its blood supply from anastomosing branches of the colic arteries that arise from the cranial and caudal mesenteric arteries. These arteries, however, are not intimately associated with the mesenteric wall of the large intestine. In contrast, they give off vasa recta which are short branches that emanate from the arteries and provide a segmental supply blood along the length of the large intestine. In the case of large bowel resections these vasa recta are individually sealed by ligation or use of a vessel-sealing device between the colic arteries and the intestinal wall thus preserving optimal blood supply from the colic arteries. Care should be taken if resection of the distal descending colon is planned to try and preserve as much of the cranial rectal artery, a branch of the caudal mesenteric which provides the principal arterial blood supply to this area of colon.

Many principles of bowel closure are common to all areas of the GI tract. When hand-sutured enterotomy closure or resection and anastomosis is performed, simple appositional suture patterns are usually preferred with the use of monofilament suture. Simple continuous and simple interrupted have been shown both in cadaver studies[1]and in vivo[2]to be largely equivalent in effectiveness and safety. More recently barbed suture has been shown to be safe for use in enteric closure although its widespread adoption has not yet occurred possibly due to current cost concerns.[3]Although skin staples have been used for enteric closure in clinical studies in both dogs and cats[4,5] some concerns have been raised as to their ability to counteract physiological pressures during peristalsis in cadaveric models.[1]No matter which suture technique is used the critical component of any enteric closure pattern is that the submucosa, the holding layer of the gastrointestinal tract, be incorporated in the closure. For small intestinal resection specifically, new data has recently been published documenting improved outcomes with surgical stapling compared to hand-suturing in certain cohorts of patients.[6,7]These multi-institutional studies have shown statistically using much larger case cohorts that dehiscence rates may be decreased if surgical stapling is used especially in the presence of septic peritonitis.[7]Generally a functional end-to-end anastomosis is created using a Gastro-intestinal anastomosis (GIA) stapler. The end of the two stapled segments of small intestine are then sealed with either a Thoracoabdominal (TA) stapler or a second GIA cartridge. These anastomoses are very rapid to perform but do add significant cost over hand-sutured techniques. However, in the subgroup of dogs requiring GI resection in the face of peritonitis this cost appears to be warranted. Surgical stapling however is not the only modality a surgeon can rely on as it really is only practical for GI resection in the jejunum and ascending duodenum as the large ends of the GIA forks need to be able to be passed through the lumen of adjacent segments of intestine. This requires significant mobility of the bowel segments involved and makes it impossible in the descending duodenum, around the ileocecocolic valve and in the large intestine. It is also not practical in smaller breeds of dogs and cats using the most commonly used human GIA staplers (e.g. GIA stapler, Medtronic, Salem, MA).

The descending duodenum is an unusual site for surgical lesions to occur with the possible exception of ulcers associated with NSAID and/or steroid use, renal disease or other conditions. In these dogs, a predilection site for the upper descending duodenum appears to be present although these lesions seem to be getting less commonplace with a better understanding by veterinarians and owners on the use of sensible prescribing habits and the avoidance of co-administration of these different groups of drugs. In the case of a perforating ulcer in the proximal descending duodenum a local resection of the ulcer bed can be performed with a transverse closure in order to minimize the risk of luminal narrowing if the lesion is modestly-sized. With more extensive ulcers or masses in this area care should be taken to visualize the common bile duct as if resection of this structure or the major duodenal papilla is deemed necessary biliary rerouting will need to be performed.

Knowledge of factors that adversely affect healing of the large intestine should be considered prior to undertaking large intestinal resections. The large intestine has a much greater anaerobic bacterial load compared to the small intestine. The large bowel heals more slowly and may in the case of large resections (such as those performed during subtotal colectomy for feline megacolon) be exposed to significant tension. Additionally, the blood supply to the lower colon may not be as robust as that of other areas of the bowel making preservation of the caudal rectal artery important when performing resections in this area. Indications for large intestinal resection are principally for management of megacolon, resection of neoplastic lesions and rarely mesenteric volvulus involving the large intestine. Colotomy for foreign body removal is generally not indicated and neither are full thickness biopsies of the colon as colonoscopic biopsies usually suffice for diagnosis of inflammatory conditions of the large intestine. Large intestinal closure is performed by this author in the same way as for small intestine with a single layer appositional suture pattern although some surgeons prefer a two-layer closure for large intestine especially in large breed dogs.

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045

IS IT STRIDOR OR STERTOR?

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM (Small Animal Internal Medicine) lrjohnson@ucdavis.edu

Is it Stridor or Stertor?

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Stertor and stridor are common complaints in brachycephalic animals, to the extent that owners often need to be informed that these loud breathing sounds are actually abnormal rather than 'normal for the breed'. Unfortunately the popularity of the afflicted dog breeds continues to grow and breeding strategies are leading to more and more debilitated animals. Stertor and stridor can also be associated with obstructive lesions of the upper airway involving the larynx, pharynx, tonsils, epiglottis, nasopharynx, and trachea in any breed of dog or cat. Laryngospasm, foreign bodies, extraluminal obstruction, and mucosal edema, inflammation, and hemorrhage can all lead to loud breathing. Differentiating stridor from stertor can help prioritize the site and type of the lesion present.

Stridor is a high pitched inspiratory noise of a single tonal quality that often results from narrowing of a large, rigid airway such as the larynx, trachea, or nasopharynx. Classically, it is described as audible without a stethoscope however subtle stridor does require laryngeal auscultation for detection. Identification can be augmented by exercising the animal. Conversely, stertor is an inspiratory or expiratory snoring noise of variable tones caused by vibration of soft tissues such as the soft palate, pharynx, or laryngeal saccules.

Patient examination begins with an appraisal of the respiratory pattern. Upper airway obstruction typically leads to inspiratory effort and noise however large airway obstruction anywhere from the larynx to the carina can result in both inspiratory and expiratory effort and noise. Decreased or lack of nasal airflow and inability to breathe with the mouth closed will localize disease to bilateral nasal cavity or nasopharynx. Auscultation should include the larynx, trachea, and all lung fields. In normal animals, loud, hollow sounds are heard over the larynx and trachea on inspiration and expiration, with a noticeable pause between the two phases of respiration.

The diagnostic work-up for animals with stertor and stridor depends on the likely diagnosis. For brachycephalic breeds, visual examination and cervicothoracic radiographs are performed initially. Work up for nasal and nasopharyngeal disease includes baseline laboratory testing, CT, and rhinoscopy. Caudal rhinoscopy and biopsy of any mass lesion is critical. Obtaining histopathologic samples with visualization is the best means for obtaining a definitive diagnosis.

Specific disease processes

Stenotic nares is the most obvious condition associated with stertorous breathing and is the most common anatomic abnormality in brachycephalic breeds. Interestingly, it's often the only manifestation of disease in brachycephalic cats. ***Elongated soft palate*** is also common in many breeds, and upper respiratory noises are often so loud that it can be difficult to distinguish other abnormalities. However careful auscultation over the larynx can allow differentiation of sounds and can be crucial in documenting stridor, which is suspicious for concurrent ***laryngeal collapse***. Laryngeal collapse, with overlap of cuneiform or corniculate processes is the end stage manifestation of brachycephalic syndrome and is also recognized in the Norwich terrier and Cavalier King Charles spaniel. Another differential for laryngeal stridor in the brachycephalic breed is ***epiglottic retroversion***, which is increasingly recognized as a cause of airway obstruction. Normally the epiglottis sits below the soft palate and during swallowing, it moves back to cover the larynx. During inspiration, it moves upward to contact the palate and direct air through the nasopharynx to the larynx. In dogs with retroversion, the epiglottis is overly mobile and travels caudally to obstruct the larynx during inspiration. This disorder might result from malacic change in the epiglottis, fracture of the epiglottis, or failure of the hyoepiglottic muscle to maintain the epiglottis in the proper position. Both laryngeal collapse and epiglottic retroversion warrant a guarded prognosis as surgical correction of these disorders is fraught with difficulty and complications.

Nasopharyngeal turbinates can result in continued stertorous or stridorous respirations in brachycephalic animals after corrective surgery of other abnormalities has been completed. It is also encountered in brachycephalic cats. Retroflex view of the choanae is required to document this lesion.

The opening to the caudal nasopharynx is normally ~1 cm across in cats and variably sized in dogs. With ***nasopharyngeal stenosis***, it can be reduced to less than 1mm or obliterated by a web of scar tissue. In cats, this is typically a thin web of tissue however in dogs, thick fibrous tissue can span a long portion of the nasal cavity and nasopharynx. This tissue can represent a congenital malformation or could be a response to chronic inflammation from chronic upper respiratory disease or regurgitation into the nasopharynx. In dogs, post-anesthetic regurgitation of gastrointestinal contents into the nasopharynx is particularly problematic. Signs associated with nasopharyngeal stenosis can be classic for upper respiratory disease, with sneezing and mucopurulent nasal discharge, however, signs due to nasal obstruction usually predominate. Stertorous or stridorous breathing sounds and open mouth breathing are often reported. Nasal airflow is absent unilaterally or bilaterally. Nasopharyngeal stenosis can usually be visualized on CT, and sagittal reconstruction of the image provides information on the length and extent of the stenosis. Nasopharyngeal stenosis can also be appreciated during endoscopic evaluation of the choana provided the investigator has an appreciation of the normal anatomy of the caudal nasopharynx. If a flexible endoscope is not available, the nasopharyngeal region can be indirectly evaluated by passing a catheter caudally through the ventral meatus into the nasopharynx and oropharynx. In the normal animal, the catheter should pass easily into the pharynx, however a stenosed region will block passage of the catheter. Treatment of this obstructive breathing disorder can be achieved through balloon dilation. In dogs, the fibrous nature of the tissue and the extent of narrowing make balloon dilation less likely to be successful. Some resolution of signs has been achieved with temporary implantation of removable stents, although these require careful monitoring and management for 6-8 weeks.

Animals with ***laryngeal disease*** present with variable degrees of inspiratory respiratory distress, exercise intolerance, tachypnea, and cough. Gagging or dysphagia can also be seen. Careful questioning of the owner may reveal a voice change or a reduction in vocalization in the recent history. The etiology could be a laryngeal mass (due to inflammatory laryngitis or laryngeal neoplasia), laryngeal collapse, or laryngeal paralysis.

Laryngeal paralysis can be a congenital condition (Dalmatian, Rottweiler, Leonberger, Husky, etc) and also exists as an acquired disease. The acquired syndrome occurs most commonly in older large breed dogs as a generalized neuromuscular disease, and it is occasionally documented in cats. Laryngeal paralysis can also be associated with trauma or a mass lesion impinging on the recurrent nerve anywhere along its pathway. History and presenting complaints include loud breathing, exercise intolerance, and continual panting in dogs. When asked, owners might recall that the pet has had a change in the character or frequency of the bark or meow. Neurologic assessment is important because additional nerve dysfunction can be detected in some congenital cases as well as in the acquired syndrome of large breed dogs. Proprioceptive placing deficits are quite common in these dogs and help establish the likelihood of disease. Diagnosis of laryngeal paralysis is based on visualization of decreased or absent laryngeal abduction on inspiration while the

animal is under a light plane of anesthesia. Ultrasound of the larynx has also been reported as a means for confirming the diagnosis. With either technique, it is important that an assistant identifies inspiratory motions to the examiner for correlation of laryngeal abduction with inspiration. In dogs, when a definitive diagnosis of laryngeal paralysis cannot be made based on visual examination, respirations are stimulated using doxapram (1.0 mg/kg IV). Animals that display marked clinical signs associated with laryngeal paralysis require surgical treatment via unilateral arytenoid lateralization. Less severely affected animals can be managed with weight loss and avoidance of heat, humidity, and over-exertion.

Norwich terrier upper airway syndrome is a congenital and likely heritable condition that appears to be a variant of brachycephalic syndrome impacting primarily the larynx. Affected dogs have narrowing of the laryngeal aditus that creates a large pressure gradient across the airway opening. This leads to secondary changes of saccular eversion, tonsillar enlargement, redundant supra-arytenoid folds, inflammation, and laryngeal collapse.

Cervical tracheal collapse results in stridor due to turbulent flow in a narrowed trachea. ***Tracheal mass lesions*** (neoplasia or granuloma) that become large can cause stridorous sounds on both inspiration and expiration.

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046

INTERACTIVE LAB: MASTERING CHAT GPT FOR EFFECTIVE COMMUNICATION

Shawn Wilkie

Talkatoo, Sowtware, Toronto, Canada

Qualifications:

Shawn Wilkie

CEO

Shawn@talkatoo.com

Integrate ChatGPT into Your Veterinary Practice

Presented by Shawn Wilkie

Shawn Wilkie is a serial entrepreneur and technology enthusiast with over twenty years of experience. He has founded six start-ups and was a finalist for Ernest & Young's prestigious Entrepreneur of the Year award in 2018. He is also the co-host of the Veterinary Innovation Podcast, where he has interviewed over 200 trailblazers in the veterinary medicine space.

A passionate supporter of the pet health industry, he has created tools that positively impact veterinary professionals in their day-to-day clinical operations and personal lives. A leader who gets things done, Shawn is the founder and CEO of Talkatoo, a purpose-driven company that gives medical professionals time back in their day.

ChatGPT is a powerful tool that can assist veterinarians in providing effective care while reducing the amount of work and time required to complete many essential tasks. GPT-4's ability to analyze patterns in data, generate contextually relevant content, and aid in management tasks opens many new avenues for veterinary practices (OpenAI, 2020).

Join Shawn in this hands-on workshop and learn how to integrate GPT-4 into your day-to-day practice management to improve treatment and diagnosis, client education & communication, and case management.

Note: Ensure each participant has a device (laptop, tablet, etc.) with an internet connection to interact with the GPT-4 tool. Technical support should be available to help with any software-related issues.

Learning outcomes:

Understand the concept of AI and its applications in veterinary medicine.

Familiarize yourself with ChatGPT, specifically GPT-4, its capabilities, and how it operates using Natural Language Processing and Large Language Models.

Explore the current applications of GPT-4 in veterinary clinical practice, including diagnostic aid, client education and communication, and case management.

Gain hands-on experience in utilizing GPT-4 for enhancing the diagnostic process by analyzing patterns in symptoms.

Develop skills in generating personalized education materials for pet owners and effectively communicating with clients using GPT-4.

Acquire knowledge on leveraging GPT-4 for efficient organization and tracking of patient history, treatment plans, and follow-ups.

Recognize the potential of GPT-4 in improving treatment and diagnosis, client education and communication, and case management in day-to-day veterinary practice.

Engage in a Q&A discussion to clarify doubts, share experiences, and exchange insights with fellow participants.

Encourage further exploration of AI in veterinary medicine and GPT-4's capabilities.

The workshop will be structured as follows:

What is AI?

Starting with this common question, the concept of AI will be introduced, highlighting its application in Vet Med.

What is ChatGPT?

An overview of ChatGPT, specifically GPT-4, as well as a brief explanation of how it works and its many capabilities. Will include a brief section on Natural Language Processing and Large Language Models.

GPT-4 in the Practice

Overview of how GPT-4 is currently being used for diagnostic aid, client education and communication, and case management.

Activity 1: Diagnostic Simulation (20 minutes)

Enhancing the diagnostic process with GPT-4, e.g. analyzing patterns in symptoms.

Demonstration: Using a simulated case study, illustrate how GPT-4 can help in the diagnostic process.

Participant Exercise: Participants work in pairs, using pre-prepared case studies to practice with the GPT-4 tool.

Activity 2: Enhancing Client Education & Communication (20 minutes)

Utilizing GPT-4 to develop personalized education material for pet owners and improve overall communication.

Demonstration: Show how GPT-4 can generate pet care instructions based on specific parameters and tailor responses to client inquiries.

Participant Exercise: Participants create their own client education materials and practice responding to simulated client inquiries using GPT-4.

Activity 3: Case Management (20 minutes)

Using GPT-4 to help organize and track patient history, treatment plans, and follow-ups.

Demonstration: Show how GPT-4 can assist in managing patient records, generating treatment plans, and scheduling follow-ups.

Participant Exercise: Participants use GPT-4 to manage simulated patient cases, developing treatment plans and follow-up schedules.

Conclusion

Recap of the session, and the potential of GPT-4 in veterinary clinical practice

047

TREATMENT FAILURE IN LEISHMANIOSIS: RESISTANCE, LACK OF EFFICACY, OR THE IMMUNE RESPONSE?

Xavier Roura

Hospital Clínic Veterinari, Universitat Autònoma De Barcelona, Bellaterra, Spain

Qualifications:

Xavier Roura

DVM, PhD, DECVIM-CA

xavier.roura@uab.cat

Key points from the presentation:

Although canine leishmaniosis is a chronic disease, most dogs respond well to recommended treatments and do not require lifelong leishmanicidal and/or leishmanostatic drugs. Also, more than 10 years after the publication of the CLWG guidelines on the treatment of leishmaniosis in dogs, they are still valid!

In dogs, the objectives of anti-*Leishmania* treatment are: (1) to induce a reduction in the parasite load to produce clinical improvement and laboratory abnormalities, (2) to help restore normal immune function, (3) to prevent clinical relapses, and (4) to reduce the transmission of leishmaniosis to other animals, including humans, by reducing the *Leishmania* load in sandflies that bite a sick dog.

These objectives point to the idea that only sick dogs need direct treatment against leishmania. This means that, in general, dogs exposed (stage A) or infected (stage B) do not need anti-*Leishmania* treatments. Therefore, prior to treatment, it is first necessary to clinically classify each dog according to stage A (exposed), stage B (infected), stage C (clinically diseased), and stage D (severely diseased) leishmaniosis.

Since the treatment of canine leishmaniosis is always a clinical decision, the veterinarian must decide the best treatment in each case, based on the clinical presentation, published scientific evidence and factors associated with each patient, each owner, and each veterinarian.

However, for dogs with leishmaniosis, the combination of antimonials at 50 mg/kg/12h or 100 mg/kg/24h SQ for 1 month and allopurinol (10 mg/kg orally twice daily, or once daily in the presence of xanthinuria, for at least 12 months) is the most widely described and effective treatment.

If this treatment regimen is not possible, an alternative is the combination of miltefosine (2 mg/kg orally once daily for 28 days) and allopurinol.

Furthermore, several studies have shown that all these above drugs can ameliorate and prevent the progression of kidney disease in dogs with leishmaniosis.

Use other protocols or drugs to treat leishmaniosis in dogs is not recommended, either because of its use in human medicine, as in the case of amphotericin B, or because it can predispose to resistance, as in the case of antibiotics.

Potential reasons for choosing a different treatment protocol than the one recommended by the main guidelines would be dogs that did not respond to conventional treatment, the occurrence of relapses soon after the end of treatment, the development of serious adverse effects, poor owner compliance with the administration of a drug, possible drug resistance, and the non-governmental approval or availability of drugs in each country.

Dogs with different clinical and serological status may differ in the way they are treated. For example, severely ill dogs show serious clinical conditions and need treatment for leishmaniosis, however these dogs often also require anti-inflammatory or immunosuppressive medications or other supportive treatments in addition to leishmaniosis treatment.

The CLWG clinical classification of canine leishmaniosis includes stage E, which would be dogs that do not respond to conventional treatment or have early relapses.

Why do we have stage E dogs? There are basically three reasons: a) because they have another disease besides leishmaniosis; b) because they have a sub-optimal immune response to control leishmaniosis; or 3) because they are resistant to conventional treatment.

Dogs that relapse when allopurinol is withdrawn, or even while on allopurinol, need different treatment approaches. In the first situation, it is necessary to restart a complete treatment again; in the second situation, the dog will again require treatment with a leishmanicidal drug such as antimonials or miltefosine. However, there are some dogs that, even when maintained on allopurinol, require leishmanicide treatment every 4-12 months to remain clinically stable.

Routine use of other protocols or drugs to treat leishmaniosis in dogs is not recommended, due to the different clinical situations discussed above, it may be necessary to choose a treatment protocol different from that recommended in the guidelines.

Even though currently the first-line treatment for canine leishmaniosis is the combined use of leishmanicidal drugs and allopurinol, some other drugs or substances have been described as effective in the control of canine leishmaniosis, such as pentamidine, enrofloxacin, marbofloxacin, metronidazole, ... and more recently, artemisia.

The use of combination therapies is relevant for canine leishmaniosis control programs because it is more difficult for *Leishmania* to acquire resistance to combined treatment than to monotherapy.

However, resistance can also develop using drug combinations, especially when the treatment is long, is given at sub-optimal doses or, above all, is repeated several times when it would not be necessary.

Increasing drug resistance in both human and veterinary medicine is recognized as a major emerging One health concern. Large anti-*Leishmania* drugs use exerts selective pressure on human and animal *Leishmania* and is considered a major contributor to the development of drug resistance.

As in many infections, diversity and selection have given rise to drug resistance and treatment failure. *Leishmania*'s drug resistance could be associated to different strategies such as decrease in drug uptake, efflux of drugs, inactivation of drugs inside the parasite, loss of drug activation pathways, alteration of drug targets, increase of efficacy in repairing drug damage, and molecular adaptations.

The most important mechanism to explain resistance of *Leishmania* to different drugs is its molecular adaptations with a combination of endogenous and acquired genes underlies resistance mechanisms.

Because several drugs kill *Leishmania* through a common cell death pathway to achieve apoptosis, strains resistant to one of these drugs could develop cross-resistance in front other antileishmanial drugs.

Clinical course of leishmaniosis in dogs is highly dependent on its immune response, perhaps the use of immunotherapy (which can enhance the dog's immune response) could provide a new therapeutic tool to prevent relapse.

Published evidence on the use of immunotherapy in human medicine shows that its efficacy increases if the disease has been treated before. This is because immunotherapy generally does not directly attack the pathogen or cause of the disease, as other drugs would, but instead

modulates the patient's immune response, increasing their protection against the disease.

So, in the case of canine leishmaniosis, perhaps a good recommendation might be to start immunotherapy after leishmaniosis treatment with a leishmanicide. In general, due to the different times to achieve maximum therapeutic efficacy, it would be advisable to start immunotherapy a few days after finishing antimonials or 3-4 weeks after finishing miltefosine.

Domperidone, a dopamine D2 receptor antagonist with an immunomodulatory effect by increasing blood prolactin levels, appears to help control leishmaniosis in dogs.

Oral dietary nucleotides together with compounds correlated with active hexose that seem to reduce the progression of the disease in dogs infected with *Leishmania*.

LiESP/QA-21 vaccine against leishmaniosis has also been used as immunotherapy since 2011, or since 2016, the other European canine vaccine based on recombinant Q protein.

As a conclusion, there is a group of dogs with leishmaniosis that has clinical relapse in a short time or that clinically doesn't respond to the treatment adequately. The main causes of both clinical situations are parasite resistance to drugs and inadequate immune response against leishmaniosis.

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048

MANAGEMENT AND DIAGNOSIS OF FELINE SMALL CELL LYMPHOMA.

Ann Hohenhaus

Animal Medical Center, Oncology, New York, United States of America

Qualifications:

Ann Hohenhaus, DVM

Diplomate, ACVIM (Oncology & Small Animal Internal Medicine)

ann.hohenhaus@amcny.org

Diagnosis and treatment of feline small cell lymphoma: 2023 update

Ann E. Hohenhaus, DVM

Diplomate, ACVIM (Oncology and Small Animal Internal Medicine)

Dr. Antonio Giuliano, *DVM*

MS, PgCert(CT), GpCert(SAM) Dip. ECVIM(Oncology), MRCVS

Disease evolution

In the feline leukemia virus era which occurred prior to the mid 1980's, most lymphoma was found in young cats and involved the cranial mediastinum. With the advent of FeLV testing and vaccination programs, gastrointestinal lymphoma has become the most common form of feline lymphoma. Around 2000, several research publications identified a cluster of lymphoma in the small intestine composed of small lymphocytes infiltrating the intestinal wall.[1,2,3] This lymphoma was slowly progressive and minimal treatment appeared to result in prolonged survival.[4]

Small cell gastrointestinal lymphoma

Multiple terms have been used to describe small cell gastrointestinal lymphoma

:

Small cell GI lymphoma

SCGL

Low grade alimentary lymphoma

Mucosal [T cell] lymphoma

Intestinal small cell lymphoma

Intestinal T cell lymphoma

Epitheliotrophic small T cell lymphoma

Enteropathy associated T cell lymphoma type II

EATL II or EATL 2

Based on a recent publication from Japan, small cell gastrointestinal lymphoma currently appears to be the most common form of feline lymphoma.[5]

Clinical presentation

The typical cat with small cell gastrointestinal lymphoma has a median age of 12y and there may be a male predilection for the disease. The clinical signs of small cell gastrointestinal lymphoma are vague and nonspecific. The clinical signs of small cell gastrointestinal lymphoma also mimic signs of common feline diseases such a chronic kidney disease, hyperthryroidism, pancreatitis and inflammatory bowel disease.

Clinical signs:	
Vomiting	24%
Weight loss	21%
Anorexia	20%
Diarrhea	10%
Lethargy	9%
Increased LEs	5%

Physical examination will reveal weight loss and possibly thick GI loops and rarely abdominal mass, commonly mild to moderately enlarged lymph nodes.

Diagnostic Evaluation

The purpose of the diagnostic evaluation of a cat suspected to have small cell gastrointestinal lymphoma is three fold:

Rule out common causes of clinical signs

Intestinal parasites

CKD

Hyperthyroidism

Pancreatic disease

Provide supporting evidence of a diagnosis of small cell gastrointestinal lymphoma

Obtain a definitive diagnosis of small cell gastrointestinal lymphoma

Components of a diagnostic evaluation

CBC

Biochemical profile

Urinalysis

T4

Fecal

Trypsin like immunoreactivity

Feline pancreatic lipase

B12, folate

Retroviral testing

Diagnostic imaging

Histopathology

Immunohistochemistry IHC)

PCR for Antigen Receptor Rearrangement (PARR)

Obtaining a biopsy

Tissue samples adequate to diagnose small cell gastrointestinal lymphoma can be obtained via endoscopy, laparoscopy or exploratory laparotomy. The key to making a diagnosis is to sample as many segments of the bowel as possible since small cell gastrointestinal lymphoma is not uniformly distributed throughout the intestine. Most common locations are jejunum and ileum. The jejunum cannot be reached via endoscopy. Thus, if endoscopy is used to obtain biopsies, both upper and lower intestine should be biopsied. Endoscopic biopsy's primary drawback is the superficial sample that is obtained. Early lymphoma may go misdiagnosed since the majority of these lymphomas originate from the muscularis layers and endoscopic biopsy frequently only collect mucosal tissue. The diagnostic precision of endoscopic biopsies is also constrained by small sample sizes and crash artifacts. While veterinarians worry about post-operative complications from intestinal biopsies in cats with intestinal neoplasia, reports of complications are uncommon.[7]

Interpreting the biopsy

In some cats, routine H&E staining will be sufficient to differentiate inflammatory bowel disease from small cell gastrointestinal lymphoma. In others, the pathologist will recommend additional testing usingIHC and/or PARR. PARR does not determine phenotype, but instead identifies clonal rearrangements of the T cell receptor gamma gene or the immunoglobulin heavy chain gene. Clonal or oligoclonal rearrangements of the T cell receptor gamma gene are found in small cell gastrointestinal lymphoma, but often not in inflammatory bowel disease.

Treatment of small cell gastrointestinal lymphoma

The goals of treatment are twofold.

Treat the lymphoma

Manage associated conditions such as pancreatitis, microbiome changes, hypocobalaminemia, hypereosinophillia

The optimal treatment for small cell gastrointestinal lymphoma is unknown but by convention, prednis(ol)one and chlorambucil are administered. Current wisdom on treatment suggests a 12 month course of therapy.[6] If the small cell gastrointestinal lymphoma appears to be in remission, then a drug holiday is prescribed with careful monitoring and treatment again at the time of relapse.

Chlorambucil is traditional chemotherapy drug of the alkylating agent class. Administration to cats has been associated with bone marrow suppression, including irreversible thrombocytopenia, Fanconi syndrome and myoclonus. Glucocorticoid therapy has been associated with an increased risk of infection, diabetes and congestive heart failure. Compounded chlorambucil is not recommended unless no other treatment options are available.[8]

Optimal dosing of chlorambucil and prednisone have not been studied. Common doses of chlorambucil include 1.4 mg/kg given q 14 days or divided over 2-3 days per week. A dose of 20 mg/m^2 q 14 days, 4 mg x m^2 once daily or every other day or simply 2 mg tablet 2-3 times per week have also been recommended.[1,2,3] A CBC should be monitored every 4-6 weeks while the cat is being treated with chlorambucil with particular attention paid to the platelet count. Biochemical profile should be monitored approximately every 3 months unless the clinical condition requires more frequent monitoring. Consideration should be given to monitoring B12 and abdominal ultrasound every 6 months for monitor response to therapy and define remission.

Remission and survival

Defining remission is difficult in small cell gastrointestinal lymphoma and is based on resolution of clinical signs, weight gain and resolution of intestinal thickening or lymphadenopathy based on palpation or ultrasound. Cats that have resolution of clinical signs are the cats most likely to have prolonged survival. Reports of median survival typically exceed 2 years.[1,2,3,6]

Management of Relapse

Because common feline diseases can mimic relapse of small cell gastrointestinal lymphoma, recognition of relapse can be complicated. When clinical signs recur or diagnostic testing reveal relapse, chemotherapy is reinstituted. Many cats on a drug holiday will respond to chlorambucil a second time. Oral cyclophosphamide and lomustine have also been used in relapsed cases. The ultimate cause of death in cats diagnosed with small cell gastrointestinal lymphoma is more often than not a second tumor, another chronic feline disease and much less often small cell gastrointestinal lymphoma.

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049

REAL LIFE CLINICAL CASES: CHRONIC PAIN

Sheilah Robertson

Lap of Love Veterinary Hospice, Meical Director, Gainesville, United States of America

Qualifications:

Sheilah A Robertson, BVMS (Hons), CertVA, PhD, DACVAA, DECVAA, DACAW, DECAWBM (AWSEL), FRCVS.

drrobertson@lapoflove.com

Real life clinical cases: chronic pain

Introduction – meet our patient.

Angel is a mixed breed spayed female dog. It is thought that she is now approximately 12 years old. The owner requested a consultation because Angel has been showing progressive signs of hind limb weakness and difficulty getting up. The history includes that she was adopted at an estimated age of 2 years and had an incident of sudden hindlimb paresis 4 years ago due to intervertebral disc disease (which was treated surgically followed by rehabilitation). Currently she is not on any medication other than her routine preventative drugs. Discussion will include further diagnosis, treatment options and outcome.

Clinical examination

Angel is overweight (weight is 27 kg, Body Condition Score is 7/9), but there is muscle wasting predominantly in the hind quarters. On observation, she is licking her forepaws and the nails on her hindlimbs are worn down and there are lesions on the skin that appear to be due to dragging or "scuffing" her legs. She requires help to get up and when she walks, she is ataxic, has trouble placing her paws correctly and drags her hindlimbs. She has proprioceptive deficits in both hind limbs but has deep pain and can pull her limbs away when the toes are squeezed, she flinches when her epaxial muscles are palpated but does not react the way one would expect with a disc protrusion. During her orthopaedic examination she flinches during extension and flexion of multiple joints and it is not possible to fully extend her left hip. Radiographs were taken and showed an old left femur fracture and large callus.

Presumptive diagnosis and treatment

Angel is overweight, has osteoarthritis (OA) and a presumptive diagnosis of degenerative myelopathy. Her muscle wastage is secondary to disuse atrophy and, based on her age, sarcopenia.

The treatment plan is integrative and includes pharmacologic and non-pharmacologic therapies. Blood work was all within normal limits except for a mild increase in liver enzymes.

Weight loss is one of the first things to address. In overweight dogs with hip osteoarthritis, weight reduction alone can result in a significant improvement in lameness (1). Angel was prescribed a joint diet and her daily calorie requirements for gradual weight loss calculated.

Polysulfated glycosaminoglycan (Adequan®) is approved for use in dogs in the US and is considered a structure modifying OA drug although there are few well controlled clinical studies (2).

Drugs; carprofen, amantadine and gabapentin were prescribed.

Non-steroidal anti-inflammatory drugs (NSAIDs) have been the first line drug therapy for OA in dogs for many years and several drugs in this class are available globally (2). Their safety and efficacy have been reviewed (3) as have their adverse effects (4).

Amantadine is an N-methyl-D-aspartate [NMDA] receptor antagonist. The NMDA receptors in the dorsal horn of the spinal cord are involved in central sensitization, which occurs in dogs with osteoarthritis (5). In dogs, NSAIDs alone may not produce sufficient pain relief, therefore adjunct drugs are often used. In one study, the addition of amantadine (3-5 mg/kg once daily), to an NSAID regimen resulted in improved physical activity after 21 days of treatment (6).

Gabapentin: gabapentin is an antiepileptic drug but also used in the treatment of neuropathic pain. Evidence is lacking for the use of gabapentin in dogs with OA (2), however there is a neuropathic component to many chronic (maladaptive) pain states and this drug is widely used by clinicians.

Non-pharmacological treatments: products and equipment that were used to assist Angel with the activities of daily living included boots to protect her paws and provide grip on slippery surfaces, a harness to assist her to rise and walk, and a soft orthopaedic bed. She received acupuncture treatments, heat therapy, physical therapy (including underwater treadmill sessions) and myofascial relief therapy. The 2022 WSAVA guidelines for the recognition, assessment and treatment of pain contains information on these treatment modalities (https://wsava.org/global-guidelines/global-pain-council-guidelines/).

Progression and outcome

Seven weeks are starting treatment, Angel was able to get up on her own, had regained good use of her hind limbs although she lacked full coordination. Six months after starting treatment her bloodwork was still unremarkable and she underwent a dental cleaning and anaesthesia was uneventful. Eight months into treatment she was weaned off gabapentin over a 3-week period but remained on amantadine and carprofen. One year and three months after treatment began her body condition score was 5/9 and she weighed 19.7 kg (43.5 lbs.), which was close to her goal weight. However her "recheck" bloodwork was abnormal; there was a large increase in her liver enzymes. Long term use of NSAIDs can induce liver enzymes and this was one theory for the changes seen on Angel's bloodwork. She was switched to grapiprant, which belongs to the novel class of NSAIDs called piprants. Grapiprant is a prostaglandin E2 EP4 receptor antagonist and does not inhibit the production of prostaglandins and theoretically has fewer adverse effects than traditional NSAIDs (2). Five weeks later her liver enzymes were back to her baseline values. Angel continued to lead an active life for over 2 years after she was first seen by her veterinarian for her mobility issues. She did, however, begin to struggle again and she stopped responding to treatment. She was no longer able to do the things she loved to do, for example visit the dog park and interact with other dogs. Quality of life assessments had been performed over the past year and it was clear she was declining and the decision was made to euthanize her.

Other options for Angel

The following options are discussed as they may be helpful in some cases of chronic pain.

Acetaminophen (paracetamol): acetaminophen's exact mode of action is not fully understood (2). It has no significant anti-inflammatory actions, showing weak inhibition of cyclo-oxygenase (COX)-1 and COX-2. It crosses the blood-brain barrier, and one of its modes of action may be inhibition of COX-3, which is thought to be a sub-form of COX-1, in the central nervous system, blocking the formation of prostaglandins. A second proposed mechanism is its serotonin agonist activity in descending inhibitory pain pathways. A third mode of action may be via cannabinoid receptors. Yet another way acetaminophen may work is by activation of transient receptor potential vanilloid 1 (TRPV1) by one of its metabolites; activation of TRPV1 in the midbrain of rodents produces antinociception (7). Acetaminophen is available alone, or in combination with codeine, hydrocodone, or tramadol, which are in the opioid class of drugs. The addition of any of these opioid drugs makes the combination a controlled substance and available by prescription only. Acetaminophen alone is

available over the counter in various strengths and formulations. In the US, there are no veterinary-approved formulations whereas in the United Kingdom there is a paracetamol/codeine product licensed for use in dogs. Although the evidence for using acetaminophen in dogs with chronic pain is anecdotal, it is worth looking at because of the growing evidence of its efficacy in the acute pain arena. There are many approved NSAIDs on the market and these should be our first-line drugs for dogs. For patients who cannot tolerate NSAIDs, acetaminophen is an alternative. However, because acetaminophen has minimal anti-inflammatory effects and primarily exerts its effects centrally, it can be used in conjunction with NSAID therapy.

Biological therapies: there has been a huge growth in the use of monoclonal antibodies to treat numerous diseases in humans and this has spilled over into veterinary medicine. Neutralizing antibodies to nerve growth factor (NGF) provide pain relief in dogs with osteoarthritis (2,8). These products were not available at the time Angel was being treated but would be utilized today.

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050

BREED-SPECIFIC PRE-BREEDING SCREENING TO PRODUCE HEALTHIER PUPPIES AND KITTENS.

Jerold Bell

Cummings School of Veterinary Medicine at Tufts University, Dept. Of Clinical Sciences, Enfield, United States of America

Qualifications:

Jerold S Bell DVM

Adjunct Professor of Clinical Genetics, Cummings School of Veterinary Medicine at Tufts University, USA

Chairman, Hereditary Disease Committee, WSAVA

jerold.bell@tufts.edu

Hereditary disease is caused by genes that are passed down from the parents. When selecting for breeding stock, screening for common hereditary diseases that are seen in clinical practice should be considered and included. Different pedigreed breeds of dogs and cats have different inherited predispositions for disease based on identified or unidentified genetic variants. The most common hereditary diseases occur across breed lines and may also be related to selection for disease-predisposing conformation.

Some of these hereditary diseases have identified and validated genetic markers or causative gene variants that can be tested for. In fully penetrant hereditary disease (where the presence of an "affected" genotype always causes clinical disease) a genetic test for a single gene pair is all that is required to identify normal, carrier (for recessive disease) and affected individuals. In hereditary disease with incomplete penetrance (where the tested genotype is not always predictive of clinical disease) there may be complex (polygenic) inheritance where other identified or unidentified gene pairs affect the clinical expression of disease. The identified variant should be considered a liability gene, but the owner should be informed that it is not directly predictive for disease.

In many instances, the genetic test for a simple Mendelian (one gene pair) disease in one breed may not relate to clinical disease in another breed or in a mixed-breed background. This is especially true for the most commonly identified genetic variants found across all mixed-breed and pedigreed breeds, such as the SOD1 liability variant for canine degenerative myelopathy, CORD1/CRD-4 liability variant for canine ocular cone-rod dystrophy, the CDDY liability variant for canine chondrodystrophy and intervertebral disc disease and the PK liability variant for feline pyruvate kinase deficiency. Knowledge of breed-specific risk for clinical disease is necessary to determine the need or appropriateness of variant genetic testing in each breed or mixed-breed individual.

The most common hereditary diseases seen in dogs and cats are complexly inherited and most do not have validated genetic tests available. However, many of these disorders do have diagnostic tests to differentiate affected from normal individuals. These include radiographs for hip and elbow dysplasia, heart auscultation and echocardiograms, patella evaluations, eye examinations, thyroid profiles (including autoantibodies), cryptorchidism examinations and respiratory function grading for canine brachycephalic obstructive airway syndrome. Unfortunately, other common hereditary diseases have no diagnostic tests that can differentiate affected from normal individuals. When this is the case, a review of the clinical patient history is important for the prospective breeding animal and their close relatives to identify affected individuals and the risk of passing on liability genes. Such diseases include allergies, epilepsy, feline urinary syndrome/inflammatory cystitis and canine gastric dilatation/volvulus (bloat).

All prospective breeding animals should undergo a general pre-breeding veterinary health examination and review of clinical history, including breed and body-type appropriate screening for common hereditary diseases (I.e. musculoskeletal, cardiac, ocular, dermatologic, and history of gastrointestinal disease). Prospective breeding animals should also be evaluated for extreme conformation that can predispose them to disease, including extreme brachycephaly in dogs and cats, extreme size (large and small), extreme dental malocclusion, extreme angulation, extreme hair and excessive skin and skin folds.

Breed-specific pre-breeding genetic screening includes hereditary disorders with validated screening tests that are more prevalent in specific breeds. There are organized programs in many areas of the world that list breed-specific pre-breeding genetic screening tests. In the USA, the OFA-Canine Health Information Center has breed-specific testing as determined by the parent breed club (https://ofa.org/chic-programs/browse-by-breed/). The UK Kennel Club has the assured breeders scheme (https://www.thekennelclub.org.uk/dog-breeding/the-kennel-club-assured-breeders/breed-specific-requirements-and-recommendations-including-health-screening/). The International Partnership for Dogs attempts to list breed-specific health screening tests with relevance to each breed but does not differentiate between common and rare disorders (https://dogwellnet.com/ctp/). While similar recommendations for cat breeds are not available, International Cat Care (Icat) lists breed-specific health conditions (https://icatcare.org/advice/?per_page=12&categories=cat-breeds).

With the recent public desire to acquire "rescued" or non-pedigreed pets, the purposeful breeding of mixed-breed dogs and cats has increased. Whenever two animals are purposely bred together, regardless of the pedigree or mixed-breed nature of the mating, the parents should be screened for common hereditary diseases. Genetic health is not related to the mixed-breed or pedigreed nature of matings, but to the presence of disease liability genes and disease-predisposing conformation. Healthy parents produce healthy offspring. All dogs and cats deserve to live healthy lives.

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GASTROPEXY TO PREVENT GDV - HOW I DO IT!

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

amsingh@uoguelph.ca

Because of the morbidity and mortality associated with GDV, *prophylactic* gastropexy has been recommended for prevention in at risk breeds. Gastropexy can be performed at the time of sterilization via open laparotomy or using minimally invasive laparoscopy. Prophylactic laparoscopic-assisted gastropexy (LAG) has been described in dogs and has been shown to result in a strong adhesion between the pyloric antrum and right body wall, and is comparable to open laparotomy techniques.

What is the Evidence for Prophylactic Gastropexy in Dogs?

In dogs with GDV, gastropexy reduces recurrence to <5% whereas failure to perform gastropexy results in recurrence rates as high as 80%. These results make the decision to perform gastropexy at time of surgery for the correction of GDV an easy one.

Prophylactic gastropexy has gained considerable interest in recent years in dogs at-risk for GDV. This is commonly done at time of spay or neuter in order to prevent an additional anesthetic episode for the dog. The question associated with a prophylactic gastropexy is what is the risk that a dog will develop GDV? If this risk is low, then prophylactic gastropexy will likely be of little benefit. In a study performed in 2003, five at-risk breeds (Great Dane, Irish Setter, Rottweiler, Standard Poodle and Weimarainer) were studied to evaluate the risk vs benefit of prophylactic gastropexy. After comparing costs associated with treatment of GDV, costs assocated with prophylactic gastropexy combined with the probability of death due to GDV, prophylactic gastropexy was deemed appropriate for all five breeds.

Technique - Incisional Gastropexy via Open Laparotomy

Numerous methods exist for gastropexy, however, the author prefers incisional gastropexy due to its speed, technical ease and biomechanical strength. An assistant is of great benefit for this procedure. The pyloric antrum is located, which is 5-7cm orad to the pylorus. The pylorus can be identified as a thick, muscular ring in the right cranial abdominal quadrant and should not be confused as a gastric foreign body. Practitioners should become familiarized with the pylorus, as in cases of GDV it is found in the left cranial abdominal quadrant and can be readily palpated. When derotating the stomach in cases of GDV, it must be grasped and rotated ventrally back to the right (and anatomically) correct side of the abdomen.

A 3-5cm incision is made in the pyloric antrum depending on the size of the dog midway between the greater and lesser curvatures in a parallel plane to the long axis of the stomach. The incision is then created through the seromuscular layer only and the mucosca/submucosa layer will be noted to bulge through this incision. In case of penetration through the mucosa/submucosa layer, the defect is closed primarily using a monofilament, absorbable, long-acting suture prior to continuing with gastropexy. The primary surgeon moves to the left side and an assistant moves to the right hand side of the patient and elevates the body wall using two towel clamps placed through the external rectus fascia. The gastric wall incision is then matched to a location in the body wall caudal to the last rib and in the ventral 1/4th of the body wall. An incision is then created using a #15 scalpel blade through the peritoneum and transversus abdominus muscle in a craniodorsal to caudoventral direction approximating the same length as the gastric seromuscular incision. (The author essential incises parallel to the fibres of the transversus abdominus muscle. The craniodorsal aspect of the body wall and cranial gastric incisions are sutured using a monofilament, absorbable long-acting suture (e.g. PDS, 0 or 2-0). At the medial aspect of the incision, the suture is tied to prevent a purse-string effect and then continued along the caudal aspect of both incisions. Failure of incisional gastropexy is uncommon. Fistula formation has been reported following the use of polypropylene sutures and is not recommended.

Technique - Laparoscopic-assisted Gastropexy

This technique was originally described by Rawlings *et* al in 2001. The author uses a modified Hasson technique to obtain abdominal access in the sub umbilical region and following establishment of pneumoperitoneum (10-12 mmHg), a 6 mm, smooth or threaded trocar-cannula assembly placed. A 5 mm x 29 cm, 0^0 or 30^0 laparoscope is inserted into the abdomen and a superficial exploration is performed. A second portal (12mm-15mm) is created 2-4 cm lateral to the margin of the rectus abdominis and 3-5 cm caudal to the last rib depending on the size of the dog under direct laparoscopic guidance. Ten mm laparoscopic Babcock forceps or DuVall forceps are inserted into the abdomen through the paramedian instrument port and can be used to carefully manipulate cranial abdominal organs to provide a clear view of the antral portion of the stomach. If a clear view can not be obtained, the dog can be placed into reverse Trendelenburg position to shift abdominal viscera caudally away from the stomach.

Once the antral portion of the stomach is clearly visualized, a location 5-7 cm aborad from the pylorus is grasped midway between the greater and lesser curvatures. The surgeon should ensure a secure grasp of the stomach as it can slip out of the forceps. Without placing excessive tension on the stomach, the orientation is maintained and the abdomen desufflated. The skin and subcutaneous tissue incisions are enlarged on either side of the instrument portal incision to create an access incision of ~3 cm in a direction parallel to the last rib. The approach is continued through the external oblique, internal oblique, and tranversus abdominis muscle layers. Each muscle layer should be carefully identified with stay sutures to facilitate accurate closure. Allis tissue forceps are used to grasp the cranial and caudal edges of the tranversus abdominis muscle to maintain clear identification of these muscles for gastropexy. Surgical approach through the muscle layers should be performed parallel to the muscle fibres.

The stomach is carefully exteriorized through the access incision with the Babcock forceps and stay sutures were placed at the orad and aborad extent of the proposed gastropexy to maintain appropriate gastric orientation which is paramount for procedural success. The Babcock forceps are removed and the seromuscular layers of the stomach are incised and the cranial edges of the transversus abdominis muscle and stomach are sutured together followed by the caudal edges in a simple continuous pattern using a monofilament, absorbable suture. The author begins the suture line laterally and progresses medially on the cranial aspect. Once the suture line reaches the medial aspect, 5-6 throws are performed, and the line continued to the other side. Following gastropexy completion, the site is lavaged and the internal and external abdominal oblique musculature, subcutaneous tissues and skin are closed in three separate layers using a simple continuous pattern with monofilament, absorbable suture. Pneumoperitoneum is re-established at 6-8 mmHg through the sub umbilical port and the gastropexy inspected to ensure appropriate gastric orientation. The laparoscope and cannula are removed and the port site closed routinely.

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SALIVARY GLAND REMOVAL - WHICH TECHNIQUE IS THE BEST?

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

amsingh@uoguelph.ca

INTRODUCTION

Salivary mucoceles, also termed sialoceles, are accumulations of saliva in the subcutaneous tissues and occur most commonly in dogs and rarely in cats. The sourse of the saliva can be from any of the salivary gland/duct complexes, but most commonly leaks from one of the four major salivary glands (zygomatic, parotid, sublingual, mandibular) with leak from the sublingual gland/duct complex predominating. The cause of a salivary leak is rarely identified but can occur as a result of trauma to the salivary gland and/or duct, foreign material, calculi in the salivary gland/duct or neoplasia.

The most clinical signs associated with a salivary mucocele are dependent on the origin of salivary leak (Table).

Origin of salivary leak (gland/duct)	Clinical signs
Zygomatic	Exopthalmos
Pharyngeal swelling from sublingual/ mandibular	Dyspnea, stridor
Ranula from sublingual/mandibular	Dysphagia,
Sublingual/mandibular	Cervical swelling**

****most common**

DIAGNOSIS

Fine needle aspiration of the swelling is recommended. Salivary mucoceles will contain thick, serosanguinos fluid that resembles saliva. Cytological evaluation of the material should be performed and will reveal variable numbers of nondegenerate nucleated cells and proteinacious material (mucin). Once a salivary leak is confirmed, medical management can be attempted, however, is not commonly successful in this authors experience. This is likely because of the continuous leak of saliva in to the subcutaneous tissues. Surgical removal of the gland producing saliva is recommended. In cases of ventral cervical swelling, determining which side (right vs left) sublingual/mandibular gland is leaking can be challenging. To help identify the side, the dog can be placed in dorsal recumbency and particular attention is paid to the side the swelling falls toward as this is generally the side where salivary leaking is occurring. Preoperative cervical ultrasound is can evaluate salivary glad structure and aid in determining the gland (+/- side) to be removed.

OPERATIVE PROCEDURE

Because cervical swelling from salivary leak from the sublingual or mandibular salivary gland/duct complexes is most common, the operative procedure for removal of these glands only will be discussed. These glands share a common duct and, therefore, a removed together as a single structure.

Lateral Approach: The dog is placed in lateral recumbency and the cervical and facial regions are clipped and aseptically prepared for surgery. The mandibular salivary gland will be located at the bifurcation of the external jugular vein, just caudal to the mandibular lymph node. A vertical incision is created through the skin, subcutaneous tissues and platysma muscle centered over the jugular bifurcation. Digital palpation will reveal the capsule of the mandibular salivarly gland which is more firmly attached and paler in color compared to the mandibular lymph node. The capsule is sharply incised revealing the mandibular gland. Using a combination of sharp and blunt dissection, the mandibular gland is freed from its capsule. An atraumatic instrument (I.e. Allis tissue forcep) can be used to grasp the gland providing gentle caudal retraction. The cranial extent of the mandibular gland is reached, revealing the duct and portions of the sublingual salivary gland. Maximal visualization is reached by caudal retraction of the mandibular salivary gland and the duct is ligated using monofilament, absorbable suture as proximally as posible. The site is lavaged and closed routinely. Following removal of the salivary gland, mucocele drainage is performed and described below.

Ventral Approach: The dog is placed in dorsal recumbency and the ventral mandibular and cervical region clipped and aseptically prepared for surgery. The angle of the mandible identified and an incision from the cranial third of the mandible to the level of the salivary gland created through the skin, subcutaneous tissues and platysma muscle. The mandibular gland is identified using similar methods as described above for the lateral approach. Once the mandibular gland and distal portion of the salivary gland have been dissected in a similar fashion to the lateral approach, the digastricus muscle is identified and a hemostat is placed from a rostro-medial to caudal underneath the digastricus to clamp the duct of the mandibular/sublingual salivary gland. The salivary tissue distal to the forceps is excised (essentially what can be removed via a lateral approach) and the forceps are withdrawn in a rostro-medial direction. The mylohyioideus muscle is identified and incised which reveals the continuation of the sublingual salivary gland (polystomatic portion) and duct. Careful dissection is performed to the level of the lingual nerve where the salivary duct is ligated using monofilament, absorbable suture and tissue distal to the ligature exicised. The site is lavaged and closed routinely. Following removal of the salivary gland, mucocele drainage is performed and described below.

Mucocele Drainage: Once the salivary gland thought to be causing the leak has been removed, the mucocele should be drained. Briefly, the author simply makes a small stab incision into the swelling to allow for drainage of the saliva and a closed suction drain placed. If the mucocele is encountered during the surgical approach (commonly occurs during ventral approach), a separate incision is not required. A closed suction drain or passive drain (e.g. Penrose) should be placed in the mucocele cavity following drainage. If the mucocele is a ranula (peri-lingual mucocele), marsupialization is then performed folllowing removal of the mandibular/sublingual gland/duct complex.

Ventral vs Lateral Approach – What should I do?

The obvious benefit of a ventral approach is the additional sublingual salivary tissue that can be removed. This has been thought to reduce recurrence of mucocele, however, a randomized, prospective study is lacking in the veterinary literature. While a lateral approach to the mandibular/sublingual salivary gland is generaly uncomplicated, a ventral approach can definitely become easier with experience. Cadaveric dissection may help the practitioner traverse the learning curve associated with this approach.

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RESPONSIBLE USE OF ANTIBIOTICS IN CANINE AND FELINE RESPIRATORY DISEASES

Patrícia Poeta[1], *Telma Sousa*[2], *José Eduardo Pereira*[2], *Luís Maltez*[2], *Vanessa Silva*[2], *Gilberto Igrejas*[3]

[1]*Head of MicroART/University of Trás-os-Montes and Alto Douro, Veterinary Sciences, Vila Real, Portugal,* [2]*MicroART/University of Trás-os-Montes and Alto Douro, Veterinary Sciences, Vila Real, Portugal,* [3]*University of Trás-os-Montes and Alto Douro, Genetic And Biotechnology, Vila Real, Portugal*

Qualifications:

Full Name: Patrícia Alexandra Curado Quintas Dinis Poeta

Qualifications: Full Professor

Email: ppoeta@utad.pt

Responsible use of antibiotics in canine and feline respiratory diseases

Abstract

When it comes to addressing respiratory diseases in dogs and cats, responsible use of antibiotics is of utmost importance. These diseases often involve bacterial infections, necessitating a thoughtful approach to treatment for companion animals. Antibiotics play a vital role in managing respiratory diseases in both canine and feline populations. However, the emergence of antimicrobial resistance poses a significant threat to both animal and human health. The responsible use of antibiotics is crucial to mitigate this challenge and preserve the efficacy of these life-saving drugs. Respiratory diseases are prevalent in canine and feline populations, ranging from mild upper respiratory tract infections to severe pneumonia. Given the similarities between human and animal respiratory systems, there is a growing concern about the transmission of resistant bacteria between humans and companion animals. To address this issue, accurate diagnosis through thorough clinical examinations, diagnostic imaging, and laboratory tests is essential. This enables the identification of the causative agents and determination of whether antibiotics are necessary. Additionally choosing the most targeted and effective options, based on antimicrobial susceptibility testing, can help reduce the emergence of resistance. The responsible use of antibiotics is essential in the management of respiratory diseases in dogs and cats. By promoting accurate diagnosis, implementing appropriate treatment protocols, and educating veterinarians and pet owners, we can help mitigate the emergence and spread of antimicrobial resistance.

Manuscript

Respiratory infections in dogs and cats are often caused by bacterial infections, leading to misuse and overuse of antibiotics. Some studies refer that treatment of respiratory disease was the third most common cause for antibiotics use, representing almost 10% of prescriptions (1). In pets acute upper respiratory tract infections can be caused by a diversity of viruses as well as primary and secondary bacterial pathogens. The majority are viral and are not likely to respond to antibiotic therapy (2). In this sense, common non-antibiotic therapies can be used to manage the upper respiratory tract diseases in cats and dogs. Antitussive therapy is the primary treatment for dogs with canine infectious respiratory disease without pneumonia (3). Both medical and nursing care are required to manage acute and chronic upper respiratory tract infections in cats (4). Appetite stimulants, such as mirtazapine and capromorelin, may be needed to counteract the decreased appetite caused by nasal congestion. Subcutaneous fluids should be measured to prevent nasal dehydration and ocular congestion (5). For eye infections, artificial tears and oxytetracycline and erythromycin-containing products have been recommended as first-line topical antibiotic therapy however triple-antibiotic cream (neomycin, polymyxin, and bacitracin) is disheartened because is ineffective against primary feline conjunctivitis bacterial pathogens (6). Famciclovir is generally considered safe and effective in antiviral therapy for cats with feline herpesvirus. It is very important to differentiate between an acute (up to 10 days) or chronic (lasting 11 or more days) respiratory infection in order to know whether or not to use antibiotics for treatment. For patients with severe clinical signs such as vomiting, coughing, and sneezing in dogs or ocular discharge in cats, veterinarians should consider other factors including physical examination and history before deciding on antibiotic prescribing decisions. Antibiotics should only be prescribed in patients showing clinical signs of systemic disease such as anorexia, lethargy, fever or pneumonia as well as animals not responding to general non-antibiotic therapy or in patients showing clinical signs for more than 10 days (7,8). The recommended antibiotic for the treatment of dog and cat upper respiratory tract infections is doxycycline because of this potential against to major pathogens, such as *Bordetella bronchiseptica*, *Mycoplasma* species, and *Chlamydia felis*, as well as to many secondary infections (7). However, the use of doxycycline in cats is associated with complications, particularly the risk of post administration esophagitis (2). If doxycycline is unavailable or inappropriate, it may be considered minocycline as an alternative (9). When doxycycline is not an option, amoxicillin and amoxicillin/clavulanate are reasonable empirical treatment options for cats and dogs, respectively (7). Amoxicillin can be an acceptable alternate first-line option for the treatment of acute bacterial respiratory infections in cats when *C. felis* and *Mycoplasma* are not very suspected (8). Normally, most respiratory infections in dogs and cats are self-limiting. However, a patient presenting with chronic signs, pneumonia or lack of response to initial therapy should be re-evaluated based on diagnostic tests. In cases of chronic upper respiratory tract a thorough investigation should be considered to identify possible causes as fungal diseases, neoplasia, foreign bodies, nasopharyngeal stenosis, oral fistula, nasopharyngeal polyps, trauma among others. In these cases, and based on diagnostic and laboratory tests, other antibiotics considered as second-line may be used, such as fluoroquinolones and azithromycin (2). Historically, antibiotics such as gentamicin without nebulization have not been recommended due to a lack of evidence of efficacy. However, new evidence suggests that nebulization of gentamicin may be an appropriate treatment where systemic antibiotics have not been ineffective (10). *Bordetella bronchiseptica* and *Mycoplasma* spp. are the primary bacterial pathogens responsible to cause bacterial bronchiolitis in pets. However, this condition is often associated with diverse situations that include inhaled irritants; infections by other bacteria, viruses, *Dirofilaria immitis*, respiratory parasites, esophageal dysfunction and allergies (8). The diagnostic includes physical examination, radiographs and cultural analysis and treatment may include empiric administration of doxycycline pending culture results, followed by targeted antibiotics based on susceptibility testing. In other respiratory conditions, the optimal duration of treatment is still uncertain, but a minimum of 7-10 days is recommended. Chronic noninfectious pneumonia is also important to consider as a differential diagnosis. Dogs and cats that develop a cough associated with fever, lethargy, inappetence or tachypnea should be evaluated for the presence of pneumonia by a complete physical examination, complete blood cell count and chest radiographs. If clinicopathologic findings and thoracic radiologic findings (alveolar lung disease) support the diagnosis of bacterial pneumonia, collection of a transtracheal, endotracheal, or bronchoalveolar lavage specimen for cytologic examination, culture for aerobic bacteria and antimicrobial susceptibility and culture for *Mycoplasma* spp. is recommended. When pneumonia is diagnosed in dogs and cats, following physical examination, complete blood cell count and chest radiographs, antimicrobial treatment should be initiated as soon as possible and within 1-2 hours if clinical signs of sepsis are present. However, consider that not all cases of aspiration pneumonia require antimicrobial treatment, as the clinical disease may be just chemical pneumonitis (8). Pyothorax, is a condition caused by inflammation of the chest cavity in dogs and cats. In cats the bacteria commonly found in the chest include *Fusobacterium* and *Prevotella*. Fighting cats and upper respiratory infections are suggested to be risk factors for pyothorax in cats. In dogs, bacteria commonly found in the chest mucus of dogs with pyothorax include a mixture of anaerobic organisms such

as *Prevotella* spp., *Peptostreptococcus* spp. (8). Treatment of pyothorax includes intravenous drainage, removal of the bladder through the chest with occasional or continuous suction, and, if necessary, lavage. Recommended antibiotics are usually oral enrofloxacin or marbofloxacin in combination with penicillin or clindamycin (8).

Preserving the efficacy of antibiotics ensures that these vital drugs remain effective in combating respiratory infections in our beloved pets while safeguarding public health. Through a thoughtful and responsible approach to antibiotic use, we can optimize treatment outcomes while minimizing the risks associated with overuse or misuse of these medications. Furthermore, by addressing respiratory diseases responsibly, we contribute to the overall health and welfare of dogs and cats, all while safeguarding the long-term effectiveness of these important medications and combating the issue of antibiotic resistance.

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ROLE OF DOGS AND CATS ARE RESERVOIRS OF LEISHMANIA PARASITES.

Filipe Dantas-Torres

Aggeu Magalhães Institute, Department Of Immunology, Recife, Brazil

Qualifications:

Filipe Dantas-Torres

MV, MSc, DSc, PhD, Dipl. EVPC, FRES

fdtvet@gmail.com

Leishmaniasis is a vector-borne disease caused by over 20 species of *Leishmania* parasites (Kinetoplastida, Trypanosomatidae). These protozoan parasites are transmitted by the bite of infected female phlebotomine sand flies (Diptera, Psychodidae), which are small blood-feeding insects that feed on many animal species including humans. Over 90 species of phlebotomine sand flies are known to transmit *Leishmania* parasites (1).

An estimated 0.9 to 1.6 million new cases of human leishmaniasis (including all forms of the disease) occur annually in endemic countries worldwide (2). There are three main clinical forms of the disease: visceral, cutaneous, and mucocutaneous leishmaniases. Each clinical form results from complex interactions between parasites and human individuals, which, in turn, is much influenced by parasite species, as well as genetics and individual immune response.

Most forms of leishmaniasis are zoonotic, with a large number of mammal species possibly acting as the source of *Leishmania* parasites to phlebotomine sand flies (3). Accordingly, most *Leishmania* parasites are maintained in nature by wild hosts, including small mammals such as rodents and marsupials. However, domestic animals (e.g., dogs, cats, horses and cattle) can occasionally be exposed to infected phlebotomine sand flies and acquire the infection. This is particularly frequent for some *Leishmania* parasites which are transmitted by phlebotomine sand flies that have adapted to live in or nearby human-modified settings, including crop plantations, gardens, natural parks, and human houses. This is the case of *Leishmania infantum*, the causative agent of zoonotic visceral leishmaniasis, a disease that may be fatal if left untreated in over 95% of cases. Indeed, *L. infantum* is transmitted by numerous phlebotomine sand flies, most of which can be found in human dwellings.

Dogs and cats can be infected by numerous species of *Leishmania* parasites in both Old and New Worlds (4, 5, 6, 7). In the New World, these include *L. infantum* (both dogs and cats), *Leishmania amazonensis* (both dogs and cats), *Leishmania braziliensis* (both dogs and cats), *Leishmania guyanensis* (dogs only), *Leishmania mexicana* (both dogs and cats), *Leishmania panamensis* (dogs only), *Leishmania peruviana* (dogs only), and *Leishmania venezuelensis* (cats only). In the Old World, both dogs and cats have been found infected by *Leishmania infantum*, *Leishmania tropica*, and *Leishmania major*. *Leishmania tarentolae*, a reptilian parasite, has also been molecularly detected in dogs in Italy (8).

Both dogs and cats can act as a source of *L. infantum* parasites to phlebotomine sand flies. The role of dogs as reservoirs of this parasite is well established. Furthermore, a recent study demonstrated that phlebotomine sand flies that acquired *L. infantum* parasites from an infected cat were able to transmit these parasites to a naïve dog (9). This presented unequivocal evidence that cats can be a source of *L. infantum* infection and eventually play a role in the transmission cycle of this parasite.

While the role of dogs and cats as possible sources of *L. infantum* infection is clear, there is limited information concerning other *Leishmania* species. Dogs have been suspected to act as reservoirs of *L. braziliensis* and *L. peruviana* in parts of South America, but there is no reliable information to support this hypothesis (10). Indeed, limited xenodiagnosis data indicate that dogs are not a good source of *L. braziliensis* parasites. For *L. peruviana* there is virtually no information on this matter.

In conclusion, dogs and cats can act as a source of *L. infantum* to phlebotomine sand fly vectors. For other *Leishmania* species, it is important to emphasize that the mere finding of positive dogs or cats to a given *Leishmania* species in a given endemic area, does not imply that they act as reservoirs. Further studies shall improve our understanding of the role of dogs and cats as reservoirs of *Leishmania* parasites other than *L. infantum*.

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CASTLES OR COMMUNES? A PRACTICE OWNER'S PERSPECTIVE ON PREVENTION STRATEGIES

Paul Davey

Grantham St Vet Clinic, Management, Wembley, Australia

Qualifications:

Dr Paul C.B. Davey OAM BSc BVMS

Bachelor of Science (Murdoch) and Bachelor Veterinary Medicine and Surgery (Murdoch)

paul@petwellness.com.au

Castles or Communes?

A practice owner's perspectives on mental health integration into veterinary practice.

This paper is written using the mistakes and successes of 20 years of practice ownership as formative influences and is provided in the hope that the reader has more success, and less mistakes.

The author also believes that the reader needs a certain level of prior learning/understanding to get be effective in this space. Ideally this should include:

1) An understanding of the benefits of time dedicated to working on the business not in it.

2) A Mental Health First Aid course or similar

3) An appreciation of the science of happiness and wellbeing [1]

4) An appreciation of the difference between Stress and Distress; and

5) An understanding of the influencing factors and their effects on mental health in our profession

The strategy for integrating mental health wellbeing strategies into practice can be explained in three sections:

Owner/manager mental health

There are few things more demoralising than watching your boss implode over a crashing medical patient, yell at a client through frustration, or slam a door and start sobbing because it all got too much. For any of these strategies to work, the implementer at the top of the hierarchy needs to model good mental health, and good mental health practices. Whether you want to be or not, you are a role model, and so the managers and leaders in a practice should:

1) Set an example. Is your life Balanced, do you model the 'work hard, play hard" philosophy, or are you a quiet achiever?

2) Work out what "balance" is for you. Full-time or Part-time, 50:50 clinical and administration time, surgical/medical or veterinarian/mother/cosplay crusader!

3) Be clear-headed to notice what is going on in the clinic. You cannot notice the subtle nuances of body language in your staff while you are worried about who will pick up the kids or how you are going to fit the abscess drainage in between consults.

4) Be vulnerable, ask open questions, and use self-reflection and healthy self-regulation. There are plenty of resources available in this space. [2]

Managers and owners will always have to perform an awkward juggle of striving for personal and business success whilst ensuring the optimal wellbeing of staff, patients and clients. This is not easy, but fortunately they are not mutually exclusive.

Management style

There is no "one" management style that suits every staff member nor every team. To some extent, a good employer chooses staff that suit their style, but a good manager also needs to appreciate each staff member is an individual and needs tailored management.

Leadership is a much-mentioned trait, but is not easy to work on as a skillset. There are many resources available for managers and owners to use to enhance this aspect of their management, and they are well worth exploring, as good, healthy, inclusive, vulnerable leaders are more likely to be trusted, and will get much better engagement from staff. A good veterinary leader has:

1) The trust of their staff

2) Great teamwork traits

3) Honesty, reliability and

4) A healthy work ethic.

The average veterinary environment is busy, dynamic, unpredictable, emotional and intense. This does not mean that it is naturally a "stressful" environment, as this is largely a mindset. Of course there are well reported adverse mental health outcomes attributed to working in busy veterinary environments without appropriate self-care and support, but we need to do more work on determining what makes these workplaces fun and rewarding for some and distressing and debilitating for others.

We know stress can be positive. The exciting, ever-different and immensely challenging and potentially rewarding environment of a veterinary workplace should be seen as a great place to work, but for some this becomes overwhelming and unsustainable.

Over time, the lessons learned have led to the incorporation of the following key changes:

1) Staff's personal lives are now part of our core business.

2) Mental Health discussions are part of every work review

3) Our "support" is tailored for each individual staff member.

4) We celebrating the successes, and acknowledge the failures, albeit with appropriate supportive language.

Systems and protocols (nuts and bolts)

The management style will only take a practice part way down the journey to being more mental-health proactive. These principles need to be embedded into the operational mechanics of the business. This pervades through many aspect of the business protocols and procedures, but most notably and importantly at these key touchpoints:

A) Selection of staff.

It is very important, perhaps now more than ever, to choose staff that complement the existing team. Desperation hiring can lead to the selection of a toxic staff member that may not be a good fit for your team, or long-term culture.

Your job interview must contain the right questions that tease out the qualities you are looking for, or NOT looking for.

It is surprising how many interviewees freely volunteer health issues when asked, and give us the opportunity to evaluate that in light of the role they will be playing. Language is important, and so we ask: "is there anything we should know that might affect your ability to do your job; AND if there is, what can we do as managers to help?"

B) Training and Induction.

Once welcomed into the team, staff need to feel safe, supported and have built-in structured expectations of their performance and progress. This starts with:

1) Documentation that explain leave protocols and entitlements

2) Job descriptions so staff know their role

3) Appointment of a supervisor/mentor

4) Regular check-ins – "open door" not sufficient for all

5) Following through with all commitments.

This "honeymoon period" is an opportunity to provide an environment of trust, build autonomy and resilience and lay the foundations that may help AVOID mental distress.

C) Practice Protocols.

Protocols help to ensure staff feel safe, protected and supported. The following give staff purpose and direction.

1) Robust procedures and protocol manuals

2) A safe workplace (physically and psychologically)

3) Roster-certainty and job security

4) Support in their own personal definition

5) Counselling available to staff

6) Strong absentee systems/strategies

7) Client complaint protocols

D) Acknowledgement.

How do you show your staff that they are valued and appreciated? Acknowledge on three levels:

1) Individually – recognition of a job well done

2) As a team – when a case is managed well or a problem identified and solved

3) As a practice – when things have been productive and everyone has chipped in to help.

E) Performance reviews.

It is important to use a template to ensure consistency, fairness, and an element of predictability. Lessons from the past have taught that people's personal life has an unavoidable and sometimes profound effect on their work, and management feel it is OK to talk to staff about their personal lives IF you have their permission AND you have their trust. Staff reviews now contain discussion of mental health and wellbeing as part of a holistic view on health. Privacy is respected and assured, but openness encouraged.

F) Measurement and Reflection.

Like any good project or business, it is very important to undertake regular assessment and self-reflection of performance. Some ways in which this can be achieved are:

1) 360 degree reviews

2) Structured staff surveys

3) Formal third party consultants

4) AVA Employer of Choice (AVA Members)

5) AVA Cultivating Safe Teams (AVA Members)

Culture:

Culture is left till last in this series of 4 points because it cannot be addressed until all that is mentioned prior to this is managed.

Culture has many definitions, and is an ethereal, mysterious and constantly changing concept that always seems to be just out of reach. This is partially because it is like the faintest of stars. It is only visible if you don't look directly at it. It may not be possible to work on culture directly, rather it has to develop as a result of the work done in so many other areas of a workplace.

Culture will change with the mix of people, the work being done and the various life stages, personal and professional events being experienced by everyone in the team. Management can set tone, and structure some elements of the determinants of culture, but it can never be completely controlled or prescribed by a minority in management.

Conclusion

Most practices have inadvertently embraced many of the matters discussed in this paper into their operation already. Simply realising the importance and relevance of them in regards to mental health is a great first step. Readjusting your management lens to specifically work on them, and fill any gaps will make a profound difference to your team.

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FLOWERS ON A GRAVE: HOW A TRAGEDY TRIGGERED A TRANSFORMATION

Paul Davey

Grantham St Vet Clinic, Management, Wembley, Australia

Qualifications:

Dr Paul C.B Davey

Bachelor of Science (Murdoch) Bachelor of Veterinary Medicine and Surgery (Murdoch)

paul@petwellness.com.au

WA Division of the AVA Graduate Support Program: "Flowers on a Grave": an historical reflection on the development of a mental health support program for Veterinarians in Australia

The purpose of this presentation is to outline how a terrible tragedy triggered the development of a support mechanism that is now core business for the Australian Veterinary Association (AVA).

Key features of the AVA New Graduate Support Scheme

Developed in 1998 (Dr Mike Lumsden and WA Division of the AVA Committee) after the tragic suicide of Dr Gavin Barugh who took his own life on November 7, 1997, roughly two years after graduation.

Assigned New Graduate Veterinarians to experienced volunteer veterinarians. Membership of the AVA was encouraged but not mandatory, though later this was enforced.

Mentor/mentee were manually paired according to preferences/ environment.

Face-to-face contact was encouraged prior to first employment. Initially a "meet and greet" at Murdoch prior to Graduation, then another session in the first 3-4 months of the following year after graduation.

Liaised with the Vet Surgeon's Board of WA to capture graduates from other states coming into WA.

Initially no formal training offered to mentors, but over time the resources offered and developed became quite sophisticated, including;

Weekend workshop with counsellor.

Advent of email offered potential broader sharing of experiences.

Development of the "collective mind' resource.

Access to online resources, articles and forums.

Prior to becoming National, program was very reliant on unpaid volunteers, but was very organically managed making it quite reliant on the personnel – for better and for worse.

Why was mentoring needed and what was the purpose?

The primary aim of the initial phase of the AVA NGSS was to prevent suicide and other mental health issues from ruining young veterinarian's lives and the lives of family and friends around them.

Almost incidentally, the role of the mentor naturally leaned into other advisory responsibilities including:

Helping with Employment related issues (pay rates, working hours, employer expectations)

Advice on Veterinary case-related issues (general medical, surgical or animal welfare questions)

Interpersonal issues (communication failings, personality clashes, relationship issues)

Career and/or job choice issues (doubts about overall career choice and/ or particular aspects of current job)

The mentors were given more training over the years to help them handle these various responsibilities, and quite early on we realised that we needed to ensure there were boundaries to the relationship.

Why Mentoring vs Coaching/Teaching/Counseling

Mentoring is a relationship that focuses on the needs of the mentee. There are a number of definitions, but for the purposes of the AVA NGSS, the mentor was a back-up support system, designed to be a fall-back or additional complementary support resource that fit in around the support already available to the New Graduate Veterinarian they were assigned to. We acknowledged that the primary support network would include family, friends, peers and so the NGSS was really there to be available if these options were not available or appropriate for some reason.

The Mentor aimed to develop a meaningful connection, and then make themselves available to provide support in whatever form that particular mentee needed at the time.

The mentee was encouraged to develop their own support networks and ideally choose themselves a life-long mentor to take them further down their chosen career pathway.

Aims of an effective mentoring scheme

Our initial plans for the mentoring program were simple: Prevent suicide. However, as the program grew organically we appreciated additional benefits and challenges in the delivery of an ideal support program. Idealistically the program needed to:

Protect and support the mentor, as well as the graduate

Match the needs of the mentee with the experiences and knowledge of the mentor

Provide education on mentoring skills to the mentor

Educate the mentors on the limit of their responsibility and capabilities including a time limit.

Encourage a bond to develop between mentor and graduate. Ideally they chose each other.

Both mentor and graduate need to be committed to the concept

The program was undoubtedly a success, but there were some challenges and hurdles we needed to address such as:

The wellbeing of the mentors was always under challenge. The role could be time -consuming, emotionally draining and occasionally cross relationship boundaries

There was great variation in commitment and passion for the concept across the mentors and new graduates.

So did the original state-based mentoring scheme work?

Thankfully, to the best of our ability to monitor, there have been no suicides amongst new-grad cohort in WA since the inception of the program in 1998.

Our feedback received predominantly through emails after the completion of the notional 12 month support period suggests that graduates felt supported and part of veterinary community.

Feedback from AVA members indicated that some thought that the Graduate Support Program was the "Most valuable thing the AVA does".

Many of the "mentored" have demonstrated their support and belief in the program by offering to become mentors too – some immediately after completing their 12-month stint as mentees.

We don't have accurate participation figures for all years, but from 2004 to 2010:

Year	# Participants	Year	# Participants
2004	59	2008	84/84
2005	76	2009	62
2006	64/81	2010	34/96
2007	56/78		

The National Version

After extensive consultation and research, the program was launched nationally by the AVA in 2015 with substantially more resources, infrastructure and sophistication.

A dedicated section on the AVA Website offers information, resources and a portal for mentors and mentees to interact with the program.[4] New mentors and mentees can apply online to participate and are given access to relevant information to allow them to up-skill and prepare for the respective role. Feedback is formally sought and assessed after each cohort completes their time in the program to allow incremental improvements. There appears to be a slight trend away from this support, but the author feels that this may be due to a myriad of other support services and mechanisms becoming available rather than an indication that the service is less valued.[3]

Year	Number of Students enrolling
2015-2016	249
2016-2017	196
2017-2018	216
2018-2019	188
2019-2020	191
2020-2021	193
2021-2022	188
2022-2023 (to date	143

Where to now?

The mental health issues that plague society in general have not dissipated since we commenced the AVA NGSS in 1998. In fact, it would seem that they have become more commonplace, or at least more people are willing to talk about them. We have not solved this, nor have we prevented veterinarians from suffering mental health challenges. The AVA NGSS paved the way for bigger conversations on veterinarians' mental health, and gave legitimacy to the birth of an AVA-supported VetHealth Initiative that brought conversations about mental health into the open.

This has created a more Holistic approach to support of veterinarians in general through:

Enhancing the Training in resilience and self-care starting at University

Acknowledgement of the value of soft skills in our profession

Highlighting the importance of measurement and reporting.

Creating a better environment for the whole veterinary team

Discussion of Whole of life/career mentoring

Wellbeing baseline enhancement

The horizon:

Veterinary Practice Boards in collaboration with the Australian Veterinary Boards Council, and their Sustainability of Practice Committee have been investing considerable resources in researching and developing better support mechanisms for veterinarians across Australia.

Discussions of mental health are now being integrated into discussions on overall wellbeing at many levels. Corporate veterinary groups have identified the importance of this through developing Employee Assistance Programs (EAPs) and providing access to counsellors, Mental Health First Aid training and in-house mentoring as tangible support options for staff.

The AVA has recently launched a structured program titled "Cultivating Safe Teams" and we are looking forward to assessing the outcomes of this in the 50 practices chosen to be part of the pilot. This takes some inspiration from Royal College of Veterinary Surgeons and the American Veterinary Medical Association's 2021 collaboration that created the Mind Matters International Statement which is a terrific concept.[5]

It is a shame that a profession that is full of people with exceptional intelligence, sensitivity, resourcefulness and determination has been so willing to accept sub-standard wellbeing as the norm for so long, and it is time for veterinarians and their support staff to become more proactive in the areas of self-care and more aggressively pursue a higher level of wellbeing. It is unsustainable to continue to accept mental health that is below-average and we should all be striving for a higher-than-average state of wellbeing, rather than seemingly wearing our mental health struggles like a badge of honour. The sustainability of our business model and profession's wellbeing is dependent on this.

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CONNECTION, PEER SUPPORT, AND WELLBEING IN VETERINARY WORK

Rosie Allister

University of Edinburgh, Business School Associate, Edinburgh, United Kingdom

Qualifications:

Dr Rosie Allister

BSc (Hons) BVSc MSc PhD MRCVS

rosie.allister@gmail.com

Connection, peer support, and wellbeing in veterinary work.

This session explores the evidence for active listening, connection, and peer support in workplace health and wellbeing for veterinary professionals.

Active listening is a key feature of leadership communication at work, and is integral to social support at work (1). Social support is one of the most important resources mediating work engagement and wellbeing at work (1, 2).

Active listening is a way of listening to another person to gain a deeper understanding of what they are saying and the context in which they are saying it. It incorporates skill in responding effectively to the person, and responding to what they are saying with emotional intelligence (3).

Supervisors' active-empathetic listening has a significant positive relationship with employee work engagement (1), work engagement is a positive, fulfilling, and emotional state of mind associated with work, and is associated with job satisfaction (2), job performance (4). client satisfaction, low turnover intention (5), and is negatively associated with burnout (5).

Active listening is important from a human perspective. A combination of active and empathetic listening where you use listening skills to understand as closely as you can and stand in the shoes of another person and hear what they are going through is powerful. It is used in high pressure situations like crisis negotiations, suicide prevention helplines, conflict resolution, and more.

Effective active listening requires self awareness. It needs attention, open minded attitude, and for us to adjust in response to what we hear. Feeling understood is powerful, and can alleviate feelings of distress. Being with someone who cares in itself can be protective. When someone is struggling it can be hard for them to find options alone, talking things through can help. At times of difficulty initial support through llistening can help more than persuasion or advice, which can initially feel invalidating.

As well as active listening, this session considers the evidence for peer support at work. Peer support has been described as: "a system of giving and receiving help founded on key principles of respect, shared responsibility, and mutual agreement of what is helpful" (6). Studies suggest workplace peer support programmes may improve well-being and relationships between employees (7).

This session considers in detail the skills needed for active listening and for peer support, as well as what barriers to active listening and peer support can be in veterinary settings. In considering skills the session reviews evidence on training, and considers training in an applied context. Training is often put forward as a solution for mental health and wellbeing issues in veterinary practice. This session considers what questions to ask before deciding on training. It looks at the evidence for training, when it might help, and when other solutions or frameworks of support following training may also be needed.

The session also considers connection, and the evidence for connection in wellbeing at work. Connectedness and relationships are powerful assets , and loneliness is often overlooked in veterinary wellbeing at work (8). This session considers different dimensions of connection, Some people don't think of veterinary professionals being lonely, but emotional, social, cultural or collective, and workplace connectedness are all important in helping people feel connected (8-10). Lacking any of these can contribute to loneliness.

Many factors affect loneliness: health status, age, relationship status, housing status, and lower neighbourhood belonging (10). This session covers how workplaces can support connection including:

- Prioritising induction

- Tackling discrimination

- Promoting community

- Leading with compassion

Briefly considering compassionate leadership the session also considers the role of workplace culture and climate in creating spaces where people can be effectively supported, and where people feel safe to access support.

This session also reflects on the application of active listening, connection, and peer support in veterinary contexts including boundaries, support for supporters, and supervision.

Many veterinary professionals find boundaries difficult to implement. We may have been conditioned that we must be selfless. But boundaries are compassionate. This session frames the use of boundaries as 'putting on your own oxygen mask first', and as a key part of workplace safety, to keep clients, co workers and professionals safe and protect the integrity of professional relationships. The session considers personal and professional boundaries, the role of self care and recognising strengths and weaknesses in maintaining personal boundaries and using boundaries as a limit to your work home interface to support you to have things you enjoy both inside and outside of work. We also consider professional boundaries as defining a space where effective support can occur. We consider what boundaries working looks like in support for wellbeing, and the structures and accountability frameworks that can support this.

The session further includes a description of a peer support service – Vetlife Helpline – which has been providing support to the UK veterinary community for over 30 years. It reviews the structure of the service, how support is provided, and the types of work Vetlife Helpline does. The session covers guidance for supporting colleagues who are distressed, including tips for those wanting to help:

- Take any distress seriously - it can be very hard for professionals to reach out for help so if someone is showing distress that's always important.

- Ask how you can help - people may want support in different ways at different times.

- Show trust and respect - mental health problems can cause a massive loss of self esteem, and make them feel like they are professionally worthless, counter these thoughts by showing them trust and respect

- Listen to how they are feeling - make sure you've got time to do this and a quiet place to talk where you won't be interrupted

- Be open minded - Be non judgemental. Avoid clichéd positivity. If someone is really struggling it's better to acknowledge that and to listen to how it feels than to tell them to 'cheer up' or 'pull yourself together'.

- Don't just talk mental health - Mental health problems can leave people isolated, spend time with the person and offer to do things together that might help, things like exercise, even a dog walk or bike ride can help.

- Be patient - let the person stay in control where possible and set the pace for getting help themselves. It may take time, let them know that you are there for them and check in with them again.

- Support them to get other help if they need it - organisations like Vetlife helpline and Samaritans are available 24 hours a day. There are also emergency GP services and Emergency Departments if you think someone is very unwell.

- If you're very worried about someone and think they are at risk stay with them and make a plan with them about how they can get help.

- Look after yourself as well - make sure that you are looking after your own wellbeing and have support for yourself too.

The session considers scenarios where listening may be of help, and looks at the practical application of active listening in providing support in veterinary practice.

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SUPPORTING NEW GRADUATE VETERINARY PROFESSIONALS

Rosie Allister

University of Edinburgh, Business School Associate, Edinburgh, United Kingdom

Qualifications:

Dr Rosie Allister

BSc (Hons) BVSc MSc PhD MRCVS

rosie.allister@gmail.com

Supporting new graduate veterinary professionals.

Many countries are experiencing shortages of experienced veterinary surgeons, and have concerns about attrition from certain types of veterinary work, including from clinical veterinary practice. The veterinary profession needs to think about retention of skilled staff, and one of the factors important in long term retention of veterinary staff is the support people experience early in their veterinary careers, including at the transition from veterinary training into veterinary practice.

A number of different types of evidence point towards the transition from veterinary study to veterinary practice being an important area to understand in terms of wellbeing, retention, and staff mental health (1). Studies suggest that it may be a time of particular risk for young vets. A systematic review of studies on veterinary mental health has highlighted that psychological distress is most common among veterinary surgeons under 35 years old (2). A qualitative study described how veterinary surgeons are most likely to first experience suicidal thoughts in their final year of veterinary school or their first few years in practice (3).

Drawing on a cohort study which followed individuals from their time at veterinary school out into veterinary practice (1), this session explores challenges and motivators for new graduate veterinary professionals. The session considers new evidence on what affects new graduate veterinary professionals' wellbeing at work. It goes on to reflect on support needs for new graduate veterinary professionals and applies evidence in considering what works in support for new graduates.

Using scenarios, quotes from new graduates, and worked examples this session translates new evidence with an applied focus.

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CAT FRIENDLY PRINCIPLES AND SOLUTIONS FOR UNOWNED CATS

Vicky Halls

International Cat Care, Cat Welfare Team, Wiltshire, United Kingdom

Qualifications:

Vicky Halls

RVN Dip Couns

vicky.halls@icatcare.org

Cat Friendly Principles and Solutions for Unowned Cats

Why 'solutions' for unowned cats?

Many thousands of people work within the unowned cat sector, in the wider area of population management or caring for cats in homing centres (shelters) and foster homes. The unowned cat sector has traditionally been a reactive one, working on a rescue model which focuses on taking cats out of situations that are perceived 'dangerous' into the comparative safety of a shelter cage or foster home. The process thereafter tends to be more passive and those caring for the cats continue to prioritise animals that need rescuing.

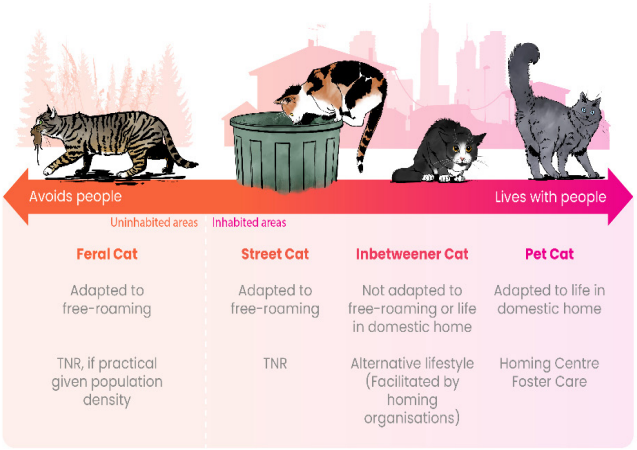
The problem with working in this way is that it takes just one crisis, maybe a particularly busy kitten season or staff shortages, to send everything spiralling downwards. Cats become ill due to the impact of overcrowding on their physical health and mental wellbeing. Staff can fall victim too, because of the extreme stress that this puts them under and dealing with a continued cycle of cats needing help.

We can only speculate how different things would be if the whole sector shifted to a more proactive and strategic way of working. Now is the time for the sector to adapt, to stop the never-ending cycle of reactivity and make a step change for cat welfare. A growing number of organisations have already started this transition to a more strategic way of working, but there is still a great deal of work to be done.

Cat Friendly Solutions for Unowned Cats

International Cat Care (iCatCare) developed Cat Friendly Solutions for Unowned Cats over more than a decade of research and planning, launching a new part of their website in 2020 devoted to unowned cats. It supports those working on the front line, with feral, street, community or pet cats, via information and guidance all in one place on the website. Cat Friendly Solutions for Unowned Cats advocates a joined-up approach to cat population management, ensuring that all elements that impact population are working simultaneously (Figure 1).

Fig 1



international catcare

Within the umbrella term of Cat Friendly Solutions for Unowned Cats is Cat Friendly Homing (CFH), referring to a way of working with unowned ***pet*** cats that prioritises the needs of the individual cat at all stages of its journey; at intake, while in the care of the homing organisation (whether that is in a foster home or cattery environment), and in the choice of outcome.

The model for this way of working was built on the foundation of iCatCare's seven Cat Friendly Principles, three dedicated to the cat, and four related to ways of working with cats, and each other, to champion cat welfare. When iCatCare refers to being 'Cat Friendly', this means embracing all seven principles.

Cat Friendly Principles

Respect Cats - *respect the diversity of the species and understand the individual cat*

As cats share our homes as companion animals there is a tendency to view them through a human lens and assume that they want and need the same things that we do. This is not the case; they are a species that has very different needs to our own and we can only care for them well if we understand those needs

Cats have a unique physiology and behavioural biology. Cats are:

Obligate carnivores with specific nutritional needs which must be met to ensure health

Both predators and prey

Socially flexible with their own and other species

All cats have common needs

Food, water

A safe place to rest, sleep and feel secure

Somewhere to toilet

Opportunities to communicate through scratching and facial rubbing

Opportunities for predatory behaviours

Within the species there is great diversity in terms of temperament and behaviour. The individuality of cats comes from an interplay between:

Genetics

The mother's physical health and mental wellbeing during pregnancy

The cat's experiences, particularly during the first two months of life

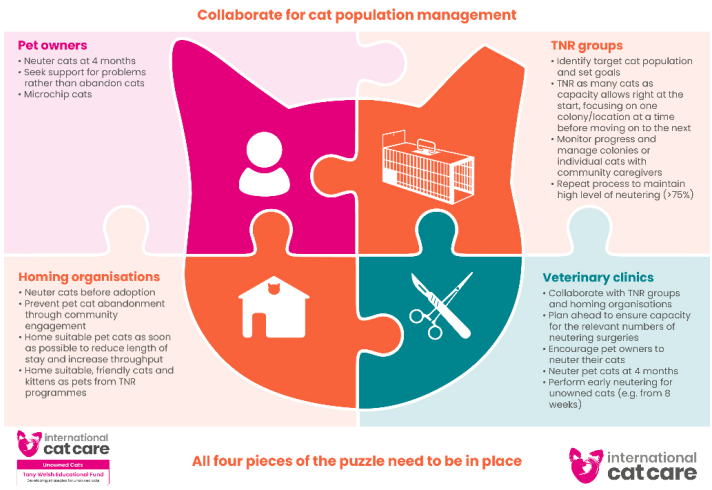
Other factors, including life stage, health, reproductive status and stress, impact on the behaviour of the individual

Cats can be better understood if considered on a lifestyle spectrum (Figure 2) based on

Whether the cat is capable of living happily with people as a pet or, at the other end of the spectrum, actively avoids people

Whether the cat is adapted to living independently of people, or at the other end of the spectrum, is adapted to life in a domestic home

Fig 2



Keep cats well – *give equal consideration to the cat's physical health and mental wellbeing*

Physical health and mental wellbeing directly impact on each other and shape the cat's living experience

Keeping cats well involves promoting good health, as well as responding to ill health

Mental wellbeing includes both the cat's emotional health (how it feels) and cognitive health (how it thinks)

A cat's physical health and mental wellbeing are both impacted when

It is in pain, physical discomfort, injured or suffering from illness or disease

It is in acute or chronic distress

Do cats no harm – *ensure cats are never worse off as a result of people or their activities*

Cruel, ill-informed or inappropriate handling of, or behaviour towards, cats can cause distress or harm

Harm can affect the physical health and mental wellbeing of a cat in the short and/or the long-term

Harm can arise in some cases from too much of something considered positive (eg food) as well as from things considered negative (eg forceful handling)

Certain medications and chemicals (even those suitable for other species) may be harmful to cats

Interactions with cats against their will and those that cause startling, often for the purpose of human amusement, can be emotionally harmful for cats

Breeding for certain looks can lead to discomfort, pain and behavioural changes, and limited gene pools can encourage the development of inherited disease

Anthropomorphism can improve empathy but may also detract from prioritising the needs of cats

Harm can be caused by failing to recognise, and act accordingly, when a cat is experiencing

Injury or pain

Negative emotional states

Poor quality of life

Harm can be caused through a lack of understanding of the consequences of letting cats breed (ie not giving due thought to the outcome for the parent animals or resulting kittens)

Be solution driven for cats – *find evidence-based, pragmatic and sustainable solutions for cats*

Addressing the root causes, rather than symptoms of issues helps to develop effective and sustainable solutions

Making informed, well-considered decisions, no matter how complex or difficult, promotes good cat welfare. When there is a problem, doing nothing is not a Cat Friendly option

Seeking evidence to support pragmatic and realistic decisions drives the best outcome for the individual cat's circumstances

Measuring the impact of any activities allows assessment of success

Ensuring continuity and longevity of cat welfare activities is important; people can only help if they stay well, physically and mentally, and can maintain the level of work comfortably

Communicate for cats – *communicate respectfully and share knowledge generously for the sake of cats*

Communicating professionally and considerately with all stakeholders allows good working relationships and promotes sharing of knowledge

Listening is an integral part of communication, to actively receive and interpret someone else's information and point of view

Active listening reduces the likelihood of misunderstanding and encourages honesty and trust

Tailoring communication style, content and means of delivery is an effective way to connect with different stakeholders

Communicating about successful cat welfare-related collaboration encourages sharing and less 'competition' between organisations and individuals

Communicating regularly on the same topics can embed learning and boost the impact of messaging

Adapting language and approach to suit the audience can considerably improve understanding and concordance

Collaborate for cats – *work together for cats, locally, internationally and with people from different backgrounds, always supporting and valuing*

each other

Collaborating with a range of different stakeholders will bring increased perspectives and insight on cat welfare issues that will result in greater impact

Working together for common goals strengthens key messages and enhances their dissemination

Collaborating effectively requires the ability to be comfortable around others who may hold different views and motivations, but still have the capacity to find the common ground and develop mutual understanding

Evolve for cats – *be innovative, embrace new knowledge, remain curious and keep learning for cats*

Evolving ways of work doesn't mean that things have been done badly in the past, but instead developing knowledge and skills shows commitment to the species and to delivering better results

Working with cats can be demanding and seem like there is no time to review, learn or improve. However, new learnings may lead to more effective solutions that are worth taking the time to explore

Monitoring progress and long-term outcomes establishes how effective interventions can be, and can influence future decision-making

Sustaining positive messaging and efforts to encourage continual improvement of understanding can help to change negative attitudes to cats in the wider community

Further reading:

International Cat Care's website content on unowned cats:

https://icatcare.org/unowned-cats/

ISFM's Cat Friendly Principles for Veterinary Professionals:

https://journals.sagepub.com/doi/full/10.1177/1098612X221128750

060

EUROPEAN SURVEILLANCE OF ANTIMICROBIAL RESISTANCE IN COMPANION ANIMAL PATHOGENS

Peter Damborg

University of Copenhagen, Department Of Veterinary And Animal Sciences, Frederiksberg, Denmark

Qualifications:

Full name: Peter Damborg

Qualifications: MSc degree in veterinary medicine (2004), PhD degree in veterinary microbiology (2008). His research has centered on many topics within veterinary microbiology, primarily zoonotic potential of bacteria, antimicrobial resistance, antimicrobial stewardship and diagnostics. Peter has a large international network and is currently Chair of the EUCAST subcommittee on Veterinary Antimicrobial Susceptibility Testing (VetCAST) and the COST Action European Network for Optimization of Veterinary Antimicrobial Treatment (ENOVAT).

Email: pedam@sund.ku.dk

In the last decades, various multi-resistant pathogens have emerged in companion animals, for example methicillin-resistant staphylococci and extended-spectrum beta-lactamase (ESBL) producing *Escherichia coli*. These and other resistant bacteria constitute a threat to animal health and potentially also public health due to the risk of zoonotic transmission. Although several publications document the existence of resistant bacteria in companion animals, resistance data are often difficult to compare between studies and over time due to differences in study populations and methods being used for antimicrobial susceptibility testing (AST). Systematic surveillance of AMR in animals at a European level would enable more precise monitoring of AMR within and between countries, and would be useful to i) advice policy makers on AMR trends and emerging resistance mechanisms, ii) explore efficacy of interventions, iii) develop evidence-based antibiotic use guidelines, iv) generate interpretive criteria for AST, v) evaluate marketing authorizations for antimicrobial agents, vi) assess the risk of zoonotic transmission, and vii) evaluate the burden of AMR in animal health.

As part of the European Union Joint Action on Antimicrobial Resistance and Healthcare Associated Infections (EU-JAMRAI), scientists from across Europe were assigned the task to design a European Antimicrobial Resistance Surveillance network in Veterinary medicine (EARS-Vet). This network is intended to be the veterinary counterpart of EARS-Net, which for more than 20 years has monitored AMR in human clinical isolates from across Europe. The work started in 2019 with defining the EARS-Vet scope, meaning the combinations of animal species/production types/age categories/bacterial species/specimens/antimicrobials to be monitored. Afterwards, potential contributors to EARS-Vet, namely existing national monitoring systems with AMR data for animal bacterial populations, were identified, reviewed and subjected to a SWOT analysis. Finally, a pilot study was conducted in 2022 to create a preliminary overview of AMR in target pathogens from animal hosts in different countries.

In this presentation, the approach to establish EARS-Vet will be presented with focus on surveillance in companion animals. This will be followed by presenting the pilot AMR data for companion animal (dog and cat) pathogens, highlighting country-specific differences in Europe. Finally, the future scenario of EARS-Vet will be discussed, focusing on the challenges of - and potential solutions to - economic sustainability, data bias and harmonization of AST methods.

061

ARTERIAL BLOOD GASES: BASIC NOTIONS AND INTERPRETATION

Veronica Salazar

Alfonso X El Sabio University, Anesthesia Section, Villanueva de la Canada, Spain

Qualifications:

Verónica Salazar Nussio

LV, MSc, PhD, DipACVAA, DipECVAA, RECOVER certified instructor

vsalanus@uax.es

Arterial blood gases (ABGs) are a diagnostic test that measures the levels (partial pressure) of certain gases in the blood, particularly oxygen (O2) and carbon dioxide (CO2), as well as the acidity (pH) of the blood. This test is performed by drawing a blood sample from an artery, usually the dorsal pedal artery in small animals, although other arteries like the femoral or the coccygeal artery can also be used.

ABG data include both measured and derived (calculated) values. Most parameters are measured, however, certain parameters are just calculated through algorithms embedded in the equipment's software, such as HCO3, BE and CaO2. In some instances, SaO2 is also calculated from the PaO2 through the O2 hemoglobin dissociation curve.

ABG analysis provides important information about respiratory and metabolic status of an individual. ABG measure/calculate the following parameters:

A. OXYGENATION

1. Partial pressure of oxygen (PaO2): PaO2 represents the amount of oxygen dissolved in the arterial blood of the patient.

2. Oxygen saturation (SaO2): SaO2 represents the percentage of hemoglobin in arterial blood that is saturated with oxygen.

3. Oxygen content in arterial blood (CaO2): CaO2 represents the oxygen content in arterial blood

B. ALVEOLAR VENTILATION

1. Partial pressure of carbon dioxide (PaCO2): PaCO2 reflects the amount of carbon dioxide dissolved in the arterial blood of the patient.

C. ACID-BASE BALANCE

1. pH: pH is a measure of the acidity or alkalinity of the blood. Normal arterial pH is around 7.35 to 7.45. Values below 7.35 indicate acidemia, while values above 7.45 indicate alkalemia.

2. Bicarbonate (HCO3-): Bicarbonate is an important buffer in the body that helps maintain pH balance. It indicates the metabolic component of acid-base balance.

OXYGENATION The alveolar equation, also known as the alveolar gas equation, is a mathematical formula used to estimate the partial pressure of oxygen (PAO2) in the alveoli of the lungs. The PAO2 will determine the PaO2 and, therefore, the degree of oxygenation of the patient's arterial blood.

The alveolar equation is expressed as follows:

$$PAO2 = PIO2 - (PACO2 / RQ) - (PH2O)$$

To understand the components of the equation:

- PIO2: This represents the partial pressure of inspired oxygen. It is the concentration of oxygen in the air the patient breathes, and it depends on the atmospheric pressure and the fraction of inspired oxygen (FiO2) of the gas the patient is breathing. The atmospheric pressure at sea level is about 760 mmHg, and the FiO2 is typically around 0.21 in room air. Therefore, PIO2 can be calculated as (760 mmHg - 47 mmHg) * 0.21, where 47 mmHg is the partial pressure of water vapor at 37°C.

- PACO2: This represents the partial pressure of carbon dioxide in the alveoli. It reflects the concentration of CO2 in the respiratory gases that reach the alveoli. It is typically obtained from arterial blood gas analysis.

- RQ: The respiratory quotient is the ratio of carbon dioxide production (VCO2) to oxygen consumption (VO2) by the body's tissues. It indicates the type of metabolic fuel being used. The RQ value can vary depending on the substrates being metabolized. Common values range from 0.7 to 1.0. For simplicity, an RQ of 0.8 is often used in the alveolar equation.

- PH2O: This represents the partial pressure of water vapor in the alveoli. It accounts for the water vapor present in the respiratory gases and is typically around 47 mmHg at body temperature.

PAO2 should always be interpreted alongside PaO2 and other clinical information for a comprehensive assessment of oxygenation status.

The CaO2 equation refers to the calculation of the oxygen content carried by hemoglobin in arterial blood. It is used to determine the oxygen-carrying capacity of blood and assess the efficiency of oxygen delivery to tissues. The equation is as follows:

$$CaO2 = (Hb \times SaO2 \times 1.34) + (PaO2 \times 0.003)$$

In this equation:

- CaO2: represents the oxygen content in arterial blood (in mL/dL).

- Hb: represents the hemoglobin concentration in arterial blood (in g/dL).

- SaO2: represents the arterial oxygen saturation, expressed as a decimal (ranging from 0 to 1). It indicates the percentage of hemoglobin binding sites occupied by oxygen in arterial blood.

1.34: represents the oxygen-carrying capacity of hemoglobin (in mL of oxygen per gram of hemoglobin). This value assumes that each gram of hemoglobin can bind with 1.34 mL of oxygen.

- PaO2: represents the partial pressure of oxygen in arterial blood (in mmHg).

- 0.003: represents the dissolved oxygen content in arterial blood (in mL/dL/mmHg). This value accounts for the small amount of oxygen that remains dissolved in the blood plasma.

The equation combines the oxygen bound to hemoglobin (determined by the hemoglobin concentration and arterial oxygen saturation) and the oxygen dissolved in the plasma (determined by the partial pressure of oxygen) to calculate the total oxygen content in arterial blood.

SaO2 stands for arterial oxygen saturation, which is a measure of the percentage of hemoglobin binding sites that are occupied by oxygen in arterial blood. It indicates the efficiency of oxygen loading onto hemoglobin in the lungs and reflects the oxygen-carrying capacity of red blood cells. A SaO2 value of 1 or 100% means that all the hemoglobin binding sites are fully saturated with oxygen, while a value of 0 or 0% indicates no oxygen binding to hemoglobin.

Hypoxemia refers to low levels of oxygen in the arterial blood. It can be caused by various factors that affect the oxygenation of blood or the exchange of oxygen in the lungs. In general, the most common causes of hypoxemia include:

1. Reduced PaO2 (such as increased PaCO2; diffusion barrier; V/Q mismatch; decreased PiO2, due to decreased FiO2 and/or decreased barometric pressure; pulmonary right-to-left shunt or cardiac right-to-left shunt)

2. Reduced SaO2 (such as all the above mentioned causes of decreased PaO2, CO poisoning, methemoglobin excess and any cause of right-shifted oxygen dissociation curve)

3. Reduced hemoglobin content (anemia)

ALVEOLAR VENTILATION

The PaCO2 equation, also known as the alveolar carbon dioxide equation, is a mathematical relationship used to estimate the partial pressure of carbon dioxide (PaCO2) in arterial blood. The equation takes into account the partial pressure of carbon dioxide in the alveoli (PACO2), the rate of carbon dioxide production (VCO2), and the alveolar ventilation (VA). It is based on the principles of gas exchange in the lungs.

The PaCO2 equation is as follows:

$PaCO2 = (VCO2 \times 0.863)/VA$

Where:

- PaCO2 represents the partial pressure of carbon dioxide in arterial blood, measured in millimeters of mercury (mmHg).

- VCO2 represents the rate of carbon dioxide production by the body, typically expressed in milliliters per minute (ml/min).

- VA is the alveolar ventilation, which refers to the volume of fresh air that reaches the alveoli per minute, usually measured in liters per minute (L/min). It equals total ventilation (VE) minus dead space ventilation (VD).

- 0.863 is a constant used to convert units for VCO2 (mL/min) and VA (L/min) into PaCO2 units of mmHg.

In clinical practice, the PaCO2 equation is often used in the interpretation of arterial blood gas (ABG) analysis to assess respiratory function and acid-base status. It can provide valuable information about ventilation efficiency and can help guide treatment decisions in the occurrence of conditions such as hypocapnia (low PaCO2, <35 mmHg, due to hyperventilation) or hypercapnia (high PaCO2, > 45 mmHg, due to hypoventilation). It is important to underline that the terms hypoventilation and hyperventilation should only be used to describe PaCO2 measurements. They should never be used to characterize a patient's rate or depth of breathing, or its degree of respiratory effort. As such, hypercapnia and hypocapnia should only refer to an inadequate alveolar ventilation in relation to the amount of CO2 produced. In fact, any combination of rate, depth or effort can reflect any PaCO2 value, and vice versa.

ACID-BASE BALANCE

The Henderson-Hasselbalch equation is a mathematical equation used in chemistry and biochemistry to relate the pH, pKa, and the ratio of the concentrations of an acidic or basic species and its conjugate base or acid. It is commonly used to describe acid-base equilibrium, particularly in solutions containing weak acids and their conjugate bases.

The Henderson-Hasselbalch equation is written as follows:

$pH = pKa + \log([A^-]/[HA])$

In this equation:

- pKa represents the negative logarithm (base 10) of the acid dissociation constant (Ka) of the weak acid.

- [A-] represents the concentration of the conjugate base of the weak acid.

- [HA] represents the concentration of the weak acid.

- BE stands for Base Excess, which is a measurement used in clinical medicine to assess the acid-base balance of a patient's blood. It provides information about the presence and degree of metabolic acidosis or alkalosis. A positive base excess value indicates an excess of base (indicating metabolic alkalosis), while a negative base excess value indicates a deficit of base (indicating metabolic acidosis). Base excess is used as a diagnostic tool to evaluate and monitor a patient's acid-base status, especially in cases of metabolic disturbances.

062

PET BEREAVEMENT: BEST PRACTICES TO SUPPORT CLIENTS.

Angie Arora

Seneca College, School Of Community Services, Toronto, Canada

Qualifications:

Name: Angie Arora

Qualifications: MSW, RSW (Veterinary Social Worker, Cerfified Compassion Fatigue Specialist)

Email: angie@angiearora.com

Pet Bereavement: Best Practices to Support Clients Angie Arora, MSW, RSW

It is widely understood that the shifting nature of human-animal interactions has impacted the bonds humans share with their companion animals. It is therefore well understood that because of this, the death of one's companion can have significant impacts on clients. What has not been widely understood however, is how the veterinary team can impact a client during their companion's end-of-life journey. This session uses findings from a recent research study to shed light onto what clients need coupled with challenges and opportunities for veterinary practices to address to improve how clients' experience their pets' end-of-life journeys.

In 2020, Seneca College in Ontario, Canada partnered with VCA Canada to better understand clients' experiences interacting with their veterinary teams during their pet's end of life to strengthen the profession's capacity to respond to clients' needs. The constant exposure to death, loss and clients' trauma, when left unprocessed, can impacts issues of burnout, secondary traumatic stress, and/or compassion fatigue for staff. Skills acquisition is considered a strong buffer to compassion fatigue and so the more equipped staff feel responding to clients in grief, the less likely they are to experience compassion fatigue. When staff are well-equipped, they are more likely to provide clients with meaningful care thus ensuring everyone's needs are being met.

Through the development of a comprehensive literature review, surveying 310 clients and speaking with professional experts in veterinary medicine, veterinary hospice and palliative care, veterinary social work, and pet cremation services, findings were analyzed and culminated in a set of best practice guidelines for veterinary teams to improve clients' experiences with their pets' end-of-life journeys.

Clients' Experiences

Key findings from the study indicate:

1	2	3	4
Overall, veterinary teams are providing clients with compassion care and good communication during their pets' endo of life including discussions and euthanasia.	When compassionate care is not provided, it can negatively impact a client's grieving process and leave lasting detrimental effects.	Clients who have experienced the loss of a pet other than a cat or dog, do not appear to receive the same level of care compared to clients who have lost a cat or dog.	Clients expect that their pets will be treated in humane and dignified ways, all the way from end of life discussions to after the pet has died.
5	**6**	**7**	**8**
Alternate treatement options, including hospice and palliative care, are either offered infrequently or are being offered too late to make an impact.	The environment and location in which the death occurs has a significant impact on clients.	Memorialization and rituals play an important part in the cients' grieving processes.	Improvements are required in how clients are supported after their pets' pass, including the referrals to community pet loss services.

More specifically:

-87% of clients with a cat or dog rated the compassion they received from their veterinary teams during their pet's end of life as excellent.

-58% of clients with a species other than a dog or cat rated the compassion they received from their veterinary teams during their pet's end of life as excellent.

-71% of clients said hospice and palliative care options were never discussed and many said at-home euthanasia was never presented as an option.

-Only 16% of pet parents were informed of pet loss community supports (e.g., support groups, counselling) by their veterinary teams.

It was determined that clients expect and require compassionate care from their veterinary teams during their companions' end-of-life however there is a lack of formalized training for veterinary staff coupled with limited training opportunities.

Promising Practices

The following guidelines are practice suggestions in which there may be limitations to implementation based on geography, practice scope and service availability. However, integration of even some of the practices in lieu of the entire set can yield positive results to all parties of the Veterinary-Client-Patient relationship.

It is suggested that veterinary practices adapt and end-of-life pre-plan to guide the process with the headings:

-End of Life Discussions and Decisions

-Hopsice and Palliative Care

-Euthanasia and Death

-Aftercare and Memorialization

-Client Support After Loss

End of Life Discussions and Decisions

-List euthanasia as a client service on hospital's website and other relevant material.

-Schedule dedicated, uninterrupted time to have end of life discussions with clients.

-Consider the use of the SPIKES Protocol to delivering difficult news to clients.

-Integrate quality of life assessments with opportunities for discussion. Examples include: Ohio State University: How Do I Know When It's Time, HuMANE Care Quality of Life Assessment Aid, JOURNEYS: A Quality of Life Scale, Lap of Love Quality of Life Calendar, Quality of Life (HHHHHMM Scale)

-Acknowledge caregiver fatigue and burnout that may be present for clients and provide informational resources and referrals to community resources when possible. www.PetCareGiverBurden.com is a helpful resource.

Hospice and Palliative Care

-Take the time to explain hospice and palliative care to clients early on in end-of-life discussions. This includes delivering a more nuanced definition of palliative are (e.g. ongoing kidney disease treatment can be considered a form of palliative care). In other words, the more proactive we become, the less palliative care is only seen a crisis intervention.

-Shift the focus of conversation by emphasizing the journey of maintaining the pet's quality of life instead of steps towards death. For example:

-What can be done to address each symptom in the moment? Could it be pain control? Release from a strict diet? Doing so can help reduce the overwhelm of the situation to smaller, more manageable steps.

-Provide digital and/or print information about hospice and palliative care services when possible. This will help clients understand the viability of hospice and palliative care options for their companion.

-Provide clarity and details for clients to determine how to interpret changes in their companion at home since clients may struggle to understand the presentation of symptoms.

Euthanasia and Death

-Engage in discussions with clients to determine their needs during the euthanasia process including but not limited to: the location where it will take place, support factors the client requires, any items that will be brought (toys, blankets, etc.). which family members will be/won't be present and respective needs, proactive discussions about dysthanasia. how much information the client wants to be told before the euthanasia takes place, payment options and timing of payment to provide choice, xplore the clients' interests and options for an at-home euthanasia.

-Help to create a calm, quiet and tranquil environment when the euthanasia takes place by considering the entire visit from the moment the client arrives to when they leave. For example: separate entrance to arrive and leave, use a room that does not feel sterilea, avoid or reduce loud noises, noxious smells to reduce triggers in an already high-stressed situation, create conditions for the client to remain with their pet rather than taking the pet out of the room for any purpose, avoid or reduce interruptions, consider using a battery-operated candle at the front desk to signify a pet is passing with a sign encouraging all to speak softly and with respect.

-Prioritize the dignity of the deceased body by: Wrapping the body in warm and comforting material (soft blanket rather than a used towel), have a team member stay with the pet until the client leaves the hospital, verbally assure the client that the pet's body will be treated with respect, care, and dignity.

-If clients inquire, be prepared to answer questions on what the body is going to be carried in, where is the body stored and for how long, how is the body moved to the crematorium, etc. This information can provide some sense of control for clients who require it.

Aftercare and Memorialization

-Stay current on aftercare and memorialization products and services in your area, and create a product and service guide for clients in both print and digital formats.

-Provide options to clients earlier in the care and treatment plan.

-Consider building in a client aftercare specialist to your team.

-Integrate spiritual and/or religious beliefs of client as much as possible.

-Ensure there is a robust quality control process (paw prints, ashes, etc.) to avoid unnecessary mistakes and emotional harm.

Client Support After Loss

-Provide each client with a package of information once their companion has died, regardless of the pet's species including relevant literature, referral list to in-person and/or virtual support groups and counsellors.

-Confirm if the client would like follow-up contact or not.

-Integrate pet loss support in the clinic's suite of services by hiring a grief counsellor or Veterinary Social Worker. If this is not possible, at bare minimum, foster relationships with community resources providing pet loss support to provide a continuum of care. This is now more possible giving the changing international options for virtual support.

Conclusion

The death of an animal companion can be a tremendously difficult experience for clients and can have a lasting impact. The extent to which compassionate care is provided from end-of-life discussions to after the pet has passed has significant impacts on a client's grieving process. The research confirms that many veterinary teams are actively including compassionate practices in their end-of-life processes. The research also confirms that there are specific areas of practice that can be further developed to support clients through their pets' end of life journey. While not all recommendations may be feasible to adopt, the inclusion of even some recommendations in current practice would improve both the client and team experiences during pet end-of-life. And, because of clients' experiences and expertise from researchers and industry experts, we have gained tremendous insight into the ways that these recommendations could also improve the veterinary-client relationship. The culmination of these findings has led to the creation of Pet Loss Best Practice Guidelines for Veterinary Teams which we anticipate will serve as a useful tool for practices to consider adopting into their work to improve outcomes for all involved.

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063

INTERACTIVE SESSION: PROMOTING THE ROLE OF VETERINARIANS IN RESPONSIBLE ANIMAL BREEDING-A PRAGMATIC APPROACH

*Paulo Borges[1], **Manuel Magalhães-Sant'Ana**[2]*

[1]Universidade Lusofona, Reproduction Centre, Lisboa, Portugal, [2]Universidade de Lisboa, Faculdade De Medicina Veterinária, Lisboa, Portugal

Qualifications:

Paulo Alexandre Paulos Borges

DVM, MSc, Dip ECAR

pborgesvet@gmail.com

Manuel Magalhaes-Sant'Ana

DVM, MSc, PhD, Dip. ECAWBM (AWSEL)

mdsantana@fmv.ulisboa.pt

Responsible breeding of animals remains a critical concern in contemporary veterinary practice, as the global demand for companion animals continues to rise. As stewards of animal health and welfare, veterinarians are expected to play a pivotal role in shaping the future of animal breeding practices (1). The primary goal of responsible animal breeding is to produce individuals with superior health, behaviour, and performance while preserving the genetic diversity necessary for long-term population sustainability (2). However, this objective must be balanced with ethical considerations, such as minimizing the risk of inherited diseases and ensuring the well-being of both the breeding animals and their offspring (3,4). By understanding these issues, veterinarians can effectively communicate the importance of responsible breeding to breeders, owners, and the general public (5).

This presentation aims to explore the multifaceted role of veterinarians in small animal breeding and provide a pragmatic approach to enhancing their involvement in this field, with a focus on maintaining the overall health and genetic diversity of populations. This interactive presentation has three main pedagogical objectives: a) to raise awareness of the practical and ethical issues involved in small animal breeding, b) to develop veterinary professional skills in small animal breeding, and c) to promote responsible animal breeding practices.

During the presentation, we will delve into the key aspects that empower veterinarians to take a proactive role in responsible animal breeding. First, the utilization of modern diagnostic tools, including advanced genetic testing and screening, will be emphasized. This includes collaborating with breeders to establish ethical breeding programs that prioritize the health, temperament, and genetic diversity of the animals. We will emphasize the importance of pre-breeding health screenings, genetic testing, and responsible mate selection to minimize the risk of passing on inherited diseases and disorders. Additionally, we will explore the significance of behavioural evaluations in breeding programs to ensure the production of physically fit and socially adaptable animals.

We will explore the ethical issues raised by the application of advanced reproductive biotechnologies in companion animal practice, namely by using the ethical matrix (6). Moreover, we will address the importance of client education and the veterinarian's role in providing accurate and evidence-based information to prospective pet owners (7). We will discuss strategies for effective client communication, including the use of educational materials, brochures, and online resources. By empowering owners with knowledge about responsible breeding, veterinarians can influence their decision-making process and steer them away from supporting unethical breeding practices.

Furthermore, the presentation will emphasize the need for collaboration and coordination among veterinarians, breeders, and regulatory bodies. We will explore the development of partnerships and networks that promote responsible breeding practices, such as breed clubs and breed-specific health organizations. By working together, veterinarians and breeders can establish guidelines, share best practices, and collectively address issues related to breed health, genetic diversity, and population management.

Finally, this presentation will highlight the importance of continuous professional development and education for veterinarians. We will discuss the need to improve veterinary continuous education in topics such as genetics, reproductive technologies, and breeding strategies, in order to equip veterinarians with the knowledge and skills necessary to advocate for responsible breeding practices. By staying abreast of emerging trends and research, veterinarians can provide cutting-edge guidance to breeders and effectively contribute to the betterment of small animal populations.

To facilitate an interactive session, we will engage participants in study cases and debate, encouraging them to share their experiences and challenges faced in promoting responsible breeding. We will explore potential solutions and strategies to overcome these obstacles, fostering a collaborative and innovative approach to responsible small animal breeding.

In conclusion, promoting the role of veterinarians in responsible small animal breeding requires a pragmatic approach that encompasses collaboration, education, and advocacy. By actively engaging in responsible breeding programs, veterinarians can make a significant impact on the health, welfare, and longevity of companion animals. This presentation aims to inspire and empower veterinarians to take a proactive stance in promoting responsible small animal breeding and contribute to the overall improvement of the veterinary profession.

Acknowledgements

M.M.-S. wishes to thank Fundação para a Ciência e a Tecnologia (FCT), I. P., Portugal for funding the research project "*EVIEDVET - Promoting education and training for evidence-based veterinary medicine*" (project number: PTDC/CED-EDG/ 0187/2020).

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064

EHRLICHIA CANIS - THE SILENT KILLER

Gad Baneth

The Hebrew University of Jerusalem, The Koret School Of Veterinary Medicine, Rehovot, Israel

Qualifications:

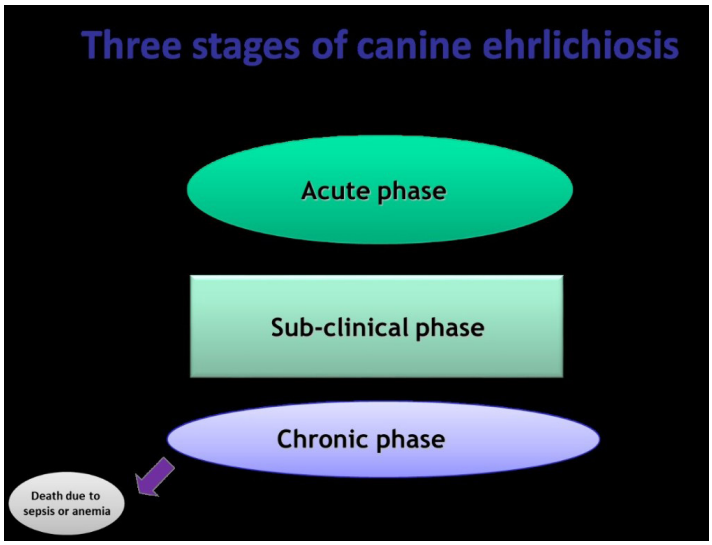
Gad Baneth, DVM, PhD, Dipl. ECVCP

e-mail: gad.baneth@mail.huji.ac.il

Introduction

Ehrlichia canis is the causative agent of canine monocytic ehrlichiosis which is an important canine infectious disease in Europe, Africa, Asia, America, and Australia. *Ehrlichia canis* is transmitted mainly by the Brown dog tick *Rhipicephalus sanguineus*. Tansmission of *E. canis* by *R. sanguineus* may start within 3 hours after the tick´s attachment to the dog's skin. The pathogenesis of the disease involves an incubation period of 8-20 days, followed by three consecutive phases: an acute phase which lasts 1-4 weeks, a subclinical phase which may last from months to years, and a chronic phase (Figure 1). Not all infected dogs develop the chronic severe form of the disease and the conditions that lead to the development of this stage are associated with individual susceptibility and breed predisposition. *Ehrlichia canis* can be transmitted by blood transfusion and is recommended for screening in the blood of donor dogs.

Figure 1 – The three stages of canine ehrlichiosis



Clinical findings in canine ehrlichiosis

The most frequently reported clinical signs of canine monocytic erhlichiosis are lethargy, anorexia, fever, lymphadenomegaly, splenomegaly and hemorrhages, mainly petechiae, ecchymoses and epistaxis. Ocular manifestations of the disease include anterior uveitis, keratoconjuctivitis, hyphema, glaucoma, chorioretinitis and retinal detachment. Polyarthritis and polymyositis have also been described in *E. canis* infection. The neurological abnormalities found in canine ehrlichiosis are associated with vasculitis, meningoencephalitis, and lymphocytic infiltration of the central and peripheral nervous system or hemorrhages affecting nerve tissues. *Ehrlichia canis* infection has been termed the "silent killer" as its infection is often not apparent during the early and sub-clinical stages of infection, and when the disease is diagnosed in the chronic stage, it may be too late to save the canine patient, as treatment may not be helpful in reversing the severe pancytopenia caused by bone marrow suppression associated with this disease.

Laboratory abnormalities in canine monocytic enrlichiosis include hematologic and serum biochemistry changes. Thrombocytopenia is the most frequent hematological abnormality occurring in more than 90% of cases. Anemia, usually non-regenerative normocytic and normochromic, is another common finding in this disease. In addition, mild to severe leucopenia is a frequent abnormality. Hyperglobulinemia, hypoalbuminemia and mild elevation of alkaline phosphatase (ALP) and alanine aminotransferase (ALT) activities are frequently reported in ehrlichiosis. Dogs in the chronic severe stage of the disease develop severe pancytopenia and their bone marrow becomes hypocellular and the prognosis of these chronically ill dogs is grave.

Immune-mediated responses play a major role in the pathogenesis of *E. canis* infection. Anti-platelets antibodies have been demonstrated less than a week after experimental *E. canis* infection of dogs. Platelet aggregation abnormalities, anti-nuclear antibodies, RBC autoagglutination with positive coombs' test, and circulating immune-complexes have been reported in infected dogs and are associated with the disease process.

The decrease in platelets during canine ehrlichiosis is a result of several mechanisms. These mechanisms include increased consumption with vascular endothelial changes, platelet sequestration and pooling in the spleen, thrombophagocytosis with immunological destruction, a decrease in the half life time of circulating platelets due to opsonization with antibodies, and production impairment due to bone marrow destruction and hypocellularity. In addition to the decrease in circulating platelet number, platelets dysfunction (thrombocytopathy) has been implicated as a additional factor contributing to lack of platelet functionality in the disease.

Diagnosis of canine ehrlichiosis

The laboratory diagnosis of canine monocytic ehrlichiosis includes evaluation of the hemogram and serum biochemistry panel. Specific diagnosis of infection includes:

A) **PCR**: Detection of the presence of *E. canis* DNA by PCR is highly sensitive and specific and is the most useful diagnostic test for the confirmation of canine monocytic ehrlichiosis. Several conventional and real-time PCR protocols with a variety of target genes and loci have been described for *E. canis* and the assay and can be performed on blood or tissue including the spleen and bone marrow.

B) **Serology**: Serology is indicative of exposure to *E. canis* and may often be helpful in ruling out progressive infection. Antibodies may not be detectable during the early stage of infection. Anti-*E. canis* antibodies persist long after recovery from the disease. Serum antibodies are thought not to be protective or play an important role in eliminating this intracellular infection. Seropositive dogs with previous exposure to the pathogen may also present in the clinic due to other urgent disease conditions.

C) **Cytology**: *E. canis* morulae found in monocytes and macrophages include several bacteria surrounded by a membranous vacuole and vary in size and shape. Morulae may contain 100 or more ehrlichiae organisms. The detection of morulae in monocytes in stained blood smears is relatively rare and does comprise a main diagnostic option. Morula also need to be distinguished from other inclusions found in phagocytic cells.

Co-infection and canine ehrlichiosis

Dogs with canine ehrlichiosis are frequesntly co-infected with other tick-borne pathogens. As *Rhipicephalus sanguineus*, the tick vector of *E. canis*, also transmits *Babesia vogeli*, *Hepatozoon canis*, *Anaplasma platys*, and *Mycoplasma hemocanis*, among other pathogens, it is recommended to screen for these pathogens in dogs with canine monocytic ehrlichiosis. Co-infection with *Leishmania infantum* has also been shown to be common in dogs living in areas that are endemic for these two pathogens, and several studies have indicated that ehrlichiosis and other tick-borne infections predispose dogs that are exposed to sand flies transmitting *L.*

infnatum, to develop clinical disease with this this zoonotic pathogen.

Treatment of canine ehrlichiosis

Ehrlichia canis is susceptible to doxycycline and other tetracylines such as minocycline which are highly efficient in clearing rickettsemia in acute cases of *E. canis* infection. Clinical recovery is noticed within 48-72 hours, yet treatment should be continued for 28 days, as some dogs may remain carriers when shorter treatment times are applied. Treatment with the injectable drug imidocarb dipropionate has been shown to be ineffective in totally eliminating *E. canis*. However, it is often used in combination with doxycyline when *Babesia* co-infection is suspected.

Prevention of canine ehrlichiosis

The control of tick infestation by topical treatment with acaricidals in collars, spray and spot on forumations which kill and repel ticks before they are able to attach and feed. Environmental eradication of ticks is recommended for the prevention of *E. canis.* No vaccines for the disease are currently available.

Further reading

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065

PROJECT KISHKA – TRAP-NEUTER-RETURN IN WAR-TORN UKRAINE, PROVIDING ESSENTIAL SERVICES TO CATS MOST IN NEED

Alesya Lischyshyna

Four Paws Ukraine, Companion Animals Departmet, Vinnytsia, Ukraine

Qualifications:

Alesya Lischyshyna

Head of Stray Animal Care Ukraine,Project manager

alesya.lischyshyna@four-paws.org

Imagine going to work at your clinic, ready to start a day of operating. As you walk in the door, the electricity goes off. You check the animals over who have been admitted for surgery, start to draw up your premedication drugs but realise that you have used up the last of your xylazine and your meloxicam supply is running low. Then, as you try wash your hands, no water runs from the taps. Just when you think that your day cannot get much worse, sirens howl a warning that bombs are about to fall. Whilst this sounds like the stuff of nightmares, and something that wouldn't happen to you, this is the stark reality for our FOUR PAWS veterinary staff working on Project Kishka in Ukraine.

FOUR PAWS is the global animal welfare organisation for animals under direct human influence, which highlights animal suffering, rescues animals in need and protects them. Through sustainable campaigns and projects, FOUR PAWS focuses on companion animals (both pets and stray animals), farm animals, and wild animals (such as bears, big cats, orangutans, and elephants) kept in inappropriate conditions, as well as in disaster and conflict zones.

Since 1988, FOUR PAWS has expanded its work for animals in need and now has offices in 13 countries across the world and runs 11 wild animal sanctuaries. The first veterinary projects for stray animals were conducted in 1999 in Romania, and ever since, the organisation has run Stray Animal Care programmes in nine countries in Eastern Europe and Southeast Asia.

Ukraine has been on FOUR PAWS' portfolio since 2012 and the organisation is a well-known name in the country when it comes to animal welfare. Nowadays, the organisation runs its own BEAR SANCTUARY Domazhyr, that currently provides a permanent home and second chance in life to 29 rescued brown bears, as well as its own Stray Animal Care projects. This has not changed when the major escalation of the Russia-Ukrainian war started. On the contrary: with its own teams on the ground, FOUR PAWS was able to deliver quick emergency response and not only continued with its established programmes for animal welfare, but also managed to establish new projects to help as many animals and people in need. And one of those projects, is the unique Project Kishka.

Before the war, many municipal communal enterprises throughout Ukraine carried out successful mass-sterilisation projects for stray dogs, but due to the current situation and lack of resources these have been halted. Some of these programmes have now been taken over by NGOs, but all lack capacity and most do not include cats. Given that cats are mostly active at night, make less noise, and people tend to be less scared of them, stray cats are invisible, so they suffer in silence! To prevent a situation where countless of stray cats are suffering in Ukraine, FOUR PAWS decided to act and established an emergency-relief project to assist local communities to take care of their stray cats. Particularly during war time, this is more needed than ever. Project Kishka (Kishka means 'female cat' in Ukrainian) was born in October 2022.

During the first year (through to the end of December 2023), the project intends to sterilise, vaccinate, and treat approximately 10,000 stray cats. To succeed, FOUR PAWS hired six additional veterinarians in six cities throughout the country: Chernihiv, Sumy, Boryspil, Poltava, Uman, and Mykolaiv. Project Kishka is unique: FOUR PAWS found the possibility to cooperate with the local communal enterprises, using their premises and infrastructure pro bono whilst providing support and employment to the local community. Given the scale of the current crisis, FOUR PAWS relies on volunteers to bring animals to the clinics, so the veterinarians are fully and solely dedicated to clinical care.

Regardless of the focus on high-volume sterilisation surgeries, surgical quality and sterility is never compromised. Each veterinarian has committed working to a set of clinical standards ensuring consistent high quality of clinical care within all FOUR PAWS projects. All veterinarians employed for Project Kishka are fully supported and supervised by a long-standing veterinary surgeon from FOUR PAWS. Additionally, the new team has been trained by FOUR PAWS' Bulgarian veterinary team, who have decades of experience sterilising and treating stray animals.

When cats are admitted for neutering, they first receive a full clinical examination to assess their suitability for surgery, with treatment given as necessary to any who show other clinical issues. All cats are anaesthetised with an individually selected protocol and intravenous catheters are placed, allowing the delivery of fluids, additional anaesthesia, or for use in an emergency. Drug availability is variable as all drugs are sourced internally and clinics do not rely on external aid shipments for supplies. The vets are adaptable and work with varied anaesthesia protocols, currently the most accessible injectable protocol is a combination of xylazine, tiletamine and zolazepam.

So far, Project Kishka has ensured the sterilisations, rabies vaccinations and treatments of 5,187 stray cats (to 31.07.2023). While the unique approach to support countless of victims of the war is very successful and likely to continue in 2024, the project does not run without huge challenges. As the war in the country continues, so do the ongoing threats to the people and animals of Ukraine.

It is difficult to stress just how surreal the daily situation is. Not a week, and sometimes not even a day, goes by without bomb shelling and explosions. Air raid sirens are an ever-present backdrop to daily life. Animals on the street are scared, they react unpredictably towards staff and civilians who are taking risks to help them. There are days that there is no electricity and people are living and working in the dark. Many of the clinics continue to operate inside their own bomb shelters, relying on battery powered lights or head torches. Teams cannot rely on electricity to power oxygen generators or anaesthetic monitors, so they often must go without. There can be days without running water, and on a good day when taps do work, salt water usually runs from the taps. Surgical instruments rust when washed in the salinated tap water, so replacements must be sourced regularly at ongoing additional cost. Some days, no patients are treated at the clinic because it is too dangerous to venture outside.

Years of university study does not prepare the veterinarians for the types of injuries they are now treating every day. With daily bombings, building collapse and gunfire, the mechanisms of injury are completely different to the types of trauma generally seen in a first opinion clinic. Project Kishka vets treat animals to the best of their abilities with limited resources - shrapnel wounds, traumatic amputations, and crush injuries are seen routinely.

Never was the cry for help from Ukraine been this big. FOUR PAWS listens, joins forces and brings hope. And as long as we are needed, FOUR PAWS will continue to reveal, rescue, and protect animals in need.

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PITUITARY DEPENDENT-HYPERCORTISOLISM: PITUITARY OR ADRENAL TARGET THERAPY?

Federico Fracassi

University of Bologna, Department Of Veterinary Medical Sceneces, Ozzano dell'Emilia, Italy

Qualifications:

Federico Fracassi

DVM, PhD, Dipl. ECVIM-CA (internal medicine)

federico.fracassi@unibo.it

Canine spontaneous hypercortisolism (HC) or Cushing's syndrome is one of the most frequently reported endocrine disorders in dogs. In 80-85% of cases, HC is resulting from hypersecretion of adrenocorticotropic hormone (ACTH) secondary to the presence of a pituitary adenoma (PDH, *Pituitary-Dependent Hypercortisolism)*.

Currently, the most commonly used medical therapy for PDH is trilostane, which allows the control of clinical signs in most cases without, however, resolving the disease.

Another treatment option is mitotane, which is an adrenolytic drug. In addition, if no action is taken at the pituitary level, the adenoma often grows leading to the development of forebrain clinical signs.

Both of these treatment options, although they represent the most commonly used treatment strategy, act at the adrenal level and do not target the center of the problem, namely the pituitary tumor.

The most effective pituitary therapeutic target is transsphenoidal hypophysectomy. This is the only therapy that can cure the animal. Unfortunately, such a surgical procedure is performed only in a few centers, has some risk, and requires subsequent replacement therapy. Radiation therapy enables action at the pituitary level. Such therapy can reduce the size of the pituitary tumor but usually does not adequately block the hypersecretion of ACTH. Research on pituitary-targeted medical treatments is unfortunately still limited. Potentially usable drugs are cabergoline, pasireotide, and retinoic acid.

In terms of risk/benefit, no treatment is clearly superior to others. In principle, we should always look more at therapies aimed at eliminating or inhibiting pituitary tumor growth. The author's preferred therapeutic technique, when possible, is transsphenoidal hypophysectomy

Trilostane

Trilostane is a synthetic steroid that competitively inhibits the enzyme 3β-hydroxysteroid dehydrogenase (3βHSD). Contrary to what was recommended 10-15 years ago, it is now preferred to use a much lower initial dosages. Since the duration of suppressing cortisol production is less than 12 hours in most dogs, the administration of trilostane twice a day can improve the patient's clinical response. When using a protocol based on two daily administrations, an initial dose of 0.5-1.0 mg/kg q12h is recommended (maximum dose of 30 mg/dog q12h for dogs weighing >30 kg). Using low dosages of trilostane, there is a significant reduction in side effects. However, the administration once a day is also a valid alternative; in this case, the starting dosage should be 1-2 mg/kg q24h.

After the onset of therapy, usually, a noticeable improvement in the clinical picture is observed.

Trilostane usually is well-tolerated, mainly if it is used at low dosages; The main adverse effect concerns transient hypocortisolism (glucocorticoid deficiency), which is usually associated with lethargy, weakness, anorexia, vomiting, and diarrhea. In severe cases, complete adrenal hypofunctionality (with a lack of both glucocorticoids and mineralocorticoids) can be observed. In most cases, side effects run out once drug therapy is discontinued; in these patients, it is advisable to resume the treatment at a lower dosage.

A check-up by Computed Tomography (CT) or MRI should be ideally carried out after about a year of trilostane treatment to reassess the pituitary size.

Figure 1: Therapeutic protocol of trilostane and its monitoring in dogs with PDH:

Mitotane

Mitotane (o,p'-DDD dichlorodiphenyldiphenyldichloroethane) is an adrenocorticolytic agent that induces selective necrosis of the so collated *zona fasciculata* and *zona reticularis* of the adrenal cortex, those responsible for the secretion of cortisol and sex hormones..

At present, mitotane has been largely replaced by trilostane in the treatment of canie PDH, due to increased safety of use and fewer side effects, in the face of comparable efficacy. It is a drug, however, still used for that 10-15% of cases with insufficient response to trilostane.

Two types of therapeutic protocols are available for mitotane: standard or selective protocol and non-selective protocol. The first aims at the selective destruction of the *zona fasciculata* and *zona reticularis*, sparing the *zona glomerulosa* and, therefore, the production of mineralocorticoids. The non-selective protocol instead determines the necrosis of the entire adrenal cortex, resulting in iatrogenic hypoadrenocorticism; with this second protocol, the dog is subsequently managed as if suffering from Addison's disease.

The ACTH stimulation test is considered the *gold standard* to evaluate the response to mitotane therapy and monitor its progress. In addition to the endocrine test, it is crucial to assess the blood concentration of sodium and potassium to regulate the dosage of mineralocorticoids administered according to the needs of each individual patient.

Figure 2 shows the selective therapeutic protocol of mitothane and its monitoring in dogs with HC.

SURGERY FOR PITUITARY TUMORS (PDH)

Transsphenoidal surgical removal of the pituitary tumor causing PDH is the treatment of choice for humans, while complete surgical hypophysectomy has been used for dogs with PDH. After hypophysectomy in PDH dogs, the 1-year estimated relapse-free fraction was 90%. The 1, 2, 3, and 4-year estimated survival rates (86, 83, 80, 79%, respectively) compare favorably to results seen in dogs treated with either mitotane or trilostane. This kind of surgery is performed only in few centers and only by few surgeons. A good intensive care unit is very important to manage the post-operative period. Postoperative intensive care includes close monitoring of vital functions, plasma electrolytes (sodium and potassium), plasma osmolality, and central venous pressure. Oral water intake is encouraged as soon as possible. Postoperative medication includes antibiotics and analgesics. Hormone replacement consists of hydrocortisone (1 mg/kg IV every 6 hours) and desmopressin, a vasopressin analogue (4 µg administered as a drop into the conjunctival sac every 8 hours for 2 weeks). When the dog has resumed eating and drinking, oral replacement therapy is started: cortisone acetate (1 mg/kg every 12 hours) and thyroxine (15 µg/kg every 12 hours). Over a period of 4 weeks the dose of cortisone acetate is gradually tapered to 0.25 mg/kg every 12 hours. Desmopressin (0.01%) is administered for 2 weeks, 1 drop into the conjunctival sac every 8 hours.

MEDICAL TREATMENT TARGETING THE PITUITARY GLAND

Treatment of dogs with PDH should ideally target the pituitary tumor.

Since dopamine (DA) and somatostatin (SST) both have an inhibitory effect on the functions of the pituitary gland, the main goal of the research is to identify possible medical therapies that have affinity for their receptors; specifically, DRD2 (receptor subtype 2 for DA), SSTR2 and SSTR5 (receptor subtype 2 and subtype 5 for SST, respectively). In canine adenomas, the one that is most highly expressed is SSTR2, while DRD2 and particularly SSTR5 are expressed significantly less. When comparing the therapeutic possibilitiès between the human and canine species, it is important to take into account that the distribution of these receptors is different; in fact, in humans, there is a higher expression of SSTR5 and DRD2. Currently, there are no drugs registered for veterinary use that target the pituitary gland for use in dogs with PDH. However, numerous studies are underway to identify the most effective and safe drug molecule for the treatment of PDH in dogs.

Cabergoline

Cabergoline is a dopaminergic agonist that binds to DRD2. Since in canine pituitary adenomas, the expression of these receptors is modest, tumor cells in vitro respond only moderately to the use of cabergoline. However, a study conducted in vivo showed that 43% of dogs with PDH had a good response to cabergoline treatment, with improvement in clinical signs, reduction in neoplasm size, and lower urinary cortisol to creatinine ratio (UCCR).

Pasireotide

Pasireotide (SOM230) is a somatostatin analogue that binds to type 1, 2, 3, and 5 receptors. In a study in twenty dogs with PDH, administration of pasireotide resulted in a reduction in plasma concentration of endogenous ACTH and improved the clinical condition of the patients, while no serious adverse effects were observed. In a more recent study, this drug was evaluated in nine dogs with pituitary macroadenoma undergoing treatment with trilostane or mitotane. Pituitary gland size decreased in six out of nine patients, while it increased in the remaining three dogs; despite this, no clinical neurological signs or serious adverse effects were observed

Retinoic acid

Proopiomelanocortin (POMC) represents the precursor molecule of ACTH, and its gene expression is regulated by several transcription factors (AP-1 and Nur77). Retinoic acid (RA) is an agent that regulates many cellular processes, among which it is responsible for reducing the binding of these transcription factors to their DNA binding site, ultimately preventing ACTH secretion. In a study of 22 dogs with PDH undergoing retinoic acid treatment, researchers noted a reduction in plasma ACTH concentration, a decrease in UCCR, resolution of clinical signs, and a reduction in pituitary size. In humans, numerous adverse effects have been noted following administration of this drug, including mucocutaneous toxicity, liver failure, teratogenic effects, and severe photosensitivity, which can be reduced by limiting light exposure.

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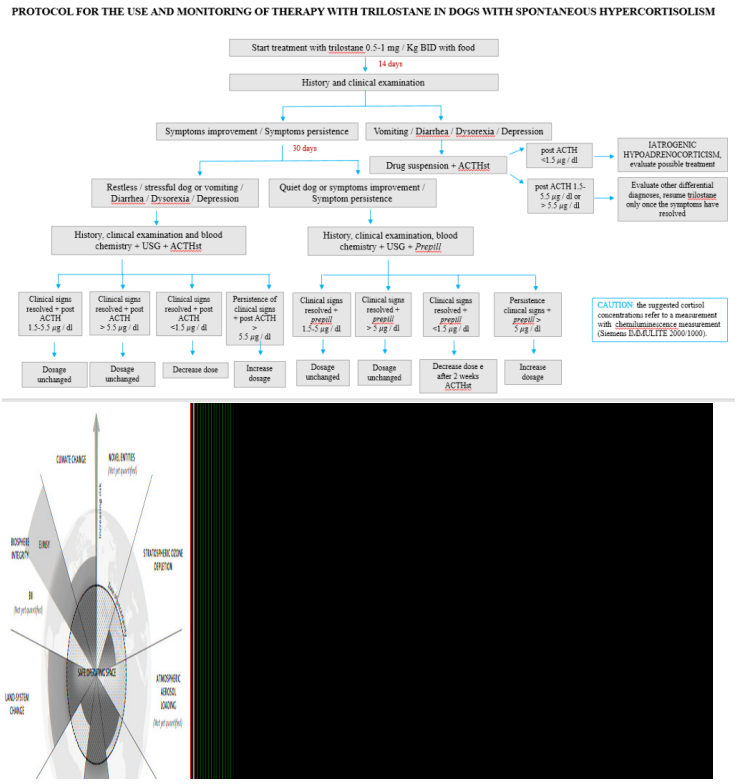

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067

FELINE ANALGESIA IN THE ER AND ICU

Veronica Salazar

Alfonso X El Sabio University, Anesthesia Section, Villanueva de la Canada, Spain

Qualifications:

Veronica Salazar Nussio

LV, MSc, PhD, Dip ACVAA, Dip ECVAA, RECOVER Certified Instructor

vsalanus@uax.es

Pain is not just a sensation, but rather an "experience" that includes both sensory-discriminative and motivational-affective components. The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage". However, the term nociception refers to the neural response only to noxious or traumatic stimuli. Therefore, all nociception produces pain, but not all pain results from nociception. This concept leads to a differentiation of pain into two categories: acute pain (due entirely to nociception) and chronic pain (in which behavioral and psychological factors play a major role, even though nociception may have been initially involved). Recently, the terms 'adaptive' and 'maladaptive' have been suggested as terms that better describe pain. In fact, the difficulty in clearly demarcating the transition from, the previously called, acute to chronic pain has led to a growing realization that previously termed acute and chronic pain are actually on a continuum, and alternative definitions may be more accurate.

Adaptive pain encompasses both nociceptive and inflammatory pain. Nociceptive pain is only activated by high threshold noxious stimuli, including stimuli that cause tissue injury. Inflammatory pain occurs after tissue damage and produces heightened sensitivity of the tissue associated with a classical inflammatory response. Both of these types of pain are considered protective or 'adaptive', as they serve to identify and/or avoid actual or potential tissue damage. They usually have an easily identifiable cause (surgery, injury, etc.), and are reversible. Maladaptive pain, on the other hand, is not protective, and is primarily due to plastic changes in the pain processing system. It can be further divided into neuropathic pain, which is pain resulting from direct damage to neural tissue, and functional pain, where there are no neural lesions or inflammation, and pain is driven by dysfunction or malfunction of the nociceptive system. In the ER and ICU clinical scenarios, cats usually suffer mainly from acute or adaptive pain, whose main pathophysiological component is nociception..

The term analgesia can be defined as the absence of pain perception, but in the clinical setting, only a reduction in the intensity of pain perceived can be achieved (with the exception of local anesthetics through local blocks). In fact, analgesia can be achieved by interrupting the nociceptive pathway at one or more points between the peripheral nociceptor and the cerebral cortex. This introduces the concept of multimodal analgesia, which results from the administration of different analgesic drugs in combination and at multiple sites in order to alter more than one part of the nociceptive process. It therefore relies on the additive or synergistic effects of two or more analgesic drugs working at different levels of the nociceptive pathway. This approach to analgesia allows for dose reduction, thereby reducing the intensity of side effects while preserving its effectiveness. This approach is particularly important in cats due to their altered drug metabolism and excretion when compared to dogs

The concept of pre-emptive analgesia is also extremely important. In fact, it has been proven that not only is the choice of drug administered of clinical importance, but also the timing of administration.

When it comes to providing analgesia for cats in the intensive care unit (ICU) and the emergency room (ER), there are several options available.

The choice of analgesic medication will always depend on the cat's individual needs, the severity of pain, underlying conditions, and the veterinarian's assessment. Additionally, the means of assessing the effectiveness of the analgesic plan should also be taken into account. Here are some common systemic analgesic options for cats in the ICU:

Opioids: Opioids are potent analgesic medications that are commonly used in cats for managing moderate to severe pain. Examples of opioids used in cats include methadone, buprenorphine, fentanyl, and morphine.

Non-Steroidal Anti-Inflammatory Drugs (NSAIDs): NSAIDs can be used to provide analgesia and reduce inflammation in cats. However, it's important to note that not all NSAIDs are safe for cats, as they can have potential adverse effects. Only NSAIDs approved specifically for use in cats, such as meloxicam or robenacoxib, should be used.

Local Anesthetics: Local anesthetics can be administered to provide pain relief for specific procedures or localized pain. Lidocaine or bupivacaine can be used in cats, but vcare must be exerted in order to avoid systemic toxicity (particularly cardiovascular).

Alpha-2 Agonists: Alpha-2 agonists, such as dexmedetomidine or medetomidine, can provide sedation and analgesia in cats. These medications have both sedative and analgesic properties and can be administered intravenously or intramuscularly.

Adjunctive Medications: Depending on the specific needs of the cat and the nature of its condition, additional medications may be used to complement analgesic therapy. These may include medications like tricyclic antidepressants, gabapentin, or amantadine, which can help treat the neuropathic component of pain.

It's important to remember that pain management in cats should be individualized, and a multi-modal approach that combines different medications and techniques should be employed. The dosages and administration routes of these medications should be determined by a veterinarian with expertise in feline analgesia and pain management to ensure appropriate and safe pain relief for cats in the ICU. Regular monitoring and adjustment of analgesic therapy may also be necessary based on the cat's response and overall condition.

Most analgesic plans consist of two to four agents that act on separate levels of the pain pathway. An appropriate opioid is usually the foundation of every analgesic protocol, although they may not always be required, particularly in situations where the patient can receive an NSAID and has been provided with a successful locoregional anesthetic technique. In any condition where inflammation is present, and the cat is a good candidate, an NSAID is usually the second component of an analgesic plan. Appropriate locoregional techniques including epidurals and nerve blocks halt nociceptive transmission and have been gaining popularity, particularly as opioid availability has become so variable. Finally, an adjunctive agent such as an alpha-2 agonists, a dissociative anesthetic, a tricyclic anti-depressant and anticonvulsants can be added depending on the need and the clinical condition.

The review of the main pharmacological characteristics of systemic analgesics such as opioids, NSAIDs, NMDA antagonists, anticonvulsants and tricyclic antidepressants can be reviewed elsewhere.

Locoregional techniques

Local anesthetics prevent nociceptive transmission and are the only pharmacologic agents available that completely abolish nociception. One of the virtues of local anesthetics has to do with their versatility, as they may be administered by a variety of routes: such as local infiltration, perineural administration, Fascial plane blocks, epidural or spinal administration, intrapleural administration (through chest tubes), through wound-soaker catheters or topically by administration of lidocaine-prilocaine eutectic cream (EMLA).

Different conditions and surgical procedures may benefit from different locoregional techniques, as an appropriate locoregional technique should

always be part of a multimodal analgesic strategy. As such, intercostal nerve blocks can provide analgesia for patients suffering rib fractures or undergoing lateral thoracotomy procedures; epidural administration through epidural catheters allow for CRI administration of opioids and local anesthetics in patients suffering from painful conditions on the pelvic limb, abdomen, and thorax. After abdominal surgical procedures, transverse abdominal plane blocks provide desensitization of the ventral abdomen. Finally, ultrasound-guided blockade of different peripheral nerves can provide analgesia

Administration of liposomal bupivacaine can greatly benefit critically ill patients. In fact, it can provide up to 72hours of analgesia at the incision site. It is usually infiltrated at the incisional site in each tissue layer at a dose of 0.4ml/kg. Infiltration of this agent in wounds that are infected or are considered contaminated should be avoided.

Lidocaine and bupivacaine are the most commonly administered local anesthetics in veterinary patients. Lidocaine has a quick onset of action, but a short duration of action. Bupivacaine has a slower onset of action, but a longer duration of action. Care should be taken with both drugs as their sensitivity to systemic toxicity is particularly significant in this species, especially bupivacaine that exerts profound cardiovascular toxicity. It should be kept in mind that dexmedetomidine may be added to local anesthetics to prolong their duration of action (usually at a dose of 1 µg/1ml of local anesthetic).

Peculiarities of epidural administration of analgesics can be reviewed elsewhere.

Wound-soaker catheters

Wound-soaker catheters can be placed at the time of surgical treatment of large wounds that are not easily covered by other locoregional techniques. If placed aseptically, they should not be a source contamination of the surgical site, however, they should only be maintained for 4-5 days postoperatively. Bolus administration of 1mg/kg of bupivacaine every 8 hours through the wound soaker catheter may be performed or a CRI of lidocaine may be used.

Intrapleural administration

The postoperative period of thoracic surgery can be very painful, particularly median sternotomies. Also, certain medical conditions such as rib fractures or pleural conditions, can benefit from this alternative. Finally, patients with indwelling chest tubes can benefit from the administration of local anesthetics into the pleural cavity. Bupivacaine can be administered at a dose of 1mg/kg through the chest tube.

068

EMERGENCE OF CANINE MONOCYTIC EHRLICHIOSIS IN AUSTRALIA

Peter Irwin

Murdoch University, School Of Veterinary Medicine, Murdoch, Australia

Qualifications:

Peter J Irwin

BVetMed, PhD, FANZCVS, MRCVS

P.Irwin@murdoch.edu.au

Introduction and Background

Canine monocytic ehrlichiosis (CME) is a tick-transmitted disease of domestic dogs and wild canids caused by *Ehrlichia canis* (*E. canis*), a Gram-negative, obligate intracellular bacterium belonging to the family Anaplasmataceae. The organism was first described in dogs in North Africa, and later came to prominence during the Second Indochina War (Vietnam Conflict) in the 1960-70's when large numbers of military working dogs died of what was then referred to as 'tropical canine pancytopenia'. Today, CME is recognised as a serious illness affecting dogs in tropical and subtropical regions of the world.

Australia remained free of CME until 2020. This somewhat incredible situation was maintained in parallel with the exclusion of canine rabies, by strict border security comprising pre-import testing and mandatory quarantine for dogs travelling to the island continent. This freedom from *E. canis* infection is all the more surprising given the widespread and well-established distribution of the vector, the brown dog tick ('tropical lineage' of *Rhipicephalus sanguineus s.l.*, recently renamed *Rhipicephalus linnaei* [1]), across central and northern Australia, especially in indigenous Aboriginal communities, where the warm climate is ideal for ticks, and tick-prophylaxis is irregular for the large, free-roaming 'camp' dog population.

Then, in May 2020, in Kununurra, northern Western Australia (WA), dogs with significant fever, malaise, and haemorrhagic diatheses were diagnosed with *E. canis* infection, sparking a national veterinary biosecurity alert. Despite its designation as a notifiable disease, the swift introduction of movement restrictions for dogs, and the unfolding COVID-19 pandemic during 2020 (that imposed travel limitations on the general public, including dog owners), CME spread rapidly in northern WA, across the Northern Territory (NT) and into northern regions of South Australia and Queensland, with high morbidity and mortalities reported, especially among dogs at indigenous communities.

The time, place and method of the incursion of *E. canis* into Australia is unknown, however comparative genomic analysis demonstrated that the Australian *E. canis* belongs to the Taiwan genotype, suggesting an origin from Asia or the Middle East. [2]

A study was designed to document the emergence of CME in Australia and report on demographic and clinical data from the first two years of the outbreak. Preliminary data are presented.

Materials and Methods

This retrospective study was conducted at veterinary clinics in central and northern Australia, located in regional urban centres in the NT and WA, between May 2020 and December 2021.

Case records were reviewed. Inclusion criteria required either a positive *E. canis* PCR, or a positive serological result to *E. canis* by immunofluorescent antibody test (IFAT), or both. Given the notifiable disease status of CME at the time of this study, mandatory testing for *E. canis* was conducted at regional or national government laboratories.

History and clinical data collected for analysis included the location and type of the dog's residence when the diagnosis was made; month of diagnosis; signalment; reason for presentation, and clinical signs. Additionally, records of laboratory findings (including haematology, biochemistry, CRP and results for other VBD, and CPV or CDV); and treatments with outcomes, if known, were reviewed.

Results

A total of 158 dogs were included in this study, most (n=100) lived in the NT, the remainder (n=58) in WA. Ninety-three dogs (58.9%) were urban-dwelling, 46 (29.1%) were dogs from Indigenous communities, 9 (5.7%) were located in shelters/pounds at the time of diagnosis, and 5 each were living on farms ('stations') or had travelled from other parts of Australia. A variety of breeds and their crosses were represented, with a mean age of 3.56 years old. Seventy-three dogs were male (or male neutered), 84 were female (or female neutered) (missing data n=1). CME was diagnosed throughout the year, with most cases April (at the end of the tropical wet season) and fewest cases in October after the dry southern hemisphere winter.

Forty-three dogs (27.2%) were clinically normal at the time of diagnosis. These dogs were tested for *E. canis* infection either because of being in-contact with a positive case, or were undergoing an elective procedure and were tested during pre-anaesthetic evaluation. Remaining individuals (n=115) were unwell and presented to veterinary clinics for signs including lethargy, hyporexia, ocular abnormalities, swelling (oedema or abdominal distension), bleeding, lameness and neurological signs.

A wide range of clinical abnormalities were recorded. The most common clinical findings were pyrexia, ophthalmological abnormalities, pale mucous membranes, vomiting and low body condition score (BCS). Other signs included dyspnoea, bleeding diatheses, hepatosplenomegaly, lymphadenopathy, dehydration, lameness, oedema and ascites, non-healing wounds and sepsis, icterus and neurological abnormalities.

With respect to laboratory data, haematological abnormalities were common; 110/131 dogs (84%) were anaemic at the time of diagnosis, and of these, most (61%) were non- or pre-regenerative. Leucopenia and leucocytosis were recorded, and most dogs (90.4%) were thrombocytopenic. Pancytopenia was recorded in 18 dogs. C-reactive protein concentration was elevated in all dogs tested (n=11). *Babesia vogeli* and *A. platys* co-infections were discovered, and five dogs had concurrent canine parvovirus infection.

Doxycycline was the specific treatment prescribed for most (>95%) dogs. Other antimicrobials (usually prescribed for bacterial comorbidities) included azithromycin, amoxicillin-clavulanate, cefovecin, tylosin, and rifampicin. Additional treatments included imidocarb dipropionate in 26/100 dogs and a glucocorticoid (dexamethasone and/or prednisolone) was given in just over 30% of the dogs.

Unfortunately, case outcomes, in terms of survival, was obscured by the relatively large number of patients lost to follow-up, especially in the NT where approximately one third of dogs were located in remote communities. In WA, 48/58 (82.8%) survived to one week, and 44/58 (75.9%) were still alive at 6 months.

Discussion

Many veterinarians worldwide are cognisant of the often-challenging nature of CME, its clinical signs, diagnosis and treatment, however the incursion of *E. canis* into Australia three years ago brings a new experience to small animal practitioners in a country where canine tick-borne infections were limited previously to babesiosis (*B. vogeli*), canine infectious cyclic thrombocytopenia (*A. platys*) and haemoplasma infections. Pet owners in eastern Australia are familiar with deadly tick paralysis (caused by *Ixodes holocyclus*) [3], but never before has the need to prevent tick attachment been so apparent. *Ehrlichia canis* is transmitted as early as 3 hours after female tick attachment [4] necessitating

acaricides that repel and kill ticks to prevent attachment. [5]

The brown dog tick species in Australia is the tropical lineage of *R. sanguineus* s.l. and its proficient vectorial capacity for *E. canis* is well recognised. Additionally, much of central and northern Australia is extremely remote, veterinary services are limited, tick prophylaxis is sporadic, and the ticks themselves are often present in extremely high numbers in and around human dwellings. Whilst accurate survival data was difficult to elucidate in this study, there was anecdotally a high mortality rate amongst camp dogs at indigenous communities, with a consequently heavy emotional toll on their owners.

Overall, the clinical and laboratory data presented here are similar to the numerous case reports and epidemiological studies of CME from multiple tropical and subtropical countries worldwide. Dogs with a history of tick exposure, living in or recent travel to a tick enzootic area, and those with non-compliant ectoparasiticide use, are at risk of tick-borne diseases. Such history with non-specific signs including pyrexia, ocular disease, bleeding diatheses, and haematological abnormalities, with elevated CRP, should prompt testing for *E. canis*.

Now that post-COVID travel restrictions are lifted, and the movement of dogs is no longer prohibited, tourism to the north from other parts of Australia has resumed, bringing large numbers of pet dogs into *R. linnaei*-enzootic areas. Cases of CME have been reported in many towns and cities in dogs returning to southern regions (where the tick is not established). Australian veterinarians will need to remain vigilant for this vector-borne disease well into the future.

Acknowledgments

The contributions of Drs Amanda Barbosa, John Beadle, Sarah Brett, Alex Burleigh, Sarah Elliot, Charlotte Oskam, and the staff of Animal Management in Rural and Remote Indigenous Communities (AMRRIC) in the preparation of data is acknowledged.

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HEALTHY PETS, HEALTHIER COMMUNITY - BUILDING CAPACITY IN LOW-INCOME COMMUNITIES OF SOUTH AFRICA

*Amit Chaudhari[1], **Katherine Polak**[2]*

[1]Humane Society International, Companion Animals & Engagement, Washington, United States of America, [2]Humane Society International, Companion Animals & Engagement, Washington DC, United States of America

Qualifications:

Katherine Polak,

DVM, MPH, MS, DACVPM, DABVP (Shelter Medicine Practice)

kpolak@hsi.org

INTRODUCTION

The continent of Africa is home to 54 countries, many of which face challenges related to free-roaming dogs. These dogs, often found wandering the streets, suffer from poor nutrition, communicable diseases, injuries, and neglect. While formal suburbs in South Africa exhibit pet ownership patterns similar to those in Europe and North America, informal settlements across the country have substantial populations of free-roaming dogs. There are many negative outcomes associated with community dogs, including dog bites, environmental pollution, cruelty, and commercial exploitation.

Despite the efforts of local animal welfare organizations, dogs and cats in South Africa specifically suffer from various welfare issues including but not limited to overbreeding, starvation, accidents, fighting, disease, parasitic infections, inadequate housing, intentional abuse, and general neglect. Due to the scarcity of suitable homes, tens of thousands of healthy animals are euthanized annually in South African animal shelters. Deliberate acts of cruelty towards animals often go unreported and unpunished. Neglect of basic care standards, such as shelter and physical welfare, is prevalent in many communities, leading to avoidable suffering. Additionally, unmanaged dog populations in urban areas pose risks to people, including possible zoonotic disease transmission, dog bites, and injuries from animal-related incidents. Moreover, the presence of sick and injured animals in communities can normalize poor animal welfare conditions and suboptimal animal care practices.

DEVELOPING AN EVIDENCE-BASED COMPANION ANIMAL WELFARE PROGRAM

The implementation of a scientific and evidence-based program aimed at improving the welfare of cats and dogs begins with obtaining baseline information in a systematic way. Before any intervention is developed, information on the target animal population, the community, and the dynamics between companion animals and people must be assessed. This helps foster a detailed understanding of the local pet ownership culture and issues facing companion animals, which can vary dramatically from community to community. Data can be collected through Knowledge, Attitude, and Practice (KAP) surveys of pet owners, and surveys of both owned and free-roaming dogs and cats to estimate the total number of animals present. KAP surveys specifically can help identify knowledge gaps and behavioral patterns among different sociodemographic groups towards animals that may need to be addressed by future animal welfare intervention.

ASSESSING SURVEY RESULTS

In June 2022, the international NGO Humane Society International conducted baseline surveys to guide the planning of an intervention in South Africa to improve the welfare of dogs and cats. A household KAP questionnaire and a street count of free-roaming dogs were performed in two towns (Bredasdorp and Struisbaai), located in Cape Agulhas Municipality, the southernmost province in South Africa. This area was chosen as a possible program site because of the animal welfare need, coupled with the presence of motivated stakeholders interested in improving animal welfare.

The survey revealed varying dog and cat ownership practices at each site, with dog ownership being more common (59% of respondents) compared to cat ownership (32% of respondents). In terms of reasons for owning a dog, respondents in the areas of Bredasdorp East and Struisbaai North were more likely to cite personal protection as a motive for owning a dog, in addition to companionship. These two sites were also home to a significant number of free-roaming dogs. In Bredasdorp East and Struisbaai North as compared to Struisbaai Town and Bredasdorp West, which are higher-income communities, the percentage of sterilized dogs was lower and dogs tended to be younger. Average dog age and sterilization rates are important indicators of dog population turnover, spay/neuter accessibility, and general animal-keeping practices.

The surveys also identified animal welfare issues including frequent animal tethering, malnourishment, and tick infestation. Identification of these issues is important to help determine the most impactful programmatic activities that should be considered as part of the wider initiative.

Based on the survey results, the estimated owned dog population across all four sites was an estimated 7,000 dogs, which is important for understanding and planning spay/neuter interventions.

PROGRAM DESIGN

In an effort to create sustainable change and serve as a model for other municipalities in South Africa, a comprehensive animal welfare program was developed, based on the survey results. The program aimed to improve animal welfare through the following:

Provision of low-cost veterinary services. Similar to many communities around the world, affordable and accessible veterinary services are lacking. As a result, many sick and injured animals end up in shelters or go untreated. To address this need, periodic high-volume spay-neuter clinics can provide desperately needed access to surgical and treatment services. Giving priority to female dogs for sterilization is a wise use of limited resources, from a dog population management perspective. Despite field-like conditions, mobile spay/neuter clinics were designed to ensure high-quality high-volume services by ensuring surgical sterility, use of gas anesthesia, multimodal pain management, and tattooing every animal following spay/neuter surgery for permanent identification. In addition to mobile surgical clinics, animal health days in the community were designed to help reach animals in need of preventive care and provide treatment for flea and tick infestations.

Humane education. There is increasing recognition of the role education and community engagement plays in improving animal welfare. Research has shown that humane education has a wide range of positive social and educational outcomes. A Training of the Trainers (ToT) model was developed to create a pool of competent instructors who can then teach animal welfare material to other teachers and students, creating a broader reach.

Law enforcement training and municipal by-law reform. Strengthening companion animal-specific laws and training law enforcement officials is essential to prevent animal cruelty. Advocating for regulatory provisions that control the breeding of companion animals, whether for profit or as a result of unwanted pregnancies is a critical part of the program.

Ongoing monitoring and evaluation. Implementing robust monitoring and evaluation systems allows NGOs to assess the impact of their programs, identify areas for improvement, and make data-driven decisions. By collecting and analyzing accurate data on program outcomes, NGOs

can determine their progress toward achieving targets and adapt their strategies accordingly

STAKEHOLDER ENGAGEMENT

To ensure long-term programmatic success and impact, strategic approaches must be employed that promote sustainability and empower local stakeholders as champions of the program. Building collaborative partnerships is essential to leverage resources, knowledge, and expertise, to help animals most effectively. By partnering with relevant government agencies, local communities, and other animal welfare charities, organizations can maximize their resources and impact. In South Africa, the Healthy Pets, Healthier Community program aims to support the efforts of local animal welfare and humane education organizations, while working with local law enforcement and the public to promote humane animal welfare practices, ensuring that interventions have a long-term impact.

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A ONE HEALTH VIEW OF COMPANION ANIMAL OWNERSHIP

Devon Dublin

The Sasakawa Peace Foundation, Ocean Policy Research Institute, Tokyo, Japan

Qualifications:

Devon Ronald Dublin

Doctor in Veterinary Medicine and Zootechnics (Agrarian University of Havana, Cuba); Master of Science in Marine Life Science (Hokkaido University, Japan); Doctor in Philosophy in Environmental Science Development (Hokkaido University, Japan)

devdub@yahoo.com

Companion animal owners can be defined as animal people, meaning those who respect the value and spirit intrinsic in non-human beings. It certainly will be sad for such persons to unknowingly cause harm to the companion animals that have become a part of their families and lives. The best way to avoid this is to adopt a One Health approach to companion ownership which must be premised on an understanding of the intersection that occurs between Animal, Human and Environmental health.

The planetary boundaries, nine processes that regulate the stability and resilience of the Earth system, were identified by a group of 28 internationally renowned scientists, which suggests that our developmental trend is not sustainable and therefore change is needed (Fig.1).

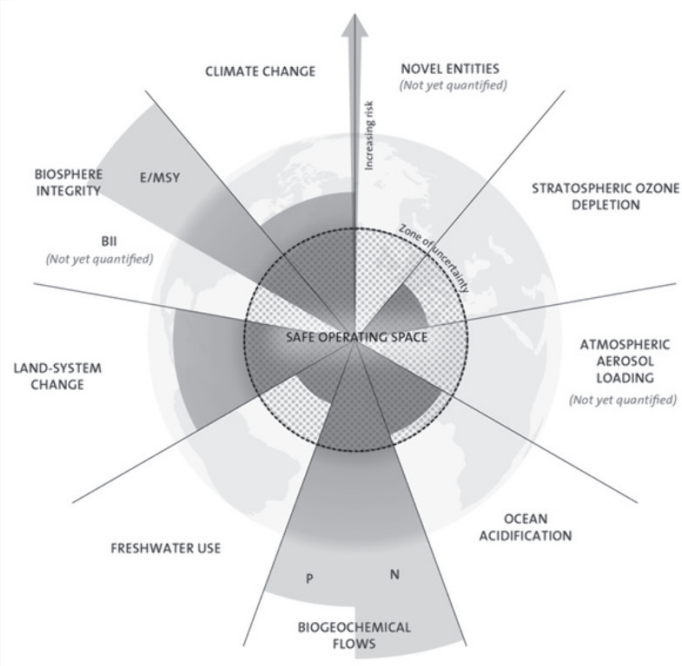

Figure 1. The planetary boundaries [1].

Global warming is certainly the main environmental challenge that need to be tackled by the world. This phenomenon leads to ocean acidification, melting ice caps, sea level rise and unprecedented natural disasters. These natural disasters include tropical storms, hurricanes, typhoons, heat waves, forest fires and flooding which are more intense and frequent than we are accustomed to. This is because of the increased emissions of greenhouse gases mainly due to the use of fossil fuels, manufacturing activities and deforestation.

These effects of global warming affect companion animals as much as they do humans. This affectation is harm indirectly caused by disturbing ecological systems and the processes of nature [2]. In many respects, animals are more vulnerable than humans since they tend to be more in contact with the earth, do not wear protective clothing, and are very dependent on pet owners for protection. This vulnerability is partly why companion animals are useful indicators in identifying sources of environmental pollution, food contaminants, infectious disease transmission and other harmful exposures [3].

While it is essential that we consider the effects of environmental changes on companion animals, it is important to be cognizant of the fact that many factors associated with the keeping of companion animals contribute to the exacerbation of those very environmental changes. This is why a harmonious relation with the environment is needed, as is adequately represented in the Japanese concept of Satoyama-Satoumi [4].

The best way to bring the One Health view of companion animal ownership into focus would be to insert pet owners directly into the One Health conversation which has not been adequately done so far (Fig. 2). Of course, the impact of companion animals on mental health, physical health and aging has been well documented but have we adequately addressed the flipside of this benefit? A One Health approach would therefore factor in the effects of this on companion animals themselves if the interaction is not properly managed and would include factors such as grief management and mismatches which expand the issue of shelters [5]. Pet owners would need to know that their actions can have far reaching environmental effects miles away from their home such as the flushing of cat feces down the toilet rather than disposing of it in a dumpster. The result of this behavior is the release of *Toxoplasma gondii* into the Oceans which is known to cause mortality in several species of marine mammals [6].

The effects of Climate Change on small companion animals are generally centered around increased ambient temperatures which lead to heat-related illness. This is particularly compounded when there is inadequate shade, water, and ventilation. Pet owners need to be aware of the level of risk their animal possess based on factors such as age, body condition, health, reproductive status and breed. Heat stroke manifests itself in different ways and include abnormal breathing, lethargy, collapsing, and diarrhea. Pet owners will need the right guidance to keep their animals safe and clinicians must be prepared to provide advice accordingly. This is critical since all animals are susceptible to climate change in one way or the other and temperature is likely to continue increasing in the future [7].

Climate Change is cyclical in nature. How do the keeping of small companion animals contribute to this phenomenon? Pet food is the main aspect related to the keeping of companion animals that has a direct link to Climate Change. Therefore, there is a need to reduce carbon emissions along the pet food value chain which starts from the sourcing of raw materials, manufacturing and transportation and concludes with waste disposal [8]. A reduction in the rate of dog and cat ownership in favor of other types of companion animals would contribute as well. Therefore, having a One Health approach to companion animal ownership would allow for more informed pet owners on matters related to environmental stewardship which is inadequately considered within the triad of One Health. The global movement towards Planetary health is a recognition of this deficiency [9].

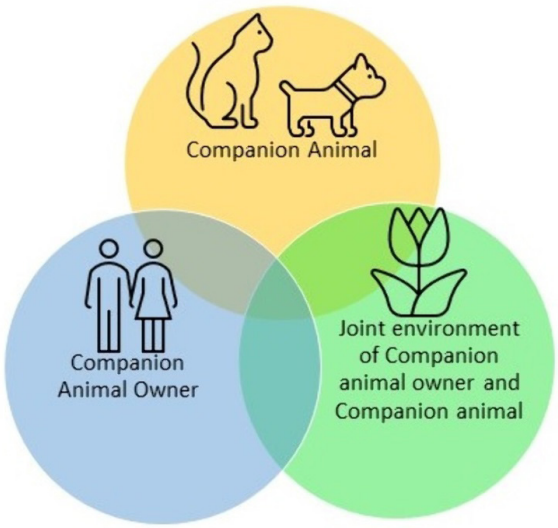

Figure 2. A representation of One Health for Companion Owners.

Additionally, the COVID19 pandemic likely arose from a breakdown in a harmonious relationship with the environment. Even the sanitation measures and lockdown mandates in response to the pandemic were detrimental to the environment with masks, face shields, gloves, gowns, and plastic associated with increased delivery and takeaway services ending up in the oceans. The World Health Organization (WHO) is warning that future pandemics are likely to be worse with far reaching impacts [10]. Therefore, lessons learned from the COVID19 pandemic will be essential in helping us live and keep our companion animals harmoniously with the environment. Future pandemics may very well be dependent on the adjustments and compromises we are willing to make for the greater good of the planet and how we bequeath it to future generations.

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CANINE HYPOTHYROIDISM: HOW TO AVOID MISDIAGNOSIS?

Federico Fracassi

University of Bologna, Department Of Veterinary Medical Sceneces, Ozzano dell'Emilia, Italy

Qualifications:

Federico Fracassi

DVM, PhD, Dipl. ECVIM-CA (internal medicine)

federico.fracassi@unibo.it

Hypothyroidism describes inappropriately reduced function of the thyroid gland and results in a state of thyroid hormone deficiency. In animals hypothyroidism may occur in a congenital form or, more often, as an acquired form; from an aetiological standpoint it is further classified as primary, if the disease primarily involves the thyroid gland, and as central if it results from a TSH deficiency (secondary/pituitary or tertiary/hypothalamic). In the dog, acquired primary hypothyroidism is an endocrine disorder commonly found in adults and is most often caused by a process of immune-mediated destruction of the thyroid gland.

SIGNALMENT

Dogs of any breed may develop hypothyroidism, however, as mentioned previously, in some breeds (Golden Retrievers, Dobermann Pinschers, Beagles, German Shepherds and Cocker Spaniels) the incidence is greater than in others.. The average age at diagnosis is around 7 years (range 0.5 to 15 years).

CLINICAL SIGNS

The onset of clinical signs is usually gradual, due to the slow progression of the disease, and multiple systems are often involved (TABLE 1).

Clinical findings	Panciera et al. (2001) 162 dogs	Lunetta et al. (2019) 68 dogs	Corsini et al. (2021) 40 dogs
Dermatological abnormalities	88%	84%	84%
Alopecia	40%	55%	70%
Weakness	12%	48%	67.5%
Lethargy	48%	41%	62.5%
Obesity	49%	46%	42.5%
Polyneuropathy	2%	26%	2.5%
Bradycardia	5%	15%	
Reproductive problems	< 2%	12%	

The majority of dogs with hypothyroidism have dermatological conditions that mainly vary based on the breed, on the severity and on the duration of the state of hypothyroidism. The abnormalities detected most often are poor haircoat condition, delayed or lack of hair regrowth after clipping, localized or widespread alopecia, primarily nonpruritic, and seborrhoea (dry or oily).

LABORATORY FINDINGS

Complete blood count The classic alteration found during the complete blood countin approximately 30-40%of dogs with hypothyroidism is the presence of a mild normocytic, normochromic nonregenerative anemia.

Biochemical profile The most common alteration found during the biochemical profile in dogs suffering from hypothyroidism is fasting **hypercholesterolemia** (75-95% of subjects) and **hypertriglyceridemia** (79-88% of subjects). Less common alterations are a mild increase in alkaline phosphatase (SAP), in alanine aminotransferase (ALT) and creatine kinase (CK).

DIAGNOSTIC IMAGING

Ultrasound scan In the case of autoimmune thyroiditis and thyroid atrophy, a reduction in the volume and echogenicity of the glandular lobes can be observed, while in euthyroid subjects or those with on-thyroidal illness syndrome, the echotexture of the thyroid parenchyma is homogeneous and hyperechoic when compared to that of the adjacent sternal muscle.

Scintigraphy In dogs, scintigraphy is mainly used in cases of suspected tumors in the cervical region. Several studies describing the use of scintigraphy to evaluate thyroid function report that in the case of primary hypothyroidism, scintigrams typically show a reduction or absence in the concentration of pertechnetate in the gland.

SPECIFIC DIAGNOSTIC TESTS

Canine hypothyroidism is currently the most over-diagnosed of the endocrinopathies found in dogs. Careful patient evaluation and correct candidate selection based on the clinical history, physical examination, and other laboratory findings are essential requirements to increase the positive prognostic value of the tests and thus reduce the incidence of false positive results.

The non-thyroidal illness syndrome is a state of altered serum thyroid hormone concentrations, due to concurrent disease not directly caused by the thyroid gland. This is a transient state provided the underlying cause is removed. The degree of thyroid hormone suppression is proportional to the severity of non-thyroidal illness

The specific basic diagnostic tests for evaluating thyroid function include the measurement of the circulating basal levels of T4, fT4, and TSH. Nevertheless, the basal thyroid hormone concentration is affected by several factors (non-thyroidal illness syndrome and several medications) that can falsely induce a reduction in the value; for this reason, the method considered the gold standard for diagnosing canine hypothyroidism to date is the TSH stimulation test.

The initial screening test used to evaluate thyroid function is to measure the basal concentration of total T_4 (TT_4) in the serum. The concentration of total T_4 comprises the fraction of thyroxine bound to plasma proteins (T_4) and the free fraction (fT_4). The reference ranges considered normal for the concentration of T_4 in the dog vary between laboratories. Most laboratories consider dogs with a serum concentration of T_4 between 13 and 50 nmol/l as being euthyroid. It is, however, worth emphasizing that there are age-related physiological differences in the concentration of thyroid hormones: puppies and dogs up to 6 years old have higher concentrations of hormones than older subjects; there are also size- and breed-related differences with medium-sized to large dogs having lower concentrations and Greyhounds, Whippets, Sloughis, Siberian Huskies, Alaskan Huskies and Basenji sometimes having concentrations below the reference range.

MEASURING FREE T_4

Two different methods can currently be used to measure fT_4: the radioimmunological assay (RIA) and modified equilibrium dialysis (MED). In all the studies performed, the accuracy of this latter method is greater than 90%, exceeding that of the T_4 assay (75-85%). Compared to the RIA for measuring fT_4, the MED technique for fT_4 has the advantage of not being influenced by the presence of any circulating anti-thyroid hormone antibodies. From the preliminary studies on the chemoluminescence technique, this method does not seem to be suitable for assaying fT_4.

MEASURING CANINE THYROID-STIMULATING HORMONE

This is a species-specific test, it is not possible to make use of laboratories for human medicine. The chemoluminescent immunometric technique (Immulite Canine TSH) is the most commonly used method.

Various studies have demonstrated the high specificity (greater than 90%) of this test in the diagnosis of hypothyroidism in the dog; furthermore, if, in association with cTSH, another parameter of thyroid function, such as T_4 or fT_4, is also measured, the specificity of the test is greater than when only the basal concentration of pituitary thyrotropin is considered. This is due predominantly to the low sensitivity of basal TSH measurements (70%); indeed, in some hypothyroid dogs (20-40%) the basal values of cTSH are still within the reference range for euthyroid dogs.

The finding of decreased basal values of T_4 or fT_4 in the serum, together with an increase of TSH in a dog with clinically suspected hypothyroidism can be considered strong support for the diagnosis. In contrast, when all these parameters are within the reference range, a state of hypothyroidism can be excluded. A rare finding is increased values of TSH and normal concentrations of T_4 or fT_4; these findings may reflect an early stage of the disease, as happens in humans. Hypoadrenocorticism is another differential diagnosis for such condition. In these cases, it is not appropriate to give the patient replacement treatment with levothyroxine, but it is advisable to repeat the test 3 to 6 months later and/or test the dog for hypoadrenocorticism.

TSH STIMULATION TEST

The TSH stimulation test is used to determine the reserve capacity of the thyroid gland by administering exogenous TSH. It is considered, along with thyroid scintigraphy, to be the gold standard for the diagnosis of hypothyroidism. The test is performed by administering recombinant human TSH (rhTSH, Thyrogen®, Genzyme Corporation, Cambridge, MA) intravenously and measuring the serum concentration of TT4 before and 6 hours after administration. Some studies proposed a cutoff of post-stimulation TT4 >28 nmol/L (2.2 µg/dl), or at least a 1.5-fold increase in it from baseline TT4, to rule out a hypothyroid condition, using an rhTSH assay of 75 µg/dl. A recent study involving 114 dogs in which a rhTSH dose of 75 µg/dog was used proposed a post-stimulation TT4 cutoff >21.9 nmol/L (1.7 µg/dl) to rule out hypothyroidism (Se 100%, Sp >93%) and a post-stimulation TT4 cutoff <16.7 nmol/L (1.3 µg/dl) to confirm hypothyroidism (Se >92%, Sp >97%).

DIAGNOSIS OF THYROIDITIS

Antithyroglobulin and antithyroid hormone antibodies The presence of antithyroglobulin antibodies (ATA) has been demonstrated in over 50% of dogs with hypothyroidism. Some laboratories offer the possibility of measuring the presence of antithyroid hormone antibodies through an ELISA method as part of the thyroid profile, especially in those cases in which unexpected T_4 and T_3 values are present. Nevertheless, it should be underlined that the presence of antibodies is not necessarily accompanied by a hypothyroid state. In some dogs a long time may pass between the detection of ATA, and hence of a subclinical thyroiditis, and the onset of this endocrine disorder. In addition, thyroiditis is not the only condition in which antibody positivity may be present; occasionally a temporary increase in antibodies may be found even in recently vaccinated dogs.

The presence of antithyroid hormone antibodies in the serum in subjects with lymphocytic thyroiditis can potentially interfere with methods for measuring T_4 and T_3, creating confusion in the interpretation of results. In these cases (<1%) the antithyroid hormone antibodies can falsely induce an increase in the concentrations of T_4 and T_3 such as to occasionally mimic a state of hyperthyroidism.

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COGNITIVE DYSFUNCTION SYNDROME: CAN WE STOP AGEING?

Gonçalo Da Graça Pereira

Egas Moniz School of Health and Science, Veterinary Medicine Department, Monte de Caparica, Almada, Portugal

Qualifications:

Gonçalo da Graça Pereira

DVM, MsC, PhD, Dip ECAWBM (BM), Dip ECAWBM (AWSEL)

Egas Moniz School of Health and Science, Charneca da Caparica, Portugal

Facebook: https://www.facebook.com/GGPEspecialistaComportamentoAnimal/

Instagram: https://www.instagram.com/goncalo_da_graca_pereira/?hl=pt

LinkedIn: https://pt.linkedin.com/in/gon%C3%A7alo-da-gra%C3%A7a-pereira-9499b245

Introduction

The Cognitive Dysfunction Syndrom (CDS) is a neurodegenerative pathology in older dogs and cats that is characterized by a cognitive gradual decline and increase of the brain disease. The early diagnose offer an opportunity of treatment as well as prevention of complications. To diagnose CDS, veterinarians usually use the history intake and adecquate anamnesis. Only with an adecquate anamnesis with correct information in take through a detailed questionnaire, the diagnose can be done and found the different stages of this pathology. So, the diagnose is initially based in clinical signs represented by the acronym DISHAA: a) **D**isorientation; b) **I**nteraction (changes in the interaction with people or other animals); c) **S**leep (change in sleep-awake cycle); and d) **H**ousesoiling (periuria). As the activity level can also show changes while time pass in animals with CDS, it was added an A from **A**ctivity. More recently another A, from **A**nxiety has been added to this acronym as generally these dogs have the fear/anxiety emotion-motivational system activated due all the clinical signs presented and brain functional changes. Once the signs are identified, every clinical condition that can cause or contribute to these signs should be excluded. As geriatric animal have frequently concomitant multiple diseases, the diagnose of a "medical" problem does not exclude the possibility of the CDS. Although behavioural changes are very common associated with cerebral aging process or CDS, other pathologies with non-behavioural origin have to be excluded in a first phase.

Aging and its effect in the brain

In dogs there is a decrease of the frontal volume, increase of ventricular size and there are evidences of meningis calcification, desmielinization, neuroaxonal degeneration and reduction of neurons number. There is also an increase of the activity of Mono-Amino-Oxidase B (MAOB). In cats there are also evidences of cerebral pathology associated to age, including neurons losing, cerebral atrophy, thickness of sulci, increase of ventricular size, but none of them are so marked as in dogs. A decline of the colinergic system can also be identified in dogs and cats and this can contribute to the congnitive decline and, possible as well, to the motor function, but also to the alterations seen in REM phase of sleep. Both in dogs and cats, as well as humans, there is an increase of the accumulation of difuse plaques of beta-amyloid and perivascular infiltrates. Nevertheless, this plaques, comparing to dogs and humans, are much more diffuse in cats.But the link between the beta-amyloid plaques and the CSD in cats is still in discussion, having studies showing a positive correlationand others that don't show it.

Strategies to "treat" CDS

Now that we saw some of the effects of brain aging, that are the origin of signs that we see in our patients with CDS, there is a specific need to see which are the strategies to delay this process. We want to improve the cognition of these animals, only delaying this process. Unfortunately the youth elixir was not yet found and we know that we will not stop this process, but only delay it.

a) Cognitive Stimulation

When we have an animal with CDS, the treatment with diet, drugs or suplements can be very useful in improving the signs and delaying the progression of this pathology and, above all, making the animal more tolerant to behavioural treatment/modification. Studies with dogs demonstrated that this is not simply an essential component in keeping the quality of life, but also an integrate part to maintain the cognitive function, using training, playing and/or exercise. This fact is similar to recent foundings in humans that shown that the education, cerebral and physical exercises delay the beginning of dementia. Moreover, the more recent scientific knowledge, namely studies on cerebral neuroplasticity from the National Institute on Aging, says that the combination between senior dogs and new "tricks" is essential for the wellbeing and mental health of this animals. The brain is an organ with plasticity and can be re-trained. When talking about animal training, the development of a plan that include cognitive stimulation, simple and that involve minimal stress is a strategy to follownot only in dogs, but in cats as well!

b) Pharmacotherapy

Before starting any medication, an health check-up must be done and also checked if any other medication is being given (or suplementation) with which can have any lateral side effects.

There are currently no drugs approved for cats. For that reason, the possibility of showing improvement on signs should be always analysed taking in attention potential side effects. Nevertheles, has been reported improvements in cases of CDS in cats with the use of Selegiline in the same dose as for dogs. The dose used vary from 0,5-1,0mg/kg, in the morning. Only some gastrointestinal signs were reported at the beginning of administration. Selegiline is an inhibitor of the Mono-Amino-Oxidase B (MAOB).It can increase the level of dopamine and other catecolamines in the cortex and hypocampus and has demonstrated improvements in the cognitive function (both in laboratoy and clinically), having at the same time an important role in the free-radicals' accumulation decrease in the brain. There should be a specially care with the simultaneous use of other MAO inhibitors as amitraz or other drugs that increase the concentration of serotonine (due the serotoninergic syndrom!).

Propentophiline is a potent vasodilator that increase the blood output to muscles and brain. For that reason it is licenced in some countries to treat apathy, letargy and depressive behaviour in the senior dog. It has been reported improvements in cats in a dose of ¼ of a pill of 50mg per day.

c) Nutritional and dietary treatment

Another strategy to delay the signs of CDS is the use of food suplements to increase the antioxidants defences and reduce the toxical effects of free radicals. In humans several studies show that the dietary management can reduce the risk or delay the beginning of dementia. For example, the high consume of fruits and vegetables, nuts, integral grains and vitamine E and C can reduce the risk of cognitive decline and dementia.

In humans, Alzheimer's Disease has been associated with many risk factors such as reduced cerebral glucose metabolism, deficiency in docosahexaenoic acid (DHA), chronic oxidative stress and chronic inflammation. With these factors in mind, PURINA® developed nutritional solutions (with medium chain triglycerides – MCT – and brain protection blend – BPB) that confirmed its benefits in managing clinical signs of CDS in dogs and enhancing cognitive function and slowing age-induced cognitive decline.

d) Complementary Treatment

In conjuntion with medication for CDS can be combined other drugs directed to specific clinical signs (always checking possible medication interactions).

In patients with changes on the sleep-wake cycle it can be importante to use an association with a benzodiazepine. Once lorazepam, oxazepam and clonazepam have not any active intermedious metabolites, they can be a good secure choice among the different benzodiazepines in patients that have alterations in the liver function.

Natural therapeutics that promote sleep and others that reduce the anxiety can be considered, including melatonine, aromotherapy and some nutraceutics, as alfa-caseine (Zylkéne®, Vetoquinol®) or a diet supplemented with this nutraceutic (Calm Diet®, Royal Canin®), the L-tryptophane combined with L-teanine (Calmex®, VetPlus®). Apart from all this, even not having studies done in this age of patients, since that pheromones help to decrease anxiety and stress, it can be a huge supportive help in these patients. The use of Feliway® (CEVA®), since its scientific proved efficacy in several studies, can be used to reduce anxiety. At the same time, reducing anxiety can promote the welfare and behavioural improvements observed in senior animals.

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PROTEIN-LOSING ENTEROPATHY IN DOGS - ARE BIOPSIES AND PREDNISOLONE REALLY REQUIRED?

Peter Hendrik Kook

University of Zurich, Clinic For Small Animal Internal Medicine, Zurich, Switzerland

Qualifications:

Peter Hendrik Kook

Professor, Dr. med.vet. Diplomate ACVIM (SAIM), Diplomate ECVIM-CA

pkook@vetclinics.uzh.ch

Protein-losing enteropathy (PLE) in dogs is an intestinal disease characterized by unselective intestinal protein loss. Intestinal lymphatic malfunctioning leads to lymphatic protein and lipid malabsorption. Histologically, it is characterized as a lymphoplasmacytic inflammation of varying severity with varying degrees of lymphatic dilation, also called intestinal lymphangiectasia (IL).[1] The main differential diagnosis, albeit much less commonly, is intestinal lymphoma.[2] Usually lymphoma dogs tend to be sicker than inflammatory PLE cases (weight loss, lethargy, concurrent anemia).[2] Classical PLE laboratory findings are marked thrombocytosis, hypalbuminemia, hypoglobulinemia and hypocholesterolemia. Hypocalcemia is associated with hypoalbuminemia but may also be due to low vitamin D concentrations. Low B12 concentrations are found in around 25 % of PLE cases but should always be measured, as B12-deficient dogs are often refractory to treatment until their B12 deficiency has been addressed.

The concurrent finding of low serum albumin and globulin concentrations points to the intestinal tract as the source of protein loss, but urinalysis (no relevant proteinuria) and serum bile acid testing (adequate liver function) rule out renal and hepatic causes of low albumin levels. Ultrasonography typically shows hyperechoic mucosal striations and speckles. It should be emphasized that not all dogs with PLE have these findings, and mucosal hyperechoic striations may also only be found focally. A small subset of diarrheic PLE dogs may have focally thickened jejunal or ileal bowl loop segments, usually with a prominent lamina muscularis propria, some loss of layering and often associated with a reactive mesentery. This focal lipogranulomatous lymphangitis is a discrete form of IL usually requiring surgical resection of the affected bowel segment. Other ultrasonographic findings may comprise mild mesenteric lymphadenopathy. Marked lymphadenomegaly should raise suspicion for possible lymphoma. Ascites in inflammatory PLE dogs is anechoic and a low protein transudate (decreased oncotic pressure). Marked ascites in the presence of only mildly decreased proteins should raise the suspicion of concurrent portal vein thrombosis.

With the above mentioned clinical, laboratory and imaging findings, the clinician can formulate a clinical diagnosis of PLE. Endoscopic biopsies can confirm the clinical diagnosis and are generally considered the diagnostic gold standard. However it should be noted that IL can also be segmental or focal, and though it usually affects the villous lacteal, in some cases it affects primarily the deeper parts of the intestinal wall.[1] Therefore, the typical histologic finding IL may be missed if only the proximal duodenum or only villi and superficial parts of the lamina propria are examined. The final histopathological diagnosis might simply be lymphoplasmacytic enteritis.

Not finding the hallmark histopathologic features of PLE is one thing. The other thing is that histopathologic intestinal findings do not correlate with response to treatment. For this reason the author prefers to start treating with diet first. Dogs with intestinal protein loss that respond to a low-fat diet do not have lymphoma and this is the most important differential diagnosis. In the authors experience, around 25 % of PLE dogs have only a partial response to low-fat diets and require additional budesonide or even prednisolone initially. Steroid doses can usually be tapered if they remain on a strict low-fat diet long-term.

To emphasize it once again, the most important part in the PLE management is the implementation of a low-fat diet.The fat content of current commercially available, highly digestible, low fat diets ranges from 1.7 to 2.6 g/100 kcal. Hills, Purina and Royal Canin all produce low-fat diets as canned and dry food diets. The authors routinely uses these low-fat diets in standard PLE dogs as a first line treatment, and around 70-75% of dogs with PLE respond to low-fat diets. This includes dogs with very low proteins and bicavitary effusions as long as they exclusively eat the recommended diet. The most important thing really is to convince owners that this relatively simple treatment works. The second most important thing is that the dog accepts the diet. If anorexia is present, only treating with low fat diet may be difficult and mirtazapine can be used initially as an appetite stimulant or dogs are started concurrently on corticosteroids. We usually re-check PLE dogs started on diet after 7-10 days. Dogs that respond to low-fat diet do so within this relatively short time frame. Proteins may not have fully normalized but an increase of 5-6 g/L is usually seen within 7-10 days. This first relatively early re-check is important in order to evaluate if feeding commercial low-fat diets are sufficient to control clinical signs and improve hypoproteinemia. Once owners realize that there is a response to dietary treatment, dietary compliance will improve. Dogs that do not response to a commercial low-fat diet may need a so-called ultra-low fat diet (ULFD) with < 1.5 g fat/100 kcal. In those cases, it is advisable to provide a veterinary-nutritionist formulated home-prepared diet. However, a relatively simple approach is to feed 2 parts skinless chicken or turkey breast and 1 part white potato without skin steamed in water (or white fish with cous-cous) (daily quantity = 2% (large dogs) - 4% (small dogs) of the dogs body weight) and re-assess proteins after another 7-10 days. This bit of additional dietary fat reduction is sometimes needed to see a response in dogs refractory to commercial low-fat diets. If clinical signs and proteins improve on an initially unbalanced ULFD, then the author gradually transitions dogs to a balanced diet. The mechanism behind the success of dietary fat restriction is thought to be a netto reduction in lymphatic pressure which in turn leads to decreasing leakage of proteins and lipids into the intestinal lumen. However, dietary fat restriction is also thought to decrease intestinal inflammation by means of improved lymphatic function.[1]

It is the authors experience that many dogs are clinically well controlled with dietary fat restriction even if their albumin does not fully normalize into reference intervals. The question is whether complete normalization levels is even necessary. Future studies following these dogs over the long term are needed to answer this.

For dogs that do not respond satisfactorily to dietary fat restriction the author uses anti-inflammatory doses of budesonide or less commonly prednisolone in combination with dietary fat restriction. Using budesonide or prednisolone depends on the nutritional status of the dog. In emaciated dogs, the additional catabolic effect of the systematically acting prednisolone should be avoided. The author also tends to believe that budesonide has less prothrombotic effects compared to prednisolone. Broadly speaking, I dose budesonide as follows: Toy breeds 0.5 mg SID, dogs < 10 kg 1 mg SID, dogs between 10-25 kg 1-2 mg SID, and dogs > 30 kg rarely get 3 mg SID (I rarely need 3 mg). This dose is then continuously tapered and many dogs can be managed long-term with 0.5 to 1 mg every 2nd or 3rd day. However, this regimen only works if owners continue to feed low fat diets. The most common reason for a PLE relapse is decreased dietary compliance. If prednisolone is needed in more severely affected dogs, the starting dose is 1 mg/kg SID.

There is a subset of dogs that need more aggressive treatment with a combination of low fat diet, budesonide or prednisolone, and a second-line immunosuppressants. But before I combine several drugs I want to be sure that at least once for 10 days ULFD was exclusively fed. If it comes to multi drug usage at all, the most common second-line drug I use is azathioprine.

PLE dogs should also be treated with supplementation of

deficiencies (e.g., B12), supportive therapies to improve appetite, and thromboprophylaxis. Dogs with PLE are thought to be at increased risk for thromboembolic events, although this is a rare complication in the authors experience. Until more information regarding the best thromboprophylactic approach in dogs with PLE is available, the usage of clopidogrel makes sense until serum albumin concentrations have climbed to > 20 g/L (our RI is 29-37 g/L).

Non-responding dogs may still require endoscopy. However, the main goal then is to exclude neoplasia which in my experience is an extremely rare finding.

In summary, *dietary management (fat restriction) is clearly the foundation of therapy in PLE dogs. Some dogs need marked dietary fat restriction (ULFD) in order to respond. Some dogs need additional budesonide or anti-inflammatory doses of prednisolone. Aggressive immunosuppression is usually not necessary in the majority of cases and especially higher doses of prednisolone (> 1 mg/kg SID) should be avoided in these dogs as muscle protein catabolism, hyperlipidemia, and thrombosis are particularly detrimental to these patients.*

Histologic confirmation of the suspected disease process (IL embedded in lymphoplasmacytic inflammation) is certainly ideal but at this point the histologic findings have no direct therapeutic consequences and the cost of endoscopic biopsies may also be put toward close clinical and laboratory monitoring as well as professional nutritional support.

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FLEA-BORNE BACTERIAL ZOONOSES

Peter Irwin[1],[2]

[1]*Murdoch University, Shool Of Veterinary Medicine, Murdoch, Australia,* [2]*Murdoch University, School Of Veterinary Medicine, Murdoch, Australia*

Qualifications:

Peter J Irwin

BVetMed, PhD, FANZCVS, MRCVS

P.Irwin@murdoch.edu.au

Introduction

It is estimated there are approximately 2,500 species and subspecies of fleas worldwide, the majority of which parasitize non-domesticated mammals and exist in sylvatic life cycles with their wildlife hosts. However, fleas (including those of domestic animals) are rarely monoxenous, and when conditions are right can feed on multiple hosts. Consequently, throughout history, fleas have been considered to be one of the most important ectoparasites of humans, responsible for zoonoses such as plague (*Yersinia pestis*) and murine typhus (*Rickettsia typhi*), and within domestic settings are important vectors of infectious agents such as *Bartonella* spp. and *Rickettsia* spp. The propensity of fleas to parasitise humans as alternative hosts is pertinent with respect to public health.

Fleas, Companion Animals and Humans

This abstract focuses on the two most important flea species of cats and dogs, *Ctenocephalides felis* and *Ct. canis*, and diseases they transmit, although it should be recognised that veterinary personnel, animal owners, and wildlife carers may be exposed to a wide range of other flea species that potentially vector pathogens, and should be proactive in preventing flea bites. Fleas cause hypersensitivity reactions and anaemia in pets and, in the case of flea-borne infectious diseases, the extent of pathogen-host coevolution seems to be a key predictor of pathogenicity. Some agents result in serious illness, whilst others are mostly clinically silent (i.e. subclinical) in our cat and dog patients.

***Bartonella* infections in dogs and cats**

The most relevant species implicated in companion animal practice are *B. clarridgeiae*, *B. elizabethae*, *B. henselae*, *B. koehlerae*, *B. quintana*, *B. rochalimae* and *B. vinsonii berkhoffii*. [1] All of these species have been associated with severe illnesses in cats or dogs and all have zoonotic potential. Cats are the reservoir hosts for *B. henselae*, *B. clarridgeiae* and *B. koehlerae* and for the most part are asymptomatic, yet experimental infections and focussed clinical studies report pyrexia (usually 'of unknown origin'), 'blood culture-negative' endocarditis/myocarditis, lymphadenopathy, neurological disease, ocular disease (uveitis), osteomyelitis and reproductive failure in a few individuals. [2] In dogs *B. henselae* and *B. vinsonii* subsp. *berkhoffii* are the main pathogenic species, although such infections may also be asymptomatic. Clinical manifestations are similar to those listed above, and also include vascular proliferative lesions, and granulomatous or pyo-granulomatous disease. Diagnosis of these 'stealth' organisms is challenging, requiring combined enhanced molecular and serological testing modalities. Treatment is not recommended in cats, unless clinically indicated, and currently a fluoroquinolone with doxycycline is usually the first-choice antimicrobial combination in dogs.

Cat Scratch Disease and other Zoonotic Manifestations of *Bartonella* infections

In humans, infection with *B. henselae* is well-characterized, most often associated with an acute, self-limiting, febrile regional lymphadenomegaly known as "cat scratch disease" (CSD). In recent years however a plethora of other illnesses have been associated with a range of *Bartonella* spp. infections in people resulting from exposure to arthropods (including fleas), animal bites and scratches, and needle sticks. [3] Symptoms and pathologies caused by *Bartonella* spp. in people are broadly similar to those in animals, with more recent studies focussed on associations with neurological diseases and psychiatric disorders. [4]

***Rickettsia felis* infections in dogs and cats**

Rickettsia species are obligate intracellular Gram-negative bacteria that are separated taxonomically primarily into the spotted fever group (SFG) and the typhus group (TG). *Rickettsia felis* has been found worldwide in specimens of *Ct. felis*, a confirmed biological vector. Despite its name and association with the 'cat' flea, recent research has confirmed that dogs, not cats, are the main domestic mammalian reservoir. [5] To date, disease associations between *R. felis* infections and dogs and cats, have not been substantiated.

Flea-borne spotted fever

In contrast to the asymptomatic nature of *R. felis* infections in dogs and cats, infection of humans (from flea-bite or contact with flea faeces) results in a febrile disease known as flea-borne spotted fever (FBSF), or cat flea typhus, characterised by a maculopapular rash, neurological signs, gastrointestinal symptoms, and cough. [6] Diagnosis of FBSF arises from clinical suspicion (including occupation and animal [flea] exposure of the patient) and confirmed by rising serological titres, sometimes with additional PCR. Treatment of flea-borne rickettsioses (generally with doxycycline) leads to a quick and complete recovery.

***Dipylidium caninum* infection in animals and people**

Dipylidium caninum, known as the flea tapeworm, is a common cestode of dogs and cats, and is also zoonotic. Oviferous capsules and eggs of the tapeworm are ingested by larvae of *Ct. felis* feeding in the environment, and develop in parallel with the maturing flea larva to its pupal stage. Subsequently, the *D. caninum* metacestode larvae are ingested while still within the flea by a cat or dog during grooming, and form adult tapeworms in the intestine of the pets within 4-6 weeks. Dipylidiasis in dogs and cats is generally mild or asymptomatic, but may cause hyporexia, intermittent diarrhoea and pruritus. Gravid *Dipylidium* segments (proglottids) resembling grains of rice are easily visible exiting the anus and on the hair coat or in the close environment of the pet, and are motile. Accidental ingestion of a flea (not the proglottids) by a human, usually a child, can result in a patent tapeworm infection, but again, rarely significant disease. Treatment of *Dipylidium caninum* infection in dogs and cats requires both an anti-cestode medication (e.g. praziquantel) and year-round flea control.

Haemotropic *Mycoplasma* infections in animals and people

Haemotropic *Mycoplasma* spp. (haemoplasmas) are unculturable, cell wall-deficient, Gram-negative bacteria that are located on the surface of the erythrocytes of numerous domestic and wild animals and, occasionally, humans, typically resulting in haemolytic anaemia. *Mycoplasma haemocanis* and *Candidatus* Mycoplasma haematoparvum the most frequently detected species in dogs, and *Mycoplasma haemofelis*, *Candidatus* Mycoplasma haemominutum and *Candidatus* Mycoplasma turicensis in cats. Subclinical infections with these (and some other) species are reported in dogs and cats, recrudescing only if the host is immunocompromised (e.g. splenectomy, cancer, glucocorticoid treatment).

Although long-suspected to be arthropod-transmitted, there is scant direct evidence of such a role for ectoparasites, although numerous studies have amplified haemoplasma DNA from fleas collected from cats and dogs. Experimental studies have shown that haemoplasmas can be transmitted in the controlled absence of ectoparasites [7], strengthening the hypothesis for transmission during inter-animal aggression and fighting. With very few exceptions, common haemoplasmas of dogs and cats are not reported to be zoonotic, however there are growing

numbers of publications incriminating recently described agents such as *Candidatus* Mycoplasma haematoparvum and *Candidatus* Mycoplasma haemohominis, usually in people with extensive animal contacts. [8]

Prevention and Control of Flea-borne infections

In the absence of vaccines to prevent flea-borne infections, the mainstay of protection is in the form of regular year-round flea control in the form of collars, spot-ons or oral formulations to minimise exposure to potentially infected fleas. There are multiple ectoparasiticide classes and compounds now available. [9] In some instances environmental flea control may be required to manage existing infestations. Additionally, good hygiene including washing hands thoroughly after handling pets and cleaning bite or scratch wounds is an important measure. Selecting an appropriate companion animal is essential for immunocompromised owners, and in the veterinary clinic care should be taken to avoid bites, scratches and needle injuries. Finally, blood transfusions have been identified as a risk of infection for many of these haemotropic organisms, so testing the donors should be an integral component of their management.

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075

APPLYING THE SCIENCE OF HUMAN BEHAVIOUR CHANGE TO DOG AND CAT POPULATION MANAGEMENT

Harry Eckman

Human Behaviour Change for Life, Human Behaviour Change, DE, United Kingdom

Qualifications:

Harry Eckman

harry.eckman@worldcetaceanalliance.org

Applying the science of human behaviour change to dog and cat population management

Presented by Harry Eckman, representing Human Behaviour Change for Life CIC

Although humans and dogs have lived in communities together for millennia, sometimes conflict can occur; for example, if free-roaming dogs chase people or foul public areas. In such situations it is important that a strategic, comprehensive approach is used to manage populations in a humane way.

The root cause of dog and cat population management challenges is human behaviour – what humans are doing, or not doing. If projects do not consider human behaviour, their impact will be limited. In this talk, we discuss the use of systems thinking to explore population management and note how human behaviour is not only the cause of many problems but also can provide the solutions.

Understand, Change, Impact as a model for change

At Human Behaviour Change for Life (HBCL), we first strive to understand as much as we can about the system behind the issue we are trying to address. We then identify what needs to be done to create the change required. Importantly, at every stage we ensure that we have a mechanism by which to measure the impact of our work. Throughout the process, feedback is provided to further hone each stage and we pull on a huge number of possible theories and tools at each stage of the process (Rogers & White, 2021).

Understand

There are usually many types of stakeholders involved including dog owners, people who feed community dogs, NGOs, local authorities, the tourism industry and so on. The beliefs, attitudes, values and behaviours of all these stakeholders can have a role in maintaining or preventing problems and it is vital that we understand the perspectives, attitudes, behaviours and more of each stakeholder before we try to implement programmes for change. Ensuring that we understand the relevant barriers and drivers involved enables us to ensure that changes we suggest are likely to address the cause of the issue and therefore be successful.

As part of the understand phase, we often use the transtheoretical model (Prochaska & DiClemente, 1983), which outlines 'stages of change' through five stages (pre-contemplation, contemplation, preparation, action and maintenance). This concept is useful to map the situation and what might be needed to move from one stage to the next. For example, sometimes local authority staff act in response to public pressure and take action that is not strategic regarding what we know about sustainable population management. The stages of change model might suggest that the staff of such local authorities might first be in the pre-contemplation stage, the possibility of a more strategic approach is not 'on their radar'. As awareness increases, the staff involved enter the contemplation stage, thinking a little about alternative options and becoming open to the possibility that there are strategic approaches that balance the need to control populations in a way that the communities affected can buy into. The preparation stage could include seeking professional input, for example from ICAM, and perhaps seeking more information through training. Next, the staff might be at 'action' stage, when they are implementing a pilot intervention under the guidance of professional support. Using this model, the maintenance phase could be that the local authority staff have used the approach in more areas, are monitoring progress and when faced with a new area seeking support are equipped with the knowledge and tools to know what to do. At any stage, the staff could regress back to a previous stage, for example due to changes in the political context or 'stories' in social media that go against the general progression through the stages.

Change

When we understand the situation, we can consider how best to change the underlying behaviours involved. There are many possible intervention processes including changing the environment to encourage the desired behaviour, restrictions (e.g., legislation), enablement, education, training and more.

When it comes to animal welfare including community engagement projects, we often assume that if we explain to people why change is needed, they will change the way they behave towards and manage their animals or animals in the community. However, we know that lack of knowledge is often not the primary barrier to change, so it is important to implement education elements of programmes alongside other activities.

There is a saying *"Tell me and I forget, show me and I remember, involve me and I truly understand".* Training elements of an intervention are more likely to be successful, if we understand that people learn and change if they are not told what to do through resources or typical top-down educational outreach, not just shown what to do through demonstration, but are truly involved in the process of change. For example, when training practical skills such as dog catching techniques, it is vital not to just tell people how to do it, not just show them, but involving them in the whole process so that they gain confidence and are likely to be able to repeat the procedure outside the training environment.

Several psychological concepts are also important to use. For example, confirmation bias is the human tendency to take on information only if it aligns with our current knowledge and beliefs and we discount information that does not. When we are considering community engagement it is important that we use values-based communication so that our 'messages' are not discounted through confirmation bias.

Impact

It is important to know if our activities to make changes at the individual, community or societal levels are working. We use the analogy of a 'dashboard' – identifying the key indicators of success regarding the problem we are trying to solve and how to measure them.

Summary

Behaviour change is complex – we must first understand the 'system' in which the behaviour we want to change lies. This will enable the most appropriate intervention to be planned and the impact of the activities to be assessed. This talk will provide some insight into some of the tools and concepts that can be used to apply the science of human behaviour change to companion animal population management.

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076

CANINE HYPOADRENOCORTICISM: ALL THE STEPS FROM DIAGNOSIS TO TREATMENT

Federico Fracassi

University of Bologna, Department Of Veterinary Medical Sceneces, Ozzano dell'Emilia, Italy

Qualifications:

Federico Fracassi

DVM, PhD, Dipl. ECVIM-CA (internal medicine)

federico.fracassi@unibo.it

Hypoadrenocorticism is the umbrella term for a range of naturally occurring or iatrogenic disorders that cause reduced function of the adrenal cortex and results in a state of glucocorticoid deficiency, mineralocorticoid deficiency or both. (Alive definition)

Classification and pathogenesis

Primary hypoadrenocorticism is due to adrenocortical injury. It can be naturally-occurring (most commonly immune-mediated) or iatrogenic due to surgery (bilateral adrenalectomy) or drugs (e.g. trilostane, mitotane).

Most dogs with primary hypoadrenocorticism have both glucocorticoid and mineralocorticoid deficiency, and consequently present with associated electrolyte disturbances.

Some dogs with mineralocorticoid deficiency maintain electrolyte concentrations within reference interval through an as of yet unknown mechanism. Based on the electrolyte alterations it is possible to carry out the following sub-classification:

Hyponatremic and/or hyperkalemic hypoadrenocorticism (defined as hypoadrenocorticism with hyperkalemia and/or hyponatremia)

Eunatraemic, eukalaemic hypoadrenocorticism (defined as hypoadrenocorticism with normal serum concentrations of potassium and sodium).

Secondary hypoadrenocorticism is a state of glucocorticoid or, less likely, mineralocorticoid deficiency due to lack of ACTH or renin, respectively.

Signalment

Hypoadrenocorticism has been reported in dogs aged from 2 months to 14 years, with a median age between 3 and 4 years. (Hanson et al. 2016)

There is a female predisposition (Hanson et al. 2016)

It has a strong heritable component in standard poodles, Portuguese water dogs, Nova Scotia duck tolling retrievers, soft-coated wheaten terriers and bearded collies.

Clinical features

The group of symptoms includes, but is not limited to, vomiting, diarrhea, inappetence, weight loss, lethargy, weakness, collapse, polyuria, polydipsia, shaking, abdominal pain, melena or hematochezia, and hematemesis. Physical examination findings are usually nonspecific and can include thin-body condition, dehydration, and a painful abdomen.

In dogs with acute hypoadrenocortical crisis approximately 30% of the time with signs of hypovolemic shock, including bradycardia or tachycardia, collapse, hypothermia, weak pulses, and poor capillary refill time

Laboratory findings

Hyperkalemia, hyponatremia, and hypochloremia represent the most consistent serum chemistry abnormalities among dogs with hypoadrenocorticism, particularly primary hypoadrenocorticism.

Hyperkalemia occurs in up to 95% of dogs with primary hypoadrenocorticism

The normal sodium to potassium ratio lies between 27:1 and 40:1. Dogs with primary hypoadrenocorticism frequently (95%) show ratios , 27:1, and sometimes , 20:1.

Other laboratory findings: increased total serum calcium (in up to 30% of cases), azotemia, hyperphosphatemia, hypercholesterolemia, hypoglycemia and increased alanine aminotransferase (ALT).

Hematologic abnormalities may include anemia, eosinophilia, and lymphocytosis

The absence of a stress leucogram (neutrophilia, lymphopenia, monocytosis, and eosinopenia) in a sick patient should prompt consideration of hypoadrenocorticism

Urinalysis often reveals impaired urine concentration ability; in patients with concurrent azotemia and isosthenuria, hypoadrenocorticism can easily be misinterpreted as primary renal disease

Endocrine tests

ACTH stimulation test (serum cortisol concentration measured before and 1 after administration of synthetic ACTH (5 µg/kg IV in dogs) is considered the most appropriate test to confirm hypoadrenocorticism

The ACTH stimulation test is considered positive when pre- and post-ACTH cortisol concentrations are <2 ug/dL

It is **essential to confirm that no exogenous glucocorticoids or progestogens are being or have been administered by any route**, **including topical**. The administration of such medications can produce false positive results up to two months after their discontinuation.

The ACTH stimulation test can be performed during initial stabilization and treatment if dexamethasone (one or two administrations) is used (does not cross-react with the cortisol assay); longer periods of treatment with dexamethasone will result in suppression of the adrenal pituitary hypothalamic axis and a false positive result for hypoadrenocorticism.

Measurement of endogenous ACTH should ideally be performed. Plasma ACTH concentrations are high with primary hypoadrenocorticism and undetectable to low with secondary hypoadrenocorticism.

Basal serum cortisol ≥2 µg/dL (55 nmol/L) allows to rule out hypoadrenocorticism. Basal serum cortisol ≤2 µg/dL (55 nmol/L) should NEVER be used to confirm the diagnosis due to the low specificity (63.3— 78.2%) (Lennon et al 2007). When basal serum cortisol ≤2 µg/dL (55 nmol/L) is detected, an ACTH stimulation test should be always performed.

TREATMENT

ACUTE TREATMENT

The initial goals of treatment of Addisonian crisis are to correct hypovolemia, hypotension, hyperkalemia and associated arrhythmias, hypoglycemia, and acidosis.

Intravenous fluids:

• Most dogs with acute severe hypoadrenocorticism will be severely hypovolemic. Initial fluid infusion should be up to 90 mL/kg of crystalloid solution given as 20 to 30 mL/kg boluses (over approximately 20 minutes) until the animal is hemodynamically stable.

• Traditionally 0.9% saline was the recommended crystalloid solution; however a disadvantage is the potential concern of increasing the sodium concentration too rapidly, which can result in central pontine myelinolysis. This is more likely to occur when the initial sodium concentration is <120 mEq/L. Sodium concentration should not increase by more than 10 to 12 mEq/L/day. Because of the potential disadvantage of 0.9% saline, some clinicians prefer using a buffer isotonic crystalloid solution containing low concentrations of potassium (4 to 5 mEq/L); e.g. lactated Ringer's solution or Normosol-R.

• If hypoglycemia is present, 50% dextrose solution should be added to the IV fluids to produce 5% dextrose solution.

If severe metabolic acidosis is present (serum bicarbonate concentration <12 mEq/L), administration of IV bicarbonate is indicated.

Treat hyperkaliemia

Potassium concentrations should be monitored every 6 hours in severe cases (>7 mEq/L) and every 24 hours in other cases.

Although most cases respond to fluid therapy alone, severe hyperkalemia (>7 mEq/L and/or bradycardia or other ECG abnormalities) may require additional therapy:

Slowly administration of 10% calcium gluconate (0.5 mL/kg) does not decrease the serum potassium but temporarily counteracts the impairment of myocardial excitability induced by hyperkalemia.

Intravenous administration of dextrose (1 to 2 g/unit of insulin) and regular insulin (0.2 U/kg) decreases the serum potassium concentration by driving potassium intracellularly.

Correction of metabolic acidosis will also promote intracellular movement of potassium.

The ECG or point-of-care potassium assays should be used to monitor response during the treatment of hyperkalemia.

Glucocorticoid/mineralocorticoid treatment

If immediate glucocorticoid supplementation is considered necessary before the ACTH stimulation test because the animal is hemodynamically unstable, dexamethasone (0.1-0.2 mg/kg IV) should be the drug of choice.

The most common author's choice is the administration of hydrocortisone at a dose of 0.625 mg/kg/h (Gunn et al 2016); another option is prednisolone sodium succinate (2 mg/kg IV initially, and then 0.5 mg/kg IV q12h

Other treatments

During an Addisonina crisis, supportive therapy, including gastro protectants and anti-emetics, is commonly necessary

LONG-TERM TREATMENT

Once the patient is stabilized, glucocorticoid and mineralocorticoid replacement therapy is required in most cases for the remainder of the animal's life.

Patients with confirmed eunatraemic, eukalaemic hypoadrenocorticism and secondary hypoadrenocorticism, require only glucocorticoid supplementation, adjusted based on clinical signs.

Glucocorticoid therapy

In the long term, the most commonly used glucocorticoid is prednisolone

In the first week, rather high dosages should be used, e.g., 1 mg/kg/day PO.

The dose should then be gradually tapered over several weeks until the lowest dose that will control the clinical signs and does not cause side effects has been identified.

In the long term, most cases require a prednisolone dose of 0.1 to 0.2 mg/kg/day PO.

Some dogs, particularly large breeds require less than 0.1 mg/kg/day

2) Mineralocorticoid therapy

Patients with evidence of mineralocorticoid deficiency (hyperkalemia and/or hyponatremia) should be treated with mineralocorticoids, such ad DOCP or fludrocortisone.

DOCP is administered at a starting dose of 1.5 mg/kg SC every 28-30 days initially (Sieber-Ruckstuhl et al 2019).

Alternatively, an oral mineralocorticoid replacement can be used (fludrocortisone acetate 5-10 µg/kg PO q12h as a starting dose).

Fludrocortisone has also glucocorticoid activity and in some dogs, the glucocorticoid component of fludrocortisone may be sufficient, and prednisolone may be discontinued.

3) Monitoring response to therapy

Monitoring the success of treatment is best obtained by concentrating on the clinical picture and the Na and K concentrations.

The dose of glucocorticoids should be adjusted based on the clinical signs

Measure Na and K concentrations 10 and 28 days (before the next injection) following the first administration of DOCP to determine whether the dose (10 days) and the dosing interval (28 days) are appropriate.

Adjust the DOCP dose at day 28-30 in 10-20% steps to achieve electrolytes within their reference intervals at day 10 and day 28-30.

Monitoring electrolytes at day 10 enables assessment of the peak effect of the dose

Monitoring electrolytes at day 28 enables assessment of the duration of the dose

Once the dose has been determined, a stable dog will have electrolytes within their respective reference intervals at days 10 and 28 during at least two consecutive treatment cycles using that same dose. Thereafter dogs should be reassessed every 4-6 months at the time of injection

When using fludrocortisone, dose adjustments should be made in steps of 0.05-0.1 mg based on clinical signs and electrolyte concentrations. Following the initiation of therapy, the electrolytes should be checked weekly until they stabilize in the normal range; thereafter, electrolytes should be checked monthly for the first 3-6 months and then every 3-6 months.

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077

SEPARATION RELATED PROBLEMS ON DOGS - A NEW PERSPECTIVE FOR TREATMENT?

Gonçalo Da Graça Pereira

Egas Moniz School of Health and Science, Veterinary Medicine Department, Monte de Caparica, Almada, Portugal

Qualifications:

Gonçalo da Graça Pereira

DVM, MsC, PhD, Dip ECAWBM (BM), Dip ECAWBM (AWSEL)

Egas Moniz School of Health and Science, Charneca da Caparica, Portugal

Facebook: https://www.facebook.com/GGPEspecialistaComportamentoAnimal/

Instagram: https://www.instagram.com/goncalo_da_graca_pereira/?hl=pt

LinkedIn: https://pt.linkedin.com/in/gon%C3%A7alo-da-gra%C3%A7a-pereira-9499b245

INTRODUCTION

Animal welfare can be seriously affected by separation related problems, being one of the most common behavioural problem (Overall, 2001, 2013; Bradshaw *et al* 2012). These problems can affect both dogs and cats, but are much more reported in dogs. The reason for that is related with all behaviour differences between both species, being cats much more subtile showing discrete signs or symptoms very different from what usually seen in dogs and even very different from case to case. The diagnose can be a challange in both species as many differential diagnoses must be considered. Treatment is dependent on the correct diagnose and many literature continue presenting approaches that can be very unproductive for the animal and its welfare. Despite the impact on animal wefare, the human-dog/cat bond bond can be disrupted leading to relinquishment of "healthy" animals or a decision to seek eutanasia (Salmon *et al*, 1998).

SIGNS

Dogs with separation related problems typically present excessive vocalization, destructive behaviour and/or elimination in the household, but during the owner(s)' absence or when can't have direct contact with the owner(s) (Pageat, 1998; Overall 2013). Althought these are the most common symptoms and also those that are annoying more the owner(s), there can be other less apparent and more subtiles, found both in dogs and cats, like anorexia, vomiting, diarrhea, changes in activity level, but also occuring only when left alone.

TREATMENT

Treatment includes making changes in the animal's environment (mainly to promote adequate stimulation – cognitive, physical and food enrichment, among others), psychopharmacology (to reduce anxiety level) and behavioural modification (to change emotional state to a positive one). The emotional change is the most important part of the treatment and the main goal is to: 1. Habituate the animal to be alone, and 2. Reduce the animal's "dependency" on the owner (Bowen & Heath, 2005; Sherman & Mills, 2008; Butler *et al*, 2011).

To achieve these two goals, the literature recommended several approaches, which currently are not recommended. Amat *et al* (2014) discussed that some of the approaches used in behavioural modification or behaviour therapy would be in contradiction to what is currently known about stress response. One important part is the predictability of the owner's departure and the other is the role of contextual fear in the treatment of this disease.

In the past it was said that one of the factors contributing to the anxiety response was the anticipation of owner's departure. Due an associative learning procedure, the animal associate several cues with the owner(s)' departure – like putting the shoes on, picking up the keys, wearing the coat, among others – we can commonly see in the recommended behavioural therapy, in order to reduce the anticipatory anxiety, to do a desensitization to these departure cues (giving false cues or leaving the household without this cues). However, the effectiveness of this technique was never studied and many of us faced that were not supporting the treatment and, in many cases, the animal improved during a certain period (for instance during the weekend, when the guardian(s) spent more time in this part of the treatment), but returning to the same or worse, suddenly, when the owner had to return to the daily routine and stop the process (for instance, due the fact that returned to work).

For that reasons, Amat *et al* (2014), after reviewing several publications in different animal species, including humans, concluded that predictability reduces the anxiety associated with highly aversive stimuli. Guardian(s)' absense is considered by these animals as a highly aversive stimuli. For this reason, the new recommendation is to increase the predictability of the caregiver(s)' departure not only maintining the cues but moreover by adding a novel cue. The reseachers team from University of Barcelona suggested a piece of white cardboard placed in the exit door just before departure and removing it on the returning (Amat *et al*, 2014). Another recommendation is that this cue should be different from another one used during the fake departures, which can be used to gradually habituate the dog to stay alone. Instead of a white cardboard, a black one can be used. Amat *et al* (2014) recommended as well that when the animal is able to stay all by himself for sixty minutes without signs of anxiety, the cue used during the training sessions (here suggested the black cardboard) should be used to signal daily "non-training" departures (like going to work or others apart from training and not controlled).

Another recommendation that can be seen in the literature is that the animal should be left alone in a particular place in order to reduce the inconveniences coming from this behaviour problem (specially destruction). However this animals can suffer from contextual fear associated with this location, and this can be even worse if they have no predictability! For this reason, currently is recommended, whenever is possible, that during the gradual training of habituation to be left alone (fake departures), that location vary from that where the animal is being currently left alone. This location should be trained in advance to be seen as a safe-place for the animal.

Finally, another common recommendation is to ignore the animal a certain amount of time (usully differing from author to author) before leaving the house and when arriving. The main idea was not to "reinforce" inadequate behaviours. However, remember that these animals are under a very negative emotional state, and we will not reinforce negative emotions. Apart from that, when the animal is ignored, there can be animals that take 30 minutes to calm while other 15 minutes or 1 hour. And during this period, the animal is still under a high stressful period, because what he was desiring (the contact with the human being(s)) is being denied. For that reason, it is recommended to calmly greet the animal up on the arrival and ask him for a previously conditioned behaviour associated with a positive emotion (here we can use relaxation protocols or simply incompatible behaviours trained under positive emotional state). It is always important to remind that behaviour modification or therapy is changing the emotional state of the animal. When treating an animal with a behavioural problem, we are treating emotions!

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TICK-BORNE RICKETTSIA AND ANAPLASMA SPECIES INFECTING DOGS AND CATS

Filipe Dantas-Torres

Aggeu Magalhães Institute, Department Of Immunology, Recife, Brazil

Qualifications:

Filipe Dantas-Torres

MV, MSc, DSc, PhD, Dipl. EVPC, FRES

Tick-borne pathogens (TBPs) are acknowledged to be an important cause of disease (TBDs) in animals and humans worldwide (1). TBPs include numerous protozoa, bacteria, viruses, and, to a lesser extent, helminths. While both soft (Argasidae) and hard ticks (Ixodidae) can act as vectors of pathogens to animals and humans, hard ticks are undoubtedly the most important from a global perspective.

Dogs and cats can be infected by numerous species of bacteria belonging to the genera, including *Anaplasma*, *Borrelia*, *Bartonella*, *Ehrlichia*, and *Rickettsia*. Concerning the genus *Anaplasma*, both dogs and cats can be infected by *Anaplasma phagocytophilum* and *Anaplasma platys* (2, 3). Additionally, *Anaplasma bovis* has been molecularly detected in cats in Japan (4). Finally, undescribed *Anaplasma* species have been detected in cats from Italy (5) and Brazil (6). Infections in cats are usually asymptomatic (3).

Anaplasma platys is the agent of cyclic thrombocytopenia in dogs (2) and in cats it has been associated with the presence of unspecific clinical signs (7, 8), being its pathogenic role not clearly established in felines (3). Cats naturally infected by *A. phagocytophilum* can present non-specific clinical signs, including fever, anorexia, lethargy and dehydration. Some cats may present some clinicopathological abnormalities including mild or moderate thrombocytopenia, anemia and lymphopenia. Dogs usually develop a self-limiting febrile illness, 1-2 weeks after infection.

Different *Rickettsia* species have been reported in dogs and cats, including *Rickettsia rickettsii*, *Rickettsia conorii*, and *Rickettsia massiliae* (3) and undescribed spotted fever group rickettsiae (3, 9). Clinical signs have been associated with *R. rickettsii* infection in dogs in the United States and Brazil (10).

Diagnosis of *Anaplasma* infections in dogs and cats may be achieved by cytology (blood or buffy-coat smears), serology (immunofluorescence or ELISA) or PCR (conventional or quantitative PCR). Cytology is useless for detecting *Rickettsia* infections, which should be diagnosed by serology or blood PCR. Serological results should be interpreted with caution; a negative result does not rule out the infection and a positive result does not confirm active infection. Cross reactions may also occur (2, 3). Blood PCR is certainly more sensitive especially in the acute phase of infection.

Doxycycline (5 mg/kg q12h or 10 mg/kg q24h PO for 28 days) is the treatment of choice to treat *Anaplasma* and *Rickettsia* infections in both cats and dogs. Animals usually respond well to treatment, but may remain persistently infected.

In conclusion, both dogs and cats can be infected by various species tick-borne *Anaplasma* and *Rickettsia* worldwide. While many infections may be asymptomatic, some dogs and cats can be presented with non-specific clinical signs and/or clinicopathological abnormalities. Proper diagnosis and treatment are pivotal to avoid disease progression. In this regard, ehrlichiosis and babesiosis should be included in the differential diagnosis, as these diseases are usually more prevalent and overlap in distribution.

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079

FELINE ORAL PATHOLOGY

Lisa Mestrinho

Veterinary Faculty, University of Lisbon, Clinical Department, Lisbon, Portugal

Qualifications:

Lisa Alexandra Pereira Mestrinho

DVM, MSc, PhD, FAVD, DAVDC

lmestrinho@fmv.ulisboa.pt

Feline oral disorders are highly prevalent, approximately 20% reported in first opinion practices in UK (1), highlighting the need to more effective interventions to improve health in pet cats.

Learning goals: revise the most frequent oro-dental diseases and be up to date with diagnosis and indicated treatments. Improve primary care and/or refer to a specialist when necessary. Traumatic and oncologic diseases are not discussed in this session.

Periodontal disease

It is the most frequent disease in pet cats. This is not just a bacterial disease, it depends on several factors, dental plaque, and host immune response. Age is important since it is positively related with time persistence of dental plaque in the absence of regular oral hygiene. Intrinsic factors such as breed, malocclusions or trauma can contribute to an early onset of this disease. Comorbidities that have an impact in immune response can also be related to an early onset or act as aggravating factor. Maximum periodontal probing in a healthy cat is 1 mm. Increased probing relates to loss of clinical attachment. Scaling, polishing, and root planning are the bullet points of treatment, but prevention is the most important measure. Dental Xray is mandatory from the staging to extraction, especially since tooth resorption can also be diagnosed concurrently.

Juvenile gingivitis

Juvenile or early onset gingivitis is related with tooth eruption since it is diagnosed around 6 to 8 months. Can be self-limiting in most cases but can evolve to early periodontal disease (2). Etiopathogenesis in unclear but probably multifactorial in which genetic predisposition might be included. Periodontal treatment, including gingivectomy and long-term management with tooth brushing and monitoring is the current recommendation. Owners must be informed about possible extractions in the long term.

Tooth resorption

The etiopathogenesis of this disorder continues to be unclear and treatment approaches remained unchanged. The two main resorption types (1 and 2) are distinguished radiographically. Both are significantly associated with age and type 1 with inflammatory conditions. Indeed, recently TR type 1 has been associated with a different oral microbiota supporting the inflammatory etiopathology (3,4). Additionally, this type is more associated with clinical signs, compared with TR2, especially because in the latest type, lesions remain sub-coronally. The knowledge obtained so far reinforces the argument for complete extraction in cases of TR type 1. For TR type 2, since it features replacement resorption and at time of diagnosis most of root is completely resorbed, crown amputation can be considered. Early type 2 lesions might not be associated with any signs like replacement resorption lesions described in humans. However, they should be closely monitored since they can evolve and lead to pain.

Chronic gingivostomatitis (caudal stomatitis)

This multifactorial inflammatory disease is characterized by bilateral distributed ulcero-proliferative lesions at the gingiva, alveolar, labiobuccal mucosa, caudal mucosa, and tongue. Signs vary from moderate to severe - oral pain, weight loss, halitosis, lack of grooming or anorexia/disorexia.

Histopathology is nonspecific, reporting lymph and plasma cell infiltrates compatible with a cytotoxic cell mediated immune response related with a viral trigger, in which FCV has been the most investigated virus (5,6). This study is also useful to discard other causes, especially in case of asymmetric lesions, e.g. squamous cell carcinoma. Chronic exposure in multi-cat environments can lead to an increased occurrence of this disorder in susceptible individuals. Retroviral diseases are important comorbidities which impact prognosis. Cats with FeLV carrying chronic gingivostomatitis have a worse prognosis when compared with FIV (7). In this author's opinion it is important to determine retroviral loads to define appropriate treatment in these cats, since in the presence of high viral loads immunosuppressive treatments is not indicated.

Dental extractions are the recommended first line treatment since it is associated with improvement of about 2/3 of cases but cure of 1/3. Regardless, 2/3 of owners consider that their cat significantly improved after extractions. Since there is no difference reported between full or partial mouth extractions or even staged, full mouth extractions might not be necessary in all cases.

Treatment bullet points:

- COHAT and dental extractions

- Chronic pain management

- Control secondary infection – antimicrobials, antiseptics

- Control retroviral disease when present – feline interferon

- Local treatments - topic gels

- Anti-inflammatories – NSAID or corticosteroids (anti-inflammatory dosage)

- Immunomodulation treatments – cyclosporin, feline interferon, mesenchymal stem cells

Eosinophilic granuloma

Eosinophilic granuloma is the oral manifestation of a hypersensitivity base disorder which can also manifest in the oral cavity. Granuloma lesions can occur at the dorsal tongue, sublingual mucosa, and palate while indolent ulcer occur in the lip. Biopsy is critical to confirm diagnosis and discard other differentials. Treatment is chronic and complex, collaboration with a dermatology specialist can be fruitful.

Treatment bullet points:

- Dermatologic approach – investigate hypersensitivity cause, ectoparasite control and hypoallergenic diet

- Local treatment – periodontal treatment to control plaque, cytoreduction of lesions if applicable

- Systemic treatments – corticosteroids, ciclosporin

Pyogenic granuloma

This disorder appears as a local exophytic proliferative lesion apical to the mucogingival line, varying from pink to yellowish, sometimes ulcerated. It is associated with chronic low-grade irritation seen in posterior teeth malocclusions causing trauma. Mostly between maxillary forth premolar to mandibular molar. This chronic trauma can also lead to significant periodontitis with gingival recession and bone loss. The malocclusion must be studied to determine which is the best treatment option. Excision alone of the exophytic mass does not resolve the problem in most cases

and extraction of the traumatizing tooth(teeth) may be necessary.

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080

HIGH RISK PREGNANCY: CLINICAL CASES

Sabine Schaefer-Somi

Platform AI and ET, Vetmeduni Vienna, Small Animals And Horses, Vienna, Austria

Qualifications:

Sabine Schäfer-Somi, Prof.

sabine.schaefer@vetmeduni.ac.at

High risk pregnancy: clinical cases

Manifold disturbances may occur during canine pregnancy (1); the following will be discussed as case-reports.

1.Delay of parturition

In dogs, the normal duration of pregnancy is 63 ± 1 days from ovulations; gestation period from day of first mating on may vary between 57 and 72 days (2). A delay of parturition can have manifold reasons. **Singleton pregnancies** are at risk because mostly parturition will not occur. When the mother appears ready for parturition and the fetus ripe (table 1), only a few days remain until a decision should be made as to c-section or induction of parturition. The latter is a risk and takes two days, and a c-section may become necessary despite the induction. In some cases, one or two days after the final control, the bitch can give birth to a healthy puppy naturally; the author repeatedly observed this in small and toy breeds. But preterm loosening of the placentas may cause another emergency. It is recommendable to estimate the stage of gestation and to inform the owner about the risk of either method. When the day of conception is known, a final control should be done at day 59/60 and the owner advised about the required controls; a final decision should be done not later than until day 64.

Delay of parturition may also occur, when the number of fetuses exceeds the average number within the respective breed. In this case, the weight of the fetuses prevents normal contractions and the high energy requirements for fetal growth stresses the mother's metabolism; severe acidosis with lethargy, inappetence and exsiccosis is the consequence and if not treated, the fetuses will remain too small and will be weak after c-section. Regular clinical and sonographical controls until the fetuses are ripe are necessary.

Table 1. Estimation of gestation time, recommended parameters (combinations recommendable)

Intestines and layers well visible within 2-8 days before parturition, increase in fetal gastrointestinal motility 5 days before parturition
Biparietal diameter (BP): accuracy: ± 2 days in 81-88% of cases. Formulas: · BP in small size bitches: DBP = (mm – 25.11)/0.61; · BP in medium size bitches: DBP = (mm – 29.18)/0.7 (also for large size bitches): accuracy ± 2 days
Body diameter (BD); Formula: 42.11-(12.75 x BD in cm)+ (1.17 x BD^2 in cm)
Body diameter and biparietal diameter: increases accuracy; Formula: 34.27 – (5.89xBP in cm)- (2.77 x BD in cm)
Inner chorion cavity (ICC): accuracy: ± 2 days; Formulas: · ICC in small size bitches: DBP = (mm – 68.68)/1.53; · ICC in medium size bitches: DBP = (mm – 82.13)/1.8
Kidney length (L), cortical (CT) and medulla thickness (MT), and CT:MT ratio; accuracy for L decreases after day 5 before parturition
Progesterone measurement: serum-concentration <3.18 nmol (1 ng/ml) at 24 h before parturition, < 8.7 nmol/l at 48h before parturition

The mother must receive high-calory diet in a proper formulation, small amounts over the day. Intravenous infusions can be necessary to correct the acidosis and exsiccosis and finally an electiv c-section must be planned. A seldom reason for delayed parturition is a **luteal cyst**. In our clinic, a pregnant four year old bitch was introduced 68 days after mating. Clinically, she was well prepared for parturition and the fetuses were ripe and vital. Serum progesterone was still at 24 nmol/l. Therefore, a c-section was done and six puppies delivered. Several ovarian luteinized cysts and an acute purulent endometritis were detected. Luteinized cysts are rare in dogs and have never been described in pregnant dogs. This should be considered in case of delayed parturition and the serum-progesterone value measured if possible.

2.Hypoluteinism

Hypoluteinism can be idiopathic (primary) or due to luteolysis caused by any disease or inflammatory disturbance (secondary) (10). A tentative diagnosis is possible, when brown-bloody, non-smelling, mucilaginous vaginal discharge appears, without disturbance of well-being. Sonographically, resorption, fetal maceration and abortion can be detectable. Progesterone (P_4) concentrations <5 ng/ml in gestational week 4 or 5 indicate the need for supplemental treatment (for example 0.1 mg/kg medroxyprogesterone acetate SOD until the fetuses are ripe). Progestins must not be given during the embryonic phase as some are teratogenic (1). In one case, P4-concentration after substitution of natural progesterone was stopped at day 58 of gestation but was still at 21 nmol/L at day 64, when a c-section was done. Progesterone metabolism is highly individual. Supplementation must be avoided in case of **bacterial infection**, since intoxication as well as sepsis may be the consequence. Bacterial infections are mostly caused by *E. coli,* streptococci, staphylococci, enterobacteriaceae, Proteus spp, Klebsiella spp, *Mycoplasma canis* or *Ureaplasma canigenitalium*. The only canine-specific bacterium is *Brucella canis* that requires special attention because of high pathogenicity and because infections of humans are possible (zooanthroponosis). Clinical signs of bacterial infection include smelling vaginal discharge of variable colour, fever and anorexia. Sonographically different stages of resorption or fetal maceration or dead fetuses can be seen. The diagnosis should include clinical examination, vaginoscopy and vaginal cytology, a swab or aborted material for bacterial examination, sonography, blood picture, ev. a blood sample for *Brucella canis* detection (antigen assay, blood culture or serology). In one case of a supposed bacterial infection with one alive fetus and another macerated fetus in one horn, the bitch was solely treated with antibiotics. The remaining fetus survived and was developed by c-section.

3.Uterine torsion

Torsion of the uterus may concern a single ampulla, one uterine horn or the whole uterus. The problem mostly occurs during parturition, seldom during late pregnancy. Clinical signs are unspecific; most bitches have a painful abdomen and there is no progress in parturition, some develop high fever and may finally collapse. During parturition, the torsion may occur before birth of a fetus or after birth of one or several fetuses, resulting in stop of parturition. In case of one-sided rotation, when the twisted organ starts to swell because of venous congestion, the ipsilateral side of the abdomen appears bulged. Sonographically, placental fluids are

augmented and jeopardized or dead fetuses may be visible. Usually, the signs are unspecific and only laparotomy will reveal the diagnosis. In one dog, high fever occurred at the end of gestation and the bitch was apathic – the owner reacted quickly, and vital puppies could be developed from the twisted and highly edematous uterus via c-section. However, in many cases, the operation comes too late and besides irreversible lesions of the uterus, the puppies are frequently dead. Therefore, any case of high fever and painful abdomen could be caused by uterine torsion and a c-section will be necessary.

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081

NOISE REACTIVITY IN DOGS AND CATS

Gonçalo Da Graça Pereira

Egas Moniz School of Health and Science, Veterinary Medicine Department, Monte de Caparica, Almada, Portugal

Qualifications:

Gonçalo da Graça Pereira

DVM, MsC, PhD, Dip ECAWBM (BM), Dip ECAWBM (AWSEL)

Egas Moniz School of Health and Science, Charneca da Caparica, Portugal

Facebook: https://www.facebook.com/GGPEspecialistaComportamentoAnimal/

Instagram: https://www.instagram.com/goncalo_da_graca_pereira/?hl=pt

LinkedIn: https://pt.linkedin.com/in/gon%C3%A7alo-da-gra%C3%A7a-pereira-9499b245

Introduction

Anxiety disorders, fear and phobias are among the most common behavioural problems of companion dogs. These problems include generalized anxiety, separation related problems and phobias of specific stimuli such as storms, fireworks, or other noises. In each of these disorders, affected dogs exist in a state of heightened arousal and distress. They may cause damage to their surroundings or themselves as an expression of their anxiety. As such, anxiety disorders represent an important welfare issue for affected dogs and may negatively impact the human-animal bond, becoming one of the major reasons for relinquishment of animals to shelters.

There are many possible causes for anxiety disorders and reactive behaviours to different stimuli. Among other causes, the following are the most commons: a) insufficient socialization (including impossibility to express normal behaviour and/or unpredictable social interactions); b) Central Nervous System fear pathways unregulated; c) Traumatic event (including severe or frequent positive punishment); d) Genetic predisposition; e) Pain (or other medical issues) and f) Cognitive decline.

Signs of light fear (subtle and commonly not understable as fear by the owners) to severe uncontrollable fear (know as phobias) are common causes of referral to behavioural practices. The most commonly reported reported reactivity is to noise (also known as sound phobia), being fireworks and thunderstorms the most common triggers. Sometimes, dogs with separation related problems, can have its origin in sound phobias.

Assessment and Diagnose

We can consider 2 different phases that each animal can arrive to our consultation. To make it easier, it will be considered phase 1 and phase 2.

Phase 1

Animals show signs of fear only when expose to a specific noise. During this event tries to hide. Usually, predicting the events, can engage in a copying strategy to control the behavioural expression of its emotional state.

Phase 2

Fear becomes more severe and the avoiding or predicting strategies fail. The sound is now experienced in a sensitising context that will lead to more serious complications. From these complications there are 2 that are very important. The first one is the excessive sensitivity to sounds, especially the unexpected ones. The other important complication is the generalisation that can occur in this phase. The generalisation can be related to individual sounds, but also to contexts and predictive cues associated to this trigger. These complications result in disruption of the daily life of the animal (and its owner).

It is really important to keep in mind that any phase 1 can progress to phase 2. Unexpected exposure, altering access to hiding places, impossibility to control the exposure, are some of the factors that can influence this progression.

Management of noise related behaviour problems

The aim of managing this behavioural problem is supporting the animal to develop copying strategies. To make a good management it is required a not simply environmental management (guarantee always access to hiding places or refuges), but also alterations in human interaction. Owners should never use positive punishment or even force the animal to the face the sound that develop the fear signs. Instead, owners should act as a role model, as not bothered with the sounds and not worried. Ignoring the fearful animal is also something inadequate, but still being recommended. Giving support and asking for an alternative and incompatible behaviour (previous trained with positive reinforcement) will help the animal to move its emotional state to a positive one.

Treatment

Treatment is based in 3 strategies: behavioural modification, pharmacological intervention and pheromonetherapy.

Behavioural modification

Dessensitization and counter conditioning is the basis to treat this animals. However the knowledge of clients to apply an adequate plan is usually low. Thus, making sure the client understand exactly all the steps and have someone (trustable animal trainer or a behaviourist) to support the behavirоural modification plan. There are many limitations in the treatment, and every step must be well previously thought to guarantee no mistakes can happen.

Pharmacological intervention

Drugs are appropriate when there is generalization, complications, cognitive imparement, affected welfare and the inducing event may cause a relapse or worsening of the problem.

Never use acepromazine as increase the sound sensitivity and reduce escape response, but also can cause disorientation and confusion, including may disinhibit aggression. In short term medication, benzodiazepines can be recommended (being diazepam or alprazolam the most suitable). There are advantages in its use: amnesic effect, anxiolytic properties and dose related sedation. However can lead to paradoxic effect with increase of excitability, cause disinhibition and impair learning. Transmucosal medetomidine (Sileo®) has been used with very good results around the world, being a great option to be used, but with owners that can apply it correctly.

In long term medication, Selegiline or Sertraline can be used. Selegiline can be used when there are patterns of behaviour that are inhibitied or avoiding. Also in cases with profound generalization or high level of sensitivity. Sertraline is indicated also with high level of sensitivity. However when predominant feature is anxiety or significant panic elements.

Pheromonetherapy

Pheromones can play a long term in long term treatment approaches. Adaptil® or Feliway® can increase the appeasing qualities of the environment supporting the behavioural modification plan.

Conclusions

From welfare perspective and quality of life, these animals deserve appropriate management and/or treatment. When left without intervention, these conditions can get worsen.

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CANINE ACUTE DIARRHEA: ARE ANTIMICROBIALS INDICATED? THE VERDICT OF THE LATEST EUROPEAN GUIDELINES

Fergus Allerton

Willows Veterinary Centre and Referral Service, Internal Medicine, Solihull, United Kingdom

Qualifications:

Fergus Allerton

BSc BVSc CertSAM DipECVIM-CA FRCVS

fergus.allerton@willows.uk.net

Canine acute diarrhoea: are antimicrobials indicated? The verdict of the latest European Guidelines

Acute diarrhoea

Gastrointestinal disease is a frequent motive for veterinary consultation in the UK accounting for 3% of total canine and 2% of all feline consults (1). This study, involving the records from more than 3000 dogs with acute diarrhoea seen in primary practice classified the clinical signs as mild (84%), moderate (15%) or severe (1%) highlighting the commonly mild form of disease seen in practice. Even where the aetiology remains unknown, the prognosis in most cases is excellent. Acute diarrhoea will typically resolve with appropriate supportive therapy (dietary modification), within 3-5 days.

Despite the predominantly mild presentation of disease and the very favourable prognosis without treatment, acute diarrhoea remains one of the most commonly-cited reasons for antimicrobial use in dogs (2). Various studies have reported antimicrobial (specifically antibiotic) prescription rates of 50-65% in dogs with acute diarrhoea (1,3) with (in the UK), metronidazole the most frequently administered antibiotic followed by amoxicillin-clavulanic acid. The likelihood of antibiotic prescription is typically higher if the diarrhoea contains blood or if the dog was pyrexic at presentation.

ENOVAT

In 2019 the European Network for Optimization of Veterinary Antimicrobial Treatment (ENOVAT) was established as a European Cooperation in Science and Technology (COST) Action CA18217 with, among others, the objective to optimize veterinary antimicrobial use via the development of clinical practice guidelines on antimicrobial prescription use. A drafting group was created to produce guidelines for canine acute diarrhoea using the AGREE II instrument and the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) approach (4) to qualitatively assess the evidence and provide confidence levels in the recommendations generated.

The guideline group consisted of 17 panel members, representing the veterinary clinical fields of gastroenterology, internal medicine, infectious diseases, general medicine and/or nutrition, veterinary microbiology, veterinary pharmacology, veterinary epidemiology and veterinary public health. PICO-questions (population, intervention, comparator, outcome) were drafted by the oversight committee and addressed key features of antimicrobial-use decision making in dogs with acute diarrhoea.

Of the six PICO questions, three concerned the use of antimicrobials and the use of nutraceuticals. The population of dogs with acute diarrhoea was separated into six subgroups according to systemic disease severity, response to fluid therapy and whether the diarrhoea was haemorrhagic or non-haemorrhagic. Dogs with mild disease would typically be treated as out-patients and would manifest no clinical signs of dehydration or hypovolemia. The presence of blood in mild disease may be best described as haematochezia. Dogs with moderate disease are deemed to warrant fluid therapy and supportive care, and are likely to be hospitalized. They may present signs of systemic disease, e.g., tachycardia due to dehydration/hypovolemia, although this would be expected to resolve rapidly with adequate fluid replacement. The most seriously affected category, the severely affected dogs were described as having moderately to severely depressed mental status and signs of dehydration or hypovolaemia consistent with severe vascular compromise/shock. Dogs in the severe disease group require aggressive fluid therapy and intensive care. It must be remembered that this latter category represents a rare variant of acute diarrhoea in clinical practice. Such patients are likely to be regarded as critically unwell and should therefore be readily distinguishable from those dogs in the moderate and mild disease groups. Dogs with both moderate or severe disease may present with haemorrhagic (acute haemorrhagic diarrhoea syndrome/AHDS) or non-haemorrhagic diarrhoea.

Literature screening

To address these questions a methodology taskforce (subgroup of the panel) screened the veterinary literature. The search yielded 1068 articles which were carefully evaluated by at least two reviewers until only six randomized controlled trials (RCT) remained that offered some evidence to answer the PICO questions. In total data pertaining to 232 dogs was extracted from these 6 studies all from the mild and moderate categories of disease. There were no studies that described management of severely affected dogs with acute diarrhoea without antimicrobial therapy, likely reflecting the current consensus that such dogs, with clinical signs consistent with possible sepsis, should be offered appropriate antimicrobial therapy as standard of care.

Key studies

In the case of acute haemorrhagic diarrhoea syndrome (AHDS), previously termed haemorrhagic gastroenteritis, there was evidence to suggest that antimicrobials are not required (5) as a randomised, placebo-controlled trial found non-inferiority, in terms of morbidity and mortality, for dogs with AHDS receiving a placebo compared to systemic amoxicillin-clavulanate (5). Interestingly another RCT, performed in primary practice, but not included in the metanalysis, found no difference in outcome for dogs receiving amoxicillin-clavulanate versus those on amoxicillin-clavulanate and metronidazole (6).

Another double blinded placebo-controlled RCT looked at the effect of metronidazole treatment on the duration of acute diarrhoea (7). Although a small but statistically significant reduction in the duration of diarrhoea was found in the metronidazole-treated group (mean time down from 3.6 to 2.1 days), this difference may not be sufficient to warrant systematic antibiotic use in this patient group. Indeed, as part of the ENOVAT work, efforts were made to engage principal stakeholders (the pet owner and primary care practitioners) in defining meaningful thresholds where the clinical benefit of reduced diarrhoea would outweigh the wider impact of treatment including the potentiation of AMR.

These articles formed the basis of the systematic review and meta-analysis performed to assess the effectiveness of antimicrobials for treatment of acute diarrhoea. The analysis found high certainty evidence that antimicrobial treatment does not reduce the duration of diarrhoea in mildly and moderately diseased dogs irrespective of antimicrobial class or duration of treatment. Antimicrobial treatment also failed to affect other outcomes favourably, including mortality, duration of hospitalization, and progression of disease. As mentioned above, no evidence was found in dogs with severe disease, reducing the level of certainty in the interpretation of results for this population.

Translation into ENOVAT guidelines

Recommendations were drafted by the panel in May 2022 in a face-to-face hybrid meeting in Copenhagen. The conclusions of the meta-

analysis have been incorporated into the new ENOVAT guidelines for the use of antimicrobials to manage canine acute diarrhoea. These strong recommendations with a high certainty of evidence, advocate the avoidance of antimicrobial use in the management of dogs with acute diarrhoea categorised as mild or moderate disease. This recommendation applies equally whether or not there is blood in the diarrhoea. For dogs with acute diarrhoea classed as severe disease, the use of antimicrobials is conditionally recommended (albeit with a low certainty of evidence). Antimicrobial selection should be broad and designed to cover the potential threat from aerobic and anaerobic, Gram positive and Gram negative bacteria. Such drug combinations may include the use of aminopenicillins or clindamycin combined with fluoroquinolones or aminoglycosides typically for a short period (< 7 days) determined by the clinical progression of the dog.

It is hoped that, once published, the ENOVAT guidelines can form a framework for national organisations to generate, region-specific versions of the guidelines that can be disseminated across Europe and beyond. Through a collaborative approach, incorporating the available veterinary evidence, these guidelines can champion improved antimicrobial stewardship and hopefully lead to reduced antimicrobial use for this common presentation. An educational animation has been developed for pet owners to communicate key messages regarding AMR and antimicrobial stewardship in the context of an acute diarrhoea presentation. The animation is freely available on the ENOVAT website (https://enovat.eu/enovat-videos-on-the-rational-use-of-antibiotic/) and has already been translated into 20 different languages to maximise its utility. Veterinarians are invited to use this resource to support their conversations with pet owners on this topic.

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USEFUL TIPS AND TRICKS TO IMPROVE THE DIAGNOSTIC QUALITY AND FACILITATE THE INTERPRETATION OF YOUR RADIOGRAPHS

Anna Adrian

Vet Meet, Education, Hergolding, Germany

Qualifications:

Dr. Anna Adrian

MRCVS MS DACVRAmerican Specialist in Veterinary Diagnostic Imaging RCVS recognized Specialist in Diagnostic Imaginga.adrian@frontier.vet

X-ray systems create a two-dimensional representation of a three-dimensional body. Similarly, photographs produce 2D representations of 3D objects. However, in regular photos, there are shadows, shading, and other visual depth cues to reveal the third dimension, which is unfortunately not present in X-ray images. Therefore, it is important to take orthogonal views by using different projection angles to enable a more three-dimensional assessment of anatomical structures.

In everyday practice, often only one X-ray image of the requested anatomical region is taken. Reasons for this include lack of time and/or poor cooperation of unsedated patients or the desire to obtain a "quick overview." However, this leads to many important findings being overlooked. Even if an orthogonal image is taken, overlapping can obscure findings. An example of this is aspiration pneumonia. For instance, if only a right lateral and ventrodorsal view is obtained, involvement of the ventral aspect of the right lung lobe may be missed. Additionally, depending on the disease, it may be helpful to deviate from standard positions. Oblique or horizontal projections, for example, can aid in diagnosing free air in the abdomen.

Therefore it is crucial to know when, which, and how many images need to be aquired.

Thorax: To select the appropriate projections for the thorax, it is essential to recall the anatomy of the lung lobes. The left lung consists of the left cranial and caudal lobes, with the left cranial lobe further divided into a cranial and caudal part in carnivores. The right lung consists of a cranial, middle, caudal, and accessory lobe.

Why is this important? Depending on the positioning, the lung lobes are aerated differently. In the positioning of a left lateral thorax image, the left lung is less aerated due to its weight compared to the right lung. Therefore, this image is used to evaluate the right lung. Conversely, the opposite is true for the right lateral image. When the patient is placed on their back, it ensures that the ventral aspects of the lungs are better aerated, while a dorsoventral image better depicts the dorsal aspects of the lungs.

One must consider what question they want to answer based on the medical history and clinical examination. Let's revisit the example of aspiration pneumonia. If there is suspicion, it is advisable to take at least a left lateral and ventrodorsal view of the thorax. Due to the bronchial anatomy, the right middle lobe is most commonly affected and can be best depicted with these views. Conversely, in cases of suspected heart failure or pulmonary embolism, a dorsoventral image should be taken instead of the ventrodorsal one to better evaluate the dorsal aspects of the lung lobes.

The degree of lung inflation is also crucial in thoracic imaging. Lungs that are not fully inflated have slight shading, often mistaken for an interstitial pattern. Small nodules may also be less distinguishable. Therefore, maximizing lung inflation is important. If the animal is not under anesthesia, care should still be taken to trigger the exposure at the end of inspiration.

In cases where it is not possible to drain the entire pleural effusion, a horizontal projection of the thorax with the patient lying on their back can be used to assess the ventral lung lobes and ventral diaphragm. Gravity causes the fluid to collect dorsally, reducing the overlap of structures.

Abdomen: In the abdomen as well, one should consider which projections to choose beforehand. The difference between lateral projections, as well as between ventrodorsal and dorsoventral projections, mainly lies in how the air in the gastrointestinal tract, especially in the stomach, behaves. For example, on the left lateral projection, the air is located in the pylorus, while on the right lateral projection, the fundus is highlighted. While a ventrodorsal projection is typically chosen as the second view in abdominal imaging to allow better organ delineation and prevent overlapping of hind limbs, a dorsoventral view can be useful to utilize the gravity-dependent behavior of air.

If a foreign body is suspected, a left lateral image is advantageous. It allows for a better assessment of whether the transition between the pylorus and the duodenum is blocked or whether the duodenum is well delineated. However, in cases of suspected gastric torsion, the right lateral projection is better suited as it shows a clearer compartmentalization of the stomach.

Furthermore, horizontal images with the patient in lateral recumbency can be helpful in depicting free air. The free air rises upward and can be more easily distinguished from the intraluminal air of the intestinal tract.

Additional Information: As mentioned earlier, deviations from standard views can and should be made when necessary. In musculoskeletal imaging, in addition to laterolateral and craniocaudal or dorsopalmar/plantar views, oblique projections can be helpful. They can better highlight bone protrusions, bone lysis, or fissures, for example.

Another aid is radiolucent paddles. Applying pressure to a selected area helps push neighboring structures out of the way, improving resolution. The examined structure is closer to the X-ray plate/detector, reducing scatter radiation. A good example of this is the improved visualization of the urinary bladder. If there is suspicion of urinary stones for example the commonly overlapping intestinal tract can be displaced.

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PAWS FOR A MOMENT: UNLEARNING BIAS

Latonia Craig

American Veterinary Medical Association, Office Of The Executive Vice-president, Schaumburg, United States of America

Qualifications:

Latonia Craig

EdD, MA, MEd

Qualifications:

Dr. Latonia Craig is a prominent leader and advocate for diversity, equity, and inclusion in the veterinary field. She is the inaugural Chief, Diversity, Equity, and Inclusion Officer for the American Veterinary Medical Association (AVMA), the leading professional organization in the veterinary field. In this role, she leads the development and implementation of strategic initiatives to promote diversity, equity, and inclusion within the veterinary community, nationally and internationally.

Known for her dynamic leadership style, ability to engage and inspire others, and unwavering commitment to creating a more inclusive and equitable veterinary profession, Dr. Craig has received numerous accolades for advancing diversity and inclusion across various academic disciplines. She is often sought after as a keynote speaker and panelist at veterinary conferences and events and is widely recognized as a thought leader and change agent in veterinary medicine. Dr. Craig currently leads the nationally recognized program Journey for Teams – a flagship diversity, equity, and inclusion program offering a pathway for veterinary professionals to enhance their skills in diversity, equity, and inclusion through micro-learning modules. To date, Journey for Teams has garnered over 14,000 users.

In addition to her professional achievements, Dr. Craig has been featured on the cover of *Today's Woman* magazine, and in 2016, she was selected as a "Top Forty Under 40" professional in the *Louisville Business First* magazine. Dr. Craig has received two (2) national "Innovative Programs in STEM" awards from *Insight Into Diversity* magazine. She holds a Certified Diversity Professional (CDP) certificate and an Insight Discovery Practitioner (IDP) license. Dr. Craig earned a bachelor's degree in political science, a master's degree in pan-african studies from the University of Louisville, a master's degree in educational leadership from the University of Cincinnati, and a doctorate in leadership education from Spalding University.

lcraig@avma.org

Paws for a moment: Unlearning Bias

PAWS FOR A MOMENT: UNLEARNING BIAS

Latonia L. Craig, EdD, MA, Med

lcraig@avma.org

Introduction

Cultural conditioning encompasses our worldview, how we think, speak, act, religious beliefs, what we consider right and wrong, how we dress, etc[1]. Your education level, parents' economic status, emotional stats, and additions all significantly affect your conditioning.

Cultural conditioning differs within and between cultures. Individuals who grew up having to say yes, ma'am, and no sir when they were raised with their parents may expect this same behavior from their children.

An individual raised in a family where love is expressed and shown daily is likely to take on the same quality. Alternatively, someone raised in a family where affection is not commonly practiced may find it uncommon to adopt such behaviors.

Cultural conditioning is an inevitable and necessary process that helps us to become functioning members of society. Still, if we are not intentionally checking the process, the norms we establish in cultural conditioning could shape our perceptions of others and result in biased engagement and stereotyping.

What is bias?

The simple definition of bias is the tendency to prefer one person or thing to another and favor that person or thing. Cultural conditioning encompasses the process by which societal norms and values shape individuals' beliefs and behaviors, including forming biases.

Common areas of cultural conditioning

Social constructs are ideas that have been created and accepted by society. Some common areas of cultural conditioning are race, gender, family, education, time, and government. As a social construct, race categorizes individuals based on physical characteristics, leading to the development of distinct racial identities and biases. Gender, another powerful construct, dictates societal expectations, roles, and behaviors attributed to individuals based on their family and sex. Family constructs define familial roles and relationships, influencing our sense of belonging and support systems. Time is a social construct that governs how societies organize activities and schedules. Government constructs determine the organization and operation of political systems, regulating societal norms, law, and order. Understanding these cultural conditioning areas sheds light on how individuals perceive themselves and others.

Stages of cultural conditioning2

There are five stages of cultural conditioning: Observation, Imitation, Reinforcement, Internalization, and the Spontaneous manifestation stage.

Stage 1- Observation: Watching and receiving lessons

Stage 2-Imitation: Modelling learned behavior

Stage 3- Reinforcement- How encouragment can influence behavior

Stage 4-Internalization stage: Finding meaning in behavior

Stage 5-Spontaneous Manifestation- Finding meaning in behavior

Effects of Cultural Conditioning

Cultural conditioning can have detrimental effects on individuals and society, leading to the maintenance of comfort zones, stifling personal growth, increasing bias, and limiting the ability to connect with others. When individuals are conditioned by their cultural upbringing, they tend to gravitate towards familial environments and ideas, reluctant to step outside their comfort zones and explore new perspectives. This aversion to change can impede personal growth. Cultural conditioning can reinforce biases, as individuals may unknowingly adopt prejudiced attitudes and discriminatory behaviors based on societal norms. This perpetuates stereotypes and further deepens divisions between different cultural groups.

Why is it essential to unlearn bias in the field of veterinary medicine?

Tied to every pet is a person, and veterinarians must navigate several different relationships with pet owners, staff, and caregivers, each of which can profoundly impact the quality of service. Unlearning bias ensures that all clients, regardless of their background, are treated with respect and understanding, leading to better communication and improved outcomes for the animals under their care. Meeting people where they are is critical to the process of unlearning bias.

Reversing the process

Individuals can unlearn bias and challenge cultural conditioning by using the stages of observation, imitation, reinforcement, internalization, and spontaneous manifestation. To intentionally reverse the process, own where you are in the process. Acknowledging where you are and that you have work to do is the most challenging part. Once you have owned where you are in the process, set some expectations for how you want to live. Surround yourself with people who will encourage that changed behavior or who will celebrate the best part of who you want to be. Consider expanding your social circle. Find team members and friends who will serve as accountability partners to you and also model the behavior you are striving towards. Acknowledge that you will need room to make mistakes and reserve grace for yourself and others as they adjust to you and as you adapt to a new way of exploring the world.

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RECONHECIMENTO E ESCALAS DE DOR

Ana Carina Costa

RVC, Clinical Sciences, Hatfield, United Kingdom

Qualifications:

Ana Carina Costa

PgCertAVN Anaesthesia and Analgesia, NCert(Anaesth), NCert(PhysioTech), Anaesthesia RVN

acosta@rvc.ac.uk

"Pain Recognition and Pain Scoring Scales"

Learning Objectives

- Recognise the physiological effects of pain

- Identify pain behaviours and body postures

- Appraise different pain-scoring scales available for dogs and cats

- How to implement pain scoring scales in practice

Pain scoring has been introduced in veterinary medicine in the last decade to improve pain recognition and management however, in busy practices and hospitals, it can be a challenging routine to implement, often leading to the administration of prescribed analgesia without prior assessment or to suboptimal pain relief. A 2007 study evaluating the attitude of veterinary nurses in the UK using pain scoring systems revealed that only 8.1% of the practices were using formal pain scoring scales, despite 80% of participants agreeing that they are a useful tool[1]. Furthermore, 96.8% of participants recognised that their knowledge of pain assessment could be improved[1]. In a recent survey of veterinarians and technicians in the USA, 47.6% reported using pain scoring scales routinely, 16.3% sometimes, and 36.1% not[2]. The last group cited lack of training and busy caseload as the main reasons for not using pain scoring scales[2].

In human medicine, self-reporting pain using unidimensional scales is considered the most reliable and accurate way to assess pain. However, this may not always be possible, such as in the case of neonates, critical patients, and those with dementia, therefore multidimensional pain scoring scales are available to help assess pain[3]. Pain is a personal experience, and its perception depends on the intensity of the noxious stimulus and how an individual processes pain. Reporting pain for someone else, a human or a non-human animal, is challenging and subjective. The multidimensional systems are based on the evaluation of physiological, behavioural, postural, and facial expressions changes, therefore are more objective, improving the consistency and reliability of pain assessment. In veterinary medicine, the multidimensional pain scoring scales also include guidelines to adjust analgesia[4,5].

Pain

The International Association of the Study of Pain describes pain as "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" [6] and, highlights that the inability to communicate does not invalidate that a human or non-human animal is experiencing pain, as verbal description of pain is only one of various ways to express it[6].

Physiological effects of pain and behavioural changes

Adequate pain relief improves patient care and clinical outcomes while preserving the animal's welfare[5,7]. Poor pain management can result in prolonged hospitalisation, suboptimal analgesia, and consequent physiological and behavioural changes. The administration of analgesia when is not necessary can lead to sedation and/or dysphoric behaviours.

Pain has physiological effects on the body such as tachycardia, hypertension, lethargy, inappetence, pupil dilation and hypersalivation. This can lead to catecholamines release, hyperglycaemia, leucocytosis, cytokine production, immune suppression, and respiratory impairment[4,5], increasing the risk of further complications, particularly after a surgical procedure. It is important to recognise that some abnormal behaviours and body postures can be reflective of pain however, those may vary between species, breeds, and individuals[4]. Painful patients may show signs of aggression or fear, self-trauma, vocalisation, and reluctance to move and to be touched. Hunched and prayer positions are often seen when the patient is experiencing abdominal pain, while low head carriage is associated with neck pain[4,5]. When in doubt whether the animal is in pain or not, a low analgesia testing dose should be given and the patient re-assessed. As animals are not aware that pain is temporary, a painful episode can lead to a traumatic experience and poor management of severe pain can result in central sensitisation leading to long-term pain[7].

Pain Scoring Scales

Pain scoring must be part of the pain management plan as it helps to[4]:

- Encourage frequent patient monitoring

- Recognise signs of pain and quantity pain

- Standardise pain assessment methods in the practice

- Support clinical judgment

- Record pain trending and information for other team members

- Assess if the treatment is working

- Adjust analgesia by VN when the veterinarian is not available

Some of the challenges that we may find pain scoring a patient include[4]:

- Time

- Patient's mentation & vocalisation

- Systemic disease - might change the normal response to pain

- Stress, fear, anxiety

- "Emergence delirium"

- Discomfort (e.g., full bladder)

Pain scoring also helps to identify patients that are experiencing pain and not showing signs, for example, pray species. Animals submitted to painful procedures should be regularly evaluated for pain, according to the time of the last dose of analgesic received and its duration of action[7]. Care to not leave the postoperative patient without analgesia until experiencing pain. In addition, based on pain scoring we might be able to decrease the dose of systemic opioids when adopting a multimodal analgesia approach.

In veterinary medicine, the following pain-scoring scales are validated[4-5,7]:

For dogs:

• Glasgow Composite Measure Pain Scale (GCMPS) - is validated to assess acute pain and is based on six categories of behavioural descriptions, including the patient's response to gentle palpation of the painful area. It is an objective numerical scale, easy to use but can be affected by the patient's temperament. The maximum score is 24, and the cut-off score to administer rescue analgesia is ≥ 6/24 or ≥ 5/20. For cats includes the evaluation of facial expressions.

• Colorado State University Veterinary Medical Center Acute Pain Scale - evaluates physiological behaviours and has drawings that help to use the pain scale. It includes gentle palpation of the painful area and has instructions not to disturb the patient if they are asleep. The maximum score is 4 and the analgesic plan should be reassessed when ≥ 2/4. Although it is available for cats is still not validated for feline species.

For cats:

• Feline Grimace Scale[8] – is based on changes in facial expressions and does not require close interaction with the patient. Assesses the ear position, orbital tightening, muzzle tension, whisker, and head position. This pain scoring scale is easy to use and requires pre- and post-analgesia assessment. The maximum score is 10 and rescued analgesia must be administered when ≥ 4/10

· UNESP Botucatu Multidimensional Composite Pain Scale – evaluates pain expressions, reaction to palpation of the painful area, and psychomotor changes such as patient's posture, comfort, attitude, activity, and physiological variables. Although it is a comprehensive pain scale, it has the advantage of being available in eight languages. The maximum score is 12 and when ≥ 4/12 rescue analgesia must be provided.

· Glasgow Composite Measure Pain Scale

For chronic pain assessment, the following pain scoring systems are available[4,5,7]:

• Feline Musculoskeletal Pain Index

· Canine Brief Pain Inventory

• Liverpool Osteoarthritis in Dogs

• Helsinki Chronic Pain Index

As anxiety can be interpreted as pain, more recently, The Lincoln Canine Anxiety Scale[9] have become available to improve stress and anxiety management during hospitalisation.

Pain is an individual experience and as its treatment. It is important to recognise that inadequate treatment of acute pain can result in behaviour changes and the appearance of chronic pain. Although pain scoring can be perceived as an extra and time-consuming task, veterinary nurses and technicians recognise it to be a valuable tool to improve pain management. Regular training and consistent use of pain scoring enhance the ability to identify pain and contribute to greater nursing care.

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UPPER RESPIRATORY TRACT OBSTRUCTION IN EXTREME BRACHYCEPHALIC DOGS; DIAGNOSIS AND SURGICAL TREATMENT

Gert Ter Haar

AniCura Specialistische Dierenkliniek Utrecht, Surgery, Utrecht, Netherlands

Qualifications:

Gert ter Haar

DVM, PhD, DECVS

gert.terhaar@anicura.nl

Introduction

Despite all the scientific evidence that brachycephaly is related to several welfare impacting diseases (brachycephaly related diseases, BRD), they still gain tremendous popularity. Brachycephalics share a complex group of anatomical features associated with short skull bones, and a relative hypertrophy of soft tissue structures, that has led to concurrent changes of the shape of the ear canals and tympanic bullae, a shallow orbit and eyelid and corneal issues, excessive facial skin that can form large skin folds around the nose, and narrow airways. Together, these features can lead to the common respiratory, gastrointestinal and ocular problems described in brachycephalics. Unfortunately, the list of problems has extended to other specialty fields such as neurology and orthopedic surgery.

Brachycephalic obstructive airway syndrome

The group of respiratory problems widely known for affecting brachycephalic dogs is known as Brachycephalic Obstructive Airway Syndrome (BOAS). The narrow airways in brachycephalics increase airway resistance, inspiratory effort and, eventually dyspnea and exercise intolerance. They can also lead to secondary gastrointestinal abnormalities, such as hiatal hernia with gastro-esophageal reflux, which can further contribute to pharyngolaryngeal swelling as well. The primary components of BOAS are increased nasal resistance as a result of stenotic nares and aberrant or protruding turbinates, narrow (naso) pharyngeal dimensions with elongated soft palate, narrow laryngeal dimensionClick or tap here to enter text., and, especially in the English Bulldog, tracheal hypoplasia. Secondary components, resulting from the chronic increased negative intra-airway pressure, that may contribute to further obstruction, include everted tonsils, nasopharyngeal collapse, everted laryngeal saccules and laryngeal collapse. Narrow dimensions in the oral cavity, macroglossis, increased glossal volume and glossoptosis often found in these breeds decrease the effectiveness of open mouth breathing.

A sniffing or nasal stridor indicates obstruction of airflow through the nasal passages, snoring is typically associated with (naso)pharyngeal disease, whereas a laryngeal stridor (g-sound or sawing sound) is associated with laryngeal disease. Depending on the degree of obstruction tachypnea or dyspnea will be present with a more or less obstructive breathing pattern. Decreased exercise tolerance, panting, hyperthermia, cyanosis and collapse are some of the more severe clinical signs. Coughing, gagging, retching, regurgitation and vomiting are also frequently present and indicate secondary or concurrent lower airway or gastro-intestinal disease. Physical examination findings are usually unremarkable except for the obvious features associated with the brachycephalic conformation of the animal and the commonly encountered audible noises associated with breathing. In addition, most patients demonstrate some degree of stenosis of the nares and increased, referred, respiratory noises upon thoracic auscultation. Whereas a clinical diagnosis is easily made, for therapeutic and prognostic reasons, further diagnostic imaging is recommended.

Diagnostic imaging using computed tomography allows for an accurate evaluation of the bony abnormalities, measurements of airway diameter, presence of nasopharyngeal turbinates and potential concurrent other brachycephaly related diseases and is therefore currently recommended to fully assess brachycephalic animals.

Direct inspection of the pharynx and larynx however, with a laryngoscope, is the most important diagnostic procedure to determine the degree of pharyngeal narrowing (e.g. dorsoventral flattening of the pharynx, diffuse pharyngeal mucosal swelling, position and size of the tongue, degree of eversion of the tonsils), laryngeal narrowing and degree of laryngeal collapse. Rhinoscopy is invaluable for evaluation of obstruction of the nasal vestibule by large alar folds, for the presence of cranial and caudal aberrant conchae and degree of increased mucosal contact points. Endoscopy of the nasopharyngeal area with flexible endoscopes allows for a thorough inspection of this area and for visualization of aberrant nasopharyngeal turbinates.

Based on clinical presentation and abnormalities found on diagnostic imaging and endoscopic evaluation, a treatment plan can be constructed. Long-term treatment of brachycephalic airway syndrome is aimed at reducing airway resistance and alleviating obstruction, either medically and/or surgically. Maintaining an adequate body weight and condition, a clean, fresh and cool environment and regular controlled exercise are advised. Corticosteroids can be used to treat mucosal swelling, whereas broadspectrum antibiotics are indicated in cases with aspiration and other types of pneumonia. It is equally important to treat any pre- or postoperative gastrointestinal signs with a proton pump inhibitor, prokinetic drugs and an antacid. Treatment with the aforementioned drugs has been proven to improve postoperative outcome and should be considered routine treatment.

The components of the BOAS that are theoretically amenable to surgical correction are stenotic nares, obstructing alar folds, aberrant turbinates, elongated soft palate, everted laryngeal saccules and laryngeal collapse. Currently, most surgeons recommend a staged procedure where low-risk, high-yield procedures are performed first, together with owner education, medication to treat secondary conditions, and very importantly, maintaining a healthy, lean body condition, which might require a weight loss program. Correction of stenotic nares and staphylectomy are techniques that if executed meticulously, improve patient welfare significantly and are associated with minimal complications. Resection of turbinates or laryngoplasty procedures are technically more demanding procedures and may be associated with increased peri-operative risks. They can and should be employed though if conservative treatment in combination with resection of the nares and the soft palate do not result in a significant improvement. Long-term follow up studies on the results of arytenoid lateralization procedures for laryngeal collapse are currently lacking and, therefore, widespread use of this technique cannot be recommended.

Whereas outcome of surgical treatment of BOAS has generally been reported to be good to excellent, the assessment has been subjective and mainly based on the opinion of owners. Objective assessment using whole-body plethysmography has been reported recently and it demonstrated that whilst a clear improvement can be seen after one stage or multi-staged procedures, the end result is still a compromised animal. The reason for this is that surgery can address and correct some of the airway abnormalities seen in brachycephalic animals but residual signs tend to persist. Therefore it is mandatory that future breeding focuses on decreasing airway resistance by allowing a longer face and nose compared to the cranium. Until then, most operated animals at least will have an improvement in quality of life after surgery so long as body weight is not excessive and is managed successfully long term.

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087

CANINE ORAL PATHOLOGY

Gottfried Morgenegg

Tierzahnarzt, Dentistry, Obfelden, Switzerland

Qualifications:

Gottfried Morgenegg

DVM, NST

g.morgenegg@tierarzt-morgenegg.ch

CANINE ORAL PATHOLOGY

Gottfried Morgenegg, DVM, NST

g.morgenegg@tierarzt-morgenegg.ch

Due to the frequency of oral diseases, an oral examination should be part of every clinical examination. It is also important that a detailed examination under general anaesthesia is carried out regularly.

Diseases of the oral cavity based on a clinical examination:

1. Visual Inspection

- Occlusion: Neutroclusion, mandibular distoclusion, mandibular mesioclusion

- Oral masses

- Paradental disorders: gingivitis, mucositis, kissing leasions, canine chronic ulcerative stomatitis (CCUS)

- Dentition: deciduous, permanent, mixed, persisting deciduous teeth

- 'Missing' teeth: congenital, impacted, root remnant

2. Disorders of the dental crown (dental probe)

- Fractures: complicated, uncomplicated

- Slab fracture

- Enamel infraction

- Enamel defect: local, generalized

- Hypomineralization

- Caries (dental decay)

- Abrasion

- Attrition

- Pink tooth

3. Periodontal disorders (periodontal probe)

- Loss of attachment

- Increased periodontal probing depth (PPD), periodontal staging

- Furcation involvement

- Mobility

- Periapical lucency

4. Tooth resorption

- Progressing process by body own cells (odontoclasts)

- Classification complicated (Peralta et al., 2010)

- Practical classification: inflammatory/non-inflammatory; exposed to oral cavity/not exposed to oral cavity

Reference:

Peralta S., Verstraete F. J., Kass P. H. Radiographic evaluation of the types of tooth resorption in dogs. Am J Vet Res. (2010). 71(7), 784-93. DOI:10.1053/j.tcam.2008.02.002

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Reiter A. M., Gracis M. Dentistry and Oral Surgery. Gloucester: British Small Animal Veterinary Association; 2018.

Pleas note: the presentation will be available for download from 25th September 2023:

https://www.tierzahnarzt.ch/index.php/downloads

088

MANAGEMENT OF DYSTOCIA IN CLINICAL PRACTICE

Natali Krekeler

The University of Melbourne, Melbourne Veterinary School, Werribee, Australia

Qualifications:

Natali Krekeler, Dr. med. vet., PhD, GCUT, DACT

krekeler@unimelb.edu.au

In order to effectively manage dystocia (*greek*: *dys-*: difficult, abnormal; *-tokos*: birth) in small animals, it is important to have a sound understanding of the physiologic birthing process (eutocia).

There are three stages of parturition:

Stage I (duration: 6 – 12 hours)

This phase may last longer especially in nervous and primiparous dams (up to 36 hours can be normal, if the rectal temperature remains low). At this stage intermittent myometrial contractions occur, the vagina relaxes and the cervix dilates. Nesting behaviour, anorexia, restlessness, vomiting and shivering may all be observed. Although some dams do not show any overt signs of first stage labour. Vaginal discharge can be copious and is clear and watery.

Stage II (duration: 3 – 12 hours)

In some dams with large litters stage II labour may last up to 24 hours. Longer than 24 hours is considered abnormal and poses risks for the dam and the pups. Often normal labour lasts 4-5 hours in average sized litters. The first fetus enters the birth canal and through stretching of the cervix and cranial vagina "Ferguson's reflex" occurs, which leads to the release of oxytocin and subsequent forceful myometrial contractions. Distension of the cervix leads to the "urge to push" and the dam contracts her abdominal muscles, which is visible externally.

Expulsion of the first fetus usually takes the longest. Expelled fetuses are usually covered by the amniotic membrane, which is removed (and often eaten) by the dam immediately. The dam normally licks the puppies vigorously. Young, inexperienced dams may not pay attention to their pups and intervention might be needed to remove the amniotic membrane from the pup and prevent suffocation.

About 60% of pups are born in anterior and 40% are born in posterior presentation. Both are considered normal in the dog. In almost 80% of cases pups are delivered alternating from the uterine horns.

The interval between pups in eutocic dams is 5 to 120 min (most pups being delivered every 30 to 60 min). Especially in large litters dams may take breaks between delivery of pups (> 2 hours).

Stage III (variable)

Stage III is characterized by the expulsion of the allantochorionic fetal membrane, which occurs 5 to 15 min after the birth of the pup. Stage II and III are often combined. Two or three fetuses can be born before their fetal membranes are expelled. Retained fetal membranes are not very common in small animals but do occur and can result in severe systemic infection of the dam.

Often dams are presented for perceived failure to start parturition or perceived failure to progress normally with parturition. It is critical to obtain a complete history and a physical exam before the course of action is determined.

History suggestive of dystocia:

Whelping not observed within 24-36 hours after temperature drop

Whelping not observed within 36-48 hours of serum progesterone drop

active labour > 4 hours and no pups produced

Interval of pups is > 30 min with apparent signs of myometrial contractions

Interval of pups is > 2 hours with no myometrial contractions (**BEWARE!** can be normal; especially if dam is disturbed frequently)

Whelping lasts longer than 24 hours total

dark green or malodorous discharge prior to whelping

profuse vaginal bleeding

signs of pain (yelping during whelping), or shock (e.g. depression, hyperventilation)

Helpful diagnostics:

Although a dystocia is always considered to be an emergency, time should be taken to assess the situation. In addition to the relevant history and physical exam, the author recommends two procedures:

vaginal exam: this can be done digitally or with a speculum; aseptic technique should be used; this will help to decide if a) an obstructive dystocia or b) uterine inertia (see below) is present

transabdominal ultrasonography: to assess the fetal wellbeing; fetal stress is reflected by a fetal heart rate of < 220 bpm; if it is < 180 bpm the fetuses are in severe danger and emergency caesarean section is indicated; take heart rates from different fetuses and base your decision on the lowest heart rate! Always include the fetus, which is closest to the cervix!

Often radiographs to assess obstruction and serum ionised calcium levels to assess hypocalcaemia are recommended. Both these procedures are of questionable benefit. As radiographs provide a two-dimensional image, the position of the fetus in relation to the birth canal is not easily assessed. However, radiographs are useful to determine the exact number of fetuses. Serum calcium levels can be normal in a clinically hypocalcaemic dam.

There are numerous fetal and maternal factors that contribute to dystocia and they can occur together. It is therefore helpful to initially assess the fetal and maternal factors independently and then consider all factors for the diagnosis.

Maternal factors

Primary uterine inertia

It is the failure to expel normal sized fetuses through a birth canal that has no obstructions.

The aetiology of primary uterine inertia is unknown but may be multifactorial, e.g. overstretching of myometrium in large litters, nutritional imbalances, age-related changes, genetic predisposition, inadequate stimulation in one or two pup litters, obesity, trauma etc.

primary complete uterine inertia: failure of uterus to begin labour at full term

primary partial uterine inertia: uterine activity sufficient to initiate parturition but insufficient to complete the birth of all fetuses

Secondary uterine inertia

Exhaustion of the uterine myometrium caused by obstruction. It is very important to distinguish secondary from primary uterine inertia!

Diagnosis: If the dam does not show any straining in reaction to a speculum exam a presumptive diagnosis of clinical hypocalcaemia can be made.

Treatment: If an obstruction is diagnosed it should be assessed if it can be resolved by digital manipulation (use lots of lube!) and possibly the use of obstetrical forceps or if a c-section is indicated.

If an obstruction is ruled out and primary uterine inertia is diagnosed 10% Calcium gluconate solution can be administered intravenously very slowly to effect. The author recommends calcium administration intravenously to effect under constant monitoring of the dam's heart rate due to the possibility of bradycardia and ventricular fibrillation. Usually between 0.2 ml to 0.5 ml/kg body weight are necessary but that can vary greatly, therefore it should be given to effect under strict cardiac monitoring.

Ten minutes after the calcium administration 1 to 10 IU of oxytocin can be given, although often this is not necessary and the next pup is born before oxytocin can be administered.

Uterine torsion/ rupture

Can occur in late pregnancy or during parturition.

A few pups may be born before this condition occurs and the dam suddenly deteriorates. Surgical intervention is always necessary and a quick diagnosis is essential for a good prognosis.

Nervous voluntary inhibition of labour

Most common in nervous primiparous dams. Low dose tranquilizer might help and whelping usually progresses normally once the first pup is born. It is important that he dam is familiar with the whelping environment and is not disturbed by excessive monitoring.

Conformation

Congenital or acquired abnormalities of the bony birth canal (e.g. genetically small pelvis, healed pelvic fractures), and vaginal and vulvar soft tissue abnormalities (e.g. annular strictures, hymen remnants) can make vaginal delivery impossible.

Fetal factors

Dystocia is fairly common if fetuses are weak or dead. A healthy fetus is active during delivery and extends its limbs and head.

Absolute or relative oversized fetus

absolute oversize: weighing > 5% of maternal body weight;

relative oversize: fetal head too big in relation to maternal pelvis

Malpresentation, malpositioning, malposture

Most common malpositions in the dog are:

breech position: posterior presentation with hind legs flexed forward

lateral or downward deviation of the head

backward flexion of front leg (especially common in weak or dead puppies)

transverse or bicornual presentation (fetus positioned in both horns, possibly due to some obstruction)

Abnormal fetal development

e.g. anasarca, hydrocephalus, Schistosomus reflexus, multiple limbs

Indications for caesarean section:

obstructive dystocia that cannot be managed medically

prolonged delivery (neglected dystocia)

green vaginal discharge before parturition (sign of premature placental separation)

dead or decaying fetuses *in utero*

illness of the dam (septicaemia/ endotoxaemia)

fetal oversize

complete primary uterine inertia not responding to medical treatment

profuse vaginal haemorrhage before or during whelping

fetal heart rates < 160 bpm

089

THE LINK BETWEEN ANIMAL AND HUMAN ABUSE

Christine Halsberghe

ESVCE, Board, Kortrijk, Belgium

Qualifications:

Christine Halsberghe

DVM, President ESVCE

christine.halsberghe@telenet.be

The Link between animal abuse and domestic violence: When animals are abuse, people are at risk; when people are abused, animals are at risk

As veterinary surgeons, we are responsible for the welfare of the animals we care for. One of the welfare needs (5 freedoms) is to protect the animals from pain, suffering, injury and disease.

Occasionally veterinary surgeons may be presented with animals that have suffered abuse:

deliberate or non-accidental injury (NAI), which can be difficult to recognize. Veterinary surgeons should be aware that abuse is perpetrated in a number of relationships: child abuse, domestic violence and abuse of older people. Therefore, if serious animal abuse is occurring, the veterinary surgeon should be aware that other forms of domestic or family violence may also be present. There is increasing clinical evidence which suggests that there are sometimes links between the abuse of children, vulnerable adults and animals (violent households)

Even if the signs of NAI are recognized with a history that supports the diagnosis, veterinary

surgeons may be reluctant to report cases of cruelty because they feel unqualified to do so,

they may be unaware of what to do or they may lack the confidence to proceed.

Our medical colleagues also face the same dilemma . It is an repugnant subject and the healthcare professional must force him/herself to think about it in the first place. Only by recognizing the problem the veterinary profession can become a part of "the link to break the cycle of violence".

Definitions

These are different forms of maltreatment; either by inflicting harm or by failing to prevent harm.

Physical abuse *(synonyms non-accidental injury or NAI):*

Physical actions such as hitting, shaking, throwing, poisoning, burning, scalding, suffocation, asphyxiation etc. Battered pet Syndrome Munro & Munro (2008)

The term '***non-accidental injury'*** means that the injury was caused deliberately.

Emotional abuse: this is easier to recognize in humans where persistent emotional maltreatment of the person by bullying, exploitation, verbal harassment or corruption

leads to a fragile emotional state. In animals, persistent threatening behavior or a failure to provide basic behavioral needs constitutes emotional abuse.

Sexual abuse: forcing a child or adult to take part in sexual activities. Munro & Munro (2008) suggest that the term animal sexual abuse should be used to describe

the use of an animal for sexual gratification. This includes injuries/acts involving the rectum/anus as well as the genitalia.

Neglect: the persistent failure to provide a person or an animal with the basic necessities of life: food, water and shelter. Failure to protect the child, vulnerable adult or

animal from physical danger or emotional harm is also abuse, as is a lack of affection/companionship.

How to recognize non-accidental injury in animals

Fortunately, most injuries seen daily in practice are the result of genuine accidents. However, most veterinary surgeons will be presented at some time with a case of non-accidental injury.

Sometimes the signs of abuse are obvious, but they are often overlooked, particularly by veterinary surgeons who are usually caring individuals who find it difficult to accept that people maltreat animals or further, to connect separate incidents as part of an abusive behavior. In addition, when an animal(s) is seen by multiple vets, the abusive behavior may not be immediately recognized.

What to look for?

There are specific indicators particularly relating to the history that may raise the index of suspicion:

Owner profile: there may be reluctance to give a full history and the history may be unsound and variable; the person presenting the animal may be apprehensive/nervous…

Was there a delay in seeking attention or a lack of concern for the animal?

Does the story fit? Are there inconsistencies?

Look at the ***injuries*** and if needed seek help from a forensic specialist.

Are the injuries too severe to be explained by the history?

Is there evidence of rib injuries, current or from previous trauma?

Repetitive injury must raise a strong index of suspicion.

Old injuries may be evident on examination, ultrasound or x-ray.

History of previous trauma in the same animal or with other animals.

Are there unexplained injuries or deaths in other animals belonging to this owner?

Is someone else blamed for the trauma?

Look carefully at the ***behavior of the animal***

Is it frightened of the owner?

Is it frightened of people in general?

Is it subdued or overly aggressive?

Has there been a behavior change?

Is it happier when separated from the owner?

What can vet's do? AVDR.

Vets are not expected to be experts in abuse: the most important step to take is recognize, document and report or refer the case. Animal abuse will be dealt with by societies for the protection of animals, violence in families should be dealt with the specialized organizations.

A : ask

Vets may find the concept of 'asking' daunting but it's a simple method to use if done correctly. However, to help vets should take advantage of the 'golden moment' (that point where a client seeks help for an abused animal or themselves. It was proved that someone seeks help after an 35 violent incidents. It may be the first time anyone has shown any interest in, or sympathy towards them. This can help those persons to seek help.

Victims have confirmed that they would like to be asked. It may be the first time anyone has shown any interest in, or sympathy towards them.

V : validate

This follows the 'asking' and provides support to the victim, which shows compassion.

D :document

Documenting by way of contemporaneous notes ensures that the history and presenting signs are properly recorded; cases of animal abuse may come to courts many years later. If a victim discloses significant information, this too should be recorded accurately.

R:Report/ Refer

The vet's main responsibility lies with the animal but they can encourage the human victim to seek help by offering information on the aid agencies.

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090

THE VOMITING CAT - PRESENTATION OF CHALLENGING CASES

Peter Hendrik Kook

University of Zurich, Clinic For Small Animal Internal Medicine, Zurich, Switzerland

Qualifications:

Peter Hendrik Kook

Professor, Dr. med. vet. Diplomate ACVIM (SAIM), Diplomate ECVIM-CA

pkook@vetclinics.uzh.ch

Vomiting is a common clinical sign in cats that is frequently associated with gastrointestinal disease but can also occur with non-gastrointestinal disorders as well. Cat owners usually think that vomiting is due to “gastric disease” and do not realize that the small bowel, hepatobiliary system or pancreas are more commonly implicated in the clinical sign vomiting. There is no consensus as to how much vomiting is normal in a cat. Some authors consider 1-2 vomiting episodes per month still as normal. Although this assumption can be tricky as occasional vomiting can also be a sign of underlying disease. Often cat owners do not consider occasional vomiting to be clinically important. Explanations provided by owners for the clinical sign vomiting include that the cat ate too fast or has a sensitive stomach. Some owners dismiss vomiting with evacuation of hairballs or as a normal reaction to cat grass. Documentation of gradual weight loss would be extremely helpful in these scenarios but body weights of cats are usually not recorded at home.

Vomiting is a centrally mediated reflex initiated by the emetic center in the medulla oblongata. Many emetic stimuli can trigger vomiting and the main pathways initiating vomiting are directly through neural pathways (vagal, sympathetic), through pathways from the cerebral cortex or vestibular system or humoral via the chemoreceptor trigger zone (CRTZ).

Vomiting can either have visceral (GI, extra-GI) causes, metabolic (CRTZ) causes or neurologic (cerebral, vestibular) causes. Results from medical history, physical examination findings, laboratory and imaging results help determining the cause of vomiting. While dogs with gastrointestinal diseases often present with vomiting and also diarrhea, cats with primary intestinal diseases such as parvoviral enteritis, inflammatory bowel disease or low-grade intestinal lymphoma can only present for vomiting and lethargy. The presentation will go through different scenarios where vomiting is the main clinical sign. The presentation will review different scenarios where vomiting is the main clinical sign and identify which findings need attention.

091

RADIOGRAPHIC DIAGNOSIS OF INTESTINAL OBSTRUCTION

Anna Adrian

Vet Meet, Education, Hergolding, Germany

Qualifications:

Dr. Anna Adrian

MRCVS MS DACVRAmerican Specialist in Veterinary Diagnostic Imaging RCVS recognized Specialist in Diagnostic Imaginga.adrian@frontier.vet

As ultrasonography is very user dependent, equipment dependent and more time-consuming abdominal radiography is still often the modality of choice in a vomiting patient. Additionally gas within the intestinal tract can obscure visualisation of all intestinal loops on ultrasound.

As always orthogonal radiographs of the abdomen should be acquired. Unless a gastric dilation and volvulus is suspected a left lateral radiograph and ventrodorsal radiograph of the abdomen are recommended. On the left lateral radiograph the gas in the stomach is highlighting the pylorus and proximal duodenum, which can help in detecting possible pyloric foreign bodies. The jejunum should measure less or equal to 1.6 times the height of the vertebral body of L5 in dogs and roughly less than 12 mm in height and cats.

My personal advice is to assess the intestinal tract in the following order. First identify the stomach, then the colon. This way you know that all other intestinal loops are small intestines. If the colon cannot be clearly identified a pneumocolonogram could be performed.

Intestinal obstruction can be either partial or complete. It is not always possible to differentiate and repeat radiographs after multiple hours, nothing per os and possible additional fluid therapy are often times helpful. A complete mechanical obstruction can be identified by two populations of bowel. This means the intestinal loops orad to the obstruction are pathologically dilated, while the intestines aborad to the obstruction have a normal diameter.

However, not always pathologic distension needs to be detected. Another indication of an intestinal foreign body could be plication. This can be seen with a linear form body, which is either lodged in the pylorus (mainly in dogs) or around the tongue (mainly in cats).

But not only foreign bodies can cause an intestinal obstruction. These intraluminal obstructions must be differentiated from intramural or extraluminal causes. In such cases ultrasonography is better in differentiating between the different locations.

092

BEYOND DIVERSITY: CULTIVATING A WORKPLACE CULTURE OF ALLYSHIP.

Latonia Craig

American Veterinary Medical Association, Office Of The Executive Vice-president, Schaumburg, United States of America

Qualifications:

Latonia Craig, EdD, MEd, MA

Qualifications:

Dr. Latonia Craig is a prominent leader and advocate for diversity, equity, and inclusion in the veterinary field. She is the inaugural Chief, Diversity, Equity, and Inclusion Officer for the American Veterinary Medical Association (AVMA), the leading professional organization in the veterinary field. In this role, she leads the development and implementation of strategic initiatives to promote diversity, equity, and inclusion within the veterinary community, nationally and internationally.

Known for her dynamic leadership style, ability to engage and inspire others, and unwavering commitment to creating a more inclusive and equitable veterinary profession, Dr. Craig has received numerous accolades for advancing diversity and inclusion across various academic disciplines. She is often sought after as a keynote speaker and panelist at veterinary conferences and events and is widely recognized as a thought leader and change agent in veterinary medicine. Dr. Craig currently leads the nationally recognized program Journey for Teams – a flagship diversity, equity, and inclusion program offering a pathway for veterinary professionals to enhance their skills in diversity, equity, and inclusion through micro-learning modules. To date, Journey for Teams has garnered over 14,000 users.

In addition to her professional achievements, Dr. Craig has been featured on the cover of *Today's Woman* magazine, and in 2016, she was selected as a "Top Forty Under 40" professional in the *Louisville Business First* magazine. Dr. Craig has received two (2) national "Innovative Programs in STEM" awards from *Insight Into Diversity* magazine. She holds a Certified Diversity Professional (CDP) certificate and an Insight Discovery Practitioner (IDP) license. Dr. Craig earned a bachelor's degree in political science, a master's degree in pan-african studies from the University of Louisville, a master's degree in educational leadership from the University of Cincinnati, and a doctorate in leadership education from Spalding University.

Email:

lcraig@avma.org

Beyond Diversity: Cultivating a workplace culture of allyship

BEYOND DIVERSITY: CULTIVATING A WORKPLACE CULTURE OF ALLYSHIP

Latonia L. Craig EdD, MA, MEd

lcraig@avma.org

Introduction

Allyship refers to individuals, particularly those in positions of privilege, actively supporting and advocating for marginalized colleagues. By promoting a culture of allyship, workplaces can become more equitable, diverse, and welcoming to all employees. Building a culture of allyship enhances collaboration, creativity, and productivity, as individuals from diverse backgrounds can freely express their unique perspectives and talents. An ally-ship driven workplace not only strengthens employee morale and loyalty but also promotes connection within and beyond the organization.

The veterinary workforce comprises individuals from different age groups representing various intersections of diversity, from the seasoned baby boomers to the tech-savvy Gen Z. Each generation brings unique experiences, perspectives, and skills. Allyship is pivotal in bridging the generational gap and fostering intergenerational understanding. Organizations prioritizing allyship through mentorship, advocacy, support, and professional development are a magnet for veterinary professionals seeking an enriching work experience.

Empathy and Building Trust

Allyship revolves around empathy, a critical skill in understanding and supporting diverse colleagues[1]. When employees feel that their coworkers genuinely care about their well-being and challenges, trust within the workplace flourishes. This trust leads to stronger relationships and effective collaboration, bolstering the organization's overall performance. Building empathy and trust requires active listening, the ability to seek understanding, empathetic communication, a moral imagination, and the ability to own mistakes.

Self-Awareness

The bedrock of allyship is self-awareness. The process of self-awareness engages the witness. It is a process of witnessing ourselves and stepping into the honesty of those ways of being which are harmful, and how we are intentional and honest in our actions. What you may find in this process are those first thoughts and reactions that you never said aloud, which you may not be even aware of yet, that certain people are different. Through our personal awareness, we can understand more clearly the moments when we unintentionally harm others and how we can create change. Self-awareness allows us to understand and witness ourselves in uncomfortable and embarrassing ways.

When reflecting on personal cultural background and biases, it involves a process of introspection and self-awareness. This process is not a quick one and done. In the Harvard Business Review, they discovered that although 95% of people think they are self-aware, only 10 to 15% are. Self-awareness requires dedicated time for self-reflection, preferably in a quiet and comfortable environment. Consider how those things may influence perception, attitudes, and behaviors while reflecting on your cultural background, heritage, upbringing, and experiences. Reflect on the language you speak, the customs you practice, and the communities you identify with**. Ask yourself, what steps do I take to ensure my communication and actions consider the perspectives of others within the team?**

Identify biases and stereotypes- As we become more self-aware, we can identify those areas of needed growth. Be honest with yourself and identify any biases or stereotypes you may hold about different cultures and how those biases might appear. Consider situations where you may have made assumptions, exhibited cultural insensitivity, or unintentionally perpetuated stereotypes. Ask yourself, Have there been situations where I've made assumptions or demonstrated cultural insensitivity unknowingly?

Exercising your moral imagination - Put yourself in the shoes of others; this will lend to a different perspective. Moral imagination requires a strong sense of empathy by actively seeking to understand and appreciate the perspectives, experiences, and feelings of others. Learning is an integral part of this work. Take the initiative to learn about different cultures, histories, and perspectives. No one group is monolithic, but continuous learning will help broaden your understanding and will help to challenge any standing bias that may be present. Biases and cultural influences are part of being human, but we must commit to continuous learning. Ask yourself, What actions am I taking to cultivate cultural sensitivity and expand my cultural awareness?

Moving from Bystander to Allyship

Think of a conveyor belt moving in one direction as the status quo, and the other direction represents change. These are active bystanders if you

actively join in negative behavior and dismiss experiences. Interrupt the behavior by becoming more aware and informed about the dynamics of your workplace and teams. While anyone can become an ally, the journey may look different depending on identity, experience, and familiarity with issues of power and privilege. The critical takeaway is being an effective ally requires significant self-reflection and the willpower to be the type of change that encourages everyone else to do the same.

As generational shifts and diversity transformations reshape the modern workplace, embracing allyship emerges as an essential strategy for success. Organizations that champion allyship gain a competitive advantage. Allyship is a moral imperative and a strategic investment in a more inclusive workplace.

References available upon request

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MANEIO DA DOR E ANALGESIA MULTIMODAL

Ana Carina Costa

RVC, Clinical Sciences, Hatfield, United Kingdom

Qualifications:

Ana Carina Costa

PgCertAVN Anaesthesia and Analgesia, NCert(Anaesth), NCert(PhysioTech), Anaesthesia RVN

acosta@rvc.ac.uk

"Pain Management and Multimodal Analgesia"

Learning Objectives

- Describe terms related to pain

- Understand the concept of multimodal analgesia and its use in targeting pain

- Identify the five pain pathway stages

- Describe how the most common analgesics interrupt the pain pathway

Pain

Pain is defined by the International Association of the Study of Pain as an unpleasant emotional and physical experience that can potentially cause tissue damage[1]. Pain is a universal and personal experience - it varies in intensity, duration, and pathophysiology[1] depending on the nature of the painful stimulus and the type of tissues affected. In human medicine, pain is associated with sleep disturbances and depression, and affects social relationships, ability to work, and enjoyment of life[2], conditions that we can relate to our veterinary patients, therefore pain management is a crucial part of nursing care.

Three types of pain are described in the literature[3]:

• Nociceptive/inflammatory - when somatic or visceral tissues are affected. Normally has protective nature and is reversible, however, if not treated can progress from an acute to a chronic state.

• Neuropathic – due to a primary lesion or disease in the central or peripheral nervous system. It can be reversed but also can progress to chronic pain.

• Neuroplastic – pain sensation without evidence of lesion. It is related to neuroplastic changes in the central nervous system (CNS) affecting the pain processing system causing a dysfunctional perception of pain. It is a consequence of long-term pain.

When a tissue injury occurs, inflammatory and chemical mediators are released in the injury site stimulating a network of nerves that transmit the nerve impulses from the periphery to the central nervous system. With time, the injury is expected to heal and pain perception will disappear however, inadequate treatment of acute pain can result in neuroplastic changes in the CNS leading to a persistent painful state. Chronic neuropathic pain has been reported in 15% of dogs after undergoing hemilaminectomy[4] and in 41% of dogs post tibial plateau levelling osteotomy (TPLO) to correct cruciate ligament rupture[5].

Chronic pain is defined as pain persistent for more than 3 months[1-3, 6], which can be representative of a longer time to small animals due to the shorter life expectancy compared to humans. Chronic pain is difficult to recognise and to quantity, and normally requires the combination of pharmacological and non-pharmacological techniques to be relieved[2,6], that is why is so important to implement a pre-emptive and multimodal analgesia approach to minimise pain onset and nociceptive pathology in our hospitalised patients.

Nociception is a physiological response to a noxious stimulus, and the point at which a stimulus is intense enough to be perceived as pain is defined as pain threshold[7]. Peripheral sensitisation takes place when the pain threshold decreases at the level of the sensory fibres nerve (somatic and autonomic nervous systems), whereas central sensitisation occurs at the level of the spinal cord and the brain (central nervous system). Central sensitisation is associated with an increase in pain intensity over time, due to a decreased pain threshold caused by repeated stimulation of the nerve fibres or by a very intense stimulus[7], also known as wind-up pain[8]. Central sensitisation can result in hyperalgesia - increased pain response to a painful stimulus; and or allodynia - pain associated with a stimulus that normally is not painful[7,8].

Pain pathway

There are three types of nerve fibres responsible for initiating the transmission of a nerve stimulus: Aβ, Aδ, and C however, only the last two are responsive to a noxious stimulus[8].

The ascending pain pathway is divided into five stages: transduction, transmission, modulation, projection, and perception[3,8,9]. Transduction is the conversion of a chemical, thermal or mechanical stimulus into nociceptive impulses. When the nerve fibres reach their threshold limit, the nerve impulses travel to the spinal cord generating an action potential, resulting in peripheral sensitisation. The primary afferent nerves carry the action potential from the nerve terminals to the dorsal horn of the spinal cord (transmission), where the impulses are inhibited or amplified by the neurotransmitters (modulation) and central sensitisation occurs. Once the nerve impulses are modulated in the spinal cord, the impulse is projected to the brain through the dorsal horn of the spinal cord and the sensory information is processed by the brain inducing a nociceptive response[3,8,9]. The descending pain pathway inhibits the ascending pain pathway to stop pain perception[8].

In the anaesthetised patient, we can observe an increase in heart, respiratory rate, and blood pressure as a physiological response to pain. Although the patient is not aware of the nociceptive stimulus, when recovering from anaesthesia the pain receptors will be activated and the patient will perceive intensive pain[9], highlighting the importance of pre-emptive, and peri anaesthetic rescue analgesia.

Multimodal Analgesia

Analgesia administration aims to prevent both peripheral and central sensitisation and the use of different classes of analgesic drugs it is known as multimodal analgesia[9]. This approach allows the anaesthetist to reduce drug doses, and consequent side effects, providing a more effective and safer pain relief.

As to human medicine, many veterinary anaesthetists are moving away from opioid analgesia, adopting a multimodal approach, and making use of the exponential advances of loco-regional techniques in recent decades. To provide effective multimodal pain relief it is essential to understand the interaction between different analgesics and the pain pathway. On the other hand, pain scoring is advised to be performed to assess pain relief effectiveness and to avoid drug overdose. Pain scoring will be discussed in the lecture "Pain Recognition and Pain Scoring".

In this lecture, it will be discussed in detail how methadone, ketamine, and local anaesthetic drugs interact with different receptors located in the central nervous system, interrupting the pain pathway. Local anaesthetics prevent the transmission of nerve impulses by binding to the sodium channels along the nerve fibres, blocking pain sensation[10]. Both opioids and ketamine have an important role in pain modulation by interacting with the depolarisation of the neurons, inhibiting the release of neurotransmitters[8,9].

The benefits of appropriate pain management extend from the patient to the owner and the veterinary team. Veterinary nurses and technicians are the members of the veterinary team who spend more time with hospitalised patients, therefore they will have invaluable skills in recognising signs of pain, assessing pain and providing nursing care to alleviate pain. The application of alternative therapies to relieve pain such as physiotherapy, acupuncture, cryotherapy, and massage, for example, has a great impact on patient comfort and outcome[6].

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OUTER EAR CANAL AND MIDDLE EAR ABNORMALITIES IN EXTREME BRACHYCEPHALIC DOGS. SURGICAL APPROACH

Gert Ter Haar

AniCura Specialistische Dierenkliniek Utrecht, Surgery, Utrecht, Netherlands

Qualifications:

Gert ter Haar

DVM, PhD, DECVS

gert.terhaar@anicura.nl

Introduction

The ear serves as the organ of hearing and balance and is divided into three distinct anatomic and functional components: the outer, middle, and inner ear. It is currently known that brachycephaly at least leads to changes of the ear canals and tympanic bullae. These changes appear to predispose brachycephalic dogs to auditory tube dysfunction, fluid accumulation in the middle ear and reduced hearing.

Ear canal abnormalities

Little data exists on the differences in ear anatomy and ear disorders between brachycephalic breeds and dolichocephalic as well as mesaticephalic breeds. Brachycephalic dogs have been reported to have much narrower ear canals, especially in the horizontal parts. There are no reports on specific ear canal diseases in brachycephalic animals but in the authors' opinion, chronic otitis externa based on allergic skin disease in these animals quickly progresses from mild ceruminous otitis externa to excessive hyperplasia of the skin and ceruminous glands. This subsequently can lead to severe stenosis of the ear canals. In addition, inflammatory polyps arising from the skin lining the ear canal are more commonly seen in brachycephalic dogs. Many dogs with this form of otitis externa appear to develop the triad of otitis externa, media and interna in a relatively short amount of time and will be candidates for total ear canal ablation with lateral bulla osteotomy. This is a difficult and challenging procedure in these breeds due to the abnormal middle ear anatomy, and due, in part, to the extensive calcification of the ear canals resulting from the disease. Recently, further data on the middle ear anatomy of brachycephalics has become available. One report identified a significantly thicker tympanic bulla wall in brachycephalic dogs compared to non-brachycephalic dogs with no clinical signs of ear disease. When adjusted to body weight, a significant smaller middle ear volume was seen in brachycephalic dogs when compared to non-brachycephalic dogs. More over, the French Bulldog and the Pug have a significantly more rostral location of the bulla in relation to the temporomandibular joint, compared to Jack Russel Terriers and Labrador Retrievers.

Middle ear problems

Brachycephalic dogs are predisposed to fluid accumulation in the middle ear. This fluid accumulation is theorized to be caused by a subclinical middle ear infection related to otitis externa, or by drainage problems that result from an abnormal tympanic bulla morphology and/or auditory tube dysfunction. In the veterinary literature there are no reports on the incidence or etiopathogenesis of otitis media in brachycephalic patients, but in people there is sufficient evidence that people with dolichocephalic skulls have otitis media less often than do people with brachycephalic skulls. It is likely that impaired ventilation of the middle ear predisposes brachycephalic patients to infections, which are theorized to ascend from the respiratory tract. Topical and systemic antibiotics are advised for animals with otitis externa and media, but total ear canal ablation with lateral bulla osteotomy is advised for recurrent cases and those who present with the triad of otitis externa, media et interna. According to one report, brachycephalic dogs appear to be predisposed for primary or secondary cholesteatoma formation, which is presumed to be a consequence of the aforementioned anatomical abnormalities as well.

Patients with middle ear effusion without diagnostic imaging or oto-endoscopic evidence compatible with otitis externa, are presumed to have primary middle ear disease and auditory tube dysfunction. Brachycephalic dogs with severe obstructive airway disease are more likely to have middle effusion on diagnostic imaging than those presenting for non respiratory reasons. Effusion in many of these patients is probably sterile, as is the case in Cavalier King Charles Spaniels. In the latter, auditory tube dysfunction is presumed to lead to middle ear effusion with bulging of the pars flaccida of the tympanic membrane which leads to depression, head shaking, ear scratching and reduced hearing. Improved ventilation of the middle ear cavity with reduction of clinical signs is possible by endoscopy-guided placement of ventilation tubes in the eardrum in the latter breed. No reports exist on the use of tubes in other brachycephalic breeds.

Inner ear abnormalities

Whereas most brachycephalic dogs will present with signs of inflammation of the external, middle or inner ear, some owners mainly report hearing loss or deafness in their animals. Although no specific reports on hearing capacity in healthy brachycephalic dogs exist, it is reasonable to assume that ear canal stenosis and/or middle ear effusion leads to significant conductive hearing loss. Animals presenting with peripheral vestibular ataxia probably also have cochlear dysfunction with decreased hearing. In addition, the use of topical ear ointment for the treatment of chronic ear infections can also lead to sensorineural hearing loss. Though total ear canal ablation with lateral bulla osteotomy can further decrease hearing capacity, surgery is indicated to remove the source of inflammation and pain associated with chronic otitis externa and media.

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VECTOR-BORNE HELMINTHS OF ZOONOTIC CONCERN: DIROFILARIA SPP

Filipe Dantas-Torres

Aggeu Magalhães Institute, Department Of Immunology, Recife, Brazil

Qualifications:

Filipe Dantas-Torres

MV, MSc, DSc, PhD, FRES, Dipl. EVPC

fdtvet@gmail.com

Zoonotic vector-borne helminths are widespread and prevalent in both tropical and temperate countries. These include several spirurid nematodes (order Spirurida), such as *Dirofilaria immitis*, *Dirofilaria repens*, *Onchocerca lupi* (family Onchocercidae) and *Thelazia callipaeda* (family Thelaziidae) (1).

Dirofilaria repens and *D. immitis* are the most common causative agents of human dirofilariasis from a global perspective (2, 3). Based on where worms are found, human dirofilariasis cases are typically classified as subcutaneous, ocular and pulmonary. Globally, *D. repens* is more frequently associated to the subcutaneous and ocular clinical variants, whereas *D. immitis* to the pulmonary variant (2, 3). However, many cases do not follow this general pattern, with *D. repens* also associated with several pulmonary cases in Europe (2). In a recent review of the literature (3), among 576 clinical cases reviewed, 416 cases were caused by *D. repens* (72.2%), 40 by *D. immitis* (6.9%), six by *Dirofilaria tenuis* (1.0%), five by 'Dirofilaria hongkongensis' (invalid species, see Ref. 4) (0.9%) and one by *Dirofilaria ursi* (0.2%).

Other species reputed to infect humans includes *Dirofilaria spectans*, *Dirofilaria striata*, *Dirofilaria subdermata*, and *Dirofilaria magnilarvatum* (5, 6). In addition, Torgerson and Macpherson (7) mentioned that *Dirofilaria corynodes* has been previously reported in humans, but provided no further details on this. Finally, a parasite formerly included in the genus *Dirofilaria* (i.e., *Dirofilaria roemeri*) has been reported in humans, but it is now placed in the genus *Pelicitus* (6).

Molecular data on species other than *D. immitis*, *D. repens* and 'D. hongkongensis' from humans is scarce, which makes old reports based on damaged worms questionable. Indeed, morphological diagnosis based on worm fragments is generally unreliable for species identification. For instance, *D. subdermata* and *D. ursi* cannot be reliably distinguished based on features available in transverse histologic sections (8). Therefore, some authors have adopted the term "*D. ursi*-like". More recent studies are attempting to generate molecular data from *Dirofilaria* nematodes recovered from human patients (9, 10), which is instrumental to improve our understanding of the whole range of *Dirofilaria* species that may actually infect humans worldwide.

While most *Dirofilaria* spp. infections can be asymptomatic in humans, patients may develop overt disease, with some patients reporting thoracic pain, hemoptysis, coughing, fever, among other nonspecific signs (2, 3). Moreover, some cases of human pulmonary dirofilariasis may be misinterpreted as lung cancer on chest images and result in unnecessary surgical interventions.

Human dirofilariasis is a neglected disease and a silent zoonosis, whose global burden may be currently underestimated. Because dogs are the most important reservoirs of both *D. repens* and *D. immitis*, controlling the infection in canine populations is fundamental not only for dogs themselves, but also for other susceptible hosts, including cats and humans.

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PERIODONTAL DISEASE - PATHOGENESIS AND SIGNIFICANT CONSEQUENCES

Brook Niemiec

Veterinary Dental Specialties, Dentistry, San Diego, United States of America

Qualifications:

Brook A. Niemiec

DVM, DAVDC, DEVDC, FAVD

bniemiec@vdspets.com

Pathogenesis:

Periodontal disease is generally described in two stages, gingivitis and periodontitis. Gingivitis is the initial, **reversible** stage in which the inflammation is confined to the gingiva. The gingival inflammation is created by plaque bacteria and may be reversed with a thorough dental prophylaxis and consistent homecare. Periodontitis is the later stage of the disease process and is defined as an inflammatory disease of the deeper supporting structures of the tooth (periodontal ligament and alveolar bone) caused by microorganisms..

Periodontal disease is initiated by oral bacteria which adhere to the teeth in a substance called plaque. Plaque is a biofilm, which is made up almost entirely of oral bacteria, contained in a matrix composed of salivary glycoproteins and extracellular polysaccharides. Calculus (or tartar) is basically plaque which has secondarily become calcified by the minerals in saliva.

Plaque on the tooth surface is known as supragingival plaque. Once it extends under the free gingival margin and into the area known as the gingival sulcus, it is called subgingival plaque. Supragingival plaque likely affects the pathogenicity of the subgingival plaque in the early stages of periodontal disease. However, once the periodontal pocket forms, the effect of the supragingival plaque and calculus is minimal. Therefore, control of supragingival plaque alone is ineffective in controlling the progression of periodontal disease.

The progression of periodontal disease is determined by the virulence of the bacteria ***combined with*** the host response. It is the host response that often damages the periodontal tissues. In fact, periodontal disease has been proven to be a genetic disease.

As periodontal disease progresses over time, the attachment loss continues in a non-linear pattern as active stages of destruction are followed by quiescent phases (burst). The end stage of periodontal disease is tooth loss; however the disease has created significant problems prior to tooth exfoliation.

Clinical Features:

The first clinical sign of gingivitis is bleeding upon probing or brushing This is followed by erythema and edema of the gingiva. Gingivitis is typically associated with calculus on the involved dentition but is primarily elicited by PLAQUE and thus can be seen in the absence of calculus. Alternatively, widespread supragingival calculus may be present with little to no gingivitis. It is critical to remember that calculus itself is essentially non-pathogenic. Therefore, the degree of gingival inflammation should be used to judge the need for professional therapy.

The hallmark clinical feature of established periodontitis is attachment loss. In other words, the periodontal attachment to the tooth migrates apically. As periodontitis progresses, alveolar bone is also lost. On oral exam, there are two different presentations of attachment loss. In some cases, the apical migration results in gingival recession while the sulcal depth remains the same. Consequently, tooth roots become exposed and the disease process is easily identified on conscious exam. In other cases, the gingiva remains at the same height while the area of attachment moves apically, thus creating a periodontal pocket. This form is typically diagnosed only under general anesthesia with a periodontal probe. It is important to note that both presentations of attachment loss can occur in the same patient, as well as the same tooth. As attachment loss progresses, alveolar bone loss continues, until tooth exfoliation in some cases.

Severe local consequences:

The most common of these local consequences is an **oral-nasal fistula (ONF)**. ONFs are typically seen in older, small breed dogs (especially chondrodystrophic breeds); however they can occur in any breed as well as felines. ONFs are created by the progression of periodontal disease up the palatal surface of the maxillary canines however; any maxillary tooth is a candidate. This results in a communication between the oral and nasal cavities, creating an infection (sinusitis). Clinical signs include chronic nasal discharge, sneezing, and occasionally anorexia and halitosis. Definitive diagnosis of an oronasal fistula often requires general anesthesia. The diagnosis is made by introducing a periodontal probe into the periodontal space on the palatal surface of the tooth. Interestingly, this condition can occur even when the remainder of the patient's periodontal tissues is relatively healthy (including other surfaces of the affected tooth). Appropriate treatment of an ONF requires extraction of the tooth and closure of the defect with a mucogingival flap. However, if a deep periodontal pocket is discovered prior to development of a fistula, periodontal surgery with guided tissue regeneration can be performed to save the tooth.

Another potential severe consequence of periodontal disease can be seen in multi-rooted teeth, and is called a **class II perio-endo abscess.** This occurs when the periodontal loss progresses apically and gains access to the endodontic system, thereby causing endodontic disease via bacterial contamination. The endodontic infection subsequently spreads though the tooth via the common pulp chamber and causes periapical ramifications on the other roots.

This condition is also most common in older small and toy breed dogs. The most common site for a class II perio-endo lesion to occur in small animal patients is the distal root of the mandibular first molars.

The third potential local consequence of severe periodontal disease is a **pathologic fracture.** These fractures typically occur in the mandible (especially the area of the canines and first molars), due to chronic periodontal loss, which weakens the bone in affected areas. This condition is again, most seen in small breed dogs, mostly because their teeth (especially the mandibular first molar) are larger in proportion to their jaws as in comparison to large breed dogs. Pathologic fractures occur most commonly because of mild trauma, or during dental extraction procedures. However, some dogs have suffered from fractures while simply eating.

Pathologic fractures carry a guarded prognosis for several reasons including: lack of remaining bone, low oxygen tension in the area, and difficulty in rigidly fixating the caudal mandible. There are numerous options for fixation, but the use of wires, pins or plates is generally required. Regardless of the method of fixation, the periodontally diseased root (s) MUST be extracted for healing to occur.

Awareness of the risk of pathologic fractures can help the practitioner to avoid problems in at risk patients during dental procedures. If one root of an affected multi-rooted tooth is periodontally healthy, there is an even greater chance of mandibular fracture due to the increased force needed to extract the healthy root. An alternate form of treatment for these cases is to section the tooth, extract the periodontally diseased root, and perform root canal therapy on the periodontally healthy root. In cases where periodontitis involving a mandibular canine or first molar is

identified during a routine prophy, it is best to inform the owners of the possibility of a jaw fracture prior to attempting extraction of the offending tooth.

The fourth local consequence of severe periodontal disease results from inflammation close to the orbit which could potentially lead to **blindness**. The proximity of the tooth root apices of the maxillary molars and fourth premolars, places the delicate optic tissues in jeopardy.

The fifth local consequence is described in recent studies which have linked chronic periodontal disease to **oral cancer**. The association in this case is likely due to the chronic inflammatory state that exists with periodontitis.

The final significant local consequence of periodontal disease is chronic **osteomylitis**, which is an area of dead, infected bone. Dental disease is the number one cause of oral osteomylitis. Furthermore, once an area of bone is necrotic, it does not respond effectively to antibiotic therapy. Therefore, definitive therapy generally requires aggressive surgical debridement.

Severe systemic manifestations:

Systemic ramifications of periodontal disease are also well documented. The inflammation of the gingiva and periodontal tissues that allows the body's defenses to attack the invaders also allows these bacteria to gain access to the body. Recent animal studies suggest the possibility that these bacteria negatively affect the kidneys and liver, leading to decrease in function of these vital organs over time. Furthermore, it has also been suggested that these bacteria can become attached to previously damaged heart valves (IE valvular dysplasias) and cause endocarditis, which in turn can result in intermittent infections, and potentially thromboembolic disease. Other studies have linked oral bacteremias to cerebral and myocardial infarctions and other histological changes. Additional human studies have linked periodontal disease to an increased incidence of chronic respiratory disease (COPD) as well as pneumonia. There are many studies that strongly link periodontal disease to an increase in insulin resistance, resulting in poor control of diabetes mellitus as well as increased severity of diabetic complications (wound healing, microvascular disease). Additionally, it has been shown that diabetes is also a risk factor for periodontal disease. Periodontal disease and diabetes are currently viewed as having a bidirectional interrelationship where one worsens the other.

While these studies are not definitive, we know that periodontal disease is an infectious process and that affected patients must deal with these bacteria on a daily basis, which in turn can lead to a state of chronic disease.

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DECISION MAKING FOR C-SECTION – TIMING FOR ELECTIVE C-SECTION

Kurt De Cramer

Rant en Dal Animal Hospital, Theriogenology, Mogale City, South Africa

Qualifications:

Kurt De Cramer

BVSc MMedVet (Gyn) PhD

kdcramer@mweb.co.za

INTRODUCTION

The high proportion of deliveries requiring caesarean section (CS) in many breeds remain a reality (1) and may approach more than 80% in some breeds. Besides breed, prior CS, large litters and small litters also predispose to CS. For high-risk parturitions, properly planned elective CS is considered a safe and justified intervention (2). Failing to intervene timeously in high-risk parturitions may result in foetal demise (3). An emergency CS is may be required when the bitch exhibits at least one of the following; green or black vaginal discharge, delivery of a dead puppy presence of a dead foetus, foetus in distress or sustained contractions for more than 30 min. The odds of stillbirths by emergency CS is considerably higher than for elective CSs.

Elective CS may be qualified as 'parturient' if performed when the cervix is open and the bitch is in labour or 'pre-parturient' when performed before the onset of labour, while the cervix is closed. What are conventionally known as 'elective CSs' are parturient CSs. In some bitches, foetal demise may occur before the first signs of parturition (such as abdominal contractions) are recognized and the decision to perform a CS is made. This may result in reduced survival of puppies delivered by parturient elective CSs (4). Therefore, scheduled pre-parturient CS, before cervical dilatation may reduce the prevalence of parturient foetal demise in bitches where a CS is essential, but requires impeccable timing. The time of day during which CSs are performed influences the proportion of still born foetuses because a full staff complement during normal working hours help maximize puppy survival.

2 PARTURITION MANAGEMENT

The management of parturition involves prediction of parturition date, mode of delivery (spontaneous parturition or elective CS). When a trial of labour fails it requires a prompt decision whether medical management of dystocia will be attempted or an emergency CS will be performed. An important consideration is whether the veterinarian has access to the bitch for serial observations to make all these decisions timeously. This depends on whether the owner of the bitch allows to hospitalise the bitch or not.

2.1 Outpatient

Most parturition management cases are dealt with as outpatients. This has the disadvantages; that it makes it difficult to perform serial observations (vaginoscopy, ultrasound assessments), increasing after hour work load, increasing probability of emergency CS and foetal demise. It has the major advantage that it leaves the responsibility of parturition observation with the owner. This is a very important consideration because performing CSs too early or too late may lead to catastrophic consequences for the foetuses and possible legal actions if retrospectively, intervention or lack thereof, is claimed to have reduced puppy survival.

2.2 In patient

In-patient parturition management can only be conceded to if 24-hour clinic. It has the main advantage that serial observations and a CS assessments can be performed and allows for early intervention mitigating foetal demise. The disadvantage is that all the responsibility rest upon the veterinary obstetrician.

3 ESTIMATION OF PARTURITION DATE

3.1 Prediction of parturition dates based on events during the peri oestrous period

When using breeding dates, the apparent gestation length can vary by as much as 14 d (57–72 d) when timed from the first of multiple matings (5). When using the first day of cytological dioestrus it predicted the parturition date with a precision of ±1 d, ± 2 d and ±3 d in 88%, 99% and 100% (6), and can be very useful but requires correct interpretation of vaginal cytology. A more practical criterion is progesterone concentration. It was concluded that pregnancy length from the day of the preovulatory rise in progesterone, defined as the day when PC rose to 5.7 nmol/L was 65 ± 1 d, 65 ± 2 d or 65 ± 3 d interval with a 67%, 90% and 100% of accuracy, respectively (7).

3.2 Prediction of parturition dates based on events during gestation or in the preparturient period

Although foetal biometric measurements such as the biparietal diameter may give some clues to estimated date of onset of parturition, it is too variable within and among litters to be useful as a means of determining readiness for caesarean section. Parturition date relative to preparturient decline in rectal temperature is not reliable as some bitches do not demonstrate a detectable decline in rectal temperature prior to parturition. Behavioural signs of impending parturition are inconsistently displayed in bitches. Nesting behaviour has been observed up to 7 d prior to onset of spontaneous parturition and waiting until clear signs of parturition are displayed, is also not without risk.

3.2.1 Parturition date relative to preparturient decline in progesterone concentration (PC)

A PC ≥15.8 nmol/L indicates that there is a 99% probability that the bitch will not enter spontaneous parturition within the following 12 h, when PC ≤ 8.7 nmol/L, there is a 99% probability of entering spontaneous parturition within 48 h or less, and when below 3.18 nmol/l, 100% probability of entering spontaneous parturition within 24 h or less. These predictions help the veterinary obstetrician in making the decision whether the bitch may be left unattended overnight or not. Whether PC can be used solely as indicator of readiness for CS requires further investigation. There is anecdotal evidence that when the preparturient progesterone concentrations decreased to below 6.4 nmol/L that is safe to perform a CS. Studies are ongoing identifying a threshold of progesterone below which it is known that all bitches are within a consistent and definable interval (12 hours) from the onset of spontaneous parturition.

The only exception may be the singleton pregnancy and two pup litter in giant breeds where it is suspected that incomplete luteolysis may be the cause of foetal demise before onset of spontaneous parturition and bitches that are aborting.

4 TIMING CAESAREAN SECTION

4.1 Parturient caesarean section

The simplest form of timing a caesarean section is confirming that a bitch is parturient. Confirmation involves observing foetal membranes, evidence of membrane rupture has been witnessed, or active contractions have been observed. By the time black or green discharges are seen there may already be foetal demise and it is no longer a parturient CS but an emergency CS. The best method however is achieved by performing serial examinations to observe for a dilating cervix. This indicates earliest onset of parturition, is consistently displayed and occurs in all cases even in breeds where dystocia due to uterine inertia is common. When cervical dilation is detected early on, the prevalence of foetal demise is decreased.

4.2 Preparturient caesarean section

This is only possible when the safe period of intervention is known and if a method exists to confirm that gestation has advanced to within that safe period. From parturition induction studies and research using predicted dates we suspect that this period is 48 h. Planned preparturient CS obviates the need for after-hour interventions and allows for timeous delivery of the puppies potentially reducing the prevalence of foetal compromise and still births. Performing preparturient CSs too early may yield premature, non-viable puppies, cause failure of placental release and increase the risk of serious uterine haemorrhage. Timing caesarean sections based on predicted parturition dates have been performed with good results (8) without using priming agents such as Aglepristone or betamethasone. However, there are instances where these are useful in cases of pregnancies at peril where earlier delivery may be indicated.

5 CONCLUSIONS

No method of timing CS is perfect all the time. Allowing owners to decide whether a bitch is at onset of parturition is problematic. Although serial observations are very useful it is labour intensive and requires 24 h round the clock attendance.

A method that works best is to have peri-ovulatory data to estimate the 4 days surrounding the estimated parturition date which curtails the parturion observation period, stern observation of bitch during that time including vaginal speculum examinations combined with daily progesterone assays in late afternoons to decide whether overnight observation is required based on the probability of onset of spontaneous parturition based on progesterone concentration.

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A CASE-BASED DISCUSSION ON BEST ANESTHETIC PROTOCOLS FOR DOGS AND CATS

Paulo Steagall

City University of Hong Kong, Veterinary Clinical Sciences, Hong Kong, Hong Kong PRC

Qualifications:

Paulo V Steagall

DVM, MSc, PhD, DACVAA

In this lecture, we suggest some anaesthetic protocols based on specific case examples, based on extensive clinical experience.

However, dosage regimens and drug protocols should be adapted and adjusted for each patient using an individualised approach and based on physical examination, patient behaviour, degree of pain, pre-existing disease, the procedure and equipment available. ASA scoring may be useful.

You should also be aware of the specific licensed products and indications for each drug within the country you practice.

Individual patients may require different approaches; therefore, clinical judgement is important when applying these case examples. The following should be taken into account:

• Anaesthetic protocols are only a part of the anaesthetic plan (infographic 1). Anaesthesia goes much beyond a universal "recipe". Pre-anaesthetic assessment is crucial, as are monitoring, fluid therapy, emergency intervention, pain management and post anaesthetic recovery.

• Pre-oxygenation is recommended before anaesthetic induction, particularly in patients with limited physiological reserves (e.g. geriatrics and paediatrics)

• Intubation should be considered on an individual basis, as there are pros and cons, especially when dealing with anaesthesia for spay-neuter programs and short procedures. However, airway protection and the ability to provide assisted ventilation are important, particularly when dealing with long/invasive/oral procedures (e.g. dentistry, mastectomy).

• Multimodal analgesia is always recommended; this includes basic local anaesthetic techniques and NSAIDs (if there are no contraindications) (infographics 2 and 3).

• Pain assessment (infographic 2) should ensure that the analgesic techniques and protocols are optimal for pain relief. This ideally involves the use of validated tools.

• Monitoring (infographic 5) is always part of the anaesthetic plan. It does not always involve expensive equipment. Judicious and continuous monitoring throughout anaesthesia by a dedicated individual will certainly decrease anaesthetic-induced morbidity and mortality.

• Emergency equipment should always be in place for each procedure, and drug doses should be pre-calculated. The whole team should be trained and involved with cardiopulmonary resuscitation (CPR). Preplaced intravenous access is good practice for drug and fluid therapy administration and is invaluable should CPR be required.

• Hypothermia is a common complication of anaesthesia. This should be prevented by insulation against conductive heat loss (e.g. from a cold surface when patients are placed directly on a metal table), limiting body cavity exposure, using warming systems (that do not burn the patient), avoiding excessive removal of hair and limiting the wetting from surgical preparation with excessive isopropyl alcohol/scrubbing solutions. The use of low oxygen flows with rebreathing circuits may also help.

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DIAGNOSTIC PITFALLS OF ACUTE PANCREATITIS IN THE DOG.

Peter Hendrik Kook

University of Zurich, Clinic For Small Animal Internal Medicine, Zurich, Switzerland

Qualifications:

Peter Hendrik Kook

Professor, Dr. med. vet., Diplomate ACVIM (SAIM), Diplomate ECVIM-CA

pkook@vetclinics.uzh.ch

Acute pancreatitis (AP) is a common disorder in dogs. It is a clinical diagnosis that is based on a combination of clinical, laboratory, and imaging findings and exclusion of other differential diagnoses. In absence of histopathology, determination of serum lipase, either as an activity (1,2-o-dilauryl-rac-glycero-3-glutaric acid-(60-methylresorufin) ester [DGGR]-based lipase assays) or as a concentration (pancreatic lipase immunoreactivity [PLI]) is considered the laboratory test of choice. Both test results correlate highly.[1,2] A recent study evaluating concurrently measured lipase activity and PLI over time in hospitalized dogs treated for AP found that both assays give virtually identical results.[2] Nature and magnitude of change was always the same for lipase activity (LIPC Roche) and PLI (Spec PL).[2] Advantages of lipase activity measurement is comparatively low cost and immediate availability.

Dogs with AP can present with a variety of clinical signs (inappetence/anorexia, vomiting, diarrhea, abdominal pain, lethargy), and some dogs can only present with one sign.[2] It is interesting to note that diarrhea is not a common clinical sign in humans with AP. Likewise, when discussing the clinical picture of dogs with AP with colleagues mainly upper gastrointestinal signs (anorexia, vomiting, abdominal pain) are mentioned. Indeed, we could recently show that lipase activity (LIPC Roche) was significantly higher when lethargy, abdominal pain, vomiting and hematemesis were present, while lipase was not significantly higher when diarrhea was present in 234 dogs examined for AP.[3] However when correlating presence or absence of clinical signs with lipase activity, PLI or c-rP concentrations in 39 dogs with AP, no significant correlations were found at admission or during hospitalization in that smaller prospective study.[2]

The question remains if hyperlipasemia in dogs with acute diarrhea as the primary presenting complaint truly reflects primary pancreatitis or may be due to reflux of duodenal juice into pancreatic ducts when small bowel loops are dilated and swollen, or could be due to ascending bacteria or their toxins.[4] Because AP is clinically indistinguishable from acute gastroenteritis and so much focus has been placed in recent years on the importance of lipase when diagnosing pancreatitis, it gets somewhat complicated when looking at the results of recent studies.

We recently showed that markedly increased lipase activity and PLI concentrations normalize within 1 to 2 days in about 60% of hospitalized dogs treated for AP.[2] Thus, an AP diagnosis can be missed in acute presentations when lipase measurement is delayed (example: dog with acute onset of anorexia, vomiting, some diarrhea comes in on a saturday night, is hospitalized and treated supportively over the weekend until blood samples for lipase measurement are taken monday morning). Our results illustrate that depending on when during treatment lipase is determined the result can be either diagnostic for AP or within reference range.

Differentiating an AP episode from an acute gastroenteritis episode may well have clinical relevance because exocrine pancreatic insufficiency and diabetes mellitus are often discussed as long-term consequences of pancreatic remodeling due to repetitive bouts of AP in dogs.

The third cornerstone of a clinical pancreatitis diagnosis besides clinical signs and laboratory findings is ultrasonography (US). However, the agreement and correlation of lipase activity and PLI concentration with pancreatic US have been repeatedly found to be low[1,2,5]. Still, abdominal US is helpful for the assessment of all other abdominal organs. When lipase is high but pancreatic US is normal this may be because of a very acute onset of disease, because the ultrasonographer could not visualize all parts of the pancreas or because subtle changes (i.e. only mildy enlarged pancreas) were not recognized as such by the examiner. When lipase is normal but pancreatic US is deemed to be compatible with a radiologic diagnosis of pancreatitis , this may be because this dog has had previous (unrecognized) bouts of pancreatitis and there are some remnant changes visible in the pancreas (i.e. heterogenous parenchyma) but the dog in fact presents for another disease. Or the dog truly has pancreatitis but has been treated and serum lipase has already decreased to nearly normal values and pancreatic changes are visible on US.[2] Emerging evidence suggests that duration of clinical signs before presentation affects lipase results and US evidence of pancreatitis differently.[3] With shorter disease duration, dogs had significantly higher lipase activities but US was not positive significantly more often for pancreatitis.[3] US pancreatic changes consistent with AP may lag behind and occur later during hospitalization. It has been shown that it may take 1-3 days until dogs with AP have an ultrasonographically abnormal pancreas.[6] We found that only a hyperechoic mesentery and not changes in pancreatic size or echogenicity correlated significantly with lipase activity and PLI when dogs with AP were acutely sick.[2] Also, significantly higher lipase activity and PLI concentrations only were found when compared between dogs with and without a hyperechoic mesentery.[2] Possibly, a hyperechoic mesentery represents an early marker for AP when the pancreas itself still appears unremarkable. Future studies using a standardized US approach and including the time factor are needed to better investigate the above-mentioned relationships between clinical signs, laboratory and imaging findings. For clinicians it is important to understand that no one test alone can make the diagnosis of AP, but that all findings must be considered in context.

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RADIOGRAPHIC LUNG PATTERNS - HOW TO COME UP WITH A PROPER LIST OF DIFFERENTIAL DIAGNOSES

Anna Adrian

Vet Meet, Education, Hergolding, Germany

Qualifications:

Dr. Anna Adrian

MRCVS MS DACVRAmerican Specialist in Veterinary Diagnostic Imaging RCVS recognized Specialist in Diagnostic Imaginga.adrian@frontier.vet

In my experience pulmonary lung patterns are one of the hardest things to correctly diagnose and differentiate on thoracic radiographs. The correct identification combined with the location of the abnormal lung pattern is crucial to come up with a correct differential diagnosis.

Coming back to the anatomy the lung is divided in the left and right lobes. On the left there is the cranial and caudal lung lobe, while on the right there is the cranial, middle, caudal and accessory lung lobe.

To properly assess the lungs a minimum of two orthogonal views is recommended. Based on the clinical question the left or right lateral and a ventrodorsal or dorsoventral view should be acquired. If pulmonary metastasis are suspected both laterals and a orthogonal view should be acquired. Generally it is important that the radiographs are made at maximum inspiration to avoid atelectasis/artefacts due to hypoinflation.

There are multiple different type of lung patterns. The most commonly visualised are: 1) bronchial pattern 2) interstitial pattern 3) alveolar pattern or a combination of these lung patterns. The interstitial lung pattern can further be divided in an unstructured interstitial pattern, reticular lung pattern and a nodular interstitial pattern. Less commonly visualised patterns are a vascular lung pattern or miliary pattern.

BRONCHIAL LUNG PATTERN: Usually the bronchial walls are not visualised on radiographs except at the perihilar region. When a bronchial pattern is present tramlines and donuts are visualised throughout the pulmonary parenchyma. This is indicative of bronchial wall thickening, luminal exudate or peribronchial cuffing. A bronchial pattern is often seen in combination with an interstitial lung pattern, which is described as a bronchointerstitial pattern. Care must be taken to not misdiagnose a bronchial pattern in older patients with mild mineralisation of the bronchial walls. Differential diagnoses for a bronchial pattern include for example bronchitis, neoplasia, bronchial wall oedema and Cushing's disease. An additional form of a bronchial pattern is the bronchiectasis, which is an abnormal bronchial dilation.

INTERSTITIAL LUNG PATTERN: If the pulmonary parenchyma has a more hazy appearance and the vasculature is ill-defined it is indicative that the pathology is located within the interstitial tissues. As mentioned before in interstitial pattern can further be divided. The diffuse interstitial pattern is the one most people think of when hearing the term interstitial lung pattern. Differentials include age-related changes, infection, oedema, neoplasia (for example lymphoma), allergies, parasitic causes of fibrosis. The nodular interstitial pattern is usually seen with pulmonary metastasis. Nodules have to be at least 3 to 5 mm in diameter to be visible on radiographs. A reticular pattern is commonly seen with lung lobe torsions and is characterised by randomly arranged linear opacities.

ALVEOLAR LUNG PATTERN:The alveolar lung pattern is probably the most easiest to recognise. It gets sometimes described as a tree standing in a snowstorm. This means that the bronchi are visualised, however the surrounding pulmonary parenchyma is radiopaque. This occurs if the alveoli lose air either by being filled or due to collapse. Differentials for an alveolar lung pattern are pneumonia, haemorrhage, atelectasis, cardiogenic or non-cardiogenic pulmonary oedema, neoplasia, contusions or PTE.

VASCULAR LUNG PATTERN: A vascular lung pattern is due to an abnormality of the pulmonary vasculature instead of the pulmonary parenchyma. It is defined by a change in number, size and shape of the pulmonary vasculature. Arteries can be larger than veins, veins can be larger than arteries or the entire vasculature is increased or decreased in size.

Depending on the location of the pulmonary changes, the age of the patient and comorbidities differentiation of different disease patterns can be made and the differential diagnoses list can be altered accordingly.

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DRIVING CHANGE IN THE VETERINARY COMMUNITY

Daniella Santos[1], *Tiago Trovao*[2]

[1]*IVC Evidensia, Director Of Professional Culture, Bristol, United Kingdom,* [2]*IVC Evidensia, Iberia, Lisbon, Portugal*

Qualifications:

Daniella Dos Santos

BSc BVetMed FRCVS

daniella.santos@ivcevidensia.com

Tiago Trovao

DVM MSc Business

tiago.trovao@ivcevidensia.pt

The veterinary profession plays a key role in society, with significant influence within our community and beyond. With our role in One Health, the veterinary community is well placed to improve the health and welfare of animals, the planet, and the communities we serve. But often the first step is driving change in the veterinary community, but how do we do that successfully?

Quite often the veterinary profession can be resistant to change despite the potential benefits, or there may be barriers in the way. In this session we will discuss, using examples, of how change in the veterinary community can be driven at local, regional, national, and international levels. From changes to improve the health and welfare of our patients, to adaptations in the way we practice ensuring a more sustainable environment. Recognising the challenges our own professions face and addressing them, or challenging the societal issues we face, this session will give you an insight into how to leverage this challenges and drive changes in our community to benefit all

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VENTILAçãO MECâNICA E ANESTESIA DE FLUXOS BAIXOS

Ana Carina Costa

RVC, Clinical Sciences, Hatfield, United Kingdom

Qualifications:

Ana Carina Costa

PgCertAVN Anaesthesia and Analgesia, NCert(Anaesth), NCert(PhysioTech), Anaesthesia RVN

acosta@rvc.ac.uk

"Ventilation and low flow anaesthesia"

"Ventilação e anestesia de fluxos baixos"

Learning Objectives

- Understand ventilation/gas exchange physiology

- Recognise when mechanical ventilation is required and potential adverse effects

- Deliver mechanical ventilation safely during anaesthesia

- Recognise the environmental impact of volatile anaesthetic agents

- Understand the concept of low-flow anaesthesia, necessary equipment, and safe use for the patient

Pulmonary ventilation is the mechanism how gas enters and leaves the alveoli, allowing oxygen to move into the lungs and carbon dioxide to be removed, and it is dependent on gas transportation and diffusion across the tissues/membranes[1]. In certain situations, controlled ventilation might be required during general anaesthesia to aid the patient's respiratory function, which may be suppressed due to anaesthesia drugs, pulmonary pathology, or body positioning. Mechanical ventilation is indicated to treat hypoventilation, hypoxemia, hypercapnia, and respiratory acidosis, when suspected increased intracranial pressure, persistent excessive respiratory effort, for intrathoracic surgery, laparoscopic procedures, to control anaesthesia depth, and when using neuromuscular blocking agents and drugs that can induce apnoea[1,2].

On spontaneous ventilation, the thorax expands generating negative pressure, which draws air into the lungs. During expiration, the chest contracts and the intrapleural pressure increases but remains negative throughout the respiratory cycle[1]. This negative pressure is essential for the thoracic pump to promote venous return, keep preload stable, and maintain cardiac output[1,3]. During mechanical ventilation positive pressure forces air into the lungs, known as intermittent positive pressure ventilation (IPPV)[1,3]. Exhalation is passive during spontaneous breathing and IPPV[1].

There are different modes of mechanical ventilation. Volume-controlled ventilation (VCV) delivers a set tidal volume, normally between 10-20ml/kg, through a constant flow over a defined inspiratory time, varying the peak inspiratory pressure (PIP) depending on the compliance of the respiratory system, while pressure-controlled ventilation (PCV) uses a decelerating flow pattern to quickly reach a predetermined pressure, limiting the tidal volume[1-4].

Recommended PIPs in cats and dogs vary between 7-8cmH_2O and 10-12cmH_2O respectively, depending on the patient's bodyweight and pre-existent respiratory pathologies[1]. Higher PIPs can be used when lung compliance is low, although above 20cmH_2O barotrauma can occur[3].

Lower peak pressures and higher respiratory rates are advised when ventilating patients with severe pulmonary disease[1,3]. In general, as the PIP is constant when using PCV, it is safer for smaller patients compared to VCV, in addition, it improves pulmonary compliance, therefore may be beneficial for patients with lung injuries[4]. However, due to the rapid reach of the pre-established pressures, it can cause cardiovascular changes. A study comparing PVC and VCV modes in anaesthetised cats with a cuffed endotracheal tube in place demonstrated that VCV produces less work breathing, more stable tidal volumes and lower occurrence of hypotension[2].

The respiratory rate should be set up between 10-20 respirations per minute, and the inspiratory expiratory ratio 1:2 or up to 1:3 in healthy patients, to mimic a physiological normal breath and allow time for the gas exchanges to occur[1]. When mechanically ventilating a patient, observation of the chest movement can help to assess if appropriate inflation is occurring[1,3] however, spirometry is more accurate in measuring inspired and expired volumes, PIP and compliance, allowing ventilation optimisation[5]. Although spirometry might not be available in every practice, capnography is mandatory when performing IPPV to assess for hypo and hypercapnia, and to adjust the ventilator settings, ideally maintaining the $EtCO_2$ between 35-45cmH_2O[1].

Applying positive end-expiratory pressure (PEEP) and recruitment manoeuvres can decrease alveolar collapse and enhance oxygen efficiency by reopening closed alveoli[1] however, caution must be taken as may negatively affect venous return and lead to hypotension[1,3]. A protective ventilation strategy combining low PIPs or tidal volumes (8ml/kg) and PEEP (5cmH_2O) has been shown to offer adequate gas exchange with minimal cardiovascular changes[6].

It's important to consider the impact of ventilation on the patient's respiratory mechanics and cardiovascular system. IPPV is non-physiologic and can potentially cause harmful side effects. Therefore, it's crucial to choose the best ventilation mode based on the patient's characteristics, respiratory pathology, and the procedure to be performed. To ensure safe and efficient ventilation with minimal risk of lung injury and cardiovascular impairment, it's imperative to monitor respiratory and cardiovascular function and have a good understanding of the ventilator modes and settings[4].

In veterinary medicine, the use of volatile anaesthetic agents (VAA) for maintaining anaesthesia has been a traditional practice. However, it is important to note that these agents have minimal biotransformation and are greenhouse gases[7]. Sevoflurane, isoflurane, desflurane, and nitrous oxide are commonly used in veterinary medicine, with each having an atmospheric lifetime of 1.1, 3.2, 14, and 114 years, respectively. These agents have a global warming potential that ranges from 130 to 2540 times more than carbon dioxide (CO_2) over 100 years[8]. Isoflurane and nitrous oxide also contribute to the depletion of the ozone layer, hence calling for more responsible usage of these agents[8].

Low-flow anaesthesia involves delivering fresh gas flow (FGF) at a rate of ≤ 1.0 L/min to maintain volatile anaesthesia. This technique is both safe for the patient and efficient, as it reduces the consumption of oxygen and volatile anaesthetic agents, resulting in less environmental pollution[9]. When high fresh gas flows are used (over 1.0L/min), the VAA can be delivered more quickly, but it exceeds the patient's oxygen metabolic requirements. A percentage of oxygen and VAA are absorbed, but the remaining volume is released into the environment after expiration[10], resulting in a significant waste of resources and financial and environmental costs. High FGFs are necessary for non-rebreathing systems (such as Aires T-piece and Bain circuits) to remove the CO_2 expired by the patient. However, with rebreathing systems (such as Circle), this function is replaced by CO_2 absorbers.

To safely use low-flow anaesthesia, the following equipment is necessary:

A low-volume low-resistance circle absorber

Capnography to monitor CO_2 for rebreathing

Gas analyser to monitor inspiratory fractions of O_2 (>30% during anaesthesia) and VAA

Considerations using low-flow anaesthesia:

The CO_2 absorber must be replaced when two-thirds have changed colour

Higher CO_2 absorber consumption, however, the overall costs-effectiveness is lower

The use of low-flow anaesthesia with sevoflurane and CO_2 absorbers containing soda lime is not recommended due to the risk of compound A production that might be nephrotoxic

Initial higher FGFs are needed to prime the breathing system and to achieve the VAA concentration desired

Leak testing of the breathing system and anaesthetic machine is mandatory

The volume lost when using a side stream capnograph

Vaporiser output decreases with lower FGFs

Dilution effect – can compromise anaesthetic depth and changes in depth will take longer

Some volume is scavenged unless fully closed circle circuits are used

Small patients – increased airway resistance to airflow flow due to circuit components, which might affect the quality of ventilation

Increase in body temperature - not recommended in hyperthermic or pyretic patients, nor after smoke inhalation

Care in patients with decreased respiratory function when using mixtures of O_2 and medical air or oxygen generators

Do not use low-flow anaesthesia with nitrous oxide

When using low-flow anaesthesia the literature recommends starting delivering O_2 at a rate of 4.0L/min for 5 minutes to allow time to prime the breathing system with oxygen and volatile agent, and then the flow can gradually be decreased[9]. The human literature recommends a minimum fresh gas flow of 0.5L/min[10], but this depends on the minimal oxygen metabolic rate, as well as the volume required for the anaesthesia machine and capnograph sampling. It is important to note that closed systems are rarely used in veterinary medicine, therefore some volume will be lost through the scavenging system.

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PERIODONTAL THERAPY FOR THE GENERAL PRACTITIONER

Lisa Mestrinho

Veterinary Faculty, University of Lisbon, Clinical Department, Lisbon, Portugal

Qualifications:

Lisa Alexandra Pereira Mestrinho

DVM MS PhD FAVD

lmestrinho@fmv.ulisboa.pt

Periodontal disease is a progressive inflammatory condition, which can lead to irreversible changes. Periodontal treatment aims to eliminate chronic inflammation and restore healthy tissues, therefore stopping progression and achieve a healthy balance. Due to the progressive nature of this disease, active and regular plaque control measures must be adopted at home.

Before periodontal treatment, it is important to know how to evaluate and stage periodontal disease.

Periodontal attachment loss must be evaluated for each tooth using a periodontal probe and dental radiography. The periodontal probe measures the depth of the gingival sulcus or the periodontal pocket when it exists. Evaluation is done at least at six points: mesial, buccal, distal, palatal/lingual, mesiopalatal/mesiolingual and distopalatal/distolingual. Normal measures correspond to a normal gingival sulcus: 1 to 3 mm for dogs and 1mm for cats.

Periodontal pocket depth is evaluated with a periodontal probe, which measures the clinical attachment level. This is an absolute measurement with some limitations in the dog due to its variations in size. For example, a 5mm periodontal pocket does not mean the same for a 2kg dog and a 50 kg dog. Therefore, dental radiography is very important in the establishment of periodontal disease stage. Since it can appreciate the height and architecture of the alveolar margin and the distance of the alveolar margin from the cementoenamel junction relative to the length of the root.

Periodontal disease (PD) stage defines a degree of severity which relates to the loss of periodontal attachment of a single tooth. Mobility and furcation involvement as well as other indexes (gingival index, plaque index, etc.) are used also as criteria for severity. They will not be detailed here. However, furcation involvement is included as a criterion for stage.

PD1 – gingivitis, there is no periodontitis and therefore no attachment loss. Reversible stage.

PD2 – early periodontitis – periodontal attachment loss less than 25%. In multirooted teeth, a stage 1 furcation involvement is also a criterion.

PD3 – moderate periodontitis – periodontal attachment loss between 25 and 50% or a stage 2 furcation involvement in multirooted teeth.

PD4 – advanced periodontitis - periodontal attachment loss more than 50% or stage 3 of furcation involvement in multirooted teeth.

Periodontal treatment includes a number of procedures, which are performed under general anesthesia (diagnosis is also performed under general anesthesia!).

It starts with an initial rinse with an antiseptic solution, supragingival and subgingival scaling and cleaning, polishing and sulcus irrigation. This initial approach is followed by periodontal probing and charting. The treatment of diseased periodontal tissues depends on stage and includes gingival curettage and root planning (mainly with manual instruments), periodontal flaps, regenerative surgery, gingivectomy/gingivoplasty and local administration of antiseptics or antibiotics. Again, the aim is to minimize pocket depth and preserve at least 2mm of attached gingiva. When some of these procedures are performed, polishing can be performed at the latter stage.

A closed gingival curettage and root planning can be done in periodontal pockets up to 4-5mm. For this purpose, specific curettes are used – examples: Gracey Curette which has one 70º cutting angle, universal curette which has two 90º cutting angles. Gingival curettage refers to the removal of the soft tissue lining of the periodontal pocket with a curet, leaving gingival connective tissue lining. It is a distinct procedure that is usually performed with scaling and root planning, which is the smoothing of the gingival root surfaces with a curette.

The open root planning is indicated in pockets larger than 5mm. Three wall defects are those that carry the best prognosis. This procedure includes the creation of a flap which provides access to the root surface and the marginal alveolar space with direct visualization of tissues. It can be repositioned in place or distally to reduce pocket depth. It is needed in regeneration procedures when bone grafts and membranes are applied.

Open root planning includes the following steps: create the flap; remove calculus and debris with curettes (or specific sonic scalers) from the tooth surface; remove diseased soft tissues; perform bone recontouring if needed and suture the flap. In case guided tissue regeneration is needed, one must fill the defect with a graft and apply a membrane to guide regeneration.

Guided tissue regeneration is complex and not mandatory in all cases since the junctional epithelium will recover and there will be an improvement of the clinical attachment. In these cases, the clinical attachment recovers at the cost of soft tissue recovery and not a complete recovery of periodontal and bone tissues. In all cases, and especially in more complex procedures, the owner must be completely commitment to follow post operatory instructions, provide long term management and follow up appointments to achieve a successful outcome.

The most frequent periodontal flaps include an initial horizontal (with internal bevel) or vertical incision. Flaps can be partial or complete thickness, can be displaced or sutured in place. Finally, the dental papilla can be preserved or not. The modified Widman flap uses a conventional collar reverse bevel incision in approximately 10 degrees of the tooth's longitudinal axis, about 1mm from the gingival margin. One or two release incisions are made. A full thickness flap is elevated with the aid of a periosteal elevator. The gingival collar around the tooth is removed.

Three possible flap designs can be used: envelope, triangular and trapezoidal. In the first case there are no vertical release incisions, and the flap is undisplaced. The envelope flap must be long enough to provide space to work and have visual access to the target area. Can be done both buccal and palatal/lingual. The triangular flap involves the use of a single vertical relief incision, ideally including the interdental papilla. Finally, the trapezoidal flap includes two release incisions.

Gingivectomy and gingivoplasty is indicated in pseudopockets. It is contra-indicated when less of 2mm attached gingiva remains after the procedure. Pseudopockets result from excessive gingival tissues, therefore the aim is to reestablished pocket depth by removing excessive tissue. The procedure can be done with a scalpel blade, knives (e.g. Orban), radio/eletrosurgery, laser and burs. Specific gingivectomy burs, made of porcelain or carbide can be very precise and hemostatic, but can be slow if large tissues need to be removed. It is frequent to combine cold blade for major sculping, followed by burs or knives for details and electro-hemostasis occasionally. The procedure starts by creating sufficient point marks 3mm from the base of the pocket to define an outline. This guides the amount of gingiva to be removed. The 3mm outline is necessary, since 1mm will be lost during the healing process. A 45º bevel from the created line must be attempted to restore the

anatomical natural contour of the gingiva from the gum line. Gingivoplasty refers to the actual contour of the gingiva to establish the normal tissue height.

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CAESAREAN SECTION IN DOGS: UPDATES AND NUANCES TO IMPROVE OUTCOMES

Rob Mccarthy

Veterinary Surgery Central Massachusetts, Surgery, Grafton, United States of America

Qualifications:

Robert J. McCarthy

DVM, MS, Diplomate ACVS

Adjunct Clinical Associate Professor, Tufts Cummings School of Veterinary Medicine

rob.mccarthy@tufts.edu

Cesarean Section in Dogs: Updates and Nuances to Improve Outcomes

Robert J. McCarthy, DVM, MS, Diplomate ACVS

rob.mccarthy@tufts.edu

History

Cesarean section has been part of human culture since ancient times, but only for the last century could maternal survival be expected. In the United States, 32% of deliveries in women are presently performed by cesarean section. In dogs, dystocia is reported in 2%-16% of all pregnancies and 60% of dystocia's are ultimately treated with surgical intervention.

Client education/common questions

Except in unusual circumstances, risk to the bitch should be minimal (<1%). With modern methods at least 80% of puppies should survive an emergent cesarean section and 95% an elective one. Brachycephaly is not a negative prognostic indicator[1]. Factors inconsistently associated with decreased neonate survival include older age, primiparous status, larger litter size, and foetus in the pelvic canal. There is no scientific evidence that simultaneous surgical sterilization increases maternal risk[2]. If concomitant sterilization is elected, lactation is normal as it is independent of gonadal hormones. Cesarean section does not decrease future fertility, number of puppies born or increase the risk of future dystocia.

Anaesthesia

The most important factors for success are familiarity with the protocol chosen, and efficiency. Before any medications are administered, an intravenous catheter is placed, and fluid administration begun. Patients are frequently anaemic, so reoxygenation by face mask is indicated. Low foetal heart rate should not be treated with anticholinergic medication, as increased heart rate without oxygen supply increases physiologic stress. Unless the uterus is necrotic or infected, antibiotics should not be administered.

The safest anaesthesia protocol for cesarean section involves no premedication at all, but if necessary for intravenous catheter placement, low dose butorphanol (0.2mg/kg SC or IM) is recommended. Pure mu opioid agonists (i.e., fentanyl, morphine, methadone, hydromorphone) should be avoided as they cause respiratory depression in the neonate. Premedication with alpha2-agonist drugs has traditionally been avoided, but studies suggest good safety in *elective* cesarean sections on *middle to large breed* dogs when used at low dosage (dexmedetomidine 2.5-3.5 mcg/kg IV), followed by immediate drug reversal in the neonate (atipamezole 50mcg SC per puppy) [3]. The bitch can also be reversed after surgery (atipamezole 200mcg/kg IV).

Adjunctive epidural anaelgesia is debated. Local anaesthetics (lidocaine 2%, 3-4mg/kg not to exceed 6.0mL) have minimal effect on the foetuses and allow lower concentration of inhalant drugs to be administered but can impede motor use in the bitch. Opioid epidurals (preservative free morphine 0.1mg/kg) offer improved anaelgesia and minimal foetal effect without altering motor function. Epidural anaelgesia should not be used if there is evidence of foetal distress and time to perform the procedure should be less than 5 minutes. Singular use of epidural anaelgesia for immobilization is not recommended.

For induction, propofol (2.0-6.0mg/kg IV) or alfaxalone (1.0-2.0mg/kg IV) is administered as needed to allow intubation. Alfaxalone has been associated with better neonate Apgar scores in the first 60 minutes after birth, but no significant difference in survival. If dexmedetomidine was used for premedication, very low doses of propofol (1.0-2.0mg/kg, maximum 2.0mg/kg IV) are likely required. The patient is then maintained on isoflurane or sevoflurane gas recognizing that high levels of progesterone in the pregnant bitch decreases minimum alveolar concentration (MAC) by 16-40%.

Surgical procedures

Ventral midline hysterotomy

The patient is placed in dorsal recumbency, and final scrub is performed. Positioning the head 15-30 degrees above the tail (Reverse Trendelenburg Position) improves respiration and decreases regurgitation. Supine hypotension has not been reported in the dog, so oblique rotation is unnecessary.

The uterus is exteriorized and packed off with moistened laparotomy sponges. A longitudinal incision is made in the body of the uterus of adequate length to assure foetal removal without tearing. Any foetus stuck in the pelvic canal is removed first. Each foetus is then gently massaged toward the hysterotomy incision. Once visible, the foetus is grasped, and steady traction applied until the placenta releases from its attachment zone. Removal of the placenta is optional provided the cervix is open, so if the placenta is firmly attached it is best to allow it to pass on its own. The neonate is freed from the amniotic sac and using a sterile towel handed off to an assistant for further care. While immediate ligation of the umbilicus and separation from the placenta is often performed, delaying separation until at least 3 minutes after onset of breathing allows additional maternal blood transfer and results in improved neonate Apgar and reflex scores.

A single layer simple continuous pattern incorporating all layers except the mucosa is used to close the hysterotomy incision. A double layer closure is often recommended, but single layer closer is both quicker and equally safe. Injection of oxytocin (0.04 IU/kg) into the uterine wall after closure will expediate involution, decrease potential bleeding from placental sites and facilitate passage of any placenta remaining attached.

Closure of the abdominal wall is routine. An intradermal pattern is recommended for skin closure to avoid suture damage by suckling puppies.

En bloc ovariectomy-subtotal hysterectomy

En-bloc ovariectomy-subtotal hysterectomy involves removal of the ovaries and majority of the uterus *before* hysterotomy and delivery of the foetuses. Both ovarian pedicles and the uterine body are completely isolated, but no forceps are placed. Any foetus in the pelvic canal is manipulated back into the uterine body. Once all relevant structures are exposed, double forceps are placed across each ovarian pedicle and the body of the uterus. The ovaries and uterus are immediately removed by dividing between the forceps and given to a team of assistants. The assistants quickly open the uterus and remove and resuscitate the neonates. Ligation of the ovarian pedicles and uterine stump is then performed.

The key to success with this procedure is speed. In a single reported study, mean time from forceps placement to delivery was 40 seconds (range 30-60 seconds), so a maximum time of 60 seconds

is recommended[4]. En bloc ovariohysterectomy is most appropriate in situations where the uterus is severely diseased or when the litter is known to be dead. It is not recommended if the foetuses are already bradycardic, and hypoxia is a major concern.

Postoperative anaelgesia

Both opioids and non-steroidal anti-inflammatory drugs (NSAID's) enter the milk, but likely in small amounts. A single dose of opioid can be administered (buprenorphine 0.02mg/kg IV), but close monitoring of maternal behavior is recommended. Single dose administration of a COX-2 preferential NSAID (meloxicam 0.1mg/kg IV, carprofen 4.4mg/kg SC) is considered both safe and effective.

Local incisional blocks with either 2% lidocaine (2.0mg/kg), 0.5% bupivacaine (1.0 mg/kg) or 1.3% liposome encapsulated bupivacaine (5.3mg/kg) are effective methods of providing anaelgesia without systemic effects. There is no evidence that local distribution will affect mammary gland sensation or nursing.

Surgical complications

Regurgitation induced aspiration pneumonia accounts for more than half of maternal deaths, likely caused by increased intraabdominal pressure, progesterone-induced decrease in lower esophageal sphincter tone and prolonged gastric emptying time. To decrease risk of aspiration, patients should be placed in the Reverse Trendelenburg position on the operating table and extubation delayed as long as possible. Metoclopramide (0.2-0.4mg/kg IV or IM) can be considered as part of the preanaesthetic protocol.

Mild intermittent serosanguinous vaginal discharge is normal for one to two months after cesarean section. More moderate, persistent discharge is usually related to subinvolution of placental sites (SIPS). Treatment of SIPS with oxytocin (0.5-5IU IM) or antibiotics has been suggested but there is little data to suggest that either of these treatments is effective. Low oral dose of a progestogen (megestrol acetate, 0.1mg/kg PO q 24 hr. X 7 days, then 0.05mg/kg PO q 24 hr. X 7 days) has been shown to treat SIPS effectively with neither side effects nor reduced subsequent fertility.[5]Severe postoperative haemorrhage is rare but can be life-threatening. Patients should be evaluated for coagulopathy and provided supportive care, including whole blood transfusion if needed. Oxytocin (0.5-5IU IM) is recommended, but no medical treatment has proven uniformly effective, so hysterectomy or ovariohysterectomy may be required.

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MAKING ANESTHESIA SIMPLE: THE ANESTHETIC PLAN FROM A TO Z.

Paulo Steagall

City University of Hong Kong, Veterinary Clinical Sciences, Hong Kong, Hong Kong PRC

Qualifications:

Paulo V Steagall

DVM, MS, PhD, DACVAA

paulo.steagall@umontreal.ca

The anesthetic plan involves all parts of the anesthetic procedure. It starts with a patient/preanesthetic assessment taking the consideration the needs of the patient, choices of anaesthetic agents and techniques, monitoring, logistics for patient position and needs for surgery, and requirements for induction and maintenance of anaesthesia, as well as recovery and post anaesthetic care including pain management.

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PLEURAL EFFUSION - COMPARING THE DIAGNOSTIC VALUE OF RADIOGRAPHS AND CT

Anna Adrian

Vet Meet, Education, Hergolding, Germany

Qualifications:

Dr. Anna Adrian

MRCVS MS DACVRAmerican Specialist in Veterinary Diagnostic Imaging RCVS recognized Specialist in Diagnostic Imaginga.adrian@frontier.vet

Pleural effusion is an accumulation of fluid in the pleural space. Filling of the pleura restricts lung expansion and impairs its physiological form. However, the effusion is a secondary manifestation and for successful treatment, the primary cause must be identified. The most common causes of pleural effusion in dogs and cats include pleural empyema, chylothorax, heart failure, neoplasia, diaphragmatic hernia, lung lobe torsion, and hemorrhage. The prognosis and treatment vary significantly depending on the underlying disease, making an accurate diagnosis crucial. While thoracentesis quickly reveals the nature of the effusion, it is essential to determine its exact origin. However, superimposition of the effusion often makes rapid diagnosis on radiographs difficult. In such cases, advanced imaging plays a crucial role in diagnosis.

When pleural effusion is suspected and the patient's clinical condition allows it, chest X-rays are often taken initially. It is essential to remove a significant amount of fluid via thoracentesis first as no patient should undergo diagnostic imaging in an unstable condition.

To gain an initial overview, it is appropriate to take a thoracic radiograph first to see if the clinical suspicion is confirmed. It is then crucial to remove as much fluid as possible before taking further X-rays. Care must be taken to minimize the entry of air into the chest cavity through the puncture needle or when placing a thoracic drainage.

Why is removing the fluid so important? This is related to the five types of radiographic density: air, fat, soft tissue, bone, and metal. Fluid has the same radiographic density as soft tissue, making it challenging to distinguish soft tissues from the effusion. For example, a tumor may be hidden by the effusion. The more fluid present, the more difficult it becomes to make a diagnosis. However, if all the fluid can be removed, X-rays should be taken in three planes at maximum inspiration.

If a residual amount of fluid remains, and there is suspicion that the primary cause is in the ventral thoracic region, a horizontal beam X-ray with the patient in a ventrodorsal position can be taken. This causes the fluid to pool in the dorsal thoracic region, allowing assessment of ventral structures.

However, there are cases where it is challenging to completely drain the entire effusion, and the differentiation of some structures due to similar radiographic densities is difficult. For example, a mass in the thorax may be visible, but an X-ray may not differentiate between an abscess and a tumor. Lung lobe torsion may not always be well visualized on X-rays. In such cases, a CT scan may be advantageous.

CT is a cross-sectional imaging method that allows the anatomical structures to be visualized without overlap. In addition to improved contrast resolution and the ability to differentiate fluid from soft tissues, the further advantage of intravenous contrast administration exists. This enables further delineation and differentiation of structures.

Before starting the CT examination, as much fluid as possible should be withdrawn. The patient should be intubated to achieve maximum pulmonary aeration with breath-hold. The recommended positioning of the animal is sternal, with the head towards the gantry. Images should be obtained approximately from C6 to L4 with a slice thickness of 1mm. Before contrast administration, a scan of the entire thorax should be done for an overview. Depending on the degree of fluid, additional fluid may be withdrawn if necessary. If a definitive diagnosis still cannot be made after contrast administration, a lymphangiography could be performed to rule out a potential thoracic duct leak.

After describing the imaging acquisition, case examples of different primary diseases will be presented.

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SUSTENTABILIDADE AMBIENTAL NO CAMV

Ana Carina Costa

RVC, Clinical Sciences, Hatfield, United Kingdom

Qualifications:

Ana Carina Costa

PgCertAVN Anaesthesia and Analgesia, NCert(Anaesth), NCert(PhysioTech), Anaesthesia RVN

acosta@rvc.ac.uk

"Environmental Sustainability in the Practice"

"Sustentabilidade Ambiental no CAMV"

Learning Objectives

- Understand the concept of environmental sustainability

- Recognise the environmental impact of veterinary practices

- Implement measures to reduce the practice's carbon footprint

The World Health Organisation states that climate change poses the most significant threat to global health in the 21st century. While the greenhouse effect is necessary for maintaining the Earth's temperature, the significant increase in greenhouse gases released since the industrial age has caused gradual and rapid environmental changes [1]. These changes have resulted in visible consequences such as sudden weather shifts, wildfires, heat waves, floods, poor air quality, and the emergence of new infectious and viral diseases [2,3]. Adopting environmentally sustainable practices in veterinary care is crucial for individuals and corporations to safeguard the One Health system, which encompasses the health of people, animals, and ecosystems.

Environmental sustainability is a concept introduced in veterinary medicine in recent years to reduce the environmental impact of veterinary practices. This ecological movement aims to minimise the waste of resources, encourage the use of products and consumables with less environmental impact, recycle and correctly dispose of material/equipment used and switch to renewable energy sources. The life cycle assessment is a method to quantify the direct and indirect environmental impact of a product or process over its lifetime, and it is used to determine its carbon footprint [4,5].

Healthcare systems have a significant environmental impact due to the use of pharmaceuticals, high energy consumption, and single-use consumables, ironically contributing to health problems. The UK's National Health Services has set a goal to achieve zero CO_2 emissions by 2050. Recent reports indicate that the NHS alone is responsible for 4% of the UK's total carbon emissions [2]. This is due to several factors such as building energy (10%), water and waste (5%), medicines and chemicals (20%), travelling (14%), medical and non-medical equipment (18%), anaesthetic gases and metered dose inhalers (5%), other supply chains (24%) and commissioned health services (4%) [2]. A survey conducted in the UK and Republic of Ireland regarding sustainability policies and practices at veterinary centres revealed that only 17% of the respondents reported having an environmental policy in their practice, 53% did not have, and 30% were unaware [6] However, environmental accreditation schemes to help organisations reduce their carbon footprint are becoming popular in veterinary medicine [7-9].

The waste hierarchy is a method that facilitates waste management – reduce, reuse, recycle, rethink and research [3]. How waste is disposed can have a greater or lesser impact on the environment. A study revealed that almost 60% of theatre waste could be recycled, but it usually ends up in a regular bin[10]. Some companies specialising in waste management segregate medical waste to produce biofuels, cement, heating, and electricity, avoiding disposal in landfills. Others also offer non-contaminated personal protective equipment (PPE) recycling programs.

Some environmentally friendly actions[2-6] are listed below.

- Responsible use of resources: decrease water consumption, reduce the use of disposable gloves giving preference to handwashing, reuse sharp containers, and switch off lights and electrical equipment when not in use, for example.

- Change energy supplier: give preference to companies who use renewable sources of energy

- Use environmentally certificated suppliers

- Use LED lighting bulbs

- Install good building insulation and solar electricity

- Purchase equipment with rechargeable batteries

- Switch to digital patient recording and invoicing instead of using paper, double-sided print when possible

- Decrease the general use of plastic: some syringes are now made of less plastic

- Correctly segregate health care waste: separate infectious and cytotoxic waste, sharps, and materials that can be recycled

- Use cloth scrub hats, reusable gowns, and surgical drapes

- Use low-flow anaesthesia, and avoid high-impact volatile agents (nitrous oxide and desflurane)

- Consider local and regional anaesthetic techniques

- Avoid single-use vials. Give preference to formulations with longer shelf-life, propofol with preservative, for example, and record the opening date of longer shelf-life medicines

- Select the smallest vials based on drug dose and patient's body weight

- Stock check drugs regularly to minimise discarding expired medicines

- Responsible use of medicines

- Use reusable incontinence pads in the kennels

- Use biodegradable cat litter and poo bags

- Donate expired or unused open equipment/consumables

- Implement a recycling program in the practice

- Conduct a clinical audit on practice waste

- Create a green team to share ideas, implement changes and promote environmental sustainability

Nowadays, many organisations have environmental sustainability schemes implemented and even use this as an advantage to advertise their services and products. This initiative promotes environmental awareness and social responsibility, encouraging employees to engage with ecological changes in their workplace, and has also demonstrated to have economic benefits.

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PREVENçãO E CONTROLO DE INFEçõES NOSOCOMIAIS

Ana Carina Costa

RVC, Clinical Sciences, Hatfield, United Kingdom

Qualifications:

Ana Carina Costa,

PgCertAVN Anaesthesia and Analgesia, NCert(Anaesth), NCert(PhysioTech), Anaesthesia RVN

acosta@rvc.ac.uk

"Prevention and Control of Nosocomial Infections"

"Prevenção e Controlo de Infeções Nosocomiais"

Learning Objectives

- Implement protocols for the prevention of nosocomial infections

- Recognise the importance of the epidemiological triangle – the agent, the patient and the environment

- Implement an isolation area at the CAMV and the level of protective equipment required depending on the pathogen

Hospital-acquired infections (HCAIs), or nosocomial infections, are defined by the Centers of Disease Control and Prevention as a "*localised or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s). There must be no evidence that the infection was present or incubating at the time of admission to the acute care setting. HCAI may be caused by infectious agents from endogenous or exogenous sources. Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal tract, or vagina that are normally inhabited by microorganisms. Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the health care environment*" [1].

In human medicine, HCAIs affect 5-10% of hospitalised patients [2] and increase to 18-30% in those receiving intensive care [3]. These infections can have a significant impact on both patient mortality and morbidity [2]. Most reported HCAIs are linked to urinary catheters, infections at surgical sites, wound infections, bloodstream infections associated with intravenous catheters, pneumonia associated with long-term mechanical ventilation, and meningitis after neurological procedures [1,2,4,5]. Patients who are immunosuppressed or have endocrine diseases are at higher risk of contracting HCAIs, and prolonged hospitalisation is also a suggested risk factor [1,4].

In veterinary medicine, common pathogens that can cause HCAIs include methicillin-resistant *staphylococci* such as *Staphylococcus aureus* (MRSA) and *Staphylococcus pseudintermedius* (MRSP), as well as extended-spectrum beta-lactamase (ESBL) producing bacteria such as *Enterobacteriaceae* and *Acinetobacter baumannii* [1,3].

The appearance of multi-drug resistant (MDR) bacteria is highly related to the misuse of antibiotics [6]. A study investigating the prescription of carbapenem in a veterinary hospital including 81 infectious cases revealed that 54% of the infections were suitable for a lower-tier antimicrobial treatment, 50% of the bacteria isolated were resistant to more than 3 antibiotic classes, 3% were resistant to carbapenem and 17% of the infections were HCAIs [7]. According to the AAFP/AAHA Antimicrobial Stewardship Guidelines, it is recommended to consider alternative treatments to systemic antibiotics, such as supportive care, surgical procedures, use of antiseptic preparations, and topical antimicrobials. The use of antibiotics should always be justified and based on a definitive diagnosis, therefore it is important to conduct culture and susceptibility testing to help determine the most appropriate antibiotic therapy [6]. For clean procedures like spays and castrations, prophylactic antibiotic therapy is often unnecessary as long as proper aseptic techniques and tissue handling are followed. In cases where escalation of antibiotic treatment is necessary, it is advised to seek consultation with an expert in infectious diseases and antimicrobial therapy [6]. Hospitals with stewardship programs and antibiotic prescription guidelines have shown significantly lower antimicrobial use [5,7].

It has been observed that many of the HCAIs that were previously only seen in human hospitals are now becoming prevalent in veterinary practice [5]. In recent times, there have been reports of outbreaks of nosocomial infections in veterinary hospitals worldwide, which have had a severe impact on the health of the animals, and on the economy of veterinary facilities and pet owners [1]. A study on an outbreak of *Acinetobacter calcoaceticus-Acinetobacter baumannii* complex bacteria in a veterinary hospital revealed that most affected animals were first admitted to the ICU. Out of the six potential risk factors, all the animals had three or more, which included prolonged hospitalisation, intubation and general anaesthesia, placement of a urinary catheter, prior cephalosporine treatment, prior surgery, and immunosuppression. Samples taken from ICU ventilators, telephones, kennels, and sinks were found to have positive cultures with MDR profiles similar to those found in the infected animals, suggesting that infection transmission to animals occurred through contaminated environment and equipment and interaction with the medical staff [2].

Preventing and managing HCAIs requires the implementation of effective infection control programs [8]. Studies in human healthcare reveal that 10-70% of HCAIs can be avoided through such programs [4]. To achieve this, staff must receive ongoing training on environmental cleaning and disinfection. Additionally, promoting regular hand washing and cleaning of high-touch surfaces like door handles, phones, light switches, computer keyboards/mice, tables, and countertops can help eliminate environmental pathogens [4]. Infection surveillance systems have been implemented in hospitals to prevent and control infections and improve patient outcomes [1,4,5,8]. The assessment of protocol effectiveness allows for early identification of infectious pathogens, which effectively limits their spread and transmission to other patients, preventing outbreaks [4]. Surveillance methods can be active, passive, targeted, or syndromic, depending on the specific needs of the hospital [9]. Some veterinary hospitals often conduct routine surface cultures to determine the prevalence of common pathogens and to adjust infection control programs accordingly. These measures are crucial in ensuring the safety and well-being of patients and must be taken seriously [9].

Medical staff plays a crucial role in preventing the transmission of infectious agents. Research has shown that multi-resistant microbes can be transmitted between veterinary students, staff, and animals, also highlighting the risks involved in acquiring zoonotic diseases from animal patients[1,5]. Hand hygiene is the most effective way to reduce the spread and transmission of healthcare-associated infections. According to the World Health Organization (WHO) [3], there are five critical moments for hand hygiene: before and after touching a patient, before a clean/aseptic procedure, after contact with body fluids, and after touching the patient's surroundings. Other infection prevention guidelines [4,5] also suggest washing hands before putting on gloves and after removing them, after using the restroom, and before eating.

When admitting or transferring a patient with a suspected infectious disease, strict adherence to guidelines is imperative to minimise the risk of spreading the infection in the hospital. These guidelines require patient triage, use of protective personal equipment (PPE), and patient admission directly to an isolation unit, if possible, to prevent contact with other patients. The isolation units must be equipped with PPE and individual medical equipment and materials to reduce the frequency of entry into rooms [4,5].

Every veterinary facility must implement infection prevention and control measures to protect patients and clinical staff, in line with the One Health

initiative. Identifying and isolating or providing barrier nursing to patients with suspected infectious diseases is one of the initial steps to prevent infection transmission to other patients. Regular handwashing and clinical environmental cleaning and disinfection is also vital to reduce the risk of contamination. Additionally, drug resistance bacteria is a severe and common issue in healthcare that contributes to HCAIs therefore, a responsible antibiotic prescription is highly recommended.

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BRACHYCEPHALIC OCULAR SYNDROME

Rick Sanchez

Specialistische Dierenkliniek Utrecht (SDU)- AniCura, Ophthalmology, Utrecht, Netherlands

Qualifications:

Rick F Sanchez

BSciBiol, DVM, DipECVO, CertVetEd / FHEA

European Specialist in Veterinary Ophthalmology

RickFSanchez@hotmail.co.uk

This talk focuses on how the special anatomical characteristics of the brachycephalic conformation affect the ocular physiology of companion animals and how they lead to diseases of the ocular surface, directly or indirectly. Often, these diseases affect vision and have a significantly effect on the welfare of affected animals. The purpose of these talks is to raise awareness of the risks a brachycephalic conformation carries for ocular health. It is important to remember that while some of the ocular health problems discussed might not necessarily be caused directly by brachycephaly, they are observed more frequently in brachycephalic breeds, or have a worse prognosis because of it.

Although the eyes of brachycephalics appear to be large they are not. The eyes are of the expected size for an adult and appear to be large due to a mixture of factors. These include a comparatively small (anterior) skull structure, very shallow sockets and a wide interpalpebral fissure (i.e., a wider-than-usual space between the upper and the lower eyelid). This makes the globe more visible (i.e., there is less eyelid cover) and situates it in a relatively more anterior position in comparison to other skull conformations. Unfortunately, these conformational characteristics cause over-exposure of the corneal and conjunctival surfaces. In addition, the corneas of brachycephalic dogs and cats are less sensitive compared to the other skull conformation as measured with aesthesiometry. The comparative hyposensitivity in dogs is thought to be caused by the presence of a lower number of nerve trunks that carry sensory information from the cornea to the brain (i.e., Ophthalmic branch of the Trigeminal nerve, CN V), while there is debate as to whether this also explains the hyposensitivity of brachycephalic feline corneas.

Last but not least, the additional morphological effect of very short noses is that the medial canthus is “tucked-in”. This appears to predispose the medial lower eyelid (and sometimes also the medial upper eyelid) of brachycephalics entropion and/or trichiasis (i.e., skin hairs that rub the medial ocular surface). In Pugs, the medial canthus very deeply relative to the rest of the facial skin (i.e., the skin is turned inward at the medial canthus) and it means that the medial corner of the eye is not lined with conjunctiva but skin that has hairs. In all of these cases, the medial bulbar conjunctiva and cornea rub against the hairs during ocular movement, causing irritation. Last but not least, Brachycephalics with a prominent nasal fold might also develop nasal fold trichiasis.

All in all, this undesirable conglomerate of craniofacial/periocular/adnexal characteristics constitutes a poor design for ocular health. This might lead to ocular surface disease (i.e., pigmentation, or irritation that might produce ulceration) and might worsen surface ocular disease (i.e., delay healing, worsen ulceration independent of the cause).

The tear film is a delicate and intricate set of superimposed layers. The average amount of blinks per minute is determined by the ability of the tear film to maintain its complex structure and having sensitive enough corneal innervation that can detect when the tear film has broken up, so that the eyelids blink and more tears are produced. The relative reduction of corneal sensation demonstrated in brachycephalics is counterproductive. In addition, maintaining a healthy tear distribution over the larger interpalpebral surface area of a brachycephalic could pose a challenge. Lastly, problems in one or more of the components of the tear film (i.e., the mucinous, aqueous (or mucinoaqueous), and/or lipidic portions) could pose further challenges. A combination of these factors predisposes the central cornea to early tear film break-up, localized central dryness between blinks and more rapid epithelial cell sloughing at that spot than normal. Brachycephalics have a general predisposition to central corneal ulcerative disease that can sometimes quickly deepen and even lead to perforation, and these events might explain why.

In addition to corneal ulceration, some brachycephalics develop progressive corneal pigment proliferation of the epithelium and superficial stroma in response to chronic corneal irritation. Pigmentation requires that there is pigment in the limbus. Pugs are particularly susceptible to Pigmentary Keratitis (i.e., progressive pigment proliferation) and often have a pigmented limbus. The chronic irritant in Pugs is usually medial lower eyelid entropion, which can also affect the upper medial eyelid. Pigmentary Keratitis in Pugs may be so severe that it can lead to blindness. Pigment proliferation usually starts in the medial limbus, where there is irritation caused by the hairs, and it progresses onto the central cornea in a triangular or ‘pie-shape (i.e., with the apex of the triangle pointing towards the pupil). As the proliferation progresses the pie-shape rounds off and widens at the tip, covering the medial pupil and ultimately the entire pupil. The pigment can even reach the lateral limbus. Not surprisingly, confocal microscopy studies have described the inflammatory component of the condition, and vascularization often accompanies this. While a population study of Pugs in the US initially suggested that entropion and macropalpebral fissure might not have been factors of importance in pigmentary keratitis in Pugs, another population study performed in the UK found, for the first time, that lower medial eyelid entropion and its severity were positively associated with the development of pigmentary keratitis in Pugs, as was the degree of limbal pigment present.

Also, not surprisingly, there are reports that associate the reduction of corneal pigment in Pugs after medial canthal surgery (i.e., medial canthoplasty) that removes the medial eyelid entropion and reduces the macropalpebral fissure. This is supported by medical therapy such as the use of topical cyclosporin and preservative-free, artificial tears.

It is worth noting that while superficial keratectomy may be used to remove pigment from a cornea, pigment may grow back during the healing process. There is no fail-proof method to remove corneal pigment though some studies have investigated keratectomy plus eyelid surgery, or cryotheraphy plus eyelid surgery, in addition to a variety of topical medications. The author has been treating Pugs over some years with a combination of bilateral medial canthoplasty, superficial keratectomy, bandage lens placement, topical, preservative-free lubrication and/or topical ciclosporin with varied success, in many cases arresting and/or regressing pigment proliferation partially, and in some cases restoring vision.

In felines, the brachycephalic conformation may also be seen in association with lower medial eyelid entropion. In some cats, this may lead to medial lower corneal sequestrum development.

An additional eyelid problem of concern in some brachycephalics, is the development of ectopic cilium that affects the central upper eyelid. It can happen in several breeds, but Bulldogs seem predisposed. It is always worth examining the conjunctival surface of the central upper eyelid for ectopic cilium in young Bulldogs with ulcerative disease, in addition to measuring tear production (STT-1) and also ruling out the presence of foreign bodies in the conjunctival sacs and underneath the third eyelid. Ectopic cilia can lead to rapidly deteriorating corneal disease and it requires our rapid attention. Distichiasis that are short and stiff can also be a problem in numerous breeds including some brachycephalics and be associated with keratitis, which is sometimes ulcerative.

Brachycephalics have also been found to have a predisposition to dry eye, as were Spaniel breeds that also happen to have prominent eyes, and dry eye has been shown to increase the likelihood of corneal ulcerative disease, especially in brachycephalics.

A recent review of brachycephalic ocular syndrome of dogs suggested there should be a breeding focus onperiocular conformation, the reduction of the exaggerated facial features that are associated with poor periocular conformation. This is in line with breeding practices that increase nose and anterior cranial length in general to improve the severe upper airway issues affecting brachycephalics.

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TREATMENT OF HEARTWORM IN THE ABSENCE OF MELARSOMINE

Filipe Dantas-Torres

Aggeu Magalhães Institute, Department Of Immunology, Recife, Brazil

Qualifications:

Filipe Dantas-Torres

MV, MSc, DSc, PhD, Dipl. EVPC, FRES

fdtvet@gmail.com

The canine heartworm (*Dirofilaria immitis*) is a filarial nematode of dogs, which may also infect other hosts, including cats, humans and various wildlife species (1). Mosquitoes (Diptera: Culicidae) belonging of several genera and species are biological vectors, which transmit the third-stage larvae during blood feeding (2).

Dirofilaria immitis is distributed worldwide, but it is more prevalent in tropical countries. While reliable diagnostic tools (e.g., microfilariae detection methods and rapid tests for adult antigen detection) are accessible to veterinary practitioners globally, treatment options are not always available. Indeed, a recently published review article evidenced that melarsomine dihydrochloride (first-line heartworm adulticide) in unavailable in most tropical countries where *D. immitis* is prevalent (3). Consequently, the so-called slow-kill protocol (i.e., a combination of doxycycline plus a macrocyclic lactone) has been widely used in countries where melarsomine is not available, as it is the only possible alternative for heartworm treatment. This protocol has also been used in countries where melarsomine is available, but not accessible due to cost reasons, or not recommended. Reasons for not recommending melarsomine include a history of a life-threatening adverse reaction to melarsomine, comorbidity conferring a guarded or grave prognosis, comorbidity making deep epaxial injection impracticable or during stabilization of severe heartworm-induced cor pulmonale (right ventricular dysfunction from long-standing pulmonary hypertension) (4,5).

The American Heartworm Society (6) guidelines recommend a combination of doxycycline, a macrocyclic lactone and melarsomine (three-injection regimen). In brief, the slow-kill protocol follows general recommendations of the American Heartworm Society, excluding the use of melarsomine. Concerning the choice of the macrocyclic lactone, studies demonstrate that moxidectin is superior to ivermectin in terms of efficacy. For a detailed comparison between these two macrocyclic lactones, see the review by Jacobson and DiGangi (5).

Concerns related to the use of the slow-kill protocol include progression of pulmonary pathology, but the slow-kill protocol is certainly less harm than no treatment at all. Moreover, doxycycline reduces pulmonary pathology, with serious complications being rare even without exercise restriction (5). The compliance issue related to the monthly administration of macrocyclic lactones is similar for their use as preventives. In certain situation, sustained-release formulations could offer a solution.

While adults take longer to die with the slow-kill protocol, moxidectin rapidly clears circulating microfilariae, breaking the transmission cycle (7). The concern regarding selection for resistance also exists with the use of macrocyclic lactones as year-round preventives. It is also important to mention that even if microfilariae eventually do not die, they become non-infective (8). Finally, from a cost perspective, the slow-kill protocol is less expensive than the full protocol, which is important in certain socio-economic contexts.

In conclusion, treatment of heartworm-infected dogs is fundamental from an One Health perspective and the slow-kill protocol is a reliable alternative in areas where melarsomine is unavailable or when contra-indicated.

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DENTAL RADIOLOGY AND INTERPREATION

Gottfried Morgenegg

Tierzahnarzt, Dentistry, Obfelden, Switzerland

Qualifications:

Gottfried Morgenegg

DVM, NST

g.morgenegg@tierarzt-morgenegg.ch

DENTAL RADIOLOGY and INTERPRETATION

Gottfried Morgenegg

DVM, NST

g.morgenegg@tierarzt-morgenegg.ch

In a clinical examination of the teeth, we can only assess the dental crowns which is about 40% of the teeth. The other 60%, the roots, are hidden below the gum. However, the roots are an eminently important part of the tooth and it is necessary to know their condition for diagnosis. To be able to assess them dental x-rays have to be taken.

Equipment

Unlike conventional X-rays, which usually use a fixed object-beamer distance, dental X-rays are movable and can be brought very close to the jaw. This results in less radiation being used, less scattered radiation and a sharper image.

Processing systems

There are basically three systems for image processing: the conventional film that has to be developed, the sensor and the phosphor plates:

Films are not widely used these days. They must be developed and fixed in liquids, but still provide the most detailed images. Their storage needs some organizational effort.

With the sensor, the pulse is sent directly to a computer, which generates an X-ray image within seconds. There sizes 0 (2x3 cm), 2 (3x4 cm) and 4 (5.4x7.7 cm) available. The problem is their width 4.5-6.5 mm. If they are defective, it becomes very expensive. For small patients sensors are often too thick and too big. The processing is very fast.

Phosphor plates come in different sizes, which makes them applicable in different areas. They are wafer-thin, are exposed to the X-ray beam and the information is read in a scanner. To protect the plates, they are packed in protective sleeves for exposure. This takes a little longer, and they are also susceptible to scratches. The different sizes from size 0 (2x3 cm) to size 6 (5x14 cm) allow X-ray studies from guinea pigs to Irish Wolfhounds. When using larger plates, only a part of the plate is exposed because of the scatter protection cone. There are users who remove the cone to expose the entire area. However, this is not recommended for the protection of employees, and in some countries it is even prohibited by law.

Technique

In the standard X-ray technique, the film is placed behind the object and exposed perpendicularly to the plate (parallel technique, Fig. 1). In the dental region, for anatomical reasons, this is only possible in the posterior part of the mandibles, caudal to the symphysis. The other teeth must be projected onto the plate using the bisecting angle technique (Fig. 2).

Figure 1 Figure 2

Usually, intraoral radiographs are taken. The film is placed in the oral cavity. Sometimes, however, it is helpful to take an extraoral image. In this case, the film is placed outside of the mouth and exposed through the open oral cavity.

Standardization of procedure

In the standard X-ray technique, generator-film distance is always the same, also the plate is always horizontal. The only variable is the patient.

With dental X-rays, on the other hand, all three, the distance, the plate and the patient are variable. For beginners, this is very complicated, if not confusing. This can be remedied by always positioning the patient and placing the film the same way. Then only the X-ray beam remains variable.

Tony Woodward created a simplified way to take dental radiographs in dogs (Niemiec et al., 2017) while Bannon (2013) described a detailed procedure. Guidelines for guinea pigs, rabbits and cats are for download on the website of the author (see below).

What makes a good X-ray image

It is of utmost importance that an X-ray image is assessable. It does not have to be perfect for daily use, but it must be assessable:

Exposure: Exposure is important so that the radiograph is neither too bright nor too dark.

Contrast: Contrast can be used to highlight special features. It is a matter of taste whether you want an image to be softer (more blurred) or harder (more accentuated).

Projection: The ideal is a perfect 1:1 image. If you don't get the angle right, the roots will be elongated or shortened. To a certain degree, this has no influence on the evaluability of the radiograph but it should be minimized.

Root: It is of utmost importance that the roots are shown in their entirety. Particular attention is paid to the apex, because pathological processes occur there.

It is always good to be able to show a tooth as a whole on one image. However, depending on the x-ray system and the size of the patient, this is not always possible and compromises have to be made. Clinically we can see and examine the crown of the tooth, but not the root. Therefore, we rely on a complete radiographic image of it.

X-ray studies

Full mouth X-ray studies are recommended for dental patients. They are an absolute must in cats, desirable in other patients. From our own experience, young patients without visual signs of indications rarely show hidden pathologies.

Presentation

A radiographic study should always be presented in a structured and clear manner so that the viewer can grasp the situation at a glance.

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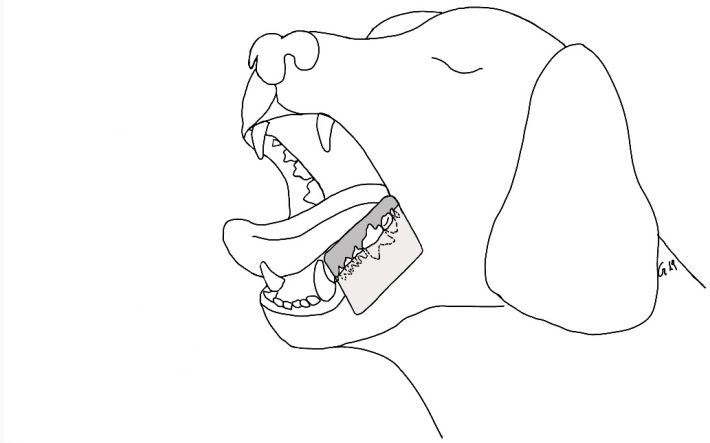
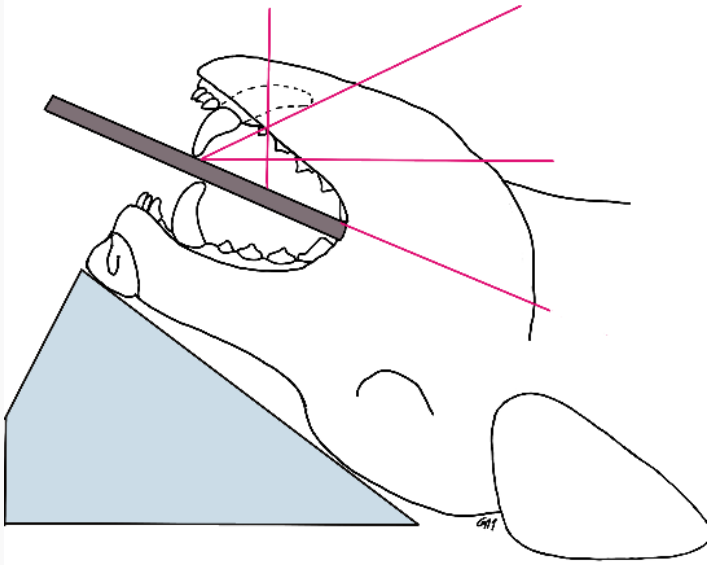
Please note: the presentation as well as guidelines for standardized radiographic studies in guinea pigs, rabbits and cats will be for download from 25th September on: https://www.tierzahnarzt.ch/index.php/downloads





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NEONATAL RESUSCITATION AND CRITICAL CARE

Michelle Kutzler

Oregon State University, Animal And Rangeland Sciences, Corvallis, United States of America

Qualifications:

Michelle Anne Kutzler

MBA, DVM, PhD, Dipl. ACT

michelle.kutzler@oregonstate.edu

Neonatal Resuscitation

Dams should be allowed to resuscitate their neonates. The dam should be allowed to remove fetal membranes away from the neonate's mouth and nose, bite off the umbilical cord and nuzzle the newborn to stimulate it, encouraging it to nurse and move it closer to her so to maintain its body temperature. Intervention should only happen if dam is not showing any interest in the newborn during first 30-60 seconds following delivery. If the dam is not caring for the neonate, then human assistance is required. Fetal membranes should be removed by wiping the neonate with a warm towel; clearing the nose and mouth area first. A bulb syringe can be used to suction out both nostrils and mouth. Swinging the neonates is no longer advised due to cerebral hemorrhage. The umbilical cord should first be clamped about 5 mm away from the body wall, ligated, and dabbed with chlorhexidine or betadine. Once the neonate is dry and breathing well, it can be put together with the dam. A healthy neonate should actively search for the dam's teat and should start suckling almost immediately.

Care should be taken in case the dam rejects the neonate and attempts to bite it. In this situation, a light tranquilization with acepromazine (0.01-0.02 mg/kg) might be necessary initially and dam should not be left alone with the offspring until the problem of rejection is overcome. Sometimes, rubbing placental fluids on the neonate may help the dam to recognize it as her own. A few drops of oxytocin may be applied topically to her nostrils to assist in mothering behavior. At times, injections (Cal-Pho-Sol 1 mL/4.5 kg subcutaneously (SC)) have been used to help with hypocalcemia-associated rejection. Appeasing pheromones may also be helpful in creating a calm, comfortable environment.

Resuscitation of neonates delivered by C-section involves the same process except that many neonates need to be resuscitated simultaneously. Additionally, fetuses that were in distress before the C-section may require more extreme measures to resuscitate (see below). Once neonates are pink and breathing well on their own, they should be placed into a warm environment until the dam has recovered.

If neonates do not start to breathe within 30-60 seconds, more extensive assistance is required. Ventilatory support should include constant flow of oxygen via a tightly fitted oxygen mask providing positive pressure ventilation. The GV26 acupuncture point may stimulate breathing. A 25-gauge needle is inserted into the nasal philtrum at the base of the nostrils where it joins the hair coat and rotated clock-wise when it reaches the bone. If this is not effective after 3-5 minutes or if the newborn's heart rate starts to drop, then intubation should be attempted. Although it is difficult to insert, a 2 mm endotracheal tube or a larger gauge intravenous (IV) catheter could be used to provide positive pressure ventilation. Cardiac stimulation should follow ventilatory support using direct chest compressions. If there is no improvement, then epinephrine should be administered (10-20 µg/kg). The preferred route of administration is IV (though the umbilical vein) or via an intra-osseous (IO) route (through the insertion of a 22- or 25-gauge needle into the humerus or femur).

Clinical Examination of the Neonate

The oral cavity should be free of congenital defects (e.g., cleft palate). The hydration status should be assessed by checking moisture of the mucous membranes because skin turgor of neonates is not as developed as in adults. Accurate examination of the neurologic system requires understanding of when various reflexes (rooting, suckling, righting) develop and disappear. Presence of weakness in any of the reflexes indicates an ill neonate. Evaluation of mental attitude (e.g., depression, hyperexcitability with excessive vocalization) is also important. Continuous crying (longer than 20 minutes) usually indicates a cold or hungry neonate, but it may be a clinical sign of other painful or infectious processes.

The abdomen should be soft and not painful. Sick neonates lack normal bowel sounds on abdominal auscultation. The presence and patency of the anus should be checked. The ability to urinate (by stimulating the area around the urethral opening) should be verified. Neonates have decreased functional capacity of many organ systems because of incomplete development of these organs at birth. Neonates normally have mild serum phosphorus elevations as well as mild blood urea nitrogen, albumin, globulin, cholesterol, and hematocrit reductions.

Common Causes of Neonatal Morbidity and Mortality

Hypothermia

Hypothermia is a very serious problem in neonate. Gut motility slows down when the body temperature decreases; causing ileus of the intestinal tract. Previously ingested milk starts to ferment, produces gas, and leads to a bloat. Subsequently, there is increased pressure on the diaphragm, which causes dyspnea. These factors in turn cause the neonate to swallow more air and thus worsen the bloating. Severe bloating can result in a circulatory collapse and death. If hypothermic neonates are tube fed, the milk replacer is usually regurgitated and aspirated. Neonates are considered hypothermic when their body temperature drops below 35.6°C. The neonate should be slowly warmed up (1°C/hour). If the body temperature is raised at 2°C/hour, life-threatening organ failure can result. External heat sources most commonly used are heat lamps, heating pads, and warm water bottles. The latter two need to be used with caution as weak neonates might not be able to crawl away from the heat source, resulting in burns and thermal injury. Warm IV or IO fluids can also be given to raise the body temperature, but the temperature of the fluids should not be more than 1°C higher than that of the body. For the reasons mentioned above, a hypothermic neonate should never be fed.

Dehydration

Although their bodies are more than 80% water, their ability to conserve it is significantly diminished since kidneys do not fully mature until 6-8 weeks of age. The fluid requirement for neonates is 0.13-0.22 mL/kg/day. If dehydrated, skin on the ventral abdomen and the muzzle may appear in a deeper red color. For severely dehydrated patients, the shock dose of fluids can be given as quick bolus of sodium chloride solution at 0.3-0.4 mL/kg. Careful monitoring is essential to prevent fluid overload.

Intraperitoneal (IP) and SC routes are less desirable as absorption rates are slower and less predictable. IV (external jugular vein) and IO routes are the preferred ways to administer fluids to the neonate. An 18- to 22- gauge spinal needle can be passed through the trochanteric fossa of the femur or greater tubercle of the humerus. The needle is inserted into the intramedullary canal, parallel to the long axis of the bone. The catheter needs to be placed aseptically and maintained as for the regular IV catheter placement. Fluid is readily absorbed and rates similar to IV administration rates can be used. It is best to use a microdrip administration set or a syringe pump to avoid fluid overload. A saline solution of 0.45% with 5% dextrose supplementation is recommended.

Hypoglycemia

Since neonates are born with limited glycogen stores, they have minimal capacity for gluconeogenesis. Without nursing, hepatic stores will be depleted in 24 hours and hypoglycemia will develop (serum levels dropping to less than 40 mg/dL). Clinical signs for hypoglycemia include

crying, weakness, tremors, coma and seizures. Therefore, providing glucose supplementation is essential in sick neonates. Dextrose can be given IV or IO at a dose of 0.5-1.0 g/kg using a 5-10% solution or at a dose of 2-4 mL/kg of 10% dextrose solution. If neonate is not too weak, has a good circulation, and is attempting to nurse, then a 50% dextrose solution can be applied to the gums. IV or SC injections of 50% dextrose treatments should never be given because of the potential side effects of phlebitis or skin sloughing.

Failure of Passive Transfer

Since <5% of maternal antibodies are passed through the placenta to the developing fetus, an adequate ingestion of colostrum must occur within the first 24 hours. Gut permeability to immunoglobulins starts to decline 8 hours after birth, and no further absorption is possible after 48-72 hours. Neonates that absorbed adequate amounts of colostrum have alkaline phosphatase and gamma-glutamyltransferase concentrations that are 30 and100 times higher than adult values, respectively.

If colostrum is not available, then maternal serum can be administered orally to a neonate less than 12 hours old via a feeding tube in the amount of 0.15 mL/kg (divided into multiple feedings). Neonates that did not receive any colostrum within the 24 hours, maternal serum can be administered SC. This should be done at a dose of 0.5 mL/kg and given three times at 6-8 hour intervals. If the lack of colostrum ingestion is due to milk production, the dam can be given low doses of oxytocin (0.2-2 units IM) 15-20 minutes prior to nursing. Metoclopramide (0.1-0.2 mg/kg PO every 8 hours) or domperidone (2.2 mg/kg PO every 12 hours) have been used to help increase milk production. Acupuncture points LI4 and SI1 have also been used to promote lactation.

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TOUCHING A RAW (MEAT) NERVE – DECODING NATURAL FEEDING

Scott Campbell

Ipswich Veterinary Group, Booval Veterinary Hospital, Booval, Australia

Qualifications:

Scott J. Campbell

BVSc (Hons), MANZCVS (Small Animal Medicine), DACVIM (Nutrition)

ausvetcon@hotmail.com

An increasing proportion of pet parents desire to feed a more natural diet, though they may have varying motivations for this, different understanding of how to achieve this and vastly different methods of attempting to effect it. Current regulatory definitions of a natural food/ingredient likely vary significantly from what owners would intrinsically assume. Both AAFCO and FEDIAF definitions allow for processes such as fermentation, rendering, extraction and extrusion, but generally exclude synthetic or chemical treatments. Practicing clinicians need to understand that owners feeding more natural alternatives genuinely believe that they are acting in the best interest of their pet. Their decisions are often driven by concerns around highly processed foodstuffs and messaging that natural feeding alternatives for humans are superior to highly-processed or synthetically produced alternatives. A variety of manufacturers, retailers and well-meaning advocates promote many potential benefits for natural or raw feeding of dogs and cats. Their messages are augmented by occasional recalls of commercially-produced processed diets and supplements, inconsistent advice around processed diet selection, and possible connections between some processed diets and health conditions (including recent issues with grain-free diets and heart disease). The vast majority of published veterinary literature supports concerns around pathogen contamination and unbalanced nutrient profiles when feeding raw diets. Recent publications also support concerns about increased carriage and shedding of antibiotic-resistant bacteria in dogs fed raw diets, and possible association with disease in humans residing in the same environment. Despite quite compelling evidence to support these concerns many proponents of raw and natural feeding disregard them citing as their reasons researcher/publisher bias and ongoing natural diet manufacturer innovation to improve stability and safety. Owners are sometimes convinced of the plausibility of these arguments and make incomplete risk/benefit and cost/benefit decisions that make raw/natural feeding appealing. While it is tempting as professionals to tell ourselves that highly processed commercial diets are the best option for most animals at this stage and ignore other options, we must recognize that some owners will make alternative choices and we must both empathize with them and work constructively together to mitigate risks adherent to any approach they choose. By explaining to owners how modern breeds of dogs and cats may vary from their genetic predecessors, how the environment and availability of fresh natural foodstuffs has altered, and the very function of the animals under our care has changed, we may be able to engage and educate more effectively. We must also remain open to innovation and discovery ourselves, as our understanding of science around feeding dogs and cats continues to evolve. Active listening skills are invaluable and it's also crucial that owners understand that we all share the primary goal of maintaining health for their pets. Supporting resources and summary approaches will be discussed through the presentation and the references below should act as a good starting point for interested parties.

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ZOONOSES OF CONCERN FOR EXOTIC ANIMAL PRACTITIONERS

Sonia Hernandez

University of Georgia, Warnell School Of Forestry And Natural Resources And Scwds At The College Of Veterinary Medicine, Athens, United States of America

Qualifications:

Sonia M. Hernandez

DVM, DACZM, PhD

shernz@uga.edu

ZOONOSES OF CONCERN FOR EXOTIC ANIMAL PRACTITIONERS

There are many zoonotic diseases that can potentially affect people who work with exotic and wild animal patients. Remember that the list below are most common, but I will also cover emergent pathogens.

Bacterial Diseases

Establishing good personal hygiene habits, hand washing and protecting open lesion, can prevent most of these infections.

BRUCELLOSIS

INFECTIOUS AGENT *Brucella spp.*

HOST White-tailed deer, fox, raccoons, and many other animals.

TRANSMISSION Contact with tissues, blood, urine, vaginal discharges, or fetuses of infected animals. Brucellosis is a highly contagious infection in many animals. It usually begins as a septicemia localizing in lymph nodes, spleen, reproductive organs, and joints where it can persist.

PREVENTION Use protective gear, especially rubber gloves, when handling infected animals.

BUBONIC PLAGUE

INFECTIOUS AGENT *Yersinia pestis*

HOST Fleas; often found on rats and ground squirrels.

TRANSMISSION Flea bite. Wild rodents, rabbits, and mammals serve as the hosts to fleas.

SYMPTOMS Wild rodents become infected but usually do not show clinical signs, but if do: fever, pneumonia, and swollen lymph nodes. In humans, the disease is categorized into bubonic and pneumonic types. The bubonic form: bacteremia and infected lymph nodes with mortality in untreated cases of 25-60%. The pneumonic form: acute pneumonia and rapidly fatal (1-3 days) if untreated (100%).

PREVENTION Active immunization may be necessary in endemic areas. Avoid fleas.

LEPTOSPIROSIS

INFECTIOUS AGENT *Leptospira spp.*

HOST Skunks, raccoons, opossums, Norway rats, mice, and many other animals including domestic species.

TRANSMISSION Bacterial penetration of abraded or lacerated skin by infected urine, contaminated food, water, or soil, or by direct contact with an infected animal, even through intact skin.

SYMPTOMS In wild animals, disease usually unapparent. In humans, fever, chills, nausea, malaise, and myalgia, when severe, meningitis.

PREVENTION Good personal hygiene; avoiding urine of wild species.

PSITTACOSIS (Ornithosis, Chlamydiosis)

INFECTIOUS AGENT *Chlamydophila psittaci*

HOST Birds (over 100 species including pigeons, raptors, and finches)

TRANSMISSION Fecal-oral contamination and inhalation of dried discharges/droppings from birds. It is commonly found in feral pigeons that appear healthy.

SYMPTOMS Signs in animals include decreased or no appetite, resulting in emaciation, lethargy, conjunctivitis, respiratory signs, and a greenish blood-tinged diarrhea or acute death. Clinical signs in people include fever, headache, upper respiratory infection, and pneumonitis.

PREVENTION Transmission is through the inhalation of aerosolized feces—wear a mask to prevent inhalation of dust from the droppings.

SALMONELLOSIS

INFECTIOUS AGENT *Salmonella spp.*

HOST Birds, mammals, and reptiles.

TRANSMISSION Fecal contamination of mucous membranes (fecal/oral). Food, water, or surfaces may become contaminated. The organism is commonly found in animals, especially birds and reptiles.

SYMPTOMS Signs in animals are often subclinical, but include diarrhea, vomiting, and mild fever. Many animals are persistent carriers. In humans, gastroenteritis (intestinal infection) accompanied by diarrhea and often abdominal pain.

PREVENTION Good personal hygiene.

TETANUS

INFECTIOUS AGENT *Clostriduim tetanii*

HOST No animal host.

TRANSMISSION Contamination through breaks in the skin from penetrating or crushing wounds.

SYMPTOMS Tetanus is caused by the toxins produced by *Clostridium tetanii*, characterized by tonic spasms of the muscle groups of the jaw, neck, and back. Untreated, 70% mortality rate.

PREVENTION Vaccination with three doses of tetanus toxoid and booster every ten years is highly effective.

TULAREMIA

INFECTIOUS AGENT *Francisella tularensis*

HOST Rodents and lagomorphs (rabbits), but also over 100 species of mammals and 25 species of birds. It has been reported in fox, beaver, mice, and muskrats.

TRANSMISSION Handling infected animals, contamination of cuts, mosquito/fly/tick bites, and by inhalation, or touching the conjunctiva of the eye after handling affected animals.

SYMPTOMS In humans, signs are flu-like with an ulcer forming on the skin

at site of entry, then enlargement of lymph nodes; if ingested, vomiting and diarrhea are seen; if inhaled, pneumonia. Severe systemic disease can lead to headaches, myalgia, chills, fever and death.

PREVENTION Use rubber gloves when handling animals, especially rabbits; protection from ticks.

Mycotic Diseases

ASPERGILLOSIS

INFECTIOUS AGENT *Aspergillus fumigatus*

HOST The fungus is ubiquitous. Animal hosts in rehabilitation are generally wild birds such as raptors or waterfowl.

TRANSMISSION While under, animals are more likely to develop the fungal disease, and shed spores.

SYMPTOMS In birds, respiratory signs. Most healthy people have no trouble resisting infection but not if debilitated by illness, or have been on antibiotic/immunosuppressive therapy.

PREVENTION Good hygiene and good ventilation. At least 12 air exchanges/hour are recommended in room with birds. Wear mask when conducting necropsies and handling of infected. Spray carcasses with a disinfectant to reduce aerosolized debris.

HISTOPLASMOSIS

INFECTIOUS AGENT *Histoplasma capsulatum*

HOST Birds and bats

TRANSMISSION Inhalation of infective spores. The organism thrives in soil enriched by decaying bird/bat droppings.

SYMPTOMS Most people develop only mild respiratory infections and, once recovered, become somewhat resistant. More severe infections are from heavily-contaminated environments, which can result in death.

PREVENTION Avoid accumulations of soil with droppings from bats/birds, or use masks or a self-contained breathing apparatus. Always wear boots and properly bag clothing for washing.

Viral Diseases

Viruses are known to infect a wide range of hosts, including humans and wild animals. There are only a few viruses that are common to humans and wildlife; however, since they have no specific cure, they can be very serious.

RABIES

INFECTIOUS AGENT Rhabdovirus

HOST Any mammal, usually carnivores; in ND, highest incidence is in skunks, foxes, bats, and raccoons.

TRANSMISSION Bite wounds, infected saliva in cuts or skin abrasions, aerosol in bat caves.

SYMPTOMS Rabies is almost always a fatal disease of mammals. The disease progresses from fever and malaise to paresis and paralysis of the muscles, to delirium and convulsions and eventual death due to respiratory muscle paralysis. In animals, ANY abnormal behavior is cause for concern. Rabbits and squirrels are rarely infected.

TREATMENT] For humans ONLY: (animal treatment is NOT an option)

Cleanse wound thoroughly with soap and flush immediately for 20 min to mechanically remove the organism.

SEE YOUR DOCTOR!

PREVENTION People working with wildlife regularly should receive preexposure immunization. **Avoid being bitten!**

Helminth Diseases (parasitic)

All species of wildlife carry their own complement of helminth intestinal parasites. There are two forms of disease in humans—*Cutaneous larval migrans* - penetration of the skin with the parasite undergoing a localized migration in/under the skin, creating an inflammatory reaction that is self-limiting; *Visceral larval migrans* - eggs of a parasite are ingested and penetrate the intestinal tract, and migrate through the animal's organs. The amount and severity depends on the organs affected. Although only *Baylisascaris* infection is described below, any roundworm is capable of tissue migration. Therefore, handling of fecal matter should be with gloves.

CUTANEOUS AND VISCERAL LARVAL MIGRANS

INFECTIOUS AGENT *Baylisascaris procyonis* (Raccoon Roundworm; other hosts such as skunks are also important)

TRANSMISSION Skin penetration, oral ingestion of eggs. For the raccoon, it causes few problems. However, it can cause serious illness to other animals, including humans.

SYMPTOMS If accidentally ingested by another species, the larvae hatch and penetrate through the intestine, migrating to many parts of the body with serious, irreversible consequences (eye, CNS). Blindness, central nervous system disease, or even death can result. Other species have roundworms that can sometimes penetrate the skin, causing a localized self-limiting skin irritation (Cutaneous *larval migrans*) in man.

PREVENTION

Avoid contact with feces, especially raccoon. Use gloves when handling fecal matter.

Good personal hygiene in handling any wildlife species.

Deworm all incoming raccoons with an effective antihelminthic drug every two weeks.

Thoroughly clean and disinfect and cages, carriers, or areas occupied by raccoons. The ova are very resistant to decontamination procedures. Recommended are autoclaving, flaming with gasoline, propane, or fuel oil, boiling in lye water (1 lb./20 gal. water), or boiling in Lysol. Cages should NOT be used again for any other species.

Keep children from handling raccoons or from exposure to raccoon feces; e.g., cover backyard sandboxes.

Protozoal Diseases

These are one-celled animal parasites that infect both wildlife and humans.

GIARDIASIS

INFECTIOUS AGENT *Giardia lamblia*

HOST Beaver, muskrat, waterfowl.

TRANSMISSION Fecal contamination of water and hand-to-mouth transfer of cysts from feces. Both wild mammals and birds (esp aquatic) can harbor these organisms which acquired from infected waters.

SYMPTOMS May be associated with a variety of intestinal symptoms: chronic diarrhea, abdominal cramps, bloating, weight loss, and frequent loose, pale stools.

PREVENTION

Avoid and hand-to-mouth contact while handling any wildlife species.

Good personal hygiene and hand washing.

TOXOPLASMOSIS

INFECTIOUS AGENT *Toxoplasma gondii*

HOST Most commonly the house cat; wild animals

TRANSMISSION Ingestion of the oocyst; eating undercooked infected meat; transplacental infection in primary infections of pregnant women. Other nondefinitive hosts only become infective when they are eaten by another animal.

SYMPTOMS The disease is seldom severe and usually is self-limiting. Acute disease may result in high fever, lymph node enlargement, muscle pain, and even death. A pregnant woman is particularly susceptible and, when infected for the first time, often passes the parasite to fetus.

PREVENTION Confining cats will prevent their contact with wild species. Make certain to practice good personal hygiene and sanitation.

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EYELID SURGERY IN GENERAL PRACTICE - THE COMPLEXITIES OF ENTROPION IN DOGS AND CATS

Rick Sanchez

Specialistische Dierenkliniek Utrecht (SDU)- AniCura, Ophthalmology, Utrecht, Netherlands

Qualifications:

Rick F Sanchez

BsciBiol, DVM, DipECVO, CertVetEd /FHEA

European Specialist in Veterinary Ophthalmology

RickFSanchez@hotmail.co.uk

Description

This lecture focuses on the complexities of entropion diagnosis in general practice and uses the 'entropion chart' to break down the different types of entropion that exist. It also discusses surgical treatment of a variety of entropions, including the different levels of surgical complexity, what a general practitioner should learn, what an advanced general practitioner with an interest in eyelid surgery should aspire to learn, and when is it most appropriate to refer a case. Lastly, it covers important aspects of the surgical technique that are often poorly understood, such as why entropion surgery can lead to overcorrection and how to avoid this.

Learning Objectives – be able to:

List the different forms of entropion based on the 'entropion chart'.

Discuss what are the types of entropion that I

could operate and why

could aspire to learn and why

should refer and why

Describe the Celsus-Hotz technique and its variations for different entropions.

What is the effect of an 'undulating' or 'elongated' lower eyelid in entropion.

Abstract

The eyelids play in protection of the globe, distribution of the tear film and removal of surface ocular debris and must maintain a natural relationship to the globe. The very sensitive nature of the cornea and conjunctiva is such that small imperfections of the eyelid margin and hairs can cause significant problems for patient discomfort.

Eyelid surgery varies in complexity. There are over 30 individually described eyelid procedures, each with a very specific indication that ophthalmic specialists must master during their 3-to-4 year specialty training, and entropion surgery encompasses a small number of these procedures, which appear deceptively easy.

There are several types of entropion including entropion of the central to lateral lower eyelid, that sometimes includes the lateral canthus (typical of young dogs and cats, as well as older cats with orbital fat loss), entropion of the lateral upper and lower eyelid that always includes the lateral canthus (typical of the Shar Pei and other breeds with large, square heads), entropion of the lower medial eyelid (typical of brachycephalic dogs and cats), and upper eyelid entropion-trichiasis (typical of dogs with droopy faces and heavy ears, that is often accompanied by lower eyelid ectropion).

The Celsus-Hotz technique (often referred to as Hotz-Celsus) is employed often to correct entropion and it consists of the removal of a strip of skin that leads to the out-turning of the eyelid margin. It is typically used in the central to lateral lower eyelid to treat entropion of young dogs and young or old cats. The Celsus-Hotz may be modified to be shorter and almost in the shape of a small triangle for certain forms of lower medial eyelid entropion, or it may be adapted into an 'arrow'-method that conforms to the lateral lower and upper eyelid as well as the lateral canthus. For upper eyelid trichiasis-entropion a complex surgery named after its creator, the 'Stades' method is employed and while it might resemble a large Celsus-Hotz to the untrained eye, it is much more complex than that and difficult to perform well. While a general practitioner may aspire to learn the Celsus-Hotz technique, this is more difficult than it appears. However, once this is learned, the arrow-modification is not difficult to learn, though it requires training, while the upper eyelid entropion-trichiasis is best left to specialists (even specialists that do this frequently will find this technique challenging). Medial lower eyelid entropion in most cases is complex and, in some animals, it might require a medial canthoplasty, which is why it is best referred when possible.

Interestingly, performing a Celsus-Hotz in young animals sometimes leads to ectropion. This may occur because too much skin was removed (iatrogenic) but in most cases it is because the surgeon has not realized there is an undulating eyelid that is too long and needs to be shortened in addition to having a Celsus-Hotz technique. This is complex, as it involves the superimposition of a Celsus-Hotz with a full thickness eyelid resection that requires a reconstruction and should not be attempted without specific, guided training.

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DRIVING CHANGE IN YOUR VETERINARY PRACTICE FOR A BETTER TEAM ENVIRONMENT

Daniella Santos

IVC Evidensia, Director Of Professional Culture, Bristol, United Kingdom

Qualifications:

Daniella Dos Santos

BSc BVetMed FRCVS

daniella.santos@ivcevidensia.com

When we have colleagues happy and thriving, they can provide the best possible care for patients. However, with burnout and recruitment challenges facing many countries, developing a supportive and productive team environment can be a challenge.

The reality is it is not a quick fix and there is no one thing that can improve a team environment, it is a multiple of factors, each needing different approaches that come together to improve working environments. In this session we will be exploring the importance of workplace culture and how you can drive change to improve your team environment

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BIOSSEGURANçA EM ONCOLOGIA CLíNICA: A TRíADE EQUIPA VETERINáRIA/PACIENTE E TUTOR/ MEIO AMBIENTE

Felisbina Queiroga

University of Trás-os-Montes and Alto Douro, Veterinary Sciences, Vila Real, Portugal

Qualifications:

Felisbina Luisa Pereira Guedes Queiroga

DVM, MSc, PhD

fqueirog@utad.pt

Biosafety in Clinical Oncology. The Triad: Veterinary Team/Animal and Tutor/Environment

Biosafety in veterinary medicine is a general concept that includes the practice of preventing the accidental exposure of people, animals, and the environment to harmful biological agents or hazardous drugs. This includes pathogens that can cause disease in animals, as well as those that can be transmitted from animals to humans (zoonoses), and hazardous drugs like cytostatic drugs, commonly used in veterinary oncology.

When working with hazardous materials, it is important to consider the veterinary team, the patient and the owner, and the environment as a triad. All three of these groups can be at risk of exposure to hazardous materials, being essential to take steps to protect them all.

Biosafety for the Veterinary Team

The veterinary team is at the greatest risk of exposure to hazardous materials in clinical oncology. They are the ones who are most likely to come into contact with these materials, and they are also the ones who are most likely to be injured if they are not properly protected. The team must also be familiar with the safety data sheets (SDS) for all hazardous materials that they use. These SDSs provide information about the hazards of the material, how to handle it safely, and what to do in the event of exposure.

There are a number of biosafety measures that the veterinary team can take to protect themselves from exposure to hazardous materials:

-Practicing good hygiene: This includes handwashing and disinfecting surfaces. Good hygiene helps to prevent the spread of infection, both from the patient to the veterinary team and from the veterinary team to the patient.

-Using personal protective equipment (PPE). This includes gloves, gowns, masks, and eye protection. PPE should be worn whenever there is a risk of exposure to hazardous materials.

-Prepare the drugs using a biosafety cabinet and/or closed system transfer device.

-Being aware of the risks. The veterinary team should be aware of the risks associated with the hazardous materials they are working with. They should know the signs and symptoms of exposure, and they should know what to do if they are exposed.

Biosafety for the Animal and Owner

The animal is also a potential victim of exposure to hazardous materials. Besides the drugs administered for treatment, animals can be exposed to contaminated surfaces, accidental spills, etc.. through direct contact with their skin, eyes, or respiratory tract. Owners (family) may be exposed if they come into contact with the patient's body fluids or if they are in the same room as the patient when hazardous materials are being used. There are a number of biosafety measures that can be taken to protect animals and owners from exposure to hazardous materials:

-Use appropriate PPE when handling the animal.

-The veterinary should educate clients about the risks associated with the hazardous materials that are being used.

-Owners should follow the instructions of the veterinary team carefully. This includes wearing PPE when necessary and washing their hands frequently.

Biosafety for the Environment

The environment is also at risk of exposure to hazards. These substances can contaminate the air, water, and soil, and constitute a threat to both animals and humans. Hazardous materials can be released into the environment through spills, leaks, or improper disposal.

Some measures that can be taken to protect the environment, include:

-Using proper disposal procedures: Hazardous materials should be disposed of properly according to the regulations. This helps to prevent the release of hazardous materials into the environment.

-Cleaning up spills and leaks promptly: Spills and leaks should be cleaned up promptly to prevent the spread of hazardous materials.

Conclusion

The triad Veterinary Team/ Animal and Owner/ Environment must be considered when manipulating hazardous materials in clinical oncology. By following biosafety practices, we can help to ensure the safety of everyone involved.

In summary:

-Always read the SDS for hazardous material before using it.

-Wear appropriate PPE for the specific hazardous material.

-Prepare the drugs using a biosafety cabinet and/or closed system transfer device.

-Dispose of waste properly.

-Clean up spills promptly.

-Monitor the health of the animal and owner, and the veterinary team for any signs of exposure.

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BRACHYCEPHALIC SYNDROME IN DOGS AND CATS

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM (Small Animal Internal Medicine)

lrjohnson@ucdavis.edu

Brachycephalic Syndrome in Dogs and Cats

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Brachycephalic syndrome commonly affects breeds such as the English and French Bulldog, Pug, Boston Terrier, Pekingese, Shih Tzu, and Lhasa Apso, as well as Himalayan and Persian cats. Most of these animals have foreshortening of the muzzle yet a form of brachycephalic syndrome also exists in the Cavalier King Charles Spaniel, Boxer, Shar-Pei, and Norwich terrier.

Phenotypic characteristics in the typical syndrome of BOAS include stenotic nares, elongated soft palate, eversion of laryngeal saccules, and ultimately, laryngeal collapse. In the English bulldog, additional airway obstruction can result from a hypoplastic trachea. An increasing number of anatomic abnormalities have been described in brachycephalic animals, including macroglossia, nasopharyngeal turbinates, and increased intranasal contact points, as well as gastrointestinal abnormalities such as pharyngeal collapse, hiatal hernia, gastroesophageal reflux disease, and redundant esophagus. Finally, a systemic inflammatory state has also been documented in brachycephalic dogs, with increased plasma concentrations of TNF-alpha, IL-10, IL-13, IL-17A, and nitric oxide.

Norwich terrier upper airway syndrome is an atypical form of BOAS typified by narrowing of the laryngeal aditus, which creates a large pressure gradient across the airway opening. This leads to secondary changes of saccular eversion, tonsillar enlargement, redundant supra-arytenoid folds, inflammation, and laryngeal collapse. A genetic mutation predisposing to lymphedema might be responsible for worsening the clinical presentation. Clinical signs include noisy breathing, exercise intolerance, cyanosis, and collapse, although some dogs are remarkably free of clinical signs or physical examination abnormalities, despite having severe anatomic malformations. Currently, sacculectomy and use of anti-inflammatory medications are the primary management options available for dogs that are severely affected.

Stertor and stridor are common complaints in brachycephalic animals, to the extent that owners often need to be informed that these loud breathing sounds are actually abnormal rather than 'normal for the breed'. Unfortunately, the popularity of the afflicted dog breeds continues to grow and breeding strategies are leading to more and more debilitated animals. Stertor and stridor can also be associated with obstructive lesions of the upper airway involving the larynx, pharynx, tonsils, epiglottis, nasopharynx, and trachea in any breed of dog or cat. Differentiating stridor from stertor can help prioritize the site and type of the lesion present and can enhance client communication.

Stridor is a high pitched inspiratory noise resulting from narrowing of a large, rigid airway such as the larynx, trachea, or nasopharynx. Classically, it is described as being audible without a stethoscope, however subtle stridor can require laryngeal auscultation for detection and sometimes is only detectable after exercise. When stridor is caused by severe, rigid obstruction, expiratory stridor/wheezing can sometimes be heard. Conversely, stertor is an inspiratory or expiratory snoring noise of variable tones caused by vibration of soft tissues such as the soft palate, pharynx, or laryngeal saccules. However careful auscultation over the larynx can allow differentiation of sounds and can be crucial in documenting stridor, which is suspicious for concurrent laryngeal collapse. Laryngeal collapse, with overlap of cuneiform or corniculate processes is the end stage manifestation of brachycephalic syndrome and is also recognized in the Norwich terrier and Cavalier King Charles spaniel. Another differential for laryngeal stridor in the brachycephalic breed is epiglottic retroversion, which is increasingly recognized as a cause of airway obstruction. Normally the epiglottis sits below the soft palate and during swallowing, it moves back to cover the larynx. During inspiration, it moves upward to contact the palate and direct air through the nasopharynx to the larynx. In dogs with retroversion, the epiglottis is overly mobile and travels caudally to obstruct the larynx during inspiration. This disorder might result from malacic change in the epiglottis, fracture of the epiglottis, or failure of the hyoepiglottic muscle to maintain the epiglottis in the proper position. Both laryngeal collapse and epiglottic retroversion warrant a guarded prognosis as surgical correction of these disorders is fraught with difficulty and complications.

The diagnostic work-up for animals with BOAS depends on likely contributors to the diagnosis. Visual examination and cervicothoracic radiographs are performed initially. Stenotic nares is the most obvious condition associated with stertorous breathing and is the most common anatomic abnormality in brachycephalic breeds. Interestingly, it's often the only manifestation of disease in brachycephalic cats. Elongated soft palate is also common in many breeds, and upper respiratory noises are often so loud that it can be difficult to distinguish other abnormalities. Cervical radiographs can be helpful in identifying an overlong or excessively thick palate although overlap of structures and oblique views can obscure definitive recognition. Fluoroscopy of the upper airway can be used to define these structures, to document pharyngeal collapse, or to identify nasopharyngeal regurgitation. Thoracic radiographs are used to identify tracheal hypoplasia, with comparison of the luminal diameter to the thoracic inlet or to the 3rd rib. Bronchoscopy can show malformation of the trachea with narrowing into a triangular shape or to a smaller diameter than anticipated. Caudal rhinoscopy can be required to identify nasopharyngeal turbinates.

Treatment of brachycephalic syndrome depends on the system affected primarily. For dogs with airway obstruction, surgical resection of the obstructing tissue is performed. Wedge resection of the nares is generally preferred in order to remove cartilage as well as soft tissue from the nasal region. Ventriculectomy is performed to remove everted laryngeal ventricles, with some surgeons preferring to remove the saccules unilaterally to avoid creation of a laryngeal web. It is important for owners to know that saccular eversion can recur over time, particularly when continued obstruction results in soft tissue swelling. Staphylectomy has long been performed to shorten the palate however a newer surgical method for relieving airway obstruction includes bilateral tonsillectomy and a U-H pharyngoplasty. Laser assisted turbinectomy has been applied to alleviate nasal obstruction in dogs that have persistent signs despite routine surgical procedures of staphylectomy, ventriculectomy, and wedge resection of stenotic nares. Removal of nasopharyngeal turbinates might also be possible with laser resection. Simple resection generally results in return of the tissue and while the turbinates can be displaced with stenting, that can lead to other complications.

Dogs with mild gastrointestinal signs can be palliated when airway obstruction is removed however others need specific management of hiatal hernia. Various open and laparoscopic procedures have been described.

Medical management of BOAS revolves around weight loss and limiting aspiration, particularly because brachycephalic breeds are at ~4-fold risk for aspiration pneumonia. Low fat diets facilitate weight reduction and also encourage gastric emptying. Judicious use of acid suppressants (omeprazole) and prokinetics (cisapride) in dogs with motility disorders can also be helpful. Achieving a BCS of 4/9 is optimal for brachycephalic breeds because excessive fat on the thorax puts pressure on the respiratory system and fatty infiltration of the liver further reduces

thoracic volume. Gradual weight loss should be stressed for all overweight animals. Owners should be given reasonable goals for an optimal weight (1-2% weight loss per week) and for the time required for weight loss. Careful monitoring of progress in weight loss and encouragement in obtaining goals is helpful in obtaining client compliance. Exposure to cigarette smoke, pollutants, heat, and humidity should be limited.

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FEVER AND FELINE VECTOR-BORNE PATHOGENS

Xavier Roura

Hospital Clínic Veterinari, Universitat Autònoma De Barcelona, Bellaterra, Spain

Qualifications:

Xavier Roura

DVM, PhD, DECVIM-CA

xavier.roura@uab.cat

Key points from the presentation:

Fever or its consequences, such as apathy or less appetite, are common clinical signs in cats. However, due to how unspecific they are, veterinarians often abuse the concept: "fever of unknown origin (FOD)".

FOD means a fever that does not resolve spontaneously, that does not respond to antibiotics and that remains idiopathic despite the performance of a minimum of diagnostic tests.

This human medicine definition for FOD has now been adopted: "Cat with a temperature >39.2ºC for, a) at least 3 weeks without an apparent cause after at least three visits; or b) three days of hospitalization without a diagnosis despite evaluation of the clinical history, physical examination, and a minimum of diagnostic tests (complete blood count, serum biochemistry, and urinalysis)."

When we have cats with a rectal temperature >39.2°C there are two possibilities: hyperthermia or fever.

Hyperthermia is caused by an increase in muscle activity, by an increase in environmental temperature, by stress or by a higher rate of metabolic activity such as hyperthyroidism.

On the other hand, when there is a fever, there is an alteration in thermoregulation in the hypothalamus due to the action of pyrogens that ends with an increase in body temperature.

The most common pyrogens are interleukin-1 and tumor necrosis factor produced by leukocytes, mainly macrophages and neutrophils.

The published information on FOD in cats is very limited, in fact there are no retrospective studies, despite the long list of possible differential diagnoses compared to a febrile cat.

Changes in thermoregulation associated with intracranial injuries, including trauma, and the use of some drugs (tetracyclines, sulfonamides, penicillins or levamisole) have also been described.

We know that the most frequent cause of FOD in cats is an infection (bacteria, viruses, fungi, and parasites), followed by some neoplasia (lymphoma) or serious inflammations (extensive traumatic injuries, pancreatitis), and being very little described associated with immune-mediated diseases (anemia or thrombocytopenia).

Fever is a frequent clinical sign in cats, and in 70% of cases an infectious disease is the cause. Several pathogens transmitted by fleas, ticks, mosquitos, and sandflies could produce fever in cats.

Despite all this, between 10% and 15% of cats with FOD remain undiagnosed despite performing an extensive battery of diagnostic tests.

Viruses are one of the most common infectious causes of FOD in cats, especially FIP and upper respiratory tract viruses. Feline leukemia and immunodeficiency viruses should be assessed in each febrile cat; however, the results should be interpreted correctly because they are not always the cause of the fever at that time.

We must not forget that some cats can have fever associated with Salmonella or Campylobacter bacteremia without presenting diarrhea, especially if there are large numbers of neutrophils on rectal cytology.

Finally, there are numerous pathogens transmitted by different arthropods (fleas, ticks, mosquitoes, sandflies) that cause FOD in cats that must be considered and included in the differential diagnosis.

There are multiple lesions, clinical signs, laboratory abnormalities or lesions associated with these diseases transmitted by arthropods in cats, but fever, anemia, uveitis, cough, dyspnea, or proteinuria are the most frequent.

When we have clinical alterations, which if it were a dog, would not suggest or include these diseases in the differential diagnosis, we must do the same if it is a cat.

Therefore, the clinical approach in cats for the diagnosis of these diseases is based on three stages: 1) suspect or think about these pathogens; 2) exclude the other more frequent pathologies that can give the same clinical alterations; and 3) perform diagnostic tests to confirm infection.

In general, unlike dogs, serology in cats is not the most useful diagnostic test to confirm the presence of these pathogens, with direct observation of the infectious agent under a microscope in lesions or detection of its DNA by PCR being the most useful tests.

Ehrlichia and *Anaplasma* spp. they should be included in the list of differential diagnoses in cats with fever, anorexia and lethargy living in endemic areas. So, any country that has *Ehrlichia canis* infections in dogs likely also has *E. canis* infections in cats.

Although infections by *Rickettsia* spp. in cats they have been associated with fever and other clinical signs, their clinical significance still raises many questions.

Bartonellosis in cats can present with endocarditis, myocarditis, fever, lymphadenopathy, osteomyelitis, and uveitis, with frequent detection of hyperglobulinemia in blood tests.

Febrile cats that are seronegative and negative for *Bartonella* species in blood by culture or PCR are unlikely to have bartonellosis as the cause of fever.

Although feline cytauxzoonosis is a serious disease in the United States, in our environment it can present with a wide range of signs, including mild infections.

Hepatozoon spp. it can infect European cats, being associated in some studies with fever and anemia and the treatment of choice in the feline species is not known in detail.

Hemoplasmas should be on the differential list for cats with a history of fighting and fever, particularly if the fever does not respond to beta-lactam antibiotics.

While it is possible that rodent fleas could transmit *Yersinia pestis* to cats, ingestion of bacteremic rodents is likely the most common route of transmission.

Cats with leishmaniosis usually present cutaneous signs, although a wide variety of visceral signs are also described such as fever. Long-term treatment with allopurinol is usually clinically effective, although parasitological cure is rare.

The clinical approach of the FOD must be personalized to each cat based

on the clinical history, lifestyle, geographical area, physical examination, and the result of a minimum of diagnostic tests.

Good communication with the owners is essential to obtain the maximum amount of information, but also so that they understand that obtaining a definitive diagnosis in a FOD normally implies a high cost of time and money.

If you are taking some type of drug and it is possible, the ideal would be to suspend it for at least 48-72 hours, and if the fever continues after that time, it can be ruled out that it is the result of a drug reaction.

The history and dates of vaccination of the cat must be properly evaluated since in cats, as in dogs, the presence of fever associated with vaccines has been described.

Knowing the type of life (indoor/outdoor), the trips made, if they use internal and external antiparasitic, the type of food (commercial, homemade, raw, etc.) or the prey preference (insects, rodents, birds, snails, etc.) that the cat has, is very important to clarify our differential diagnosis and decide which diagnostic tests may be more interesting.

If there is a definitive diagnosis, the treatment must be specific for that disease.

Empirical antibiotic treatments should be based on the type of tissue or organ affected, or the type of infectious agent suspected.

Empirical treatment with prednisolone should be considered in cats with FOD when diagnostic tests are inconclusive, or could not be performed, and they have not responded to antibiotics.

Antipyretics are generally not recommended because most are NSAIDs, which in sick cats can be counterproductive if there is dehydration or anorexia, and because fever can have a beneficial action as it reduces the action of some pathogens and improves the efficacy of some antibiotics.

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BASIC EXTRACTION TECHNIQUES - CLOSED EXTRACTION

Brook Niemiec

Veterinary Dental Specialties, Dentistry, San Diego, United States of America

Qualifications:

Brook A. Niemiec

DAVDC, DEVDC, FAVD

bniemiec@vdspets.com

DENTAL RADIOGRAPHS

Dental radiographs should be exposed on all teeth prior to extraction. Dental radiographs are invaluable resources for the practiconer. Radiographs allow the practitioner to determine the amount of disease present, any root abnormalities or ankylosis. Help with radiographic interpretation is available while the patient is under anesthesia at www.vetdentalrad.com. In addition, the radiographs will serve as evidence for the extraction in the medical record. Radiographs should also be exposed post-extraction to document complete removal of the tooth.

OBTAIN PROPER VISABILITY AND ACCESSABILITY

The patient should be positioned in such a way as to allow maximum visibility of the area as well as make the surgeon most comfortable. Note that during the extraction procedure the ideal position may change and the patient should be adjusted appropriately. The lighting should be bright and focusable on the surgical field. Suction, air/water syringes, and gauze should be utilized continually to keep the surgical field clear, and mouth gags can be used to hold the mouth in proper position for surgery. Finally, magnification may help the surgeon locate furcations or retained root tips.

PAIN MANAGEMENT

Extractions are surgical procedures and are moderately to severely painful for the patient. Depending on patient health, a multimodal approach (combination of opioids, NSAIDs, local anesthetics, and dissociative) should be employed, as this provides superior analgesia. Preemptive analgesia is proven to be more effective than post-operative, and it is therefore important to administer the drugs BEFORE the painful procedure.

SINGLE ROOT EXTRACTIONS

INCISE THE GINGIVAL ATTACHMENT

This is accomplished with a scalpel blade (number 11 or 15), elevator, or luxator. The selected instrument is placed into the gingival sulcus with the tip of the blade angled toward the tooth (this will help avoid going outside the bone and creating a defect or cutting through the gingiva). The blade is then advanced apically to the level of the alveolar bone, and the instrument is carefully worked around the entire tooth circumference.

This step is very helpful as the gingival attachment contributes approximately15% of the retentive strength of the periodontal apparatus. More importantly, however, this procedure will keep the gingiva from tearing during the extraction procedure. This is most important with mobile teeth where little elevation is needed, but one edge is still attached. Gingival tearing can cause defects that require closure or can make a planned closure more difficult.

ELEVATE THE TOOTH

Elevation is the most dangerous step in the extraction procedure. Remember that you are holding a sharp surgical instrument and working in an area of numerous critical and delicate structures. There have been many reports of eyes that have been gouged and lost by extraction instruments as well as at least one confirmed fatality due to an elevator puncturing a patient's brain. The index finger is placed near the tip of the instrument to avoid causing iatrogenic trauma in the event of instrument slippage or encountering diseased bone. In addition, the jaw should be gently held with the opposite hand to provide stability and avoid mandibular fracture.

First, select an instrument which matches the curvature and size of the root. There are numerous instruments available including the classic elevator, the luxating elevator, and the winged elevators. Classic elevators and winged elevators are used in an "insert and twist" motion to tear the periodontal ligament, whereas luxators are used in a rocking motion during insertion to fatigue as well as cut the periodontal ligament. Luxators can be GENTLY twisted for elevation, but they are not designed for this and can be easily damaged when used in this manner.

Elevation is initiated by inserting the elevator or luxator firmly yet gently into the periodontal space. The insertion should be performed while keeping the instrument at about a 10 to 20 degree angle toward the tooth, to avoid slippage. Once in the space between the bone and the tooth, the instrument is ***gently*** twisted with two-finger pressure. This is not to say that the instrument should be held with two fingers, rather the entire hand should be used to hold the instrument. Twist only with the force that you could generate when holding with two fingers. Hold the position for 10-30 seconds to fatigue and tear the periodontal ligament.

It is important to note that the periodontal ligament is very effective in resisting intense, short forces. It is only by the exertion of prolonged force (i.e. 10-30 seconds) that the ligament will become weakened. Heavy stresses only serve to put pressure on the alveolar bone and tooth which can result in the fracture of one of these structures, so it is important not to use too much force.

After holding for 10 to 30 seconds, reposition the instrument about 1/8 of the way around the tooth and repeat the above step. Continue this procedure 360 degrees around the tooth, each time moving the elevator apically as much as possible. Depending on the level of disease and the size of the tooth, a few to several rotations of the tooth may be necessary.

The key point to successful elevation is PATIENCE. Only by slow, consistent elevation will the root loosen without breaking. It is always easier to extract an intact root than to remove fractured root tips.

EXTRACT THE TOOTH:

Removing the tooth should only be attempted after the tooth is very mobile and loose. This is accomplished by grasping the tooth with the extraction forceps and gently pulling the tooth from the socket. Do NOT apply undue pressure as this may result in root fracture. In many cases, especially with premolars, the roots are round in shape and will respond favorably to *gentle* twisting and holding of the tooth while applying traction. This should not be performed if there are root abnormalities (significant curves, weakening) seen on the pre-operative radiograph.

It is helpful to think of the extraction forceps as an extension of your fingers. Undue pressure should not be applied. If the tooth does not come out easily, more elevation is necessary. Start elevation again until the tooth is loose enough to be easily removed from the alveolus.

CLOSURE OF THE EXTRACTION SITE:

This is a controversial subject among veterinary dentists, and thus some texts recommend suturing only in large extractions, other authors (including this one) recommend suturing almost all extraction sites. Closure of the extraction site promotes hemostasis and improve post-operative discomfort and aesthetics. It is always indicated in cases of larger teeth (e.g. canines, carnassials), or any time that a gingival flap is created to allow for easier extraction. This is best accomplished with

size 3/0 to 5/0 absorbable sutures on a reverse cutting needle. Closure is performed with a simple interrupted pattern with sutures placed 2 to 3 mm apart. It is further recommended to utilize one additional throw over manufacturer's recommendations to counteract tongue action.

EXTRACTION OF MULTI ROOTED TEETH:

Section all multi-rooted teeth into single rooted pieces. The roots of almost all multi-rooted teeth are divergent and this will cause the root tips to break off if extractions are attempted in one piece. Root fracture can occur even if a tooth is relatively mobile to start with. With mobile teeth, the sectioning step alone often allows for simple extraction.

The best tool for sectioning teeth is a bur on a high-speed air driven hand piece. Besides being the quickest and most efficient tool for the job, it also has air and water coolant that will avoid overheating the tooth. Many different styles of burs are available, however this author prefers a cross-cut taper fissure bur (699 for cats and small dogs, 701 for medium dogs and 702 for large breeds).

The best way to section the teeth is to start at the furcation and work towards the crown of the tooth. This method is used for two major reasons. First, it avoids the possibility of missing the furcation and cutting down into a root, which subsequently weakens the root and increases the risk of root fracture. In addition, this method avoids the possibility of cutting through the tooth and inadvertently damaging the gingiva or alveolar bone.

After the tooth has been properly sectioned, follow the above steps for each single rooted piece. In some cases, the individual tooth pieces can be carefully elevated against each other to gain purchase.

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INFECTIOUS AND NON-INFECTIOUS DISEASES IN NEONATES

Kurt De Cramer[1],[2]

[1]*Rant en Dal Animal Hospital, Theriogenology, Mogale City, South Africa,* [2]*Rant en Dal Animal Hospital, Reproduction, Mogale City, South Africa*

Qualifications:

Kurt De Cramer

BVSc MMedVet (Gyn) PhD

kdcramer@mweb.co.za

INTRODUCTION

Determining the neonatal period in dogs is controversial with ranges from 3-6 weeks of age. Neonatal Infections infection in kennels and catteries is highly relevant to perinatal mortality, with the mother (uterus, secretions, skin) and the environment being the most common sources of infection in the litter. Colostrum uptake is vital and the time period during which this occurs is may be a lot shorter (4-8 hours) than previously reported (1). Inadequate colostrum uptake is a leading indirect cause of death and serotherapy may be useful in this regard. Neonatal infections may be bacterial, viral, or parasitic.

The normal puppy and kitten has strong suckling reflex, gain weight and rest, whereas ill puppies incessantly cry and keep moving around followed by progressive weakness and death.

2 INFECTIOUS DISEASES

2.1 Bacterial sepsis

Bacterial infections are the leading cause of death through sepsis (34%) and with 65% of all mortalities attributed to sepsis following bacterial infection. Multiple bacterial species have been implicated (Escherichia coli most common). Bitches and queens may not show clinical signs; and the source of the bacteria may be maternal in up to 80% (from secretions or skin) with the remainder from environment. In large commercial breeding entities antibiotic abuse plays a role. The clinical signs of sepsis are diarrhoea, weight loss, dehydration, hyperaemia, omphalitis, purple abdomen, abdominal pain and necrosis of extremities. The course of the illness is usually hyperacute with death within 24 hours. In most cases a presumptive diagnosis is made and empiric treatment may be required of litter mates (using cephalosporins, penicillins and fluoroquinolones). In addition to antibiotic therapy, serotherapy and colostrum may be of use. Other ancillary treatment involves correcting neonatal triad (hypothermia, hypoglycaemia, hypovolaemia). Definitive diagnosis rest upon blood or urine culture but necropsy findings and culture is the most common diagnostic modality (2).

Other manifestations of bacterial infections include neonatal opthalmia, polyarthritis and puppy strangles. Frequently more than one puppy in the litter is affected suggesting an infectious cause despite failure to isolate infectious organisms in many of these cases. Treatment of affected puppies is mostly successful.

Neonatal tetanus is a very rare cause of death in puppies, is typically seen at the age of 3–5 days, and the few cases the author has seen have all originated from warmer climates and premises where other livestock (especially horses and cattle) are kept.

White scours is a very apt name given to a form of diarrhoea seen in puppies 2–4 weeks of age that are still nursing. Unlike dogs, it is a well-recognised condition in domestic livestock. The condition is characterised by the sudden onset of profuse white diarrhoea (semi congealed) without mucus or blood. Based on bacterial culture of stool and response to treatment using gram negative spectrum antibiotics, gram negative bacteria such as Escherichia coli and others.

Infectious juvenile pneumonia. This condition is often associated with large breeding kennels which host a large number of susceptible puppies at any given time. Typically, these puppies will be 3 weeks. The infection usually follows a kennel cough outbreak in the adult dogs with neonates showing signs of severe sinusitis, bronchopneumonia and death. Including a Bordetella vaccine in your vaccination regimen (particularly breeding dams) may help prevention of the condition if Bordetella is the cause and the intranasal vaccine may be administered as early as 2 weeks of age in puppies.

2.2 Viral infections

Canine herpesvirus is found worldwide in dog breeding colonies with infection rates of 30–100%. Following oronasal transmission, a variety of clinical manifestations low grade occurrence is most common. For the most part, only the foetuses in the pregnant bitch and puppies 4 weeks or younger will suffer ill effect from herpesvirus including resorption, abortion, weak underweight puppies, stillbirths, and small litter sizes. Puppies born apparently normal that contract the herpes virus later, (7–14 days) have a very high mortality rate approaching 100%. Control involves vaccination. Treatment may be attempted using thermoregulatory measures and anti-viral therapy but has poor prognosis. Serotherapy may be protective in in-contact litters.

Canine Parvo Virus 2 (CPV) can cause myocarditis in the infant period, usually between 3-6 weeks of age but this manifestation in vaccinated populations is rare as maternally transferred antibodies are mostly protective. CPV in older puppies remains common but usually manifests in puppies 8 weeks and older and fall outside the neonatal period.

The Minute Virus of Canines (CPV type I) may cause acute respiratory distress, diarrhoea and death in first 1-3 weeks of life but is likely underdiagnosed since seroprevalences of up to 50% have been reported (3). Confirmative diagnosis remains difficult and should be pursued more often.

Feline parvovirus is also a deadly gastrointestinal disease in kittens and may affect kittens as young as 3 weeks old when born of naïve queens or when exposed to overwhelming infections in shelters.

Feline upper respiratory tract disease (FeURTD) is common in catteries (morbidity up to 100%) with clinical signs (lethargy, inappetence, sneezing, nasal and ocular discharges and ulceration and systemic disease and death (4). Although there is sufficient evidence that the primary pathogens (FHV, FCV, Chlamiydia Felis, Mycoplasma Felis and Bordetella bronchiseptica) commonly associated with FeURTD have been positively linked with this clinical entity, there are many carrier states of these pathogens which remains a serious problem in catteries despite regular vaccination. Intensive vaccination protocols over and above routine, identifying and isolating carrier cats and shedders and adopting limited to no contact between litters and queens in the cattery without compromising good ventilation are good preventative measures.

2.3 Protozoal infections

Giardia lamblia is a frequent opportunistic infection in dogs and cats and may affect neonates.. Transmission occurs via oral contact with organisms in faeces of infected individuals. Stress may result in higher parasite counts in the faeces and increased severity of disease. It may also be part of an erosive multi factorial disease complex. The clinical signs may vary from subclinical disease to very severe enteritis, inappetence and weight loss and even death. Besides antiprotozoal agent therapy (fenbendazole, nitroimidazoles) of puppies and kittens, disinfection of the environment and therapeutic washes of animals themselves are indicated.

Coccidiosis in low numbers is usually asymptomatic and self-limiting

in puppies but may become a clinical entity (neonatal triad and bloody stool), particularly when acting as erosive disease in conjunction with other pathogens. The source of infection is usually the pregnant bitch which infects the puppies soon after birth (5). Preventative treatment in dams may therefore be indicated in commercial kennels.

Encephalitozoon cuniculi is a widespread infection of rabbits and occasionally of rodents and may in rare instances be spread via urine to dogs from these hosts. Infected dogs, irrespective of what age they were infected at, will usually show no clinical signs. Only puppies from infected dams will normally develop clinical signs following intrauterine infection. The age of manifestation varies and may be as early as 3–4 weeks of age or as late as 12 months. The clinical signs are failing to thrive, depression, weight loss, ataxia (unsteady gait), head tilt, head swaying, blindness, hind quarter paresis and seizures. Encephalitozoonosis is also a potential zoonoses but human infection is very rare.

2.4 Parasitic infections

Parasitic infections in neonates can occur in up to 60% of kennels and catteries. Trans mammary, transplacental and early infection to neonates (roundworms, hookworms) with nematodes are common in puppies and kittens. Preventative treatment before and during pregnancy and regular (every 2 weeks) deworming may be required in neonates. Adequate control may be complicated by the deworming gap phenomena (larval stages escaping treatment whilst migrating) as well as latent larval stages in pregnant dams.

Ectoparasites in the kennel or cattery such as mites, fleas and ticks may also be problematic but are easily controlled.

Environmental cleaning and disinfection with suitable products are essential and keeping environment dry (desiccation and UV light are natural disinfectants).

3 CONCLUSIONS

Among infectious causes, bacterial infection is the most common cause of neonatal mortality and morbidity in dogs and kittens. Ensuring adequate colostrum, maintaining hygienic conditions, regular parasite control and pursuing a definitive diagnosis in puppy mortality count as most valuable in control of these conditions.

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LEGUMES TO LARVAE: ALTERNATIVE IDEAS FOR DOG AND CAT DIETS

Marge Chandler

Vets Now Referrals, Nutrition, Lasswade Midlothian, United Kingdom

Qualifications:

Marjorie Chander

DVM, MS, MANZCVS, DACVIM (SA Internal Medicine and Nutrition) MRCVS

chandlermarge05@gmail.com

Pet owners may wish to avoid meat in pet diets due to ethical concerns about animal welfare or the environmental effects of livestock production. Sustainability of foods is highly complex and involves ingredients, CO_2 and other green house gas production, processing, transportation, packaging and land and water usage. Ingredients likely have the greatest effect on sustainability, and the protein source is the most costly of ingredients. Alternative protein sources under consideration for pet foods include plants and insects.

VEGETARIAN/VEGAN PET FOODS

Vegetarian owners may wish to feed their pet a vegetarian diet. In one study most of the people feeding a feline vegetarian diet stated ethical reasons[1]. While owner survey studies have of course shown that owners who choose to feed vegetarian diets perceive them to have good palatability and feel that their pets are healthy, there are nutritional concerns about these diets[2,3].

Dogs, as omnivores, can do well on plant based diets, e.g. racing sled-dogs fed a complete and balanced vegetarian diet showed good performance and maintained haematology parameters[4]. Cats are obligate carnivores and require animal-sourced ingredients to provide essential nutrients, including pre-formed vitamin A, taurine, niacin, and arachidonic acid, higher requirements for arginine and the sulphur-containing amino acids cysteine and methionine, all of which are low to absent in plant ingredients. Meat from livestock, poultry or fish have a better complement and ratio of essential amino acids for both dogs and cats. In order to provide missing or limiting essential nutrients, vegetarian diets must be heavily supplemented with synthetic sources of essential nutrients to ensure that the diet is balanced.

Egg and dairy products are highly digestible sources of many essential amino acids, but contain little to no taurine[5]. The essential amino acid lysine may also be insufficient in grain based diets and the processing and cooking of the diet may further limit its absorption.

Ingredients used in vegetarian diets may be poorly digestible, contain inadequate essential nutrients, or have high fibre and phytate contents, which can prevent nutrient absorption resulting in deficiencies. Nutrient deficiencies that can occur with inadequately formulated vegetarian diets include zinc-deficient dermatosis caused by phytate (a phosphate compound found in plants) binding to and preventing absorption of zinc by the animal; higher fibre diets preventing absorption of essential fatty acid (EFA) resulting in poor skin and haircoat; inadequate arachidonic acid intake in cats resulting poor reproduction performance. Inadequate taurine results in taurine-deficient cardiomyopathy and/or retinal degeneration.

Several studies have noted deficiencies in plant based pet diets. Two cats presented with lethargy, dysorexia, muscle wasting, weight loss, low serum folate, and macrocytic anaemia after dietary transition to a plant-based pet food. Food analysis showed multiple nutrient deficits. Folic acid supplementation improved dysorexia, and reintroduction of animal-derived ingredients restored appetite, weight and normal mentation[6].

A study showed 4 vegan pet foods meeting minimum macronutrient concentrations but deficiencies in calcium, potassium sodium, Ca:P ratio, and excess zinc, copper and iron. Deficiencies in protein and taurine were found in cats fed at units/$Kg^{0.67}$ body weight[7].

One fourth of 24 vegetarian pet diets did not meet all AAFCO amino acid minimums and most diets studied were not compliant with AAFCO labelling regulations[8]. Of 26 commercial plant-based pet food products, only four met AAFCO and one met FEDIAF nutrient recommendations for canine maintenance No diet met AAFCO or FEDIAF recommendations canine or feline growth and none met requirements for feline maintenance. Nutrients commonly found insufficient were sulphur amino acids, taurine, arachidonic acid, EPA and DHA, calcium phosphorus and vitamin D[9].

Growing animals are at the greatest risk of nutrient deficiencies when fed improperly formulated diets. Animals with chronic medical conditions may have altered nutritional requirements for which vegetarian diets may help or hinder.

INSECTS AS A PET FOOD PROTEIN SOURCE

Insects can contribute a nutritious source of protein and other essential nutrients to pet foods and are potentially more sustainable than conventional meat sources. The three species of farmed insects most commonly used in pet food are: black soldier fly (BSF) larvae (Hermetiaillucens), yellow mealworms (YMW), (Tenebriomolitor), and house crickets, (Achetadomesticus). The amino acid profiles of some insect ingredients are comparable to fishmeal and soybean meal[10]. Additionally, insects can provide high amounts of fats or oils, minerals, and vitamins, depending on what they are fed and their larval stage at the time of harvest. Insects are able to eat vegetable by-products and foods that are surplus to human requirements and efficiently convert them into quality proteins and valuable by-products such as chitin and insect oil. Insect-based snacks, e.g. crickets, are also available on the market.

Palatability

Cats and dogs may have different taste preferences for insects. The type of insect and the amount included can affect the food's acceptability. Dogs preferred dry foods with BSF larvae meal over those with yellow mealworm meal, while cats favored the YMW-based food, both at 30% of the dietary protein. Some cats refused food or ate an insufficient amount of food with higher amounts of BSF larvae[11].

Consumer Acceptance

A high percentage of consumers accept insects as an alternative and sustainable protein source in pet feed and show an interest in having more information[12]. Media focus and campaigns by farmers, academics, non-profit organizations and pet food companies are helping to increase acceptability of insect-based ingredients among pet professionals and owners.

Environmental impact

Eight of 12 commercial insect-based pet foods included a claim that insects are a sustainable protein source. Insects are energy-efficient and have a relatively high proportion of edible weight[13]. Higher feed conversion efficiencies can be achieved by insects than by conventional livestock species. Depending on the comparison, insect protein may have a emission of CO2- equivalents than ruminant, pig or poultry protein[14]. As with livestock species, insect species differ in their environmental impact, e.g., production of 1 kg YMW protein is estimated to generate 6 to 14 kg CO2-equivalents[15] compared to about 3 kg when BSF larvae are fed a feed-grade substrate but approximately 19 kg when they are fed food-grade substrate[16].

The benchmark to which insect protein is generally compared to is meat products, which have an overall high environmental impact. For most pet

food the environmental impact should be compared to meat by-products (e.g. meat meals and organs) as these are more often used in pet foods[11]. A report estimated an impact of about 1 kg CO2-equivalents per kg protein for a mixed meat meal and 2 kg/kg protein for a poultry meal[17] which is lower than that for BSFL and YMW; therefore, the claim that insects are a more sustainable protein source depends on the comparison, the method of quantification, and the aspects of sustainability.

Insect production does require fewer resources than traditional livestock, e.g. lower land use and lower water use[14]. A gram of edible beef meat protein requires 8-14 times more land and 5 times more water than mealworms, although again a comparison with meat by-products may be more accurate for pet foods.

Nutritional adequacy

As with conventional animal meals, nutrient composition varies among insect species and processing methods. In vitro nitrogen (N) digestibility of freeze-dried ground BSF larvae, housefly larvae (Musca domestica; HFL), YMW and lesser mealworm (Alphitobius diaperinus) is approximately 90%, comparable to poultry meat meal (87.9%)[18,19]. In dogs, apparent faecal N digestibility of foods containing BSFL ranged from 73.2 to 87.2% and for a YMW containing food was 83.6%[11]. Feeding dogs extruded foods with 8, 16 or 24% banded crickets resulted in apparent faecal N digestibility values of 84.8, 86.0 and 82.1%, respectively[20]. These values are similar to the average apparent faecal N digestibility of commercial pet foods which is ≥80%[11]. In cats, reported faecal N digestibility values of 73.4 to 79.8% have been reported for diets containing BSFL meal[11] and 80.4% for YMW[13], lower than for most cat foods.

Although total protein content in insects is usually good, some amino acids, e.g. methionine and threonine, may be limiting for dogs, and arginine, methionine and leucine, limiting for cats. These potential deficiencies would be even more significant during growth[11].

Allerginicity

Insect-based pet foods are sometimes marketed as being 'hypoallergenic'; however, with their increasing inclusion in foods allergies may develop. They may also be included as only part of the protein source rather than as a single source. Dogs allergic to house dust mites may also clinically show cross-reactivity with mealworm proteins[21] .

Summary

For both plant based and insect based pet foods it is essential that safety and efficacy testing is performed. Plant based foods must undergo rigorous nutritional evaluation and assessment of nutrient interactions. Studies have evaluated aspects of the nutritional quality of various insect species; however, the impact of long-term feeding for both insect and plant based foods on the nutritional status and health in dogs and cats is still needed.

References available on request

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BEARDED DRAGON MEDICINE

Sonia Hernandez

University of Georgia, Warnell School Of Forestry And Natural Resources And Scwds At The College Of Veterinary Medicine, Athens, United States of America

Qualifications:

Sonia M. Hernandez

DVM, DACZM, PhD

shernz@uga.edu

BEARDED DRAGON MEDICINE

Bearded dragons (*Pogona vitticeps*) have surpassed the green iguana in popularity as lizard pets, in large part because people perceive them to be relatively easy to maintain in captivity. There are two species commonly seen: the Eastern (*Pogona barbata*) and the Central Bearded Dragon (*P. vitticeps*).

Natural History and Husbandry

Bearded Dragons are terrestrial, semiarboreal, and diurnal lizards of Australia in the family Agamidae. Husbandry requirements should provide a diurnal light cycle, ample space to display natural behaviors and vertical structures for climbing (min recommended: 1.5 m wide, 0.6 m deep X 1 m high). Ventilation is very important—most commercial reptile enclosures now include screen on tops/sides that have greatly improved ventilation. Glass tanks are not adequate. As with most reptiles, bearded dragons need a range of temperature in their enclosure to achieve normal body functions such as digestion and immune defense. Their Preferred Body Temperature is 35°C, thus a basking area of 40°C and an area that is cooler (35°C) is optimal. Overheating the enclosure is common. All Bearded Dragons inhabit relatively arid, dry regions in Australia. The humidity provided should range between 30-40% and monitored. To maintain the humidity low, use a shallow bowl of water, minimize the use of plants and remove any spills or damp litter. Providing full-spectrum lighting (both UVA and UVB) and calcium supplementation (every other day for juveniles and weekly for adults) are both essential to avoid metabolic bone disease (MBD). As with all reptiles, time outdoors for exposure to natural sunlight is invaluable. The substrate should be large enough that the dragons cannot eat it (avoid fine sand especially for juveniles), thus leaf litter, large gravel or other materials (paper pellets) that can be easily scooped and cleaned/discarded are ideal. Dragons like to hide in hollow logs or caves.

Diet

Bearded dragons are omnivorous. Adults should get 90% vegetable and 10% animal matter; juveniles consume 50% vegetable and 50% animal matter. Juveniles require more animal protein, but vegetables should be offered daily to avoid them habituating to insects alone. Variety is the key to keeping reptiles nutritionally healthy, but beware that some insects have been known to cause toxicity in this species (e.g. firefly (genus Photinus), Monarch Butterfly (Donaus plexippus) and Queen Butterfly (Donaus gillipus), and lygaeid bugs (Oncepeltus fasciatus). Commercially-available insect prey are acceptable—some reptile keepers warn against feeding mealworms to juvenile bearded dragons because of impactions.

Sexing

Sexual maturity is attained by 18–24 months of age. Male bearded dragons have larger femoral pores, wider and thicker cloacal folds and thicker tail bases, as well as deeper coloration. The hemipenes can be everted by putting pressure with a thumb towards the cloaca.

Ecdysis

Bearded dragons shed their skin piecemeal in large patches of skin. The frequency varies with age (juveniles shed as often as monthly), diet, season, temperature/humidity in the enclosure and health. They should have a large rock or log with which to rub against to aid in shedding.

Physical Exam

The exam of a reptile should begin with a thorough discussion of the husbandry, diet, when and where the animal was acquired, the number and type of other pets in the household and the general "movement" of other animals in the household. It is common for reptile caretakers to trade and purchase animals frequently, which has obvious implications for introducing pathogens/parasites into the household. In addition to the husbandry details, practitioners should ask about hygiene and disinfection methods, source of water, frequency/quality of defecation, frequency/quality of shedding and how often the owner handles the lizard. A normal dragon will be alert, move its head in response to sound and movement, stand high and strong on all four limbs and attempt to run when you try to catch it. The body and limb muscles are well rounded and firm without excessive creasing or discoloration of the skin. It is very useful to obtain a respiratory rate from a distance and note both frequency and the depth with which the ribs/chest move. Once handled, they may hold their breath. Equally, I attempt to slip a doppler unit between the forelimbs to obtain a resting heart rate (range 40–90 beats per minute) before handling. A physical exam progresses "from tip of the nose to tip of the tail" paying particular attention to eye, external tympanum, nares, mouth—noting symmetry, swelling or discharge. The skin color ranges from brown to orange depending on the color morph, health status, and body temperature but the skin should not be discolored, creased; the folds of skin around the eyes/limbs is where mites may be located. Dehydration is present if there are excessive folds, the eyes are sunken, and the saliva is stringy. The mucous membranes should be pale yellow-pale pink but not white, and moist. The tip of the tongue should be darker in color than the rest of the tongue. Note any abnormal odor from the mouth. Are there oral plaques or petechiae present? Examine the gums for any sign of redness, ulceration or necrosis as stomatitis and gingivitis are not uncommon in this species. Palpate the entire body, beginning at the neck and working down the body. Feel for organs and any firm masses or fluid. Careful when palpating reproductively active adult female dragons. Ovarian follicles are fluid-filled structures that can rupture if handled roughly. Bearded dragons lack a urinary bladder. The dragon should be breathing with its mouth closed. Open-mouth breathing, abnormal respiratory wheezes or whistling are signs of severe disease. Examine each joint for full range of motion or any swelling paying particular attention to toes where sheds often cause toe necrosis. Unilateral lameness is more common than bilateral, and the dragon should be encouraged to walk in the exam room to evaluate its mobility and neurologic status. The dragon should not act "sleepy" or overly distressed, which may signal poor health. Collect a body weight to the nearest gram.

Sample Collection

Venipuncture (between 0.5-1% of body weight) can be achieved from the coccygeal vein approaching it either ventrally or laterally. Radiographs are obtained like other reptile patients. Common radiographic findings are metabolic bone disease, osteomyelitis, articular gout, fractures, lower respiratory tract disease, impactions, follicular development, presence of eggs, and metastatic mineralization. Endoscopy is minimally invasive and provides direct visualization of organs and biopsy collection. A lung lavage to diagnose respiratory disease is obtained by instilling 1-5 mL/kg of sterile saline through a sterile tube passed down the endotracheal tube of an anesthetized dragon. A similar volume of saline can be inserted into the cloaca for a colonic wash with a well-lubricated tube for cytology or parasite assessment. A fresh fecal sample is more useful for parasite identification.

Selected Medical Conditions

Atadenovirus (Adenovirus)

CS: nonspecific (e.g., anorexia, lethargy, diarrhea, and encephalopathy); highest morbidity/mortality occurring in neonates and juveniles; Subclinical carriers can act as reservoirs. Trans: Vertical suspected; poor growth and mortality in young dragons and poor growth and failure to thrive in older animals.

Path: liver, pancreas, kidneys, and intestines are most commonly affected. The virus infects enterocytes and is shed in the feces. Histopathology demonstrating the presence of basophilic intranuclear inclusions in hepatocytes, enterocytes, and kidneys

Diagnosis: fecal-based PCR assay or negative staining electron microscopy

Treatment: none

Aneurysm

Several cases of aneurysms have been reported in bearded dragons from the internal carotid artery or aorta.

Diagnosis: large fluctuant/firm swelling on the dorsolateral neck that pulses on ultrasound

Treatment: surgical dissection of the aneurysm, after location with MRI/CT; poor prognosis

Atherosclerosis and pericardial effusion

Characterized by inflammation of arterial smooth muscle cells and formation of atherosclerotic plaques. This buildup leads to abnormalities in blood flow and diminished oxygen supply to target organs.

Diagnosis: a single case report exists of a dragon on an all-insect diet; ultrasound, histopathology

Treatment: none; presumably dietary changes

Ectoparasites

The folds of skin around eyes, limbs, cloaca, axillae etc should be inspected for ectoparasites. The snake mite (Ophionyssus spp.), lizard mite (Hirstiella trombidiformis), and chigger mite (Family: Trombiculidae) have been described.

Diagnosis: observation

Treatment: 1% injectable ivermectin at 5 mg/0.95 L of water sprayed topically on the lizard q 7 days for 8 treatments; fipronil 0.29% sprayed topically on the lizard q 7 days for 2 treatments; or 10% permethrin diluted to 1% with tap water and applied topically on the lizard (treat in a well-ventilated room) every 10 days. The environment must be treated and all disposable materials discarded.

Coccidiosis

Coccidiasis = presence of oocysts in the feces of clinically healthy animals; coccidiosis = infection and disease in affected animals.

Etiology: Isospora amphiboluri, Eimeria spp.

CS: anorexia, lethargy, and diarrhea

Diagnosis: fecal exam

Treatment: Ponazuril 30 mg/kg PO q 24 h for 7 days and again 2 wk later.

Chrysosporium anamorph of Nannizziopsis vriesii (CANV)

CS: granulomatous dermatitis; yellow to yellow–brown hyperkeratotic areas of skin and toenails; can also invade lung, coelomic fat pads, liver, and spleen

Diagnosis: biopsy, histopathology and culture

Treatment: voriconazole at 10 mg/kg PO q 24 h

Note contagious and possibly zoonotic

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INDICATIONS, TIPS AND TRICKS FOR ENUCLEATION IN DOGS AND CATS

Rick Sanchez

Specialistische Dierenkliniek Utrecht (SDU)- AniCura, Ophthalmology, Utrecht, Netherlands

Qualifications:

Rick F Sanchez

BSciBiol, DVM, DipECVO, CertVetEd / FHEA

European Specialist in Veterinary Ophthalmology

Description

This lecture covers the most important aspects of the enucleation technique for general practice, such as the dissection route to avoid getting lost in the soft tissues around the eye, what breeds we must be more patient with during dissection, how to avoid causing bleeds that are difficult to control (and how to deal with bleeds if they happen), the most efficient manner to arrive at the globe with the aim to transect the extraocular muscles with minimal bleeding before transecting the optic nerve, and whether or not to it is indicated to clamp and/or ligate the optic nerve. Last, but not least, closure of the wound is also discussed.

Learning Objectives – be able to discuss

What the angularis oculi vein is, where to spot it and how to avoid it.

Where eyelids and the third eyelid dissection can lead to bleeding.

What do we mean by 'changing the direction of dissection' and it is important.

How to cut the extraocular muscles, without forgetting the retractor bulbi.

When to ligate the optic nerve head and when is it considered contraindicated.

Suturing an enucleation wound.

Abstract

The two most important approaches to enucleation are the transpalpebral approach and the transconjunctival approach. Both are acceptable approaches for primary practice as well as ophthalmologists, though the transpalpebral approach is arguably the best approach to use in general practice. The transpalpebral approach starts by dissecting through the eyelid and avoids entering the conjunctival sac. Dissection around it means that all of the conjunctiva and the third eyelid and its gland are removed with the eyelids and the globe. The goal is to have as little bleeding as possible and to leave as much of the soft tissues inside the orbit (except for the eyelids, conjunctiva, third eyelid, gland of the third eyelid and the globe). The other goal is to not put any traction in the optic nerve, as this can lead to traction damage of the chiasm and damage of the optic nerve of the other eye, especially in cats. Because the transpalpebral approach cuts through the eyelids first, there is more bleeding at the start of the surgery that must be controlled compared to the transconjunctival approach. Bleeding from the eyelids may be controlled with a bipolar unit. It might also be more challenging for the surgeon to locate the extraocular muscles during the transpalpebral approach. All of the muscles must be transected at the insertion into the globe to avoid bleeding. Finding the extraocular muscles requires that the surgeon changes the angle of the dissection and this is often the key component to enucleation that surgeons forget about. The vector of the dissection around the eyelids is aimed at the optic nerve (more or less).

When dissecting the dorsomedial corner of the eye, the surgeon must be aware of the angularis oculi vein (a branch of the facial vein) that can bleed profusely if cut. It must be identified and avoided. The moment the eyelid are dissected free from the rest of the skin and the medial canthal ligament and the lateral tendon, the dissection vector must also change. The surgeon must direct it towards the equator of the globe (an imaginary circle that wraps around the eye more or less behind the ciliary body). There are 6 recti that insert there (dorsal, dorsal oblique, lateral, medial and ventral, as well as ventral oblique). The dorsal oblique has a cartilaginous pully that also has a blood vessel very near it. There is also a set of muscles with 4 muscle-'bellies' that sit deep to the 6 extraocular muscles, behind the globe, around the optic nerve and that we consider 1 (extensive) muscle. It is called the retractor oculi. One way to find the extraocular muscles at the point of their insertion is to use a muscle hook. This requires some instruction and observation. Once transected the optic nerve may be transected with enucleation scissors. It is worth buying specific enucleation scissors as they are curved (some much more than others) and allow us to transect the nerve without looking. There is no need to ligate the nerve before cutting it, as there is no central artery in it. However, there are veins around it that might bleed. In large dogs this may be a source of bleeding and ligation may prevent it. However, it should be noted that ligation in cats is considered contraindicated, as it can easily lead to enough traction of the optic nerve to cause damage to the contralateral optic nerve.

The transconjunctival approach entails cutting through the conjunctiva, which facilitates localization of the insertion of the extraocular muscles with minimal bleeding. However, after transection of the optic nerve as explained above, the eyelids with all of the conjunctiva and third eyelid as well as the third eyelid gland, must be removed with extreme care to not leave any of the conjunctiva behind.

Bleed control in every step of the surgery is paramount. A surgeon might choose to create a small lump of tissue that almost recreates a purse string, with all the tissues found in the orbit. This can help control small, deep bleeds by creating a close purse (i.e., pressure) all around them and avoiding any tissue gaps through which the bleeding can escape. However, this is not intended to cover for poor control of bleeding. Excessive bleeding can put a lot of pressure on the wound and in some cases can lead to bleeding between sutures. Closure of the wound in 3 layers is recommended with the first two layers using absorbable sutures and the last layer using simple interrupted sutures of non-absorbable material.

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ENVIRONMENTAL SUSTAINABILITY IN VETERINARY PRACTICE: FROM AMBITION TO ACTION

Hannah James

VetPartners Ltd, Sustainability, York, United Kingdom

Qualifications:

Dr Hannah James

CEnv MIEMA PhD MSc BSc

hannah.james@vetpartners.co.uk

This session provides a brief overview of the importance of sustainability to veterinary practices, advice on structuring activities in this area, and 'real-world' advice on how to act on ambitions. All delegates will take away at least one action they will take for sustainability in their workplace.

The importance of sustainability to veterinary practice

Climate change and environmental degradation pose numerous risks to veterinary practices and the veterinary sector. Like other businesses, the sector faces risks to infrastructure and supply chains caused by extreme weather, and the existential risks of the climate and nature crises. Heatwaves and increases to the range of vectors for infectious diseases[1] can lead to increased animal disease burden, and biodiversity loss increases the likelihood of zoonotic spillover[2]. Climate risks also affect the livestock sector, with implications for farm veterinary businesses.

In addition to physical risks, 'transition risks' – socioeconomic factors which arise due to environmental changes – also affect the sector. In many societies there has been a rapid increase in adoption of vegetarian and vegan diets over the past decade, due in large part to environmental concerns[3] (although globally meat consumption has continued to grow and only recently shows signs of levelling off[4]). While a similar shift away from companion animal ownership has not been seen, negative impacts on consumer livelihoods and income caused by environmental risks are likely to affect spending on veterinary services.

In light of this, it is unsurprising that interest in sustainability among veterinary professionals is high. A 2019 survey by the British Veterinary Association found that 89% of vets would like to play a more active role in the UK sustainability agenda, and there has been a proliferation of working groups for veterinary sustainability such as Vet Sustain in the UK, the Food Safety & Sustainability Working Group of the Federation of Veterinarians of Europe, and the Veterinary Sustainability Alliance in the USA and Canada.

Taking action for sustainability can also provide benefits and opportunities to veterinary practices and businesses. Given the high levels of interest among veterinary professionals, a demonstrable commitment to sustainability can give businesses the edge when it comes to recruitment and retention. Many actions which improve sustainability – reducing energy consumption, water use and waste volumes – also result in financial savings, and planning for and mitigating environmental risks improves business resilience and reputation.

Where to start: thinking about a strategy

Whatever the size of your business, taking time to think about a project plan or strategy for sustainability will facilitate success. There are many different aspects to sustainability, and it is usually more effective to work on one or two at a time rather than attempting everything at once. In a busy workplace, a planned approach will also ensure that people have time to work on the projects and see progress without becoming overworked. Larger workplaces with multiple departments will likely require a more detailed plan, whereas smaller workplaces may simply make a checklist of actions and put them in order of priority.

The session *Environmental sustainability in the real world: a practical workshop* will provide more advice and detail around formulating a sustainability strategy for your workplace.

'Quick wins' in practice

Regardless of the scale of your ambition, a good approach for a sustainability plan is to begin with some 'quick wins'. These are actions which are easy to implement and low cost, but still have a good level of positive impact. This is both an excellent way to motivate team members as they see positive results early on, and a low-risk way to identify any barriers or problems that may arise – particularly if sustainable working is a new concept for your workplace.

Practical examples of quick wins in veterinary practices include:

Energy

– Turning off electrical equipment when not in use, particularly high consumption items such as electric heaters, air conditioning and other forced air, oxygen generators and active scavenging equipment

– Making turning off computers, screens and televisions part of the closing routine

– Using heating and cooling systems efficiently by setting timers, using thermostats and taking time to understand how the system works

– If you have a choice of energy provider, switching to a renewable tariff

Water

– Check with your water provider or with water saving organisations to see if they provide free audits or water saving devices

– Check for any leaks or dripping taps

– Use easy-install devices such as tap aerators and cistern blocks

– If replacing washing machines or other appliances, choose new models that are highly rated for water efficiency

Waste

– Install some recycling bins if you have access to a recycling service: recycling pickups are often cheaper than general waste

– Purchase a water distiller rather than using bottles of distilled water

– Replace single use items with reusable alternatives. Easy options include: scrub caps, surgical gowns, surgical drapes, rechargeable batteries, and autoclave boxes instead of pouches

– Send electronic receipts and invoices as default

– Print double sided (or not at all)

Going further

Once you have implemented some quick wins, you can consider some further actions which may take longer to implement or require some financial investment, but will yield greater impacts and often save the business money in the medium to long term.

Anaesthesia

Inhaled anaesthetics are potent greenhouse gases, and reducing their escape to the atmosphere is one of the most impactful things veterinary

practices can do to reduce their environmental impact. Minimising or eliminating the use of nitrous oxide is especially effective since nitrous is the most potent greenhouse gas of the anaesthetic gases. You can also seek training in low flow anaesthesia techniques and use of alternatives to inhaled anaesthesia where appropriate.

Parasiticides and anthelmintics

Balancing animal and human health with the environmental impacts of parasiticides and anthelmintics is a complex issue, and research and discussions are ongoing in the veterinary and agricultural sectors. However, it is straightforward to ensure that clients are always given appropriate advice regarding the safe use of these products, appropriate disposal of packaging and applicators, responsible cleanup and disposal of faeces, and the interval to leave between application and allowing bathing or swimming.

Energy

Upgrades to your practice or office building can significantly increase energy efficiency. Replacing fluorescent lightbulbs with LEDs pays back very quickly, and installing motion sensors for lighting will significantly reduce energy consumption. Other measures include installing double or triple glazing, improving insulation, and considering low carbon technologies such as heat pumps and solar panels.

Travel

Measures to encourage more sustainable and active modes of travel include providing secure bicycle storage, changing and drying facilities with lockers, and promoting car sharing schemes. Many governments or regional authorities provide tax relief or grants for purchases of bicycles or electric vehicles: investigate whether you can provide these benefits to employees as part of their reward package. Allowing remote working and teleconferences where possible will also cut down on travel emissions and costs.

Nature

In light of biodiversity loss around the world, many conservation organisations have called for people and businesses to make their outdoor spaces more nature-friendly, no matter how small. These efforts can create networks of thriving green spaces in our everyday surroundings, including gardens and yards in urban and suburban areas.

Even the smallest and most urban outside spaces can help to boost local wildlife and will brighten up your practice, providing a welcoming sight for clients and an area for team members to relax outside. With some simple and cheap improvements, you can make the outside of your practice a home for native plants, pollinators, birds, and a host of other wildlife. The best choice of plants will depend on your region, but as a general rule providing flowering plants (these can be in pots), bird feeders and 'bug hotels' are simple actions which can have a big impact on local wildlife.

Overcoming common challenges

The workshop *Environmental sustainability in the real world: a practical workshop* will discuss advice and strategies for overcoming common challenges encountered while implementing sustainability in practices and businesses.

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FLUIDOTERAPIA E TRANSFUSãO SANGUíNEA

Ana Jacinto[1,2]

[1]*IVC Evidensia Hospital Veterinario Bom Jesus, Medicina Interna, Única, Portugal,* [2]*IDEXX Laboratories, Internal Medicine Consultant, Wetherby, United Kingdom*

Qualifications:

Ana Margarida Leça Jacinto

DVM, DipECVIM-CA (Internal Medicine)

EBVS® European Veterinary Specialist in Small Animal Internal Medicine
RCVS Specialist in Small Animal Medicine

jacinto_ana@hotmail.com

A administração de fluidoterapia é uma prática rotineira na clínica de pequenos animais que pode salvar vidas, mas que também pode ser profundamente prejudicial para o paciente se não respeitar princípios fisiológicos fundamentais. Tal como é importante saber quando é necessário administrar fluídos, também é fundamental sabermos quando o paciente deles não necessita.

Cerca de 60% do corpo de um cão ou gato adulto, com uma condição corporal normal, é constituído por água (água total corporal) que se distribui pelos compartimentos intra e extracelular[1]. Do total da água corporal, cerca de dois terços estão dentro das células (compartimento intracelular) e cerca de um terço localiza-se no compartimento extracelular, ou seja, fora das células[2,3]. O compartimento extracelular, por sua vez, compreende o compartimento intravascular (plasma), o compartimento intersticial (fluído que rodeia as células) e o fluído transcelular[1]. O fluído transcelular representa uma ínfima quantidade do volume total de água corporal, estimando-se corresponder a cerca de 2% da água total corporal ou a aproximadamente 1% do peso corporal[3]. O compartimento transcelular inclui fluídos tais como secreções glandulares e respiratórias, bílis, fluído gastrointestinal, liquído sinovial e líquido cefalorraquidiano[3]. Há uma porção da água total corporal que está presente em tecidos conjuntivos densos, ossos e cartilagens mas que não é considerada na fluidoterapia de rotina[3]. Assim, de uma forma simplificada, estima-se que o compartimento intravascular represente aproximadamente 25% e o compartimento intersticial aproximadamente 75% do fluído extracelular[1].

O movimento de fluído entre compartimentos é essencial para, entre outras funções, fornecer nutrição e oxigénio às células e para remover detritos[1]. Os fluídos corporais contêm não apenas água, mas vários solutos que se distribuem de forma heterogénea e cuja composição pode estar significativamente alterada durante estados patológicos[3].

Na avaliação do paciente, é importante destrinçar que compartimentos estão afetados e que desequilíbrios, nomeadamente electrolíticos, estão presentes. O desequilíbrio de fluídos pode ocorrer devido a alterações no seu volume (por exemplo desidratação), no seu conteúdo (por exemplo hipercalemia) ou na sua distribuição (por exemplo efusão pleural)[4]. As indicações para fluidoterapia são muito variadas e incluem choque, desidratação, e alterações iónicas e ácido-base[5].

A distinção entre sinais de desidratação e sinais de hipovolemia é fundamental porque a aproximação terapêutica difere no que diz respeito ao plano de fluidoterapia a seguir, nomeadamente em relação ao volume e velocidade de administração de fluídos [1].

Sinais de desidratação (*deficit* de fluído intersticial) incluem membranas mucosas secas e prega de pele persistente[1]. A percentagem de desidratação pode ser estimada com base nos sinais clínicos. No entanto, uma vez que os sinais são influenciados por vários fatores tais como o estado corporal, idade e comorbilidades, importa perceber que pode ser pouco exata[4]. Se o paciente não apresentar sinais clínicos de desidratação, mas tiver uma história clínica que sugira perda de fluídos (tais como diarreia ou vómito) pode assumir-se uma percentagem de desidratação inferior a 5% [6]. O *deficit* de fluído é calculado com base na percentagem de desidratação (Peso corporal (Kg) x % desidratação = volume (L))[4]. O volume em *deficit* é adicionado ao volume de manutenção e às perdas que ocorram[4] aquando do cálculo de volume de fluído a administrar.

Sinais de choque hipovolemico incluem taquicardia, comprometimento da perfusão periférica, extremidades frias, prologamento do tempo de repleção capilar e pulso fraco[5]. Sinais de desidratação, hipovolemia e hipotensão podem coexistir no mesmo paciente[4]. No entanto, um paciente pode estar hipovolemico sem estar desidratado, e o contrário é também possível[4].

Entre os diferentes tipos de fluídos incluem-se os colóides e os cristalóides. Os colóides, que incluem os de origem sintética tais como hidroxietilamidos, dextranos e gelatinas, permanecem mais tempo em circulação do que os cristalóides[2] . O uso de colóides suscita debate sobre potenciais efeitos secundários a eles associados incluíndo risco de hemorragia. A administração de colóides (por exemplo "tetrastarch") é considerada nalgumas circunstâncias tais como em hipoalbuminemia severa. Os cristalóides são classificados em hipotónicos (por exemplo dextrose 5% em água) , isotónicos (por exemplo lactato de Ringer) ou hipertónicos (por exemplo solução salina 7%) de acordo com a sua tonicidade relativamente ao plasma[7]. As soluções cristalóides poliónicas isotónicas tais como o lactato de Ringer são frequentemente utilizadas como fluído de reposição e manutenção por um período limitado de tempo[4].

A administração de fluídos pode fazer-se por via oral em pacientes estáveis, com trato gastrointestinal funcional; no entanto, em pacientes com comprometimento de absorção de fluídos enterais (por exemplo pacientes com doença intestinal severa, vómito) é necessária a administração parenteral de fluídos [4,5]. Nalguns casos (desidratação antecipada, distúrbio de volume ligeiro em paciente não hospitalizado) pode considerar-se a administração subcutânea de fluídos. Em pacientes com desidratação severa, é, no entanto preferível, a administração intravenosa de fluídos uma vez que a absorção subcutânea de fluídos é geralmente lenta[5]. Quando não é possível colocar um catéter intravenoso, a via intraóssea pode ser uma opção. Em pacientes críticos, por vezes, é colocado um catéter central intravenoso que permite para além da administração de fluídos, por exemplo, a mensuração da pressão venosa central[5].

A monitorização do paciente sujeito a fluidoterapia deve detetar sinais de "sub-administração" tais como taquicardia persistente, alteração da qualidade de pulso , hipotensão; mas deve também estar atenta a sinais de "sobrecarga de fluídos" tais como aumento da frequência e esforço respiratórios, aumento desadequado de peso, sinais sugestivos de edema pulmonar ou periférico, etc[5].

A medicina de transfusão em pequenos animais tem progredido notavelmente nos últimos anos. Indicações comuns para administrar sangue e seus componentes incluem coagulopatias e anemia[8]. A administração de hemoprodutos tem contudo possíveis riscos que devemos conhecer bem. Os tipos de sangue mais reconhecidos no cão pertencem ao sistema DEA ("dog erythrocyte antigen") sendo que transfundir sangue DEA 1+ num cão DEA 1-, pós prévia sensitização, causa resposta marcada de aloanticorpos [9]. Nos gatos, os tipos sanguíneos mais reconhecidos são A, B e AB, embora existam antigénios eritrocitários fora desse sistema, tais como MiK[9,10]. A tipificação sanguínea prévia à primeira transfusão é aconselhável em cães (pensa-se que não têm aloanticorpos extremamente significativos se não tiverem sido sujeitos a uma transfusão), sendo essencial em gatos (têm aloanticorpos naturais que podem causar reações fatais mesmo numa primeira transfusão sanguínea) [8,9]. O teste de compatibilidade "crossmatch" deteta a presença de anticorpos no sangue do recipiente contras eritrócitos do dador ("crossmatch" maior) e a presença

de anticorpos no sangue do dador contra eritrócitos do recipiente ("crossmatch" menor)[9]. Em gatos, embora seja ideal realizar teste "crossmatch" maior antes de qualquer transfusão, a obrigatoriedade de o realizar antes da primeira transfusão não reúne consensualidade. No entanto, presença de reações de incompatibilidade maior em gatos, nunca previamente sujeitos a transfusão, leva a que alguns aconselhem sempre a sua realização[8,9]. O "crossmatch" é indubitavelmente aconselhado em gatos cuja história de possível transfusão é desconhecida ou dos quais sabemos terem recebido uma transfusão há dois ou mais dias [8]. O mesmo se aplica a cães nos quais se pondere realizar uma transfusão mais do que quatro dias depois duma transfusão anterior[9]. A transfusão de sangue ou dos seus componentes pode causar reações imediatas ou tardias. A monitorização do paciente para detetar reações à transfusão é fundamental[9].

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MEDICAL COMPLICATIONS OF BRACHYCEPHALY IN DOGS AND CATS

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM (Small Animal Internal Medicine)

lrjohnson@ucdavis.edu

Complications of Brachycephaly in Dogs and Cats

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Respiratory

The primary respiratory problems of obstructed breathing associated with stenotic nares, elongated soft palate, everted laryngeal saccules, and laryngeal collapse are well known. Some of these are obvious with visual inspection while others require laryngoscopy for the diagnosis. In some breeds, especially bulldogs, tracheal hypoplasia can contribute to airway obstruction and typically, this is a fixed resistance to airflow. In Pugs, nasopharyngeal turbinates are found, which contribution to loss of nasal airflow and can be a continued source of stertorous breathing after surgically correctable conditions have been addressed. In many dog breeds affected by brachycephaly, internal crowding of nasal turbinates results in persistent obstruction of nasal airflow and challenges to nasal breathing.

Less well-known features include nasopharyngeal collapse and epiglottic retroversion. These upper airway obstructive lesions can contribute to stridorous and stertorous breathing and can be difficult to document without specialized imaging including fluoroscopy, nasopharyngoscopy, and computed tomography. Other respiratory complications include vocal fold granulomas. These inflammatory nodules might result from chronic regurgitation or from chronic inspiratory effort against a narrowed laryngeal aditus. When accompanied by fibrous tissue proliferation, surgical resection is required for management. Finally, another well-established respiratory complication of brachycephaly is aspiration injury. Dogs with BOAS have almost a four-fold increased incidence of the development of aspiration related disease compared to dogs with more normal face shapes. Less is known about any predisposition of brachycephalic cats to aspiration pneumonia.

Gastrointestinal

Brachycephalic dogs more than cats suffer from many GI issues that have been well-characterized including hiatal hernia and esophageal dysmotility as well as mild gastrointestinal inflammation. These disorders are typically manifest by ptyalism, regurgitation, or true vomiting, although some dogs can present primarily with respiratory signs related to aspiration pneumonia or pneumonitis. The incidence of disease varies across breeds and among individuals, with some studies showing French and English bulldogs to be disproportionately represented when gastrointestinal signs are evaluated. Whether signs result from true esophageal or intestinal pathology or whether they reflect aerophagia and lack of coordination of respiration and prehension is difficult to discern in many cases. Initial management is often employed using judicious combinations of omeprazole, cisapride, maropitant, and sucralfate but some animals are severely affected by their disease process. Some animals will show improvement in GI signs when respiratory abnormalities are addressed surgically while others require definitive GI surgery such as herniorrhaphy.

Ocular

Brachycephalic ocular syndrome results from the breeding pressures that favored a degree of exophthalmia, abnormally large eyes, and poor eyelid closure along with poor ocular lubrication. The palpebral fissure is excessively long in brachycephalic breeds and the orbit is shallow, allowing protrusion of the globe and worsening exposure to irritants. Brachycephalic dogs, and likely cats, suffer from lagophthalmos, or incomplete blinking that fails to disperse tears across the cornea. All of these features, combined with decreased corneal sensitivity, accentuate disorders associated with exposure keratitis including corneal ulceration, pigmentation, and fibrosis. Entropion, keratoconjunctivitis sicca, and distichiasis, trichiasis, or ectopic cilia add to pain and discomfort and can increase the risk of corneal damage that leads to vision loss and sometimes to loss of the eye.

Abnormal skull conformation also affects the function of the nasolacrimal apparatus, with obstructions resulting in sustained epiphora, which worsens dermatitis associated with excessive skin folds. In cats, it has been demonstrated that foreshortening of the facial bones with dorsal rotation of the mandible causes the nasolacrimal drainage system to become shortened and steeper, with the exit point of the duct more dorsal than the punctum. These many features result in ineffective drainage and constant epiphora.

Skin

A multitude of dermatologic diseases are reported in brachycephalic dogs and cats, with a prevalence suggested to range between 10-30% in various breeds. Differing disease processes reflect variable genetics as well as divergent genetic populations and environmental influences that might lead to antigenic pressures. The severity of brachycephalism accentuates infolding of the skin with subsequent repetitive frictional trauma, increased humidity, and bacterial trapping that results in chronic skin injury. Some of these features, such as exaggerated facial folds, are prized by owners, and disease processes go un-noticed or untreated. Constant diligence is required for medical management and owners are not always happy with surgical therapy that alters appearance. Interdigital dermatitis results in lameness that is often complicated by obesity.

Conformational aberrations of the skull can also cause pressure changes in the inner and middle ear as well as nasopharynx that result in the development of bullous effusion or middle ear canal disease. These disorders were first obvious in the Cavalier King Charles Spaniel and resulted in neuropathic pain or even ataxia, seizures, nystagmus, and cranial nerve deficits. Secretory otitis media is a second middle ear disease primarily seen in the Cavalier that results in typical neurologic presentation. Brachycephalic dog and cat breeds are also over-represented in reports of external ear canal disease. French bulldogs and Pugs have narrow external ear canals which makes them prone to repetitive ear disease. Otitis conditions can require advanced imaging and expensive surgeries, as well as lifelong medical management. Finally, diseases of the immune system, response to internal and external parasites, and alterations in the microbiome likely play a role in the variety of skin diseases encountered in brachycephalic individuals, including *Malassezia* and bacterial folliculitis.

Neurologic

Brachycephalic dogs suffer from syringomyelia, ventriculomegaly, hydrocephalous, Chiari-like malformation, and other common differential diagnoses including screw tail and intervertebral disc disease (IVDD). Syringomyelia might be the most common syndrome recognized particularly in the Cavalier King Charles Spaniel, with many dogs being relatively subclinical at an early age. The disease is slowly progressive and gradually results in worsening cervical pain or scratching at the neck area. MRI is typically used for diagnosis of this and other spinal lesions associated with brachycephaly, and screening of breeding animals is advisable. Gabapentin and non-steroidal anti-inflammatory agents are generally used for afflicted animals with prednisone reserved for only the most severely affected and refractory cases.

Other

Cardiac defects are less common in brachycephalic individuals than some of the other systemic abnormalities however given the popularity of the BOAS breeds, more and more problems are being recognized. Ventricular septal defect has always been a common congenital defect in the cat, pulmonic stenosis and chemodectoma are also common findings in dogs with BOAS. Brachycephalic dogs tend to develop medial patella luxation and other orthopedic abnormalities. Many brachycephalic animals suffer from dystocia due to the large size of fetal heads in relation to the birth canal.

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PROTEINURIA AND VECTOR BORNE DISEAASE

Xavier Roura

Hospital Clínic Veterinari, Universitat Autònoma De Barcelona, Bellaterra, Spain

Qualifications:

Xavier Roura

DVM, PhD, DECVIM-CA

xavier.roura@uab.cat

Key points from the presentation:

Proteinuria is defined as the presence of an excessive or abnormal amount of protein in the urine.

The glomerular filtration barrier, composed of the glomerular capillary endothelium, basement membrane, and epithelial podocytes, limits the passage of medium and high molecular weight proteins from the blood into the glomerular urine filtrate, typically retaining albumin (69 kDa) and larger proteins.

The glomerular filtrate albumin is largely reabsorbed through the proximal convoluted tubule.

Protein loss in urine in healthy dogs and cats normally does not exceed 10-20 mg/kg/day and 30 mg/kg/day, respectively.

Renal proteinuria may be of glomerular origin (due to changes in the structure or function of the glomerular filtration barrier) and/or tubular origin (reduced ability of proximal tubular cells to reabsorb albumin).

The urine strip is a useful diagnostic method in dogs to exclude the presence of proteinuria.

The UPC allows obtaining a quantification of proteinuria and is crucial for clinical decision-making.

Following the guidelines of the International Renal Interest Society (IRIS), dogs and cats with UPC<0.2 are classified as non-proteinuria; dogs with UPC 0.2-0.5 or cats with 0.2-0.4 as borderline proteinuria; and dogs with UPC>0.5 or cats >0.4 as proteinuria.

A high degree of renal proteinuria (UPC index>2) could suggest primary glomerular disease, particularly once renal disease has been established. Higher values (UPC>10) could well be associated with nephrotic syndrome.

Renal biopsy is indicated only when having an accurate histological diagnosis is likely to have an impact on patient management.

Patients whose management is most likely to be altered by the results of a renal biopsy include those with CKD IRIS stages 1 and 2 protein-losing nephropathy that is unresponsive to treatment.

Renal biopsy is generally not indicated in patients with CKD IRIS stages 3 and 4 because histopathology results are unlikely to change their treatment or prognosis.

Proteinuria is frequently present in dogs and, with less frequency, also in cats. Chronic kidney disease is the main cause of proteinuria in both, dogs, and cats. However, several vector-borne pathogens could be cause of this CKD such as *Leishmania, Ehrlichia, Bartonella, Dirofilaria*, *Borrelia,* etc.

Glomerulonephritis and amyloidosis are the most frequent causes of proteinuria in dogs and cats.

Specific treatment of any underlying disease identified is always recommended, followed by specific treatment for proteinuria.

Dogs and cats with proteinuria, and cats with borderline proteinuria, need treatment.

Renal prescription diet has a large effect on the magnitude of proteinuria, and protein-restricted diets are our first choice of treatment.

For medical treatment we have angiotensin converting enzyme inhibitors such as enalapril or benazepril at 0.5 mg/kg PO every 12 hours or angiotensin receptor blockers such as telmisartan at 1 mg/kg PO every 24 hours.

If severe hyperkalemia develops or proteinuria is not adequately controlled with an angiotensin receptor blocker or ACE inhibitor, they can be interchanged or used in combination.

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SURGICAL EXTRACTION TECHNIQUES

Jerzy Gawor

Klinika Weterynaryjna Arka, Dental Department, Krakow, Poland

Qualifications:

Jerzy Pawel Gawor

DVM PhD, DiplAVDC, DiplEVDC, FAVD

jgawor@pp.com.pl

EXTRACTION OF MULTI ROOTED TEETH:

Section all multi-rooted teeth into single rooted pieces. The roots of almost all multi-rooted teeth are divergent and this will cause the root tips to break off if extractions are attempted in one piece. Root fracture can occur even if a tooth is relatively mobile to start with. With mobile teeth, the sectioning step alone often allows for simple extraction.

The best tool for sectioning teeth is a bur on a high-speed air driven hand piece. Besides being the quickest and most efficient tool for the job, it also has air and water coolant that will avoid overheating the tooth. Many different styles of burs are available, however this author prefers a cross-cut taper fissure bur (699 for cats and small dogs, 701 for medium dogs and 702 for large breeds).

The best way to section the teeth is to start at the furcation and work towards the crown of the tooth. This method is used for two major reasons. First, it avoids the possibility of missing the furcation and cutting down into a root, which subsequently weakens the root and increases the risk of root fracture. In addition, this method avoids the possibility of cutting through the tooth and inadvertently damaging the gingiva or alveolar bone.

After the tooth has been properly sectioned, follow the above steps for each single rooted piece. In some cases, the individual tooth pieces can be carefully elevated against each other to gain purchase.

SURGICAL EXTRACTIONS

The more difficult extractions are best performed via a surgical approach. This includes canine and carnassial (maxillary fourth premolar and mandibular first molar) teeth, as well as teeth with root malformations or pathology, and finally retained roots. A surgical approach allows the practitioner to remove a small amount of buccal cortical bone, promoting an easier extraction process.

A surgical extraction is initiated by creating a gingival flap. This can be a horizontal flap along the arcade (an envelope flap) or a flap with vertical releasing incisions (a full flap). An envelope flap is created by releasing the gingival attachment with a periosteal elevator along the arcade including one to several teeth on either side of the tooth or teeth to be extracted. The gingiva along the arcade is released to or below the level of the mucogingival junction (MGJ) and the flap is connected by incising the gingiva in the interdental spaces. The advantage to this flap is that the blood supply is not interrupted and there is less suturing.

The more commonly used flap includes one or more vertical releasing incisions. This method allows for a much larger flap to be created, which (if handled properly) will increase the defects which can be covered. The vertical incisions are created at the line angle of the target tooth, or one tooth mesial and distal to the target tooth. The incisions should be made slightly apically divergent (wider at the base than at the gingival margin). Furthermore, it is important that the incisions be created full thickness, in one motion (rather than slow and choppy). A full thickness incision is created by incising all the way to the bone, and the periosteum is thus kept with the flap. Once created, the entire flap is *gently* reflected with a periosteal elevator. Care must be taken not to tear the flap, especially at the muco-gingival junction.

Following the flap elevation, a small amount of buccal bone should be removed (approximately 1/3 to ½ of the root length depending on the situation) to the depth of the root. This should only be performed on the buccal side. Next, the teeth should be sectioned if multirooted and the teeth then extracted as described above. After the roots are removed the alveolar bone should be smoothed and the defect closed.

Closure is initiated with a procedure called fenestrating the periosteum. The periosteum is a very thin fibrous tissue which attaches the buccal mucosa to the underlying bone. Since the periosteum is fibrotic, it is inflexible and will interfere with the ability to close the defect without tension. The buccal mucosa however, is very flexible and will stretch to cover large defects. Consequently, incising the periosteum takes advantage of this attribute. The fenestration should be performed at the base of the flap, and must be very shallow as the periosteum is very thin. This step requires careful attention, as to not cut through or cut off the entire flap.

After fenestration, the flap should stay in desired position without sutures. If this is not the case, then tension is still present and further release is necessary prior to closure. Once the release is accomplished, the flap is sutured normally.

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HEALTH DETRIMENTS OF GONAD REMOVAL

Michelle Kutzler

Oregon State University, Animal And Rangeland Sciences, Corvallis, United States of America

Qualifications:

Michelle Anne Kutzler

MBA, DVM, PhD, Dipl. ACT

michelle.kutzler@oregonstate.edu

In the dog with gonads, the hypothalamus secretes gonadotropin-releasing hormone (GnRH), which stimulates the anterior pituitary gland to release luteinizing hormone (LH). LH stimulates the secretion of gonadal steroid hormones. These gonadal steroid hormones then negatively feedback to the hypothalamus and anterior pituitary to decrease the secretion of GnRH and LH, respectively. However, in the gonadectomized dog, there is no negative feedback, which results in LH concentrations more than thirty times higher than dogs with gonads. In addition to the reproductive tract, there are LH receptors present throughout the body. Activation of LH receptors in non-reproductive tissues stimulates nitric oxide release and induces cell division, among other functions. Constant activation following gonad removal also upregulates LH receptors, further magnifying the effects of the supraphysiologic LH concentrations in non-reproductive tissues. The net result of these effects is the development of several health detriments mediated by LH receptor activation in non-reproductive tissues.[1]

Health detriments on energy metabolism

The majority of gonadectomized dogs are overweight or obese. Gonad removal stimulates food intake and increases indiscriminate appetite. In unaltered dogs, food intake suppresses the secretion of gastrointestinal hormones (cholecystokinin and glucagon) resulting in satiety (alleviation of hunger). However, within one week following gonadectomy, food intake increases by 20% and then persists.[2] It is possible that LH receptor stimulation in the gastrointestinal tract following gonadectomy increases cholecystokinin and/or glucagon release. LH receptors in the hypothalamus are involved in the increase in appetite.

Thirty percent more gonadectomized dogs develop hypothyroidism compared to unaltered dogs. The concentrations of thyroxine in gonadectomized dogs were significantly lower in both genders when compared to intact dogs. Our laboratory has reported on the presence of LH receptors in the canine thyroid gland colocalized with thyroid stimulating hormone (TSH) receptors.[3] It is possible that continuous LH receptor activation is interfering with the mechanism of action of TSH in the thyroid, resulting in hypothyroidism.

Health detriments on the urinary tract

The association between urinary incontinence and gonad removal in female dogs was first described seventy years ago, with a reported incidence ranging from 5-30%. LH receptors are expressed in all regions of the canine lower urinary tract. Gonadectomized female dogs with urinary incontinence have a significantly higher number of LH receptors in the lower urinary tract compared to unaltered females. Urinary continence can be restored in gonadectomized females by reducing circulating LH concentrations using estrogens, GnRH agonists or GnRH immunization.[4]

Health detriments on the musculoskeletal system

Canine hip dysplasia is associated with the abnormal joint structure and laxity of the muscles, connective tissue, and ligaments that would normally support the hip. As hip joint laxity increases, the articular surfaces between the acetabulum and the head of the femur lose contact with each other, resulting in subluxation. The incidence of hip dysplasia can be as high as 40-83% in giant and large breed dogs. Compared to unaltered dogs, gonadectomy increases the incidence of hip dysplasia by 1.5-2 times the occurrence in unaltered dogs. Our laboratory has demonstrated the expression of LH receptors within the ligament of the head of the femur, the hyaline cartilage and subchondral bone of the femur head.[5] It is possible that LH receptor activation in the structural support tissues within the hip joint results in increased laxity, which is responsible for the higher occurrence of hip dysplasia in gonadectomized dogs.

Gonad removal also significantly increases the prevalence of cranial cruciate ligament rupture, doubling the occurrence reported for unaltered dogs with an incidence as high as 5.1% and 7.7% in males and females, respectively. Prepubertal gonadectomy delays tibial growth plate closure, which extends the length of tibia and the steepness of the tibial plateau. Increased steepness of the tibial plateau can increase the cranial tibial thrust, which is a risk for cranial cruciate ligament rupture. Despite the skeletal deformations that occur with pre-pubertal gonadectomy, even dogs post-pubertally gonadectomy have an increased risk for cranial cruciate ligament rupture. Our laboratory has demonstrated the expression of LH receptors within the cranial cruciate ligament.[5] It is possible that an increase in LH receptor activation in the cranial cruciate ligament results in increased laxity, which is responsible for the higher occurrence of ligament ruptures in gonadectomized dogs.

Health detriments on behavior

Reproductive-related behaviors are reduced or eliminated following gonadectomy. Fear of storms, fear of gunfire, fear of noises, fear biting, timidity, separation anxiety, and submissive urination all increase significantly following gonadectomy.[6] Gonadectomized females are also more reactive to the presence of unfamiliar humans and dogs. Dominance aggression and owner-directed aggression occur with a higher frequency in gonadectomized dogs compared to unaltered dogs. The hippocampus and hypothalamus both play important roles in controlling behaviors, especially those pertaining to fear and aggression. LH receptors are abundant in hippocampus and hypothalamus. In addition, administration of supraphysiologic concentrations of LH to gonadectomized animals can induce aggression and other behavioral changes.

Cognitive dysfunction syndrome is a neurodegenerative disorder of senior dogs, which is characterized by both cognitive changes and neurophysiological pathologies. Memory impairment, poor problem-solving skills, social disconnect, confusion, and day-night reversal may occur as the condition progresses. Gonad removal significantly increases the development and progression of cognitive dysfunction syndrome in dogs.[7] Increases in LH are associated with declines in cognitive performance. In addition, elevated LH concentrations increase beta amyloid plaque formation and are implicated in the development of Alzheimer's syndrome in humans. Therefore, it is possible that LH and its receptor are important in the development of cognitive dysfunction syndrome in gonadectomized dogs.

Health detriments of certain cancers

Hemangiosarcomas can arise in any vascular tissue, but the spleen and heart are the most common locations for hemangiosarcoma to develop. Even with surgical removal, the mean life expectancy is 86 days (range, 10–202 days) without adjunctive chemotherapy and 189 days (range, 118–241 days) with adjuvant chemotherapy. Gonadectomized female dogs have two times the risk for developing splenic hemangiosarcoma and five times the risk for developing cardiac hemangiosarcoma compared to unaltered females. Our laboratory has also demonstrated the expression of LH receptors in hemangiosarcomas, which may explain why this cancer is more common in gonadectomized females.[8]

Gonadectomized dogs have an increased risk for developing mastocytoma.[6] Our laboratory has shown that not only do mastocytomas express LH receptors, but that these tumors express three distinct

patterns of LH receptor immunoexpression.[9] Moreover, mastocytomas from gonadectomized dogs had significantly higher more LHR-positive mast cells (84.2±8.7%) overall as well as LHR-positive mast cells exhibiting the type 2 pattern (66.6±15.3%) compared to mastocytomas from intact dogs (64.3±4.2% and 49.2±8.4%, respectively).[9] The higher expression of LHR provides a mechanism that could be exploited in intervention strategies (e.g. using GnRH agonists) for mastocytoma recurrence in gonadectomized dogs leading to prolonged survival time.

Lymphoma is the most common cancer diagnosed in dogs accounting for up to 24% of all canine cancers. LH receptors are present in lymphocytes and lymphoid tissue (medulla of thymus). Our laboratory has demonstrated that in healthy dogs, the mean percentage of circulating LH receptor-positive T lymphocytes is significantly higher in gonadectomized dogs (16.6%) than in sexually intact dogs (10.5%); whereas the percentages of circulating LH receptor-positive B lymphocytes did not significantly differ by reproductive status.[10] Gonadectomy increases the incidence of lymphoma.[6] Gonadectomized males are three times more likely to develop lymphoma than unaltered males and about 1 in 10 neutered males will develop lymphoma. Our laboratory has demonstrated that 12.4% of cells in canine neoplastic lymph nodes express LH receptors.[10]

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THE GOLDEN YEARS: FEEDING SENIOR DOGS AND CATS

Lisa Weeth

Metropolitan Animal Specialty Hospital, Clinical Nutrition, Los Angeles, United States of America

Qualifications:

Lisa P. Weeth

DVM, DACVIM (Nutrition)

lweeth@mash.vet

Introduction: Unlike transitioning from juvenile to adult life stages, there is no set age or physiologic markers that can be used to declare that a companion dog or cat has moved from an "adult" to a "senior" life stage. Healthy aging will vary with each individual and will depend on husbandry/lifestyle choices made by the owners as well as the development of concurrent diseases. American Animal Hospital Association (AAHA) Life Stage Guidelines consider dogs to be seniors when they are within the last 25% of their expected lifespans and senior cats are those over 10 years of age.[1,2] Aging itself poses an adverse health risk for otherwise healthy individuals as the cycles of development, maturation, and senescence that routinely occur on a cellular level can become dysregulated over time with senescent cells accumulating in the body rather than being targeted for removal by the immune system. The accumulation of senescent cells with aging has been associated with a number of age-related diseases such as cancer, cognitive decline, and osteoarthritis.

Managing Age-Related Conditions

Musculoskeletal: Two distinct musculoskeletal conditions can occur with aging: sarcopenia and osteoarthritis. Sarcopenia is an age-related decrease in both the number and size of muscle fibers resulting in a generalized loss of lean body mass in older individuals. Reduction in lean body mass is one of the markers of frailty in elderly humans and, as also seen in humans, frailty in dogs is a predictor of all-cause mortality.[3] In cats, unintended weight loss has been shown to precede subsequent diagnosis of renal disease by up to three years and is a negative prognostic indicator for long-term survival after renal disease diagnosis.[4] Osteoarthritis (OA), or the gradual erosion of cartilage in a joint causing inflammation, is estimated to affect 20% of all dogs over 1 year of age,[5] and while data on cats is more limited, radiographic evidence of joint disease may be present in about 34% of younger cats[6] and up to 90% of cats over 10 years of age.[7] Clinical signs include decreased range of motion, pain, and crepitus in affected joints, but signs, especially in cats, can also be more subtle. Excess adiposity can exacerbate these signs. Older dogs and cats that develop OA also become less active overall, which can compound the effects of sarcopenia of aging with disuse atrophy and the combination of excess body weight and loss of lean body mass can worsen OA signs. Avoidance of obesity has been shown to promote longevity and support joint health in dogs and cats; intentional weight loss, when needed, can improve mobility in clinically affected animals.[8,9] Increased intake of the long-chain omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), may reduce pro-inflammatory cytokines and improve mobility and quality of life parameters in dogs and cats with chronic OA.

Digestive Changes: In aging humans, delayed gastric emptying, attenuation of gastric mucosal lining, altered gut-associated immune function, microflora dysbiosis, and reduced cobalamin absorption are all commonly reported in humans over the age of 65. Similar survey reports of age-related changes to global digestive function have not been done in veterinary populations but may also occur in aging dogs and cats. Clinical signs of gastrointestinal dysfunction with aging can include unintended weight loss, recurrent vomiting or regurgitation, and changes to or reduction in appetite (hyporexia). Blunting of small intestinal villus height has been documented in seniors relative to young adult dogs and cats, which results in an overall decreased digest capacity.[10,11] Inadequate protein and amino acid uptake, even with seemingly adequate levels provided in the diet, can contribute to loss of muscle mass worsening the effects of sarcopenia of aging. To counter this potential age-related change in digestion some pet food manufacturers formulated their "senior" diets with higher and more digestible protein contents; conversely, other manufacturers may be concerned that older dogs and cats have occult renal disease and will reduce the level of protein in their "senior" formulas. There is no industry or regulatory body standard for what constitutes a commercial pet food marketed for use in senior dogs or cats, and any diet change should be based on a thorough evaluation of the patient's medical and diet history.

Brain Ageing: Clinical signs of cognitive decline in older animals can include disrupted sleep-wake-cycles, disorientation or difficulty with spatial awareness, increased anxiety, and house soiling.[12] These changes are often attributed to several physical changes in the aging brain including cortical atrophy, cerebral amyloid angiopathy, and ventricular enlargement that can result in severe and irreversible brain atrophy. There is no known treatment once these changes have occurred and current research and management recommendations are focused on preventing, or at least slowing, the development of brain atrophy.[14] The long-chain omega-3 fatty acids, EPA and DHA, are incorporated into both the peripheral and central nervous systems and the combination of a high lipid content and high metabolic activity within the brain results in an increased risk of damage from reactive oxygen species (ROS). As such, increased intake of EPA and DHA and antioxidant supplementation may help protect against ROS damage and age-related cognitive declines. Prospective interventional studies are limited but have demonstrated that diets supplemented with these nutrients may help slow progression of age-related cognitive declines in older dogs and cats.[13] It is important to note that these benefits have not been seen in control groups of younger dogs and cats and the current recommendation is to start supplementation once the individual has reached its senior life stage, whatever the age criteria being used may be. Annual monitoring and scoring of cognitive health in otherwise healthy senior patients can help identify early indicators of cognitive decline and help target dietary or supplement interventions.[14]

Summary: Age is not a disease, yet as dogs and cats advance in years several changes occur that may impact tolerance and acceptance of food, as well as affect individual quality of life parameters and relationship to people and other animals in the household. Aging animals may experience changes to digestive ability, altered sense of smell and taste that may result in the refusal of previously palatable foods, and the development of age-related medical conditions that can affect metabolism or end-organ function. There is no standardized approach or nutritional modification recommended for senior dogs and cats and dietary modification and supplementation should be targeted for individual patient medical and dietary needs. Annual wellness examinations by a veterinarian are important for all companion dogs and cats. Additionally, giant breed dogs over 6 years of age, medium to large breed dogs over eight years of age, and small dogs and all cats over ten years of age should have annual diagnostic tests (hematology, biochemistry with T4, and urinalysis) to screen for common age-related conditions that would warrant a dietary intervention. In addition to these more objective tools, annual subjective owner assessment of cognitive function in older dogs and cats may help with the early identification of any behavioral issues, potentially before the onset of more overt clinical signs. Dietary changes to calorie and macronutrient intake or the addition of supplements should be made based on clinical presentation, diet history, and development of age-related changes or comorbidities.

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CHELONIAN CARE: FROM EXAM TO EMERGENT DISEASES

Sonia Hernandez

University of Georgia, Warnell School Of Forestry And Natural Resources And Scwds At The College Of Veterinary Medicine, Athens, United States of America

Qualifications:

Sonia M. Hernandez

DVM, DACZM, PhD

shernz@uga.edu

CHELONIAN CARE: FROM EXAM TO EMERGENT DISEASES

Chelonians remain popular pets, perhaps because people perceive them as requiring relatively low maintenance. However, most medical conditions reported in turtles under human care can still be attributed to inappropriate husbandry. The first step in successful chelonian medicine is a thorough understanding of the species at hand and their basic ecology in the wild, and the recognition that there are serious limitations to providing care in captivity. For example, there are significant differences in the care of red-eared sliders and other aquatic turtles—red-eared sliders are social and tend to be extroverted, whereas map turtles, need places to hide to remain healthy. Whereby these may seem like trivial nuances, it highlights the importance of understanding the ecology of these animals in the wild. Thus, I have found that time in nature to observe the species that I later see as patients is invaluable. Whenever that is not possible, there are many great resources for understanding the care of turtles, beyond the bare bones "how to house, how to feed" care sheets from museums, reptile texts and the primary ecology literature. Care sheets are not all created equal, and I prefer those published by reputable resources like dedicated exotic animal practices (e.g. https://www.seavs.com/exotic-pet-care-information/), but also like the pet owner version of Merck's manual (https://www.merckvetmanual.com/all-other-pets/reptiles/providing-a-home-for-a-reptile), and the Tortoise Trust (https://www.tortoisetrust.org/articles/). It is also essential for medical practitioners to be familiar with the local laws and regulations that govern keeping turtles in captivity. Many species of turtles are experiencing population declines in part due to the exotic pet trade and veterinarians should avoid being complicit in this issue. For example, box turtles are native to the USA and people find and attempt to keep them in captivity, yet this is illegal in many states. Often these animals fail to thrive and are then re-released in poor condition. The release of pet chelonians has been associated with the introduction of pathogens that have devastated free-living populations (e.g. *Mycoplasma* spp in desert tortoises).

Chelonian Exam

The complete chelonian exam should begin with a thorough review of husbandry. As mentioned above, even if inappropriate husbandry is not the primary cause for presentation, it often exacerbates underlying disease and must be correct in tandem of medical treatment. The size of the enclosure should allow the turtle to exhibit its normal temperature-regulating behavior (bask, but also cool off) and the owner should be able to monitor a temperature range in the enclosure. Natural sunlight, even for short periods per week, is very beneficial to all turtles. In the absence of sunlight, artificial ultraviolet (UV) light sources have been evaluated and should be referenced to acquire full-spectrum UVA and UVB. Clean water is crucial to good health of aquatic turtles and best achieved through frequent full water changes and enclosure cleaning. Owners should be discouraged from relying on filters and taught to monitor water quality. The water can be kept cleaner if the turtle is fed in a separate container.

The likelihood of an infectious disease is largely dependent on 1) how long the pet has been in the house (recent acquisition), 2) the type and number of other pets in the household 3) the frequency with which animals are moved in/out of the house (frequent trading is a common activity of reptile keepers). A complete exam must initially focus on body weight, the condition of the shell, skin, eyes, tympanum, and oral mucosa. Owners must be warned that a thorough physical exam that includes the oral cavity cannot be performed without sedation in some species (e.g., softshells, snapping turtles and tortoises). In most species, careful elevation with a probe can be successful without sedation. Evaluation of the eyes and nares should confirm symmetry and describe the presence and nature of any swelling or discharge. Conjunctivitis and rhinitis are common signs of diseases and careful attention should be paid to these structures—even when active disease is not present, asymmetry may indicate prior clinical disease and persistent infection (e.g. with *Mycoplasma* spp). Symmetry and swelling of the tympanic membranes should be noted. An oral examination should be performed in each animal; it may demonstrate dehydration, anemia, septicemia, infectious diseases (such as herpesvirus which can cause oropharyngeal stomatitis and glossitis or ranavirus), and vitamin deficiency. The physical examination should continue with evaluation of the axial and appendicular musculoskeletal structures, noting swelling, flaking of skin, pitting, ulcerations, erosions of shell, and abnormalities of the limbs. A neurological examination that includes the ability to use the fore- and hindlegs is critical and turtles should be encouraged to walk in the exam room. A tortoise should walk on its toes and there should always be space between the plastron and the ground—otherwise this may indicate weakness.

Biological Sample Collection

Venipuncture is best achieved from the jugular vein, subcarapacial sinus, brachial vein, femoral vein, or tail veins. The jugular vein is the site least likely to result in lymph contamination and can be accessed with the neck in full extension by drawing an imaginary line from the middle of the tympanum to the shoulder and aiming ventral to that line, but this may require sedation. The dorsal and ventral tail veins are great options for large animals or those that are aggressive. An approach to the occipital sinus has been reported for aquatic turtles by extending the head and accessing the vessel with a 25 gauge needle on the dorsal midline. Blood collection should be limited to ~0.5–0.8% of the body weight. Oral (choanae and oral epithelium) and cloacal swabs are often required to diagnose the most common upper respiratory pathogens and gastrointestinal pathogens of chelonians. Fecal direct and float exams should be part of the medical workup of turtles, particularly those that are wild, kept outdoors or recently acquired. Swabs and biopsies of the skin and shell are very useful for obtaining definitive diagnoses of skin and shell diseases, and ultimately guiding the best path for treatment.

Imaging

Radiography is essential in diagnosing lower respiratory diseases, gastrointestinal foreign bodies, fractures, ileus, etc. Unlike mammals and birds, chelonian radiographs require three views. The patient should be placed in a horizontal plane: dorsal-ventral, right or left lateral, and cranial-caudal. The horizontal beam of the cranial-caudal projection allows accurate diagnoses of pulmonary disease as this is the only view that separates the lung fields without superimposing GI or reproductive structures. "Plastron stands" that are not radiopaque can be used to position turtles for radiography without needing sedation.

Common Presentations and their Etiologies

Trauma remains common in pet turtles if they are allowed to roam in the house or if there are other domestic animals in the household. Drowning is an emergency for tortoises that fall in pools.

Anorexia is a common presentation in sick reptiles, and it is nonspecific. Diarrhea can indicate parasitism, but turtles fed a lot of fruit can develop diarrhea. Tortoises require a lot of roughage in their diet to maintain formed stools.

Overgrown rhamphotheca and toenails can indicate nutritional secondary

hyperparathyroidism (metabolic bone disease), or both deficiency/excess in protein intake (e.g. feeding dog food to omnivorous turtles). Distortions of the shell can also indicate NSHP or previous trauma, or in the case of pyramidal growth, other husbandry inadequacies like low humidity, lack of temperature range etc. Tympanic protrusions are common in aquatic turtles where the water quality is poor and abscesses form in the external ear canal. Discoloration of the skin or shell (practitioner must be familiar with the range of coloration of shells in the particular species at hand) can be attributed to fungal, parasitic or bacterial infections. Abnormal skin sloughing (more than piecemeal, which is normal) has been described in fungal and bacterial infections (especially anaerobic), poor nutrition, and burns, but can also be related to inappropriate temperature and humidity for some species (e.g. tortoises kept too damp). Excessive sloughing of scutes may also be associated with moist environments, chronic renal failure and nutritional deficiencies. Shell ulcers or necrosis occur with trauma, burns, and infections—wet necrosis is often bacterial and dry necrosis is fungal. Ulcerative shell disease is chronic condition of aquatic turltes caused by a variety of G- bacteria.

Respiratory signs are by far one of the most common signs for which turtles present for medical care. Nasal or ocular discharge, bubbling from the nose, palpebral edema, rhinitis, conjunctivitis, anorexia and weight loss with or without lesions of the oral cavity can be associated with *Mycoplasma* spp (several species) infection. Several other pathogens can cause similar clinical signs: ranavirus, adenovirus, intranuclear coccidiosis, chlamydiosis, reovirus, paramyxovirus, etc. *Mycoplasma* and herpesvirus are the top two most common causes of nasal discharge and plaques of the oral cavity. Dyspnea (including stretching the neck and gaping of the mouth), clicking or wheezing sounds may indicate lower respiratory disease often by the aforementioned pathogens or G- bacterial infections. Aquatic turtles will often float unevenly when inflammatory material accumulates in one lung, but uneven floating may also indicate gastrointestinal disease, foreign body or other conditions.

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IMPORTANT FELINE OCULAR DISEASES TO BE AWARE OF IN GENERAL PRACTICE

Rick Sanchez

Specialistische Dierenkliniek Utrecht (SDU)- AniCura, Ophthalmology, Utrecht, Netherlands

Qualifications:

Rick F Sanchez

BSciBiol, DVM, DipECVO, CertVetEd / FHEA

European Specialist in Veterinary Ophthalmology

Abstract

Feline corneal sequestrum

Corneal sequestrum is a spontaneous corneal disease of cats. A light tan discoloration under intact epithelium appears before the epithelium falls off forming a superficial ulcer. The discoloration turns darker until a dark plaque of variable size forms. This can partly separate from the rest of the cornea and vascularize. The lesions can reach up to Descemet's membrane. Theoretically, even subtle microtrauma, when continued/repeated, can lead to sequestrum formation. Sequestra affect brachycephalics and Sphinx cats and other predisposing factors include entropion, superficial grid scrape (or grid keratotomy) and any repeated trauma. Feline herpes virus (FHV-1) might be associated with it too. One must rule out known associated problems that are amenable to treatment (i.e., entropion).

Sequestra require removal via keratectomy but have a strong tendency to recur after removal. A study showed a tendency for sequestra to have a lower recurrence rate when vascularization was still present, either through grafts or through persisting corneal vascularization. Studies that used corneolimboconjunctival transposition (CLCT) (aka corneoconjunctival transposition; CCT), are associated with almost zero recurrences. This author only uses keratectomy with CLCT reconstruction and finds recurrences to be extremely rare. The use of CLCTs offer a clear cornea, which is important for centrally located corneal lesions. Alternative grafting techniques include conjunctival pedicle grafts and biomaterials.

Eosinophilic keratoconjunctivitis (EKC) of cats

This is thought to be an immune mediated condition. The cellular infiltrate seen in cytology (i.e., use of a topical anesthetic drop to numb the cornea, a cytobrush to gently collect the sample and place it onto a glass slide, and the use of a DiffQuick® stain to stain the sample), contains many neutrophils, some lymphocytes and plasma cells, and clusters of eosinophils. Diagnosis is reached when eosinophils are seen on cytology. The lesion is cellular (proliferative) in either multiple, white to pink, slightly elevated spots, or a plaque, and it might up-take fluorescein stain. It appears typically in the dorsolateral perilimbal cornea and conjunctiva, but can also appear in other areas of the corneal circumference and is accompanied by a vascular response, mucous and discomfort. Left untreated it will progress.

Treatment consists of the topical application of an immune modulator, such as a topical corticosteroid (i.e., dexamethasone phosphate) in high frequency doses at the start (4-6x day depending on severity). This is then tapered off at variable speeds depending on the needs of each patient including patient response. A maintenance dose is needed (e.g. every other day applications) for long periods of times. Some cats cannot be off medication. Topical ciclosporin might be effective, though some cats will not tolerate it. A topical corticosteroid may induce re-activation of a latent FHV-1 infection and the concomitant use of oral Famciclovir or topical use of Ganciclovir might also be needed. Historically, systemic megestrol acetate may prove effective for non-responsive cases although the drug is known to have a significant number of potential side effects.

Feline Herpes Virus -1 (FHV-1)

Accepted treatment based on the evidence collected thus far include oral Famciclovir and/or topical Ganciclovir. Historically, some advocate the oral administration of interferons or L-lysine, though the latter two have never been proven to be effective.

L-lysine has never been shown to significantly help with ocular signs or recurring ocular disease caused by FHV-1. We know that it competes with arginine, and one would need to have near depletion of arginine for it to work as intended. However, arginine is an essential amino acid and we would not want cats to be in that situation (i.e., arginine depletion). Some of the first studies (Maggs et al AJVR 2000) on this relationship (L-lysine and Arginine) made the pharmaceutical companies jump at the chance of producing L-lysine to sell it to clinics. The work had been well intended, but there was no evidence that it would work in clinical settings. Interestingly, another study (Maggs et al AJVR 2003) found that the use of L-lysine reduced the amount of viral shedding in latently infected cats. At the time, this was theorized to potentially being of help in multi-cat households, or catteries where a cat might be or is known to be infected (i.e., by reducing the amount of viral shedding in that environment). However, another study that also included (Drazenovich et al AJVR 2009) found that in practical terms it did not help. So, the theoretical implication did not translate well into a live situation, at least not the one tested. A separate study (Cave et al AJVR 2014) looked again at the effect of L-lysine in vitro but from slightly different angle and concluded that while L-lysine led to a small reduction in viral replication, it was so small that it was not clinically significant, which agreed with previous studies. Therefore, a review article in 2015 strongly recommended clinicians to cease prescribing oral L-lysine due to the lack of evidence-based medicine to support its use (Bol and Bunnik BMC Vet Res 2015).

Antivirals target virus replication and are "-static", which is why they require a high enough systemic dose that is sustained when given systemically or frequent topical use. Oral Famciclovir is a well-described treatment of FHV-1. It is the only safe antiherpetic for oral administration in cats and 'poor-doers' that have upper respiratory tract infections / chronic rhinitis. Famciclovir is expensive and the tablets are large, but it works very well at a dose of 90mg/kg 2x day until resolution of clinical signs. Personally, I continue with it 1x day for another 4-5 days after resolution of clinical signs. Anecdotally, doses of 50-60 mg/kg orally 2x day might also work though they do not reach the desired blood concentration concentration in blood (i.e., 3.5µg/mL). An option is topical gancyclovir gel, which is much cheaper and is given 3-4x day. An interesting study comparing these medications was published in 2022 (Ledbetter et al JOPT 2022). There are no 'recipes', as each patient has different needs.

Feline diffuse iris melanoma (FDIM)

Pigmentary changes start as benign melanosis, which is a superficial change of the iris stroma (the part we see). The moment the pigment change becomes deepter, it is theorized to have become FDIM and it begins to affect the musculature of the iris. This results in changes to pupil motion during dilation and/or constriction, and changes in the shape of the pupil (dyscoria). It is possible to take a biopsy at that stage but this might not be diagnostic and requires intraocular surgery. The diagnosis is otherwise only determined via histology of the eye, as the characterization we give the pigment changes through observation can only estimate the stage of the disease process.

Further progression will affect more of the iris until secondary glaucoma develops. If an eye with FDIM is enucleated before glaucoma develops, the survival rate is thought to be the same as that of a cat that never had FDIM. Enucleation for pain control is still recommended for eyes that have already developed glaucoma, but eye removal has no preventative effect with respect to possible metastasis. It appears that metastasis may take months even 1-2 years or more. This reasons are poorly understood.

Aqueous misdirection syndrome

This was first described in 2005 (Czederplitz et al JAVMA 2005) in middle aged to older cats. The presentation is a striking shallow anterior chamber of the affected eye due to the anterior displacement of the lens and iris that nearly touch the endothelial side of the cornea. This collapses the iridocorneal angle, which makes matters worse. These patients have intact zonules (not a lens luxation) and are theorized to have posterior 'misdirection' of the aqueous humor, that accumulates behind the lens. The condition might respond to medical therapy and while reduction of the lens volume has been attempted response to surgery is also variable (Atkins et al VO 2016). It is important to recognize patients with this problem to refer them promptly to an ophthalmologist for assessment and treatment.

Feline Acute Bullous Keratopathy

An acute corneal disease of cats that can be disastrous. It may be unilateral or bilateral and can affect cats of any age and breed. The condition remains idiopathic and treatment options have been presented and discussed but have not been thoroughly studied. One study reported a possible association with systemic administration of cyclosporine, though there is no conclusive evidence that this is the case (Pierce VO 2016). The disease might be associated with a break in Descemet's membrane in some cases.

Algoever I (DipECVO) presented 14 cases (ECVO Congress, 2012), including 12 unilateral and 2 bilateral cases. As there was no recommended treatment at the time, options varied from keratectomy to third eyelid flap and/or oral famciclovir. It took 22 days until resolution of clinical signs in responsive cases while the 2 cases that were affected bilaterally did not respond and 8 cases resolved with surgical treatment alone and 4 resolved with medical treatment alone.

Treatment with a third eyelid flap in 21 cases for 15 days (6-30 days) in a published case report, was successful in 90% of the patients included (Pederson VO 2016). The 'flap' was thought to apply pressure over the bulla that dissipates while the cornea heals. Keratectomy with reconstruction is advocated for more advanced cases.

Rapid recognition, referral and treatment are paramount as the disease can lead to corneal perforation within 24-72 hours.

References available upon request

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ENVIRONMENTAL SUSTAINABILITY IN THE REAL WORLD: A PRACTICAL WORKSHOP

Hannah James

VetPartners Ltd, Sustainability, York, United Kingdom

Qualifications:

Dr Hannah James

CEnv MIEMA PhD MSc BSc

hannah.james@vetpartners.co.uk

This session is a practical workshop on how to make sustainability initiatives work in veterinary practice. Delegates will identify opportunities to improve sustainability in their workplace, learn how to plan and take action, discuss how to anticipate and overcome challenges, and plan continuous improvement.

Identifying environmental issues

- Form a working group or arrange a practice meeting
- Gather ideas and concerns: use a mind map
- Use feedback from clients
- Observations from other practices (case studies)
- Consider training resources

Turning ideas into action

- Prioritise your efforts
- Define the goal
- Consider higher impact actions
- Decide how to measure success
- How to quantify environmental impact
- Consider an accreditation scheme
- Create an action plan

Overcoming barriers

Common barriers

- Time
- Money
- Lack of buy-in (management, team)
- Lack of understanding or knowledge
- Resistance to change
- No obvious solutions available

Overcoming

- Seek the opinion of those affected
- Explain your rationale
- Encourage feedback
- Strike the right tone
- All initiatives can be a pilot trial
- Ringfence cost savings to offset costs

Remember: you don't have to achieve everything at once.

Continuous improvement

- Annual (at least) review
- Calculate improvements from the baseline
- Seek feedback
- Encourage suggestions
- Make changes
- Consider continuity
- Create plans and policies
- Celebrate success

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POSICIONAMENTO RADIOLóGICO E SEGURANçA DA EQUIPA

Rafael Lourenço

Centro de Cirurgia Veterinaria de Loures, Surgery, LOURES, Portugal

Qualifications:

Full Name: Rafael Pratas Lourenço

Qualifications: Veterinary Surgeon

Email: cirurgiavet@gmail.com

Tem sido um dos papeis crescentes da enfermagem veterinária o de executar e participar nos exames complementares de diagnóstico, como é o caso das técnicas em radiologia de pequenos animais.

É de igual modo importante que o enfermeiro(a) veterinário(a) conheça as medidas de protecção radiológica para ajudar a implementá-las no ambiente clínico.

Assim, para se obter exames de boa qualidade sem colocar em risco desnecessário os humanos envolvidos nestes procedimentos é necessária uma compreensão das informações mais relevantes sobre:

A radiação X – podemos caracterizá-la como uma "luz" invisível aos nossos olhos e cujo nível de energia lhe permite atravessar alguns objectos, como por exemplo o corpo dos animais estudados

Feixe primário *versus* radiação dispersa – o feixe primário é a porção da radiação X que fazemos incidir sobre as partes do corpo do animal e que irá contribuir para a formação da imagem (de orientação essencialmente vertical) ; a radiação dispersa é a porção da radiação que após colidir com os objectos segue múltiplas trajectórias, podendo incidir sobre os profissionais envolvidos nos exames

Principios de posicionamento em pequenos animais – os objectivos são isolar a parte anatómica a estudar (por forma que não fique sobreposta a outras) e colocar essa região de estudo na posição que trará as informações clínicas mais relevantes . Será importante adaptar as técnicas de posicionamento nos casos de animais que sofreram trauma ou que estão severamente debilitados e igualmente para animais não cooperantes

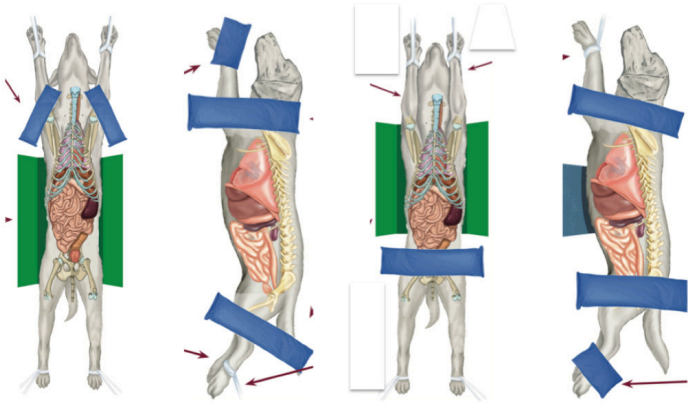
Principais artefactos nas imagens –os mais comuns na prática clínica serão os erros de posicionamento e os artefactos causados pelo movimento da região de estudo ; a revelação digital com os seus algoritmos de optimização vieram eliminar a maioria dos problemas de revelação das imagens

É importante dominar a terminologia anatómica e radiológica, e conhecer os marcos anatómicos relevantes para cada estudo .

Os estudos podem ser divididos por regiões : Cabeça e pescoço, regiões torácica e abdominal , membros e coluna vertebral

Cabeça e pescoço – nos rx latero-laterais da coluna cervical é crucial a sedação profunda ou a anestesia, ambas com analgesia, para permitir um relaxamento da musculatura cervical e evitar desvios da posição das vértebras. As asas do Atlas são facilamente palpáveis e ajudam-nos a conseguir a simetria desejada; para as vértebras cervicais caudais (C6 e C7) é necessário fazer tracção caudal nos membros torácicos para que a escápula não se sobreponha a estas vétebras; Em grande parte dos estudos latero-laterais de mandíbula, bulas timpânicas e articulações temporo-mandibulares é necessário criar uma pequena rotação sobre o eixo sagital para que as referidas estruturas esquerda e direitas não se sobreponham. A estrutura a estudar ficará sobre a mesa de exame.

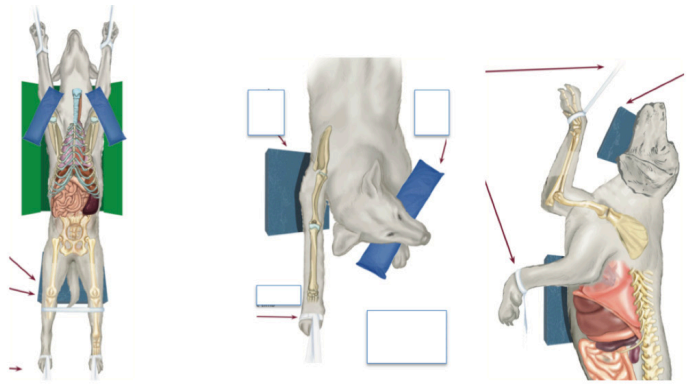
Regiões torácica e abdominal – é possivel geralmente posicionar os pacientes por meio de cordas, sacos de areia, etc, por forma a que não permaneçam profissionais no interior da sala durante a exposição . Para este efeito a anestesia geral é obrigatória . Apresentamos alguns exemplos destes posicionamentos:



Membros e coluna vertebral – Os estudos de segmentos esqueléticos (exs: perna, antebraço, braço, mão) requerem essencialmente exposições ortogonais ao plano sagital para as vistas medio-laterais e ortogonais ao plano coronal para as vistas dorso-ventrais e ventro-dorsais . Dependendo da doença do animal deverão ser escolhidos os posicionamentos que caudam o menor desconforto possível. No caso das fracturas, o exame radiográfico não deverá agravar o desalinhamento ósseo por elas causadas.

Nos exames da coluna vertebral é importante centrar o feixe de radiação nas regiões de interesse. Por exemplo nos casos de hérnias discais, em que estamos a inferir a herniação do disco intervertebral baseando-nos na diminuição do espaço intervertebral, só podemos considerar relevantes os espaços intervertebrais perto do centro do feixe de radiação . Quanto mais o objecto de estudo se afasta deste centro, mais a radiação incidente terá obliquidade em respeito ao eixo vertical, tornando as medições espaciais cada vez menos fiáveis.

Incluimos alguns exemplos de posicionamentos de segmentos esqueléticos:



Medidas de protecção radiológica para os membros da equipa e de público – para minimizar a radiação que contacta com os profissionais devem ser seguidas normas cujos objectivos se resumem em : 1. Distanciar o corpo da fonte de radiação e colimar correctamente o feixe primário; 2. Diminuir os tempos de exposição; 3. Usar equipamento de protecção individual da forma tecnicamente correcta

Monitorização da radiação recebida – o exemplo dos dosímetros individuais e de área

Como minimizar a exposição a radiação ionizante : colimação, protecção

Sedação e contenção dos animais – as técnicas de contenção química (sedação e anestesia) e manuais permitem obter imagens de qualidade, diminuindo os artefactos por movimento e assim diminuem o número de exposições para cada estudo

Análise de erros comuns de posicionamento: após a visualização das imagens deverá ser criticado o posicionamento por forma a melhorar o protocolo utilizado. A palestra abordará alguns exemplos.

Q e A e partilha de experiência pessoal em ortopedia e traumatologia de pequenos animais

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INTERACTIVE SESSION. “A COMPLEX ISSUE, A SIMPLE SOLUTION?

Monique Megens

Monique Megens Consulting, Self Employed, Sant Josep de sa Talaia, Spain

Qualifications:

Monique Megens

DVM

mmegens@planbveterinair.nl

‘A complex issue, a simple solution?’

The breeding of dogs with excessive traits has increasingly come into the spotlight over recent years. There has been an explosion in the popularity of certain breeds with extreme conformations. While often desired by the public, such a conformation can adversely affect the health and welfare of a dog.

At the same time, for more than 60 years, more and more initiatives, by many different stakeholders, in many countries and internationally have been launched to create awareness, educate the public, and regulate the supply — all with varied success.

We all acknowledge that it is a complex issue, and it is in our nature to desire quick, easy, and simple solutions. But, if we can solve it with a simple solution, why haven’t we solved it by now? Maybe we still don’t understand the complexity of the issue.

The issue

The issue is that dogs suffer because of their extreme conformations deliberately selected for and desired by us humans.

Extreme conformation is defined by The International Collaborative on Extreme Conformation in Dogs (ICECDogs), an international multistakeholder group, as follows:

Extreme conformation in dogs describes a physical appearance that has been so significantly altered by humankind away from the ancestral natural canine appearance that affected dogs commonly suffer from poor health and welfare, with negative impacts on their quality and quantity of life.

The most well-known example is the brachycephalic dog. Still, there are many other examples of extreme conformations: sloping backs, droopy eyes, skin folds, short legs, long backs, miniatures, or giants to name a few. Dogs with these excessive traits are very popular amongst the public, and where there is a demand, there is a supply.

Complexity

It is a complex issue because of various reasons.

First of all, because of the involvement of many different stakeholders and the complex interactions. Breeders, veterinarians, kennel clubs, breed clubs, the media, authorities, Non-Governmental Organisations (NGO’s) including welfare organisations, and, of course, the public play a role. We also need to acknowledge that there are different viewpoints within a stakeholder group. For example, there is no such thing as *the* breeder. A breeder could be a kennel club member that strives to put health and welfare before conformation. However, a breeder could also be somebody running a puppy farm only because of the enormous profits.

Secondly, it is an international issue. Many countries cannot fulfill the demand for dogs at a national level; therefore, dogs are legally and illegally traded across countries. Even more challenging is that the illegal puppy trade is not only an animal welfare issue, but it is believed to be the third most profitable organised crime within the EU after narcotics and weapons trafficking stated by the European Parliament.

Cultural, socio-economic, and national differences complicate the issue further across countries.

Thirdly, and probably the most complicating factor, is the emotional and human side of the equation. A part of the public desires certain extreme conformations and is blind to the negative impact on welfare. And not just the public; many, including veterinarians, normalise certain excessive traits.

Although scientific and clinical knowledge concerning the impact of extreme conformations on health, welfare, and longevity has increased significantly in recent years, as we know only too well, human behaviour is far too often more related to emotion than evidence.

Simple solutions

The desire for quick, easy, and simple solutions to complex issues is a natural impulse, and it very much applies to veterinarians, whose profession is to solve many problems daily. However, in many cases, the simple solutions either don’t exist or, where they do, are mostly or entirely ineffective. Unfortunately, wanting solutions to be simple does not mean it is always an option.

We could break complex issues down into smaller, more easily managed pieces. Doing so ignores the important interactions between these pieces and effects that emerge when those interactions generate their own impacts on the wider system. Taking a complex issue apart until we find a piece of the problem we can solve, means that only that piece is ever addressed. The unintended consequences that come from only solving a small part of the problem might negate any progress made. There are no shortcuts to unraveling complex issues.

Instead, we could also consider the complex issue as a whole and look at how the different parts work together, how each piece is connected to the other parts, and what impact changes in one piece have on other parts.

We could ask yourselves the “what if..?” questions. What if we address one part? What will be the effect on the whole issue?

What if, in a particular country, we ban several pedigree breeds with excessive traits? Will fewer dogs suffer from their extreme conformation, or will they be replaced by look-a-likes or other breeds with even more welfare issues, or will they be illegally imported without control? Or, what if we regulate breeding stricter in one country? Will fewer dogs suffer from their excessive traits, or will fewer dogs be bred in that country and replaced by puppies from puppy farms imported via illegal trade with maybe even more welfare issues and again less control?

The solution

What, then, is the solution? How will we stop the unnecessary suffering of the dogs involved? On the demand side, one solution could be to change human behaviour, to make the public aware of the health and welfare issues so they don’t buy them anymore. And, as in economics, where there is no demand, there will be no supply. But, changing human behaviour is the hardest thing to do. However, looking at, for example, anti-smoking campaigns, it can be done. Maybe not 100%, but a significant decrease can be achieved.

On the supply side, we could make sure there are sufficient healthy puppies to meet the demand. We could change breed standards, breed for genetic diversity, and/or breed dogs in commercial farms where health and welfare standards are met.

We know from experience, after many awareness campaigns in many countries and many measures to regulate the supply by many stakeholders, that there is no such thing as a simple solution to stop the unnecessary suffering of dogs because of their extreme conformation.

We need to acknowledge the complexity of the issue and take into

account the interactions. We cannot solve it with a simple solution by just one stakeholder in just one country.

The solution demands a holistic approach and a strategic vision. We can only move forward toward a sustainable solution if all stakeholders work together nationally and internationally.

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MUSCULOSKELETAL MANIFESTATIONS OF VECTOR BORNE DISEASES

Xavier Roura

Hospital Clínic Veterinari, Universitat Autònoma De Barcelona, Bellaterra, Spain

Qualifications:

Xavier Roura

DVM, PhD, DECVIM-CA

xavier.roura@uab.cat

Key points of the presentation:

Clinical presentations vary from no obvious clinical findings but detectable laboratory abnormalities to severe clinical signs or laboratory abnormalities that may require hospitalization.

Vector borne diseases produce many different lesions in dogs and cats.

Fever or lymphadenopathy are quite frequent, however, there are other less frequent but present in dogs and cats such as myositis, muscular atrophy, polyarthritis, osteomyelitis, etc.

Polyarthritis and bone alterations has frequently described in dogs with vector-borne diseases.

It's necessary to include vector-borne diseases in the differential diagnosis of any musculoskeletal manifestations in dogs and cats living or has living in an endemic area.

Musculoskeletal manifestations associated to VBD can be variable, depending on the strain, the immune response of the patient, and the presence of concomitant infections with other vector-borne pathogens.

Several of this type of clinical signs such as lameness may result from secondary immune-mediated inflammation to vector-borne pathogens.

The most frequent immune-mediated diseases associated to musculoskeletal manifestations are hypersensitivity and autoimmunity.

Excessive antibody production develops tissue lesions like those associated with type II and type III hypersensitivity.

Immune-mediated diseases produced by pathogens sometimes persist once the infectious agent has been eliminated, and this is very important to decide the treatment and give a prognosis in each case.

It is difficult to always find a correlation between immune-mediated disease and pathogen because there is no perfect test for the diagnosis of infectious diseases transmitted by arthropods.

Because the diagnosis of vector diseases is complex, perhaps many of the immune-mediated diseases have a pathogen as the activating factor.

The combination of the clinical history, the physical examination, the laboratory tests, and the response to the treatment, are necessary for the confirmation or not of the diagnosis.

However, it has not been possible to confirm that all these vector-borne pathogens cause immune-mediated diseases, since some of the confirmatory tests such ANA test can give false positives secondary to the intense and severe inflammatory reactions associated with these infections.

Immune-mediated diseases produced by pathogens sometimes persist once the infectious agent has been eliminated, and this is very important to decide the treatment and give a prognosis in each case.

Vector-borne pathogens such as *Leishmania infantum, Ehrlichia canis*, *Anaplasma phagocytophilum*, *Rickettsia rickettsii*, *Borrelia burgdorferi*, *Babesia canis*, *Bartonella* and filariae have been also linked to joint disease in dogs and cats

Although some older studies have included lameness, due to polyarthritis, as a sign of ehrlichiosis, no evidence-based studies have supported this sign.

It is advisable to rule out other vector-borne infections such as *Borrelia*, *Anaplasma* or *Leishmania* when lameness and/or polyarthritis is present in dogs infected with *E. canis*.

One of the most frequent clinical manifestation associated to *Borrelia* infection in dogs is Lyme arthritis.

Osteolytic granulomatous osteomyelitis has been associated with *Leishmania* infection.

The first and best treatment of immune-mediated diseases associated with pathogens carried by arthropods is the elimination of the infectious agent as quickly as possible.

From a clinical point of view, we must consider in each case whether a specific treatment is necessary for the immune-mediated disease or not. Sometimes it will be necessary to use, together with the treatment against the pathogen, the use of immunosuppressants, while in other cases it will only be necessary anti-inflammatory treatment or the use of other drugs.

In most cases, the recommendation today is to add treatment with prednisone or prednisolone at an anti-inflammatory dose, while treating the pathogen that has caused the clinical alteration.

The prognosis of immune-mediated diseases associated with pathogens transmitted by arthropods is good in most cases and the use of immunosuppressants is limited to the first weeks.

However, there are some clinical situations that often do not respond and have a guarded or severe prognosis.

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NEW INSIGHTS ON PROSTATIC DISEASES IN DOGS

Stefano Romagnoli

University of Padova, Animal Medicine, Production And Health, Legnaro, Italy

Qualifications:

New insights on prostatic diseases in dogs

Stefano Romagnoli, DVM, MS, PhD, Dipl ECAR

Dept Animal Medicine, Production and Health - University of Padova, Italy

stefano.romagnoliunipd.it

Introduction

The two canine prostate conditions which have prompted extensive clinical investigations over the last decades are benign prostatic hyperplasia and prostatic adenocarcinoma. This paper will review the approach to these diseases.

Benign Prostatic Hyperplasia (BPH)

Steroidal antiandrogens - Compounds such as megestrol acetate, medroxyprogesterone acetate, delmadinone acetate, chlormadinone acetate and cyproterone acetate have been used in male dogs with BPH. A decrease in libido and fertility is observed following use of any of the compounds listed above. The following therapies have not been associated with drastic decreases in fertility and therefore might be used in breeding dogs for short-lived (maximum 2 months) treatments **(1, 2, 3)**

- medroxyprogesterone acetate, 3.0 mg/kg SC once
- megestrol acetate, 0.5 mg/kg per os for 2 months or 4.0 mg/kg once daily for 7 days or 2.2 mg/kg for 2 weeks

- chlormadinone acetate, 0.1-0.3 mg/kg/day per os for 1-2 months

- cyproterone acetate at the oral twice daily dosage of 2.0 mg/kg for 1-2 weeks and then decreasing to 1.0 mg/kg

Osaterone acetate (OA) is an analog of chlormadinone acetate with a specific inhibitory action on prostatic volume in dogs. OA is slowly metabolized by the liver with a very long half-life of 198±110 hr. For this reason, a 7-day course of treatment allows for a pharmacological concentration of the drug to last for about 6 months. OA is very effective in treating canine BPH, and works well also in case of prostatitis **(4)**. Being a progestogen derivative, OA may cause suppression of the pituitary-hypophysial-adrenal axis with reduced cortisol production and/or low or no response to ACTH stimulation tests lasting for days or weeks following treatment withdrawal. Although this is normally not a problem in healthy dogs, it should be considered when a dog being treated with OA has to undergo surgery or suffers a trauma. Also, treatment with OA should be avoided in dogs with hypoadrenocorticism or with reduced kidney or liver function. Semen quality is not affected to a great extent, and will actually improve when initially poor due to the prostatic condition.

Non-steroidal antiandrogens – These drugs include 5-alpha-reductase (5AR) inhibitors such as finasteride and the more recent dutasteride or pure androgen antagonists such as flutamide. Through different mechanisms these compounds inhibit the action of androgens at the target organ without decreasing the concentration of testosterone (T) in the general circulation.

5a-reductase inhibitors – These compounds block 5AR enzymes which are responsible for the conversion of T to its active metabolite di-hydro-testosterone (DHT). Finasteride inhibits only type-2 5AR, while dutasteride inhibits both type-1 and type-2 5AR enzymes and is much more potent than finasteride. Both lower the concentration of DHT without altering serum T concentrations. This leaves spermatozoa production undisturbed, which makes 5AR inhibitors a good choice for breeding dogs suffering from androgen dependent conditions such as BPH (although a chronic use may be associated with a decrease in ejaculate volume as well as decrease in semen quality). It can be used at the daily oral dose of 1.25 mg (1/4 of a 5.0 mg pill) regardless of dog body weight for 6-month cycles, although it is expensive and owners tend to discontinue it after 2-3 months when they see that the dog is doing well. As soon as finasteride is discontinued the prostate will start growing again within a matter of a few weeks (although it may take a few months to reach again a pathologic size) (**5**).

PROSTATIC NEOPLASIA

The aging prostate gland is subject to neoplastic transformation. In dogs, prostatic neoplasias are typically malignant epithelial tumors with gland-like, acinar structures which are classified ad adenocarcinomas. Transitional cell carcinoma from the urinary tract, metastatic lymphosarcoma, hemangiosarcoma, leiomyosarcoma, lymphoma and squamous cell carcinoma have also been reported in the dog but are thought to be extremely rare. Canine prostates affected with neoplasia very frequently feature areas of BPH, cysts with clear fluid or pus and lymphoplasmacytic inflammation. Historical problems in affected dogs are similar to those of prostatitis and diagnosis of prostatic neoplasia in dogs is based on the same parameters as prostatitis compounded by chronic weight loss, identification (through rectal palpation, ultrasonography, radiography) of nodules within the prostatic parenchyma (which may be characterized by mineralization) or areas with complete loss of architecture. Metastatic disease is commonly present at the time of diagnosis and should be searched for at the level of the lumbar vertebral bodies and pelvic bones, bladder, lungs, long bones, scapula, ribs and digits. Unless metastatic disease is evident on X-ray or on CAT-scan, diagnosis of prostatic neoplasia should always be confirmed by biopsy or needle aspiration since the prognosis is poor. If a surgical biopsy is taken, the sublumbar lymph nodes should be sampled as these are a preferential target of prostatic adenocarcinoma (instead of the iliac ones). In intact dogs with increased prostatic size, neoplasia must be distinguished from prostatic abscessation and paraprostatic cysts. Dogs with adenocarcinoma have a mean age of 9-10 years and tend to be medium to large breeds, therefore BPH is always a likely finding and the use of BPH drugs should always be considered. Also, treatment for prostatitis should be considered as focal areas with acute or chronic inflammation may be present. The presence of BPH is not considered as a risk factor for the subsequent development of prostatic adenocarcinoma in dogs.

The role of hormones on the development of prostatic neoplasia

Because of the key role of androgens in stimulating differentiation of canine prostatic ductal into epithelial cells, the prostatic acinar tissue of the dog has always been considered as an androgen-dependent tissue while the ductal system and stromal tissue have been considered as androgen-independent. The definition of “androgen independence” has led many authors to conclude that androgens do not play any role in the development of prostatic neoplasia, a belief which has been supported by a) the increased incidence of prostatic cancer in castrated dog and b) the lack of expression of androgen receptors by canine prostatic carcinomas. However, the fact that the canine prostatic ductal epithelium and prostatic stroma show marked changes following castration is an indirect proof that such tissues are somehow influenced by androgen secretion; therefore, they should be probably regarded as “androgen-sensitive” (**6**) The role of androgen stimulation vs androgen deprivation in the development of canine prostatic neoplasia remains controversial and deserves further studies. The following mechanisms have been suggested to explain the lower risk of intact dogs in developing prostatic cancer:

- a potential protective role of androgens which may have an antiproliferative effect on prostatic ductal cells (24, 25).
- in (young, 24-30 month-old) Beagle dogs orchiectomy causes death of prostatic epithelial cells while basal (ductal) cells survive but lose their

ability to differentiate into secretory epithelial cells and tend to form a continuous layer around the atrophic prostatic acini (**6**). As early as 30 days after castration the prostatic stromal component of the dogs of this study shifted from primarily actin-positive smooth muscle cells to vimentin-positive mesenchymal cells **(6).** Vimentin is a marker of poorly differentiated prostatic carcinomas

- canine prostatic carcinoma originates from prostatic ductal cells; castrated dogs have a higher population of ductal cells in their prostates compared to intact dogs **(7, 8**)
- castration increases expression of endothelin receptors by the canine prostate (**9**). Endothelins are growth factors produced by prostatic epithelial cells involved in the development of obsteoblastic metastases in prostate cancer through a paracrine mechanism. Their increase following castration suggests that endothelins may stimulate growth of prostatic carcinoma cells through a paracrine mechanism.

All the above considerations make the decision as to whether or not advice routine castration for healthy dogs very difficult. Because of failure of most previous studies in reporting intervals between castration and diagnosis of prostatic carcinoma a clear connection between orchiectomy and development of prostatic neoplasia within a reasonably short amount of time (weeks or months) cannot be established (**10**). Canine prostatic adenocarcinoma is obviously a disease of elderly dogs, nevertheless a role for castration early in life in increasing the risk of developing the condition cannot be ruled in or out. When advising clients, the very low (<1%) risk of developing a prostatic tumor should be weighed against the risk of developing large prostatic cysts or prostatic abscesses and their inherent surgical risk. The need for a regular complete andrological exam (which should include rectal palpation, prostatic ultrasound and assay of serum CPSE) to be repeated at least once/year from when the dog has reached 40% of his life expectancy should be stressed with clients opting to keep their male dogs intact.

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IF WEIGHT WAS HARD ENOUGH: FEEDING OBESE PETS WITH COMORBIDITIES

Cecilia Villaverde

Expert Pet Nutrition, Clinical Consultant, Fermoy, Ireland

Qualifications:

Cecilia Villaverde

BVSc, PhD, DACVIM (Nutrition), DECVCN

cvillaverde@expertpetnutrition.com

Obesity and overweight is a prevalent condition in dogs and cats, with an estimated prevalence of approximately 30-60% depending on the geographical area[1].

It is believed to increase the risk of several health conditions in cats (such as diabetes mellitus, dermatosis, feline hepatic lipidosis, etc.) and in dogs (such as degenerative joint disease, urolithiasis, etc.)[2,3]. In dogs, being overweight is also associated to a decreased life span[4].

There are many factors that are associated to an increased overweight/obesity risk, both related to the animal and to the owners[1]. Focusing on those risks during the nutritional evaluation[5] helps identify those pets at risk and allows the development of specific weight management plans to prevent this problem. Prevention is important because treatment of overweight (calorie restriction) is hard and has associated challenges, including metabolic resistance to weight loss[6], and has a high rate of recurrence[7,8].

Calorie restriction is the main treatment for overweight pets, to create a negative energy balance where the patient uses its own body fat reserves to obtain the energy needed to function. Calorie restriction is more important that diet choice in that regard, but the use of weight loss veterinary diets has multiple benefits, including potential for satiation[9] and nutrient fortification, to ensure nutrient provision while restricting calories[10]. Veterinary weight loss diets tend to have lower kcal per kg by using one or a combination of different strategies (moderate fat, high fibre, high moisture), and have a higher nutrient to calorie ratio compared to maintenance diets formulated to maintain weight. This diet should be fed in amounts low enough to create a negative energy balance and subsequent weight loss, and the recommended rate of weight loss is 1-2% per week. The daily allowance can then be adjusted every 2-3 weeks to achieve this rate of weight loss.

In overweight pets that also have other diseases, the use of veterinary weight loss might not always be possible. In these cases, the process needs to be decided on a case-by-case basis, following this process (figure 1):

List the nutritional goals for each disease present in the patient, taking into account that some diseases do not have specific nutrient requirements besides providing a complete and balanced diet.

Once listed, compare the nutritional goals for each condition and check if they are compatible or not.

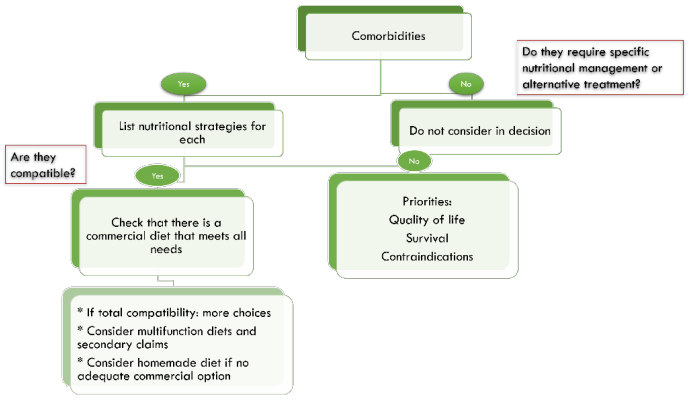
If they are **compatible**, identify a commercial product that would meet all of the goals. Take into account the existence of combination-style veterinary diets, and also some diets have secondary claims (such as urinary claims, for example). Ideally, choosing a diet formulated for safe weight loss should be a priority,

If they are compatible and there are no commercial products that would meet all goals, consider consulting with a specialists to obtain a homemade diet, or treat these conditions as incompatible.

If the goals are **incompatible**, the diseases must be prioritized depending on both quality of life and survival. It is important to decide if weight loss should even be attempted, or if the focus should be on preventing further gain.

If a veterinary weight loss diet cannot be used, and weight loss is still desired, this can be attempted with a slow rate of weekly weight loss (<0.5%) and it is important to choose a diet, among those available, lower in calories than others (wet foods can be particularly useful in this regard).

Figure 1: Decision tree in pets with co-morbidities



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BACKYARD CHICKEN MEDICINE

Sonia Hernandez

University of Georgia, Warnell School Of Forestry And Natural Resources And Scwds At The College Of Veterinary Medicine, Athens, United States of America

Qualifications:

Sonia M. Hernandez

DVM, DACZM, PhD

shernz@uga.edu

BACKYARD CHICKEN MEDICINE

Backyard chickens are a necessity in many regions of the world and have suddenly become very popular across North America and Europe. Their management can be easy, provided that some basic rules of biosafety and hygiene are followed. Backyard chickens can be engaging companions that also produce valuable animal products for owners and will likely continue to increase in popularity.

Husbandry

Entire chapters have been written about the optimal conditions for rearing and keeping chickens and thus I cannot do justice to all aspects in this publication. However, there are some very general tenants to follow that will keep the flock safe and healthy: 1) predator proofing is a must—mesh that does not allow snakes to enter, that is buried to keep mammals to digging under and with a roof to keep avian predators and keeping chickens in a coup overnight will prevent most predation; 2) pest-control—chicken food will attract pests (flies, cockroaches, rodents, etc) all of which play a role in maintaining pathogens and parasites chickens, 3) keeping food secure will discourage other species (especially other birds) from visiting the flock, 4) providing a good quality diet appropriate for specific life stages includes a balanced pelleted food with grains and vegetables as supplements, 5) hygiene, achieved through frequent cleaning and good ventilation are very important for their health, 6) obtaining chickens from reputable sources, 7) keeping a closed flock will avoid the majority of pathogens and 8) happy chickens do better-providing enrichment and exercise will go a long way. A word about diet: Generally, feed falls into three growth-related categories: starter, finisher, or meat builder and laying/breeding ration. It is extremely important to buy the right feed for the right growth stage, particularly for breeder/layer hens. Laying birds must have calcium supplementation and layer ration. Medicated feed contains a anticoccidials or antibiotics which is recommended for backyard poultry.

Selected Common Conditions

Trauma

Chickens that are allowed to free-roam are especially prone to trauma from a variety of sources. Fortunately chickens are hardy and respond well to topical treatment of most wounds.

Cannibalism

This can be a frustrating management problem in chickens, often starts when they are young and not provided enough food and may require a variety of interventions (including removal) to end it.

Bumblefoot

It is an inflammatory condition of the foot characterized by swelling, ulceration, and erythema, It localized to the plantar metatarsal pad or plantar digital pads. This is more common in chickens that are not allowed to free-roam, are standing in moist litter or have inadequate perches that are too big in diameter, too small or smooth. It is also associated with hypovitaminosis A and overweight chickens. Acute infections result in caseous necrosis rather than purulent and liquefied exudate. Prevention is key. Treatment may involve providing analgesia, soaking in Epsom salts, topical antimicrobial creams and bandaging that redistributes the weight of the foot.

Hepatic Lipidosis

Is often associated with pet poultry that are fed chicken scraps and are not provided sufficient exercise. Birds are often obese, have pale combs, and wattles have extreme fat deposition, sudden drop in egg production, and increased mortality.

Osteporosis

Also known as cage-layer fatigue. Birds are unable to stand and have brittle bones, have ribs that are ocaved in or fractured at the junction of the sternal and vertebral components but remain alert. These birds are have vitamin D3, calcium, phosphorous deficiencies or imbalances. Treatment involves providing analgesia, intramuscular vitamin D3 or intravenous calcium

Gluconate. Oyster shell added to the scratch regularly can prevent this condition.

Egg binding and dystocia

This condition (as well as cloacal prolapse) is often seen in obese hens. There can be eggs in the abdominal cavity (retrofluxed); single or multiple eggs in the oviduct; or shell membranes, shells, and yolk/albumin concretions in the oviduct. This is diagnosed by palpation and radiographs. Conservative supportive care can resolve milder cases, but more complicated caess will need analgesia, parenteral fluids, manual obstetrical delivery methods, salpingotomy, and salpingohysterectomy.

Mites, Lice and Ticks

Two common mites of poultry are the northern fowl mite (Ornithonyssus sylviarum) and the red mite (Dermanyssus gallinae). The northern fowl mite lives on its host and is most commonly found around the vent, tail, and breast of the bird. They are easily observed and are a reddish-brown color, but the red mite does not live on its host and only feeds at night, is found in cracks and seams near the bedding areas and appear as white fuzz balls or salt-and-pepper–like deposits. Red mites will cause feather loss, irritation, and anemia. Treatment involves over the counter insecticides or ivermectin (200 ug/kg PO or SQ) monthly X 3 mos. Poultry mites can move to humans and bite. Lice live at the base of the feathers and heavy infestations can make chickens anemic yet do not get on humans. They are treated similarly. Fowl ticks are soft ticks of various species and heavy infestations can cause anemia or tick paralysis. They do not spend much time on the bird itself and treatment of empty houses chickens with insecticides is needed.

Helminths

Large roundworms and tapeworms are the most common endoparasites of backyard chickens and are generally the result of soil contamination and poor management. Unless infestations are heavy, clinical disease is usually not evident. Annual fecal exams and fenbendazole at 10 to 50 mg/kg once and again 10 days later is useful are useful.

Coccidia

This is one of the more common conditions of backyard chickens. It causes diarrhea, which can be bloody, and death. It is associated with high-density flocks. Prevention is through medicated feed or treatment with sulfas in non-laying hens during outbreaks.

Maerk's disease

This is the top viral disease found in backyard chickens in the USA. The primary lesions are tumors of the viscera, muscle, skin, and peripheral nerves. Birds with visceral tumors will often have only cachexia but tumors of the skin/muscle are palpable. Birds may have enlarged crops or crop impactions. Virus is shed from the feather follicles and dander and disinfection and biosecurity is difficult. Owners should purchase chicks that have been vaccinated or vaccinate immediately after hatching. Vaccination does not prevent infection or shedding of the virus but it prevents clinical disease. In the backyard situation, mortality of young is high and adults die sporadically.

Mycoplasmosis

It is caused by *Mycoplasma gallisepticum*. Birds develop respiratory signs, discharge from nares, swelling of the sinuses and anorexia. Serology, PCR, and isolation and identification of the organism can be used for diagnosis. A killed vaccine is available to prevent clinical disease (but not infection/transmission). Treatment with tylosin is expensive and clinical signs can recur. Egg and meat withdrawal times must be observed when treating with tylosin.

Pastereullosis

Infection by Pasteurella multocida include an acute form which is very fast and signs may only be present for a few hours before death including fever, anorexia, ruffled feathers, mucous discharge from the beak, diarrhea, increased respiratory rate, and cyanosis. The chronic form consists of localized infections like swollen wattles, sinuses, joints, foot pads, conjunctivitis and pharyngitis, torticollis and dyspnea. Diagnosis can be made through cytology of a choanal swab stained with Wright's stain or PCR. Treatment involves antibiotics (sulfanomides and tetracyclines).

Sudden mortality events

When large mortality events over a short period of time occur, both velogenic Newcastle Disease Virus and Highly Pathogenic Avian Influenza must be considered. Birds with both diseases often die acutely without lesions; however, birds may have blue combs/wattles, skin hemorrhages, torticollis, ataxia, and piling. Vaccination for endemic Newcastle is available but typically only administered for birds that are taken to shows. Voluntary participation in certification programs allows owners access to testing for Low Pathogenic Avian Influenza Viruses (as well as other pathogens such as *Salmonella pullorum* and *gallinarum*). The National Poultry Improvement Plan (NPIP) is a voluntary cooperative plan involving State and Federal governments and the poultry industry. It was initiated to mitigate infectious diseases, including *Salmonella*. Backyard owners with breeding birds can participate in the plan. Owners who purchase from NPIP certified flocks are assured disease-free birds.

Diseases that are less common in backyard chickens

Mycobacteriosis caused by M. avium complex (MAC) is more common in smallflock operations that maintain older chickens. It is a protracted and chronic disease with high morbidity and mortality due to chronic wasting. Birds have biliverdinuria, lameness, and diarrhea, enlarged liver and spleen and granulomas on spleen, liver and intestines. Mycobacterium persists in the environment for long periods and there is no treatment other than depopulation and disinfection through burning of soil and housing.

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SINONASAL ASPERGILLOSIS; FROM ENDOSCOPIC TO SURGICAL TREATMENT

Gert Ter Haar

AniCura Specialistische Dierenkliniek Utrecht, Surgery, Utrecht, Netherlands

Qualifications:

Gert ter Haar

DVM, PhD, DECVS

Gert.terHaar@anicura.nl

Introduction

Nasal aspergillosis is a condition characterized by destruction of the nasal turbinates associated with the growth of large colonies of fungal hyphae. Masses formed by the fungal hyphae are often referred to as aspergillomas. Though dogs noses can be infected by other fungi like Penicillium, Cryptococcus, Rhinosporidium and Trichosporon species, Aspergillus species are the most common ones. Aspergillus is a saprophytic fungus, ubiquitous in the environment, with world-wide distribution. A. Fumigatus is the most common species encountered, although A. Niger, A. Clavatus, A. Terreus, A. Nidulans, and A. Flavus are occasionally involved. Aspergillus fumigatus grows most abundantly in decaying vegetation, sewage sludge compost, decomposing wood chips, moldy hay, and organic compost piles. The aspergillus species produce large numbers of small spores (2-3 mm), which are the source of infection for animals. The capacity of fungal elements to result in infection may depend upon both host immunocompetence and virulence factors associated with the fungal organism. Trapping and removal of inhaled fungal elements by the respiratory tract mucociliary defences usually prevent deeper access. Where this fails, additional innate immune system mechanisms are employed, including the alternative complement system, phagocytic cells, natural killer and T-cells which work to destroy pathogens intracellularly or by secretion of compounds extracellularly. Exposure to large fungal inocula, reduced mucociliary clearance, decreased phagocytic cell numbers or impairment in their capacity to destroy organisms are therefore thought to be key factors in the etiopathogenesis of the infection. Though immunologic studies performed before and after treatment have revealed both T- and B-cell dysfunction, canine nasal aspergillosis usually occurs without concomitant malignant or immuno-suppressive disease, and affected dogs are in otherwise excellent health.

Symptoms

The disease is usually seen in dolichocephalic and mesocephalic dogs and is very rare in brachycephalic breeds. Specific breed predispositions are observed, such as in the Golden Retriever and other retriever dogs. Dogs of any age may be affected, but approximately 40% are 3 years or younger and 80% are 7 years or younger. The disease is very uncommon in dogs younger then 1 year old. Male and female dogs appear to be equally affected, a male predisposition is not consistently supported. The main clinical features are profuse nasal mucopurulent to sanguinopurulent discharge or frank epistaxis, sneezing, reverse sneezing, nasal pain, and ulceration of the external nares. Depression as a result of pain and frontal sinus involvement can occur in a later stage of the disease. Additionally, in severe disease signs of systemic illness, facial deformity, epiphora and seizures as a result of erosion through the cribiform plate may be identified.

Diagnosis

No single diagnostic test is accurate enough when considered in isolation. False-positive and false-negative results occur with cytologic, histopathologic, mycologic, and serologic testing. Blind cytologic examination or culture of discharge is often unrewarding and can erroneously suggest the disease to be a simple bacterial rhinitis. Cytologic examination may also reveal Aspergillus or Penicillium as contaminants. Therefore caution should also be taken in interpreting a positive fungal culture result. After culture of nasal swabs taken blindly from normal dogs of from dogs with nasal neoplasia, 30% to 40% cultured positive for either Aspergillus or Penicillium spp.

Radiographic features of sinonasal aspergillosis are well described and usually demonstrate focal to advanced turbinate destruction within the nasal cavity, evident as wide-spread punctuate lucencies or a generally increased radiolucency. Mixed-density patterns or an overall increase in opacity may be seen with accumulation of fungal plaques, debris or discharge. CT improves sensitivity compared to radiography for demonstration of cribriform plate involvement, mucosal thickening and reactive maxillary, vomer and frontal bones.

Direct visualisation with rhinoscopy is a particularly valuable diagnostic tool because the fungus destroys turbinate tissue leaving a large airspace within the nasal cavity, which in turn affords good visualisation of fungal plaques. Rhinoscopy may demonstrate marked turbinate destruction, mucoid nasal discharge on chronically inflamed remnant turbinates and fungal plaque which appear as white, yellow, or light-green mold lying on the mucosa. Sometimes masses or granulomas are seen, which should be biopsied in all cases. With marked turbinate destruction, even with rigid endoscopes the frontal sinuses can be evaluated. If the frontosinal ostium is not obviously patent, trephination of the frontal sinus with or without sinoscopy may be necessary to retrieve samples for culture and for treatment. Rhinoscopy assisted biopsies will allow for the highest detection rates of Aspergillosis. Histopathological examination is highly accurate in detecting Aspergillosis and findings are usually consistent with chronic, erosive, non-invasive mycotic rhinosinusitis with a mixed neutrophilic and mononuclear to lymphoplasmacytic infiltrate, though actual fungal hyphae are not seen in all cases. Serologic diagnosis is possible utilizing agar gel immunodiffusion, counter immunoelectrophoresis or enzyme-linked immunosorbent assay, but results are variable with respect to sensitivity and specificity and do not affect treatment options or outcome.

Treatment

A variety of conflicting opinions regarding the treatment of sinonasal aspergillosis exist and often the use of a particular treatment protocol is based upon personal or regional preference. Though the evidence base in support of individual treatment recommendations is weak, topical antifungal administration remains the most widely used method of treatment in dogs. Poor clinical responses are reported when oral azole antifungal agents alone are prescribed, but they may be indicated as part of a treatment regimen for infections that have invaded extranasal structures. In addition, these treatments are expensive, prolonged and possibly give rise to hepatotoxicity. Surgical treatment in the form of rhinotomy is controversial and probably best left for refractory cases only.

Original topical therapeutic techniques involved instillation of enilconazole twice daily for 7 to 14 days, via catheters surgically implanted into the nasal cavity. Although very successful (success rates between 80-95%), prolonged hospitalisation and morbidity led to declining popularity. Administering the antifungal agent not as a flush but instead as a 1-hour soak using general anesthesia revolutionized topical therapy. The distribution of topical agents after noninvasive infusion via the external nares has been studied in both normal dog skulls and in dogs with fungal rhinitis. A foley catheter (24-French diameter) is retroflexed into the nasopharynx to occlude this area (along with gauze sponges) and the drug is delivered through the external nares into the dorsal nasal meatus with additional catheters (10 French) whilst the external nares are blocked by others (12 French). A 1% solution of clotrimazole is introduced under pressure (60 ml per side for middle to large breeds, to a pressure of 15 cm H2O) to enhance drug distribution. Furthermore, by placing the dog on its back to start with and rotate the dog every 15 minutes with 90 degrees to achieve a full 360 degrees after one hour, very good distribution is obtained. Care must be taken after the procedure is completed to allow

the solution to drain out with the dog in sternal recumbency and its head tilted ventrally and to remove all gauze sponges and suction the pharynx. Enilconazole and clotrimazole have both been evaluated at varying concentrations with outcomes varying from 47 to 70% for first treatment outcome and 90 to 94% for overall success, albeit in small numbers of dogs for some studies. It is the author's opinion that thorough endoscopic debridement before topical treatment is installed will lead to the highest success rates using this technique.

Further improvements in topical treatment consisted of the use of viscous antifungal creams for application in the frontal sinuses installed either during perendoscpic guidance or after trephination of the frontal sinus and evaluation of the sinus with endoscopy to assure complete removal of fungal material.

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TRIAGEM CARDíACA E ABORDAGEM AO PACIENTE DISPNEICO

Rui Máximo

Faculdade de Medicina Veterinária, Universidade de Lisboa, Hev, Lisboa, Portugal

Qualifications:

Rui Miguel de Oliveira Gomes Máximo

DVM, CertAVP

rmaximo78@gmail.com

Triagem Cardíaca e Abordagem ao Paciente Dispneico

A receção de um paciente dispneico é um dos desafios clínicos mais frequentes no dia-a-dia de uma clinica/hospital veterinário. O maneio inicial e a estabilização do paciente são fundamentais para o sucesso terapêutico e para a sobrevivência do paciente.

É da natureza dos nossos animais de companhia ocultar sinais clínicos de doença, o que leva a que estes se apresentem muitas vezes numa situação frágil, daí a manipulação cuidadosa ser fundamental em qualquer paciente dispneico, seja gato ou cão.

O Enfermeiro veterinário que recebe uma urgência de um paciente dispneico deverá numa primeira fase conseguir estabilizar o paciente.

A fase seguinte é tentar identificar qual a causa mais provável da dispneia. Mais uma vez, a fragilidade destes pacientes não permite exames muito invasivos como radiografia ou ecocardiografia. Para uma diferenciação de causa cardíaca *versus* respiratória na origem da dispneia, existem algumas ferramentas que podem (e devem) ser utilizadas nestes pacientes para nos ajudar no raciocínio clínico e na tomada de decisões.

O objetivo desta palestra é fornecer ao enfermeiro veterinário ferramentas úteis para este processo de decisão:

Como receber um paciente dispneico

Estar preparado antes da entrada do paciente

O maneio correto de um paciente dispneico é essencial: o stress/intervenção excessiva antes da estabilização pode precipitar uma crise respiratória. Devemos ter um local próprio onde recebemos as urgências respiratórias. É fundamental nesse local haver meios disponíveis para a administração de oxigénio e um *crash car*.

O *crash car* deverá estar equipado com tubos endotraqueais, ambu, laringoscópio, fármacos de urgência, material para realização de toracocentese e material de monitorização.

Formas de administração de oxigénio

A administração de oxigénio pode ser efetuada de várias formas, *flow-by*, máscara, cateter nasal, entre outras. Existem vantagens e desvantagens nas diferentes formas de administração. A escolha é realizada em função das características do paciente, da sua apresentação clínica e dos recursos humandos presente no apoio à urgência. As diferentes formas de administração estão descritas na seguinte tabela:

Técnica	Equipamento	Taxa	Pros	Contras
Jaula	Jaula de O2 ou incubadora	3-10 l/min (depende tamanho)	Menos stress	Concentração de O2 (dificuldade em atingir e manter concentração elevada)
Colar	Cobrir 80% colar isabelino com papel transparente	0.5-1 l/min	Menos stress	Alguns pacientes não toleram. Rico de hipertermia e acumulação de CO2.
"Flow-by"/ Máscara	-	2-3 l/min	Fácil de montar	Mal tolerado por gatos acordados
Cateter Nasal	Tubo alimentação (4-6 fr) com anestésico local	500-100 ml/kg/min	Muito eficaz	Colocação stressante Mal tolerado

Estratégias de redução de stress

Como já referido, a manipulação deve ser mínima e os pacientes devem ser sedados para redução do stress/ansiedade (ex: butorfanol 0,2-04 mg/kg SC ou IM).

Colher uma história clínica de forma breve e direcionada para um paciente dispneico.

A colheita de historia clinica é fundamental em qualquer paciente, em pacientes instáveis não há a mesma disponibilidade de tempo comparativamente a uma situação não urgente. Este poderá ser feito em simultâneo enquanto decorre estabilização por outro elemento da equipa. As questões devem ser direcionadas com o objetivo de obtenção do máximo de informação possível que nos auxilie na identificação da causa da dispneia. Exemplos:

Anamnese (idade, raça etc)

Poderá ter havido Trauma?

Os sintomas são agudos ou crónicos?

Existe alguma doença respiratória/cardíaca previamente diagnosticada?

Fez alguma medicação? Que resposta houve a essa medicação?

É importante nesta fase tentar obter sempre um consentimento/declaração de sedação. Poderá ser necessário a realização de procedimentos invasivos (ex: toracocentese)

Observação do padrão respiratório.

A observação do padrão respiratório é um auxiliar importantíssimo na tentativa de localização anatómica de causa da dispneia. O clássico exemplo é a do paciente com dispneia marcadamente inspiratória que nos permite de imediato localizar a causa da dispneia nas vias aéreas superiores. No decorrer da palestra serão abordados os tipos de dispneia:

PADRÃO	Descrição	Localização	D.D mais comuns	Exames a fazer
Inspiratório	Fase inspiratória lenta e longa, frequentemente acompanhada por estridor.	Aparelho respiratório superior	Obstrução nasofaríngea (pólipo, CE), obstrução laringe (massa, lesão inflamatória, paralisia, etc)	Visualização/ imagem vias áreas superiores
Restritivo	Padrão rápido e superficial com um esforço uniforme na inspiração e expiração	Espaço pleural, alvéolos e interstício.	Efusão pleural, pneumothorax e ICC.	TFAST. NT-proBNP? Rx torax? (apenas se estável)
Panting	Paroxístico: boca aberta, rápido, curto, respiração pouco profunda	Não específico; pode não representar uma verdadeira dificuldade respiratória se o padrão respiratório for normal entre episódios	Stress Hipertiroidismo Doenças cardiovasculares dir-esq	Dependente de restante Quadro clinic.
Inspiratório	Fase inspiratória lenta e longa, frequentemente acompanhada por estridor.	Aparelho respiratório superior	Obstrução nasofaríngea (pólipo, CE), obstrução laringe (massa, lesão inflamatória, paralisia, etc)	Visualização/ imagem vias áreas superiores
Restritivo	Padrão rápido e superficial com um esforço uniforme na inspiração e expiração	Espaço pleural, alvéolos e interstício.	Efusão pleural, pneumothorax e ICC.	TFAST. NT-proBNP? Rx torax? (apenas se estável)
Panting	Paroxístico: boca aberta, rápido, curto, respiração pouco profunda	Não específico; pode não representar uma verdadeira dificuldade respiratória se o padrão respiratório for normal entre episódios	Stress Hipertiroidismo Doenças cardiovasculares dir-esq	Dependente de restante Quadro clinic.

Observação do padrão respiratório:

NOTA: Quando os sinais de stress respiratório são associados a alterações posturais como a ortopneia, o paciente deve ser considerado como muito instável.

Ferramentas úteis na diferenciação cardíaco *versus* respiratório, exame clínico sumário.

Nesta palestra vão ser abordadas várias ferramentas que são úteis nesta diferenciação:

Características do exame clínico como a intensidade do sopro e como esta se correlaciona com a gravidade da doença na doença mixomatosa mitral (1), ou como um som de galope pode ser útil nos gatos nesta distinção(2).

A utilidade do POCUS (*point-of-care ultrasound*) demonstrado tanto em cães (3,4) como em gatos (4,5) e dos biomarcadores cardíacos como o NT-proBNP vão também ser discutidos (5–8).

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NEUROLOGIC AND OCULAR MANIFESTATIONS OF VECTOR BORNE DISEASES

Jane Sykes

University of California-Davis, Department Of Medicine & Epidemiology, Davis, United States of America

Qualifications:

Jane Emily Sykes

BVSc(Hons) PhD MBA GCPH DipACVIM(SAIM)

jesykes@ucdavis.edu

Neurologic and Ocular Manifestations of Vector-Borne Disease

Jane E. Sykes BVSc(Hons) PhD MBA GCPH DipACVIM(SAIM)

Professor, University of California-Davis

Signs of neurologic and ocular disease in dogs and cats can result from infection with many vector-borne pathogens, although the underlying pathogenetic mechanisms are varied. These signs can be life-threatening or lead to permanent disability. Considering vector-borne pathogens on the list of differential diagnoses early is important, as early treatment has the potential to improve outcomes. In addition, when neurologic disease occurs, it has important public health significance, because the clinical signs can resemble those of rabies. Neurologic and ocular manifestations may result from infection by viruses, bacteria, protozoal organisms, and parasites. In addition, a variety of vectors may be involved (sandflies, fleas, ticks, mosquitos, and midges). Because many of these pathogens can cause disease in humans, dogs and cats represent important sentinels for human infection. The geographic distribution of these diseases reflects that of the vectors and reservoir hosts, and often occurs seasonally. This session discusses some of the more important vector-borne pathogens that cause these signs, the underlying pathogenic mechanisms, and treatment.

Arboviral Diseases

A large number of enveloped RNA viruses that are spread by arthropod vectors (sometimes referred to as *arboviruses*, for *ar*thropod-*bo*rne *viruses*) infect dogs and cats, often causing encephalitis. Disease is sporadic, and infections are often subclinical. Dogs and cats, as well as other domestic animal and human hosts, are generally considered "dead end" hosts. After transmission, viremia occurs, and neuroinvasion can then lead to neuronal necrosis and non-suppurative inflammation. Arboviruses capable of causing neurologic disease in dogs include alphaviruses (especially eastern equine encephalitis virus [EEEV]), the reovirus African horse sickness virus, and flaviviruses (West Nile virus and tick-borne encephalitis virus).

Bacterial Diseases

Ehrlichioses

Among *Ehrlichia* species that infect dogs, neurologic signs have primarily been described in association with *Ehrlichia canis* infection. *Ehrlichia canis* is primarily transmitted by *Rhipicephalus sanguineus*. Infection occurs in dogs in Asia, Africa, Europe, the Americas, and most recently in Australia. Subclinically-infected dogs may be transported to non-endemic regions and subsequently develop disease (canine monocytic ehrlichiosis [CME]) months or years later. The course of CME has been divided into acute, subclinical, and chronic phases, but chronic CME develops in only a small percentage of infected dogs. Clinical signs occur 8 to 20 days after infection, and include lethargy, fever, lymphadenomegaly, splenomegaly, and mucosal bleeding. Although not always present, classically the chronic form is manifested by severe pancytopenia, which results from hypoplasia of all bone marrow cell lines. Neurologic and ocular signs are more often observed in the acute phase and result from hemorrhage or non-suppurative inflammation (uveitis, retinitis, meningitis). Dogs with CNS involvement may have increased CSF protein concentrations and lymphocytic pleocytosis. Occasionally, morulae have been reported in cells within the CSF.

Granulocytic Anaplasmosis

Anaplasma phagocytophilum is transmitted worldwide by *Ixodes* ticks. Disease occurs in dogs, cats, humans, horses, and, in Europe, domestic ruminants. In the United States, *A. phagocytophilum* is most prevalent in the upper Midwest, northeast and western states. Infection also occurs throughout continental Europe and the United Kingdom, Asia, and Russia. *Anaplasma phagocytophilum* replicates and forms morulae within the cytoplasm of neutrophils and eosinophils. The major clinical signs of infection are fever, lethargy, inappetence, splenomegaly, and lameness due to polyarthritis; but ocular and neurologic signs also can occur. These can be subtle, such as scleral injection and cervical pain due to meningitis; such signs are often overlooked but can be important clues to diagnosis. Occasionally neurologic signs are more severe, and include seizures, circling, and decreased placing reactions. Neurologic signs have also been described in humans.

Rickettsioses

Rickettsia rickettsii and *Rickettsia conorii*, the cause of Rocky Mountain Spotted Fever (RMSF) and Mediterranean Spotted Fever, respectively, are the main *Rickettsia* species associated with disease in dogs and humans. However, other spotted fever group rickettsias are being recognized as causes of disease in humans and dogs. RMSF occurs in North America, Central America, and South America (where it is known as Brazilian Spotted Fever). In the United States, *Rickettsia rickettsii* is primarily transmitted by *Dermacentor* ticks (especially *Dermacentor variabilis*) and *Rhipicephalus sanguineus* which is reflected by its geographic distribution in the southeastern and south-central United States. However, it is also transmitted by *Amblyomma* species (*Amblyomma cajennense* and *Amblyomma aureolatum*). *Amblyomma americanum* may be capable of transmitting *Rickettsia rickettsii* and/or other pathogenic spotted fever group rickettsias in the United States. *Rickettsia conorii* is transmitted by *Rhipicephalus* ticks, and is found in Europe, Africa, Asia, and the Middle East.

Spotted fever group rickettsias primarily infect endothelial cells, which leads to systemic vasculitis. Disease occurs after a short incubation period and typically death or recovery follows within 2 weeks. In people, cutaneous macules, papules, and petechiation that occur in association with vasculitis look like "spots," hence the name "spotted fever." Vasculitis results in hemorrhage, tissue edema, hypovolemia, and microthrombosis. Clinical signs include fever, lethargy, lymphadenopathy, splenomegaly, respiratory signs, polyarthritis, cutaneous involvement (petechiae, ecchymoses, edema, hyperemia, necrosis), and arrhythmias. Ocular signs are common and include conjunctivitis, uveitis, and retinal hemorrhages. CNS abnormalities can be focal or generalized and include paraparesis, tetraparesis, ataxia, hyperesthesia, central or peripheral vestibular signs, stupor, seizures, and/or coma. Residual neurologic deficits may occur after infection in severely affected individuals.

Lyme Disease

Lyme disease is caused by spirochetes that belong to the genus *Borrelia*; *Borrelia burgdorferi* sensu stricto in the United States, and in Eurasia, primarily *Borrelia afzelii, Borrelia bavariensis*, *Borrelia garinii*, and *Borrelia burgdorferi* s.s. These bacteria are transmitted by *Ixodes persulcatus* complex ticks. In North America, the geographic distribution is mostly limited to the northeastern U.S., southeastern Canada, and the upper midwestern U.S., with scattered foci in California. In Europe, most cases occur in Scandinavia and in areas of central Europe with moderate temperature and moderate humidity. From the tick bite site, borreliae

replicate and migrate through skin and connective tissues. Signs in humans include cutaneous lesions (erythema migrans and acrodermatitis chronica atrophicans), arthritis, neurologic signs (cranial nerve palsy, polyradiculitis, and meningitis), and rarely, arrhythmias secondary to myocarditis. The main outcomes in infected dogs are polyarthritis and/or protein-losing nephropathy. Although neuroborreliosis is an important late manifestation of infection in humans, especially due to *B. garinii*, neurologic signs have not been associated with infections in dogs. Experimentally, infected young dogs developed mild focal meningitis, encephalitis, and perineuritis; neurologic signs were not observed.

Protozoal Diseases

Babesiosis

Babesiosis in dogs is caused by a variety of tick-transmitted protozoal piroplasms of the genus *Babesia*. Some species (such as *Babesia gibsoni* in North America and Europe) can be transmitted through aggressive interactions among dogs and transplacental transmission where competent vectors are absent. *Babesia* spp. divide by binary fission in erythrocytes; the most common manifestations of disease relate to erythrocyte destruction and anemia, with fever, lethargy, pallor, and splenomegaly. The three subspecies of *Babesia canis* have now been reclassified as *Babesia canis*, *Babesia vogeli*, and *Babesia rossi.* Infections with *Babesia rossi* have the most severe consequences, including hypotension, acute kidney injury, neurologic complications, disseminated intravascular coagulation, hepatopathy, and acute respiratory distress syndrome. *Babesia rossi* is transmitted by the yellow dog tick, *Haemaphysalis elliptica* (formerly *Haemaphysalis leachi*), and has a geographic distribution that is primarily limited to Africa, with the overwhelming majority of infections reported from South Africa. Neurologic signs result from sludging of erythrocytes in the CNS. Increased adhesiveness of erythrocytes results from activation of the kallikrein system by soluble parasite proteases, which induces formation of fibrinogen-like proteins. Hypoxemia and hypoglycemia can also result in neurologic signs.

Leishmaniosis

Leishmania spp. infections are transmitted by sandflies of the genus *Phlebotomus* in the Old World (Africa, Europe, and Asia) and *Lutzomyia* in the New World (the Americas). Transplacental infections can also occur. Ocular manifestations of leishmaniosis in dogs are varied and include anterior uveitis, blepharitis, conjunctivitis, keratoconjunctivitis sicca, panophthalmitis, and glaucoma. In keratoconjunctivitis sicca, inflammatory infiltrates located around the lacrimal ducts cause secretory retention and decreased tear production. In some cases, ocular abnormalities are the only clinical signs. Dogs with CNS involvement have most commonly a lymphocytic pleocytosis in association with non-suppurative meningitis. Inflammatory cell infiltration including lymphocytes, macrophages, plasma cells, and some neutrophils have been described in the choroid plexi, subventricular zone, and leptomeninges as well as around parenchymal blood vessels in dogs.

Conclusions

Vector-borne pathogens should be considered on the differential diagnosis list in dogs with acute onset of ocular and/or neurologic signs, depending on regional prevalence. Because neurologic signs typically occur within the first 1 to 2 weeks of infection, diagnosis typically requires organism-detection tests, such as nucleic acid amplification tests. In order to reduce the chance of permanent ocular and neurologic damage, specific anti-infective treatment should be instituted early, based on clinical suspicion, with or without supportive nucleic acid test results. This requires a high level of awareness of the causes reviewed above and a knowledge of their geographic distribution and risk factors for infection.

Supplemental Reading

Greene's Infectious Diseases of the Dog and Cat. Sykes JE. 5th ed. Elsevier. 2023.

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IMPACT ASSESSMENT OF DOG POPULATION MANAGEMENT - ARE WE MAKING A DIFFERENCE?

Elly Hiby

ICAM, Director, Cambridge, United Kingdom

Qualifications:

Elly Hiby

PhD

ellyhiby@icam-coalition.org

Introduction

ICAM (International Companion Animal Management) is a coalition of international animal welfare organisations and specialist groups. Our goal is to increase the use, and improve the effectiveness, of humane dog and cat population management around the world, with a focus on resource-limited communities. Here we explore the role of monitoring and evaluation in improving the impact of humane dog population management (DPM).

We define DPM as a system of services, including reproduction control, vet care and promotion of responsible ownership. Each service influences one or more processes in dog population management, including abandonment, acquisition and confinement/roaming of owned dogs. Efficient DPM systems start with an understanding of dog population dynamics, so that the sources of unwanted or free-roaming dogs are identified and addressed by appropriate services, which then work together to reduce sources and manage the current free-roaming dogs.

ICAM has outlined this approach to DPM in our Humane Dog Population Management guide (2019) available on our website www.icam-coalition.org and taught through our online courses for both implementers and policy makers on our e-learning portal icam.talentlms.com. There is significant alignment between this ICAM guide and the World Organisation for Animal Health's (WOAH) standards on DPM in Chapter 7.7 of the Terrestrial Animal Health Code, designed to support Veterinary Authorities with implementation of DPM.

An ICAM principle of humane DPM is to use an evidence-base for designing, monitoring and evaluating your system of services. The design phase focuses on that question of what processes in dog population dynamics are acting as sources of unwanted or free-roaming dogs, and what are the human behaviours that are driving those processes – another ICAM principle is to recognise the central role of human behaviour in DPM, as domesticated animals, much of dog population dynamics is influences by what people do with dogs. The following explores the subsequent phases of monitoring and evaluation in DPM.

What is monitoring and evaluation?

Monitoring is the collection of data to track whether change is happening. Evaluation uses the data collected through monitoring to learn what has changed and why. Evaluation aims to answer the question "what difference did this intervention make?" by exploring the difference made by the intervention and considering what would have happened without the intervention, also known as the 'counterfactual' (ideally there is a 'control' area available so that the DPM system 'treatment' can be compared to the absence of DPM, but this is rarely achievable). An important step in evaluation is the use of this knowledge to make adaptations to improve impact. The following provides definitions of some of the terms that are used in monitoring and evaluation:

Definition	DPM Example
An **intervention** is a set of activities or services that aims to make a targeted change or impact to a set of people, animals or the environment.	Catch, neuter, vaccinate and release of free-roaming dogs in an Indian city.
Effort is the time and resources put into implementing the intervention.	Financial costs per dog plus capital costs of intervention infrastructure.
Outputs are the immediate achievements of your efforts.	Number of dogs caught, neutered, vaccinated and released.
Impacts are the changes we hope to contribute towards through our interventions.	Reduce rabies. Improve the welfare of roaming dogs.
Indicators are measurable signs of impacts (also known as metrics); they are the things we would see or hear if our desired impact was occurring.	Number of dog rabies cases, dogs bites and human rabies deaths per year. % of roaming dogs with emaciated body condition.
Methods of measurement are the methods we use to measure our indicators.	Quarterly meetings with municipal veterinary department and General Hospital to access data on bites and rabies cases. Body condition scoring of all roaming dogs observed on an annual street survey.

Why invest in monitoring and evaluation?

In recognition of the significant resources required to implement DPM, justification for additional resources to be spent on monitoring and evaluation may be required. Where DPM systems are funded by charitable giving, donors will expect the impact of their funding to be measured and reported. Similarly, the outcome of government funding should be expected by the public who fund such work through their taxes. The public, and in particular dog-owners, may want to hear the outcome from their perspective as beneficiaries of these efforts. But perhaps the most important purpose is for learning and improving the current intervention and subsequent interventions through dissemination of learnings. A further ICAM principle is to recognise and respect that DPM systems are a permanent requirement and not a short-term project to 'solve' a dog problem. However, the DPM system will need to be adapted as dog population dynamics and public expectations change over time – and monitoring and evaluation is necessary to drive this evolution. Hence the investment in monitoring and evaluation should create a return in the form of more efficient systems that are understood and supported by the public.

Monitoring and evaluation of DPM

Developing a monitoring and evaluation system for DPM starts with the identification of the impacts the system is trying to achieve. ICAM has identified 8 broad impacts of DPM, this is not an exhaustive list but includes those commonly stated for DPM systems. Note that most systems will be aiming for 3 or more of these impacts but are unlikely to have all 8 in mind:

Improve dog welfare.

Improve care provided to dogs.

Reduce dog density/Stabilise turnover.

Reduce risks to public health.

Improve public perception.

Improve rehoming centre performance.

Reduce negative impacts of dogs on wildlife.

Reduce negative impacts of dogs on livestock.

These 8 impacts reflect the One Health impact of DPM, leading to changes for people, dogs and other animals. The services within a DPM system also span sectors, including veterinary services, human health, education, legislation and urban development.

Once the impacts have been identified, one or more indicators must be established to measure change in that impact. These indicators need to be accessible to measurement using practical methods of measurement that can realistically be implemented on a regular basis; it is the regularity of measurement that is the defining feature of monitoring. Ideally more than one indicator is used to provide some triangulation of measurement for the impact.

For example, for the impact of improving dog welfare, the body condition score of free-roaming dogs can provide an indicator of welfare that can be scored efficiently without the need for a clinical exam of each dog. A 5-point scale from emaciated through to obese has been used during street surveys of free-roaming dogs to measure a change in their visible welfare state; when used in Jodhpur, India, sterilised dogs had odds of being in an ideal body condition, as opposed to thin or emaciated, that were 1.7 times that of unsterilised dogs (1). The street survey is also an opportunity to score free-roaming dogs for signs of a visible skin problem as another indicator of general welfare state; both as an indicator of their underlying health status and a welfare problem due to potential discomfort.

ICAM has published a guide on monitoring and evaluation that provides a list of recommended and suggested indicators for each of the 8 impacts; 'Are we making a difference? A guide to monitoring and evaluation of dog population management interventions' (2015) also available to download from our website www.icam-coalition.org. Those indicators that are relatively well tested within the DPM context are 'recommend', whilst others have the potential to be valuable for measuring change in stated impacts but are relatively novel to the DPM field and hence are termed 'suggested' indicators. Perhaps more importantly, this guide provides practical advice on implementation of methods of measurement that can be affordably repeated over time. Here are just two examples:

Street surveys are an efficient method of collecting data relating to a range of indicators. Their efficiency makes them particularly suitable for monitoring and evaluation because they can be repeated several times a year. The data collected is only related to roaming dogs seen on public property and the ownership status of these dogs may not be clear: these roaming dogs may be owned roaming, community owned dogs or entirely unowned dogs either born unowned or abandoned/lost by their former owners. Street surveys can provide data related to dog welfare but also population density and turnover by recording the number of dogs observed and indicators of reproductive activity like the percentage of females that are lactating or the percentage of puppies. ICAM has developed a survey app to help with implementing street surveys called Talea which is available on our website. The evaluation of a CNVR project in Bangkok, Thailand, provides and example of the use of street surveys to monitor changes in dog density in response to a DPM system (2).

Data collected through **clinic records** can be used to measure indicators relating to dog welfare, dog population stability and care provided to dogs. These may be records collected by veterinary clinics run specifically for the purpose of population management (low-cost, high-volume clinics) or general practice veterinary clinics. Indicators include animal-based measures including body condition, skin conditions, specific infectious diseases and the percentage of dogs reaching 'old' age. It may also include indicators that measure responsible dog ownership, such as the percentage of dogs that are microchipped, sterilised before their first litter, the proportion of appointments that are for preventative care as opposed to emergency treatment and euthanasia for reasons other than health.

Conclusion

The veterinary sector has an essential role to play in the implementation of DPM systems. Veterinarians also have an important role to play in monitoring and evaluation of DPM; using their skills of objective observation and understanding of the scientific method, they can contribute both data and an important evaluation perspective to drive DPM system improvements.

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LAUNCH OF THE WSAVA ZOONOSES GUIDELINES - WHAT YOU CAN CATCH AT WORK

Michael Lappin

Colorado State University, The Kenneth W. Smith Professor In Small Animal Clinical Veterinary Medicine, College Of Veterinary Medicine And Biomedical Sciences, Fort Collins, United States of America

Qualifications: Michael R. Lappin DVM, PhD, DACVIM
Michael.Lappin@ColoState.edu

Abstract Body: Zoonotic diseases are defined as being common to, shared by, or naturally transmitted between humans and other vertebrate animals. Humans are infected with zoonotic agents from direct contact with the infected pet, contact via contaminated food or water, from shared vectors, and from the shared environment. Direct contact with animal feces (enteric zoonoses), respiratory secretions, urogenital secretions, or infected skin and exudates, as well as bites and scratches can result in human infections. Pets that are healthy, being dewormed, and on flea and tick control are unlikely to be dangerous for their owners. Owners should bring their pet yearly to the veterinarian to assess for zoonotic risk and to appropriately provide preventative health care. Veterinarians should work closely with the family physician on pet ownership issues. Some zoonotic agents are transmitted between animals and man by shared vectors like fleas, ticks, or mosquitoes. *Rickettsia rickettsii* (ticks), *Ehrlichia* spp. (ticks), *Borrelia burgdorferi* (ticks), *Rickettsia felis* (fleas), *Bartonella* spp. (fleas, ticks), *Anaplasma phagocytophilum* (ticks), *Dirofilaria immitis* (mosquitoes), *Dipylidium caninum* (mosquitoes), and West Nile virus (mosquitoes) are examples of vector borne zoonoses. The pet brings the vector of the organism into the environment resulting in exposure of the human. *Bartonella* spp. are notable examples as some species like *B. henselae* survive in flea feces for days. Flea and tick control should always be maintained on our client's animals and infested animals that are seen in the clinic should be treated immediately. Use of flea control products have been shown to block transmission of *B. henselae* amongst research cats and so theoretically could lessen transmission to humans. Neurobartonellosis (headaches, blurred vision) in veterinary health care providers is now recognized as an important zoonotic disease syndrome related to *Bartonella* spp. in flea frass. Some zoonotic agents including *Sporthrix schenkii*, *Histoplasma capsulatum*, *Coccidioides immitis*, *Blastomyces dermatitidis*, *Cryptococcus neoformans*, and *Aspergillus* spp do not usually infect humans from direct with the infected pet but are acquired from the same environmental source. The WSAVA One Health Committee has assembled a group of small animal veterinarians, veterinarians that specialize in non-traditional pets, and physicians to make a group of recommendations about direct zoonoses including agents transmitted by vectors. In the core document, to be published in Journal of Small Animal Practice if approved, recommendations are given for control of zoonoses common around the world. In the future, regional guidelines are expected to follow. In the lecture today, I will present the major disease agents being covered in the guideline. Most of the agents discussed in this lecture can infect and cause disease in anyone, but disease is generally more prevalent or more severe in those that are immunodeficient. Humans with AIDS are discussed most frequently, but there are many more immunodeficient individuals including the very old, the very young, and those receiving chemotherapy for immune-mediated diseases, organ transplantation, or neoplasia. Humans are unlikely to contract zoonotic diseases from contact with their pets and so in most cases do not need to relinquish their animals. The Centers for Disease Control of the United States online site, Healthy pets Healthy People (http://www.cdc.gov/healthypets/index.html) is a great resource for veterinarians and owners. The American Association of Feline Practitioner's Zoonoses Guidelines states 'All human or animal care providers should provide accurate information to pet owners concerning the risks and benefits of pet ownership so that an informed decision about acquiring and keeping pets can be made' (Lappin et al, 2019). The Companion Animal Parasite Council also provides great information to help with decision making about zoonotic parasitic diseases (www.capcvet.org; www.petsandparasites.org/). The WSAVA One Health Committee encourages veterinarians and physicians to work closely together to determine the risks associated with pet ownership for individuals and their families.**Enteric zoonoses.** There are multiple infectious agents of the gastrointestinal tract that potentially can be shared between pets and humans. Since some enteric zoonotic agents are infectious when passed with feces (*Campylobacter* spp., *Salmonella* spp., *Giardia* spp., *Cryptosporidium* spp. and others), direct contact with infected animals can result in human infections. However, it is felt that most enteric zoonoses result from ingestion of the infectious agent in contaminated food, water, or other environmental sources. *Giardia* spp., *Cryptosporidium* spp., *Toxocara* spp., and *Toxoplasma gondii* are notable examples. *Toxoplasma gondii*, hookworms, and roundworms require a period outside the host prior to becoming infectious. While on the zoonoses list, *Giardia* and *Cryptosporidium* spp. of dogs and cats are rarely detected in people and human strains have not been associated with illness in pets. The minimal diagnostic plan to assess for enteric zoonoses in pets with diarrhea includes a fecal flotation, *Giardia* spp., screening procedure, and fecal wet mount. Fecal culture should be considered if *Salmonella* spp. or *Campylobacter* spp. are on the list of differential diagnoses. In the United States, heartworm preventatives that control hookworms and roundworms are recommended year round (http://www.capcvet.org). Dogs and cats with normal stool are not considered human health risks. **Bite, scratch, or exudate exposure zoonoses.** Approximately 300,000 emergency room visits per year are made by people bitten by animals in the United States. Local infections are most common but 28% to 80% of cat bites become infected and severe sequelae can develop. Immunodeficient humans or humans exposed to *Pasteurella* spp., *Capnocytophaga canimorsus* (DF-2), or *Capnocytophaga cynodegmi* more consistently develop systemic clinical illness. Splenectomized humans are at increased risk of developing bacteremia. *Mycoplasma* spp. and L-form bacteria infections of people has been associated secondary to dog or cat bites. *Bartonella* spp. *Yersinia pestis*, and *Francisella tularensis* infections of humans can be associated with bites and scratches but these agents are also vector-associated zoonoses. Of the many fungal agents that infect both humans and animals, only *Sporothrix* spp, and the dermatophytes have been shown to infect humans upon direct exposure. *Histoplasma*, *Blastomyces*, *Coccidioides*, *Aspergillus*, and *Cryptococcus* infections of humans and animals can occur in the same household, but infection of humans generally results from a common environmental exposure rather than by direct contact with an infected animal. Rabies is still the only significant small animal viral zoonosis in the United States. Psuedorabies is a herpesvirus that infects pigs; dogs and humans can develop self-limiting pruritic skin disease following exposure. Feline retroviruses are not zoonotic.**Respiratory and ocular zoonoses**. *Bordetella bronchiseptica* and *Chlamydla felis* cause mild respiratory disease and *C. felis* has rarely been associated with conjunctivitis in people. Most people with *Bordetella* infections are infected by *B. pertussus* but some immunocompromised people develop infection by *B. bronchiseptica*. Humans are the principal natural hosts for *Streptococcus* group A bacteria, *S. pyogenes* and *S. pneumoniae*, which cause "strep throat" in people. Dogs or cats in close contact with infected humans on rarely develop transient, subclinical colonization of pharyngeal tissues and so theoretically can transmit the infection to other humans. *Yersinia pestis* and *F. tularensis* can be transmitted from cats or dogs to people in respiratory secretions. Several influenza A viruses have been detected in dogs or cats. SARS-CoV-2 is a well documented reverse zoonosis (passed from infected owners to their pets) but only causes transient and mild infection in small companion animals with cats and hamsters being the most permissive.**Genital and urinary tract zoonoses.** *Leptospira* spp. (dogs more than cats), *Brucella canis* (dogs), and *Coxiella burnetii* (cats more than dogs) are the most common zoonotic agents in this group. *Coxiella burnetii* is a rickettsial agent found throughout the world, including North America. Many ticks, including *Rhipicephalus sanguineus*, are naturally infected with *C. burnetii* and so this agent is also a shared vector zoonoses. It most commonly is associated with respiratory disease in infected humans that come in contact by inhaling the organism which is shed in high numbers

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SYSTEMIC ASPECTS OF ORAL HEALTH

Jerzy Gawor

Klinika Weterynaryjna Arka, Dental Department, Krakow, Poland

Qualifications:

Jerzy Pawel Gawor

DVM PhD, Dipl AVDC, Dipl EVDC, FAVD

jgawor@pp.com.pl

The oral cavity is not an isolated area in animals and many systemic conditions influence oral structures. In carnivores, the oral cavity is not only the beginning of the alimentary tract but also a sensory apparatus and is used for offense and defense. Attention to the patient as a whole is important to avoid tunnel vision and thus missing a precise diagnosis when the oral lesion might be only a part of a wider clinical syndrome. Therefore, on seeing oral lesions, one must take into account their varied possible causes, collect a full general history and perform a thorough general physical examination.

The list of conditions presented below includes selected diseases which, in their clinical appearance, affect oral health or functionality.

Genetic and developmental disorders: Cleft lip, cleft palate, hydrocephalus and deformations of the palate, nose, pharynx, lip or tongue are associated not only with malfunction of the oral cavity but also can lead to severe disease or even death. Masticatory muscle myositis (MMM), cranio-Proceedings mandibular osteopathy (CMO) and temporomandibular joint dysplasia affect the functionality of the masticatory apparatus and the comfort of the patient. Von Willebrand's disease is also a genetic syndrome, which can nowadays be diagnosed using a commercial test and in predisposed breeds (e.g. Doberman Pinschers) this test should be performed as a qualification to any surgery in particular when teeth extraction is planned.

Systemic diseases:

Infectious disease: Diseases that are caused by viruses and are associated with oral lesions include: viral papillomatosis, feline calicivirosis, feline herpesvirus, feline immunodeficiency virus or feline leukemia virus. Canine distemper and infectious hepatitis can, due to fever and vomitus, influence enamel development and enamel quality in dogs.

Chlamydia spp., Clostridium tetani, Leptospira canicola and Fusobacterium are microorganisms, which cause infections that affect the functioning of the oral cavity.

Although mycotic infections of the oral cavity are uncommon, Candida species can appear as an opportunistic agent in stomatitis. Aspergillus infection mostly affects the nasal cavity and sinus but it may penetrate the nasopalatine ducts and cause oral lesions. Blastomycosis and cryptosporidium are reported as causative factors of oral or oropharyngeal lesions. Actinomyces in rabbits should be considered when a differential diagnosis for facial abscesses is considered.

Immune related disorders: Erythema multiforme (EM), eosinophilic granuloma complex (EGC), pemphigus vulgaris, mucous membrane pemphigoid, epidermolysis bullosa aquisita and systemic lupus erythematosus are on the list of immune related inflammatory diseases causing oral lesions and oral signalments. Pemphigus foliaceus and bullous pemphigoid do not usually present with oral lesions. In this group, one should also include problems that are exclusively related to the oral cavity and surroundings but severely affect the animal: feline chronic gingivitis stomatitis (caudal stomatitis), plaque-associated stomatitis in dogs, feline juvenile gingivitis. In puppies, juvenile dermatitis present on the face may cause difficulty in eating due to pain.

Metabolic disease: Severe clotting system disorders associated with bone marrow disorders or thrombocytopenia, osteopenia juvenalis very often caused by malnutrition, hyperparathyroidism associated with renal failure, diabetes, hypothyroidism and acromegaly are all maladies that must be taken into account when a differential diagnosis for oral and maxillofacial problems is considered. Additionally many of them require stabilization and control to efficiently manage periodontal disease.

Toxic conditions: The toxic influence of some medicines can result in intrinsic staining of the dentition, tooth discoloration or proliferation of the gingiva. Poisons, chemical burns, snake or insect bites, which affect the animal through oral cavity, can cause lesions in oral mucosa.

Traumatic conditions: neuropraxia is a disorder of the peripheral nervous system in which there is a temporary loss of motor and sensory function due to blockage of nerve conduction, usually lasting an average of six to eight weeks before full recovery. It often occurs after overuse of the jaws while, for example, carrying heavy timbers or tyres by ambitious dogs. Seizures, accompanying epilepsy or other neurological disorders, may cause tongue injury during the attack. Similar injuries can happen after prolonged desensitization of tongue after a badly performed nerve block.

Idiopathic problems: vitiligo, myositis atrophicans, proliferative stomatitis.

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ANESTHESIA & ANALGESIA CONCERNS FOR GERIATRIC PATIENTS

Tamara Grubb

International Veterinary Academy of Pain Management, Ivapm, Uniontown, United States of America

Qualifications:

Tamara Grubb

DVM, PhD, DACVAA, President, IVAPM

tamaragrubb@wsu.edu

Improved preventive care and support of aging patients has led to longer life spans and a subsequent increase in the number of senior/geriatric patients that may need anesthesia at some point in their later years. The percentage of senior/geriatric dogs and cats in veterinary practices is estimated at 44% of the total patient population (AAHA Senior Care Guidelines 2023). Because of the wide range of breeds and body sizes, dogs don't age at the same speed so an exact age is not specified but the geriatric life stage is generally considered to be the last 20% to 25% of the animal's normal expected life span (Hoskins 2004). Cats are more uniform and the AAFP has defined senior cats as >10 years of age (AAFP-AAHA Feline Life Stage Guidelines 2021). However, as with humans, dogs and cats age at different rates and patients close to these age ranges may have changes associated with aging, often defined as 'frailty', that can impact overall health status.

Although age is not a disease, limited organ reserve is likely to be present in aged patients, leading to a blunted physiologic responses to anesthesia-related changes like hypotension and hypoventilation. Central nervous system changes can result in increased 'sensitivity' to anesthetic drugs that manifests as exaggerated or prolonged effects after the administration of drug dosages that are appropriate for young adult patients. However, pre-existing pain is common and can lead to peripheral and central nervous system amplification, resulting in the need for more robust analgesic protocols to decrease the negative impact of pain-related stress. CNS changes can also manifest as age-related dysphoria, anxiety and other behavior changes. The physical and physiologic differences between young adult patients and geriatric patients culminate in increased anesthetic risk in geriatric patients (Brodbelt 2009). A brief review of pertinent changes and their effects on anesthesia is presented in **Table 1**. More information is available in these open-access resources: AAFP-AAHA Feline Life Stage Guidelines (https://www.aaha.org/aaha-guidelines/life-stage-feline-2021/feline-life-stage-home/); AAHA Senior Care Guidelines for Dogs and Cats (https://www.aaha.org/aaha-guidelines/2023-aaha-senior-care-guidelines-for-dogs-and-cats/home/); AAFP Senior Care Guidelines (https://catvets.com/guidelines/practice-guidelines/senior-care-guidelines).

Anesthesia & Analgesia Protocols

Because of the decreased physiological reserves, anesthetic management, with a focus on physiologic monitoring and support, is generally more important than the choice of anesthetic drugs themselves. However the exaggerated response to drugs means that, on occasion, the specific drugs must be chosen carefully and often the drugs will need to be dosed conservatively. For healthy patients, most of the currently used sedative and anesthetic drugs are appropriate, but drug dosages are often lower than those used for young and middle-aged adults. In compromised patients, drug selection may be more critical and drug *dosage* can be extremely critical. Always dose drugs 'to effect' (ie, deliver slowly so that the exact dose required to achieve anesthesia is delivered to the patient). The patient's needs in all 4 phases of anesthesia (preanesthesia, induction, maintenance, recovery) should be determined prior to the administration of any drugs.

Preanesthesia

Preparation: A thorough physical examination is important for all patients, regardless of age. A complete blood count (CBC), serum chemistry and urine analysis (UA) should be strongly considered in most patients and required for geriatrics since underlying organ dysfunction is more common in this age group. An ECG should also be considered and other tests should be performed based on the patient's overall health status (eg, thoracic radiographs for cardiac disease, specific lab tests like thyroid levels, etc...). Hydration status should be critically evaluated since geriatric patients adapt poorly to hypovolemia. Preoperative fluid therapy may be necessary. However, because protein may be low and renal clearance may be compromised, overhydration can occur if fluid needs are not carefully calculated. Geriatric patients are generally fasted before surgery but a short fast (4-6 hours) is likely adequate and will have less of an impact than a long fast on nutritional needs and fasting-related anxiety. Hospital time should be limited, especially in patients with anxiety, with the procedure scheduled early in the day. Strongly consider pre-visit anxiolytics (eg, gabapentin, trazodone, etc.). Because of low oxygen reserve, the patients should be preoxygenated for 3-5 minutes before induction and receive oxygen for as long as necessary (as measured by ability to maintain ≥90% SpO_2 when breathing room air) after the surgical procedure. Carefully assess for pre-existing pain (eg, osteoarthritis) and control pain prior to anesthesia if at all possible. Handle carefully especially when extending limbs for IV catheterization, etc. Provide appropriate analgesia for both the procedure and the underlying disease as pre-existing pain = amplification of pain sensation.

Premedication: All patients, especially geriatric patients, benefit from premedicant sedatives because the sedatives decrease the dose of induction and inhalant drugs required to induce and maintain anesthesia. Since the inhalants, and most of the injectable drugs, cause dose-dependent decreases in cardiovascular and respiratory function, decreased drug dosages can be critical for patient safety. Opioids are an extremely safe class of drugs in veterinary patients and the effects of opioids are reversible, adding to their safety. Opioids alone are often suitable for preoperative analgesia and tranquilization, especially in dogs. Full mu agonists like morphine, methadone and hydromorphone should be the first choice (if available), especially for procedures causing moderate-severe pain. Dosages may need to be decreased and ventilation supported in geriatric patients. Partial-agonist opioids like buprenorphine may not provide adequate sedation when used alone but drug-related cardiovascular and respiratory changes are blunted or absent. Analgesia is moderate. Butorphanol provides moderate sedation but must be supplemented with other drugs for analgesia since the duration of action is very short. Benzodiazepines (eg, diazepam, midazolam), which cause minimal to no respiratory and cardiovascular changes, can be added to the opioids if more sedation is needed. Acepromazine might be used in some cases but the duration of action can be extremely prolonged if hepatic metabolism is impaired. Also, acepromazine-mediated vasodilation may contribute to hypotension in patients with minimal vascular and baroreceptor control. The alpha-2 agonists (eg, medetomidine, dexmedetomidine) may be suitable for healthy geriatric patients that need moderate to profound sedation (Muir et al. 1999) but the alpha-2 induced cardiovascular changes preclude its use in patients with most cardiovascular diseases. The effects of the alpha-2 agonists are reversible. In addition to sedative/analgesic drugs, consider anti-emetics as vomiting can contribute to dehydration, hypoglycemia, abdominal pain, etc. Also consider anxiolytics if they were not administered before the patient left home.

Induction: When used at reduced dosages, any of the currently available injectable induction drugs (eg, propofol, alfaxalone, ketamine/diazepam) are appropriate in healthy patients. Because of the multiple routes of elimination, propofol – and potentially alfaxalone - are often the best choices since compromised metabolic and clearance mechanisms won't affect elimination of the drug. However, appropriate ventilatory and circulatory support is required to compensate for the respiratory and cardiovascular depression caused by these drugs. Ketamine + benzodiazepine is also an option in most geriatrics unless the ketamine-mediated increase in heart rate could be detrimental. Ketamine is primarily cleared by hepatic metabolism but is also excreted unchanged

by the kidney in cats. Mask or chamber induction is not acceptable because excitement and struggling will greatly increase oxygen demand, cause tachycardia and hypertension and the dose of the inhalant cannot be titrated to effect, thus the patient is often over-dosed by the time anesthesia is achieved. Mask/chamber induction has been shown to increase anesthesia-related mortality (Brodbelt 2009).

Maintenance

Drugs: Isoflurane and sevoflurane are appropriate choices for maintenance of anesthesia. As with other patients, inhalant anesthetic concentrations during maintenance of anesthesia should be kept to a minimum since inhalant anesthetics are major contributors to hypotension, hypoventilation and hypothermia. Analgesic drugs should be used along with the anesthetic drugs as part of a **balanced anesthetic protocol.** Adequate analgesia can allow a significant decrease in the dose of inhalant anesthetic drugs necessary for anesthesia. *Analgesia is imperative and absolutely should not be withheld from these patients because of misconceptions about pain perception in the very old, or fear of the side effects of analgesic drugs.* Pain itself can cause tachycardia, hypertension, decreased renal blood flow, slowed gastro-intestinal motility and myriad other effects that may not be well tolerated in patients with minimal physiologic reserve. Local anesthetic drugs provide profound non-sedating analgesia and should be used in any all patients possible. If opioids are not available, rely heavily on the local anesthetics and repeat the blocks postoperatively if the surgical procedure is a long duration (eg, >2 hours if lidocaine used or >4 hours if bupivacaine or ropivacaine used). Intraoperative analgesia should also include supplemental dosages of opioids and/or the use of constant rate infusions (CRIs) of opioids, ketamine, lidocaine, alpha-2 agonists or combinations of these drugs. If pre-existing pain is present, the analgesia protocols may need to be more robust than anticipated.

Monitoring & support: The limited physiological reserves increase the possibility of anesthetic complications, and these must be prevented if at all possible or recognized early if they do occur. A staff member should be dedicated to careful monitoring of the patient throughout the entire procedure. Monitoring should include basics like HR, RR, pulse strength, mucous membrane color and capillary refill time, and electronic-based monitoring like oxygen-hemoglobin saturation (SpO_2), blood pressure, end-tidal CO_2 and ECG analysis. Hypoventilation is common and the anesthetist may need to breathe for the patient (but don't over-breathe!). Hypotension is common and may require more IV fluids, perhaps colloids especially if the protein is low (crystalloids will cause more protein dilution than colloids). Myocardial contractility is commonly impaired and inotropes are routinely required in geriatric patients. Thermoregulatory control is impaired so body temperature must be monitored and normothermia supported. Hypothermia causes a myriad of adverse effects (eg, decreased myocardial contractility, delayed drug metabolism, impaired immune function, etc.). Shivering greatly increases oxygen consumption (up to 200%) and can contribute to hypoxia. Thus, every attempt should be made to avoid hypothermia.

Recovery: Geriatric patients will very likely require extra support in recovery. Unfortunately, most anesthetic deaths occur in recovery (Brodbelt 2009) and many of these deaths are preventable with appropriate monitoring and support. Oxygen and fluid therapy may need to continue into recovery and the duration of support depends on the age/health status of the individual patient. Active warming is generally necessary. Blood glucose concentrations should be checked, especially in patients with severe liver compromise and in any patient that is having a prolonged recovery. Dysphoria should be treated with sedatives and/or analgesics and the patient may need to be discharged with anxiolytics.

Discharge: The pet caregiver should receive written, detailed instructions on post-surgical care, including the need for good husbandry and the importance of administering all dispensed drugs.

Table 1: Physical and physiologic characteristics of geriatric patients that may affect anesthesia (NOTE: the changes listed below are general changes associated with age but may not be present in all geriatric patients.)

Physiologic Characteristic	Effect on Anesthesia/Patient needs
CNS and General Characteristics	
Hypoalbuminemia	
Neuronal degeneration	
Decrease in neurons & neurotransmitters	Exaggerated effect from standard drug dosage for young adult patients, decreased dosage required – may contribute to delayed recovery; decreased tolerance to fluid load, don't over or under-hydrate; Hypothermia contributes to delayed recovery, keep warm. Position and pad carefully. Robust analgesic protocol required – especially with pre-existing pain. Be prepared to prevent/treat dysphoria/anxiety with pre-visit anxiolytics and/or sedatives in recovery.
Decrease in skeletal muscle (sarcopenia)	
Increase in body fat	
Impaired thermoregulatory system	
Potential for underlying sources of pain like arthritis	
Dysphoria/anxiety generally more common	
May be thin with boney prominences at hips, etc..	
Renal / Urinary System	
Decreased RBF, GFR & tubular function	Prolonged duration of action of renally cleared drugs, may prolong recovery time; decreased tolerance to fluid load, don't over hydrate. Check electrolytes!
Decreased filtration rate & excretory capacity	
Hepatic System	Prolonged duration of hepatically cleared drugs, may prolong recovery time. Hepatic disease may also cause hypoalbuminemia and hypoglycemia.
Decreased hepatic mass & hepatic blood flow	
Respiratory System	
Loss of strength of muscles of ventilation	Decreased respiratory reserve. Both oxygen and ventilatory support are required for most patients and may need to be continued into recovery. Hypothermia causes numerous adverse effects and shivering in recovery can cause oxygen consumption in excess of oxygen delivery – avoid hypothermia. Higher respiratory rate, lower tidal volumes and less distensible lungs when compared to younger patients should be considered when supporting ventilation.
Thorax becomes rigid, lungs lose elasticity	
Increased alveolar closing volume	
Reduction in arterial oxyhemoglobin saturation	
Decreased respiratory response to hypoxemia and hypercapnia	

Cardiovascular System	
Myocardial hypertrophy or atrophy; Fibrosis of the endocardium; Decreased myocardial contractility; Loss of vascular distensibility so vessels less compliant; Maximum heart rate decreases, cardiac output is stroke volume dependent; sympathetic nervous system is less responsive to stress; changes in blood volume occur; decreased vasoconstrictor & baroreceptor responses.	Decreased cardiac reserve and response to hypotension and hypovolemia. Thus, hypotension will not 'fix itself' and must be treated immediately. Cardiovascular support includes judicious use of IV fluids & inotropic (potentially chronotropic) support. Even in the absence of cardiac disease, cardiac contractility can be decreased.

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WHAT IS NEW IN THE 2023 WSAVA VACCINATION GUIDELINES?

Richard Squires

James Cook University, Formerly: Veterinary Science, Townsville, Australia

Qualifications:

Richard A. Squires BVSc (Hons), PhD, DVR, Dip. ACVIM, retired Dip. ECVIM-CA

member of WSAVA Vaccination Guidelines Group

richard.a.squires@gmail.com

WHAT IS NEW IN THE 2023 WSAVA VACCINATION GUIDELINES?

Richard A. Squires BVSc (Hons), PhD, DVR, Dip. ACVIM, retired Dip. ECVIM-CA

member of WSAVA Vaccination Guidelines Group

richard.a.squires@gmail.com

A fourth version of the WSAVA vaccination guidelines has been authored by the WSAVA Vaccination Guidelines Group (VGG; https://wsava.org/committees/vaccination-guidelines-group/) and is currently undergoing peer review. The new version is expected to be launched formally before the end of 2023. Previous versions of these guidelines were published in 2007, 2010, and 2016[1]. There have been many developments in companion animal clinical vaccinology since the third version of these guidelines was authored in mid-2015. Our new version has therefore been extensively updated.

The next version can be expected to include:-

A revised definition of "core" vaccines with an explanation as to why this change was considered helpful and necessary;

A new section dealing specifically with maternally derived antibody (MDA), given its high importance in veterinary clinical vaccinology;

Further discussion and explanation of the recommendation to consider vaccinating puppies and kittens with selected core vaccines at 26+ weeks of age rather than waiting until 12-16 months of age;

A renewed section on current and emerging topics in canine and feline clinical vaccinology;

An updated and substantially revised section on types of vaccine;

Inclusion of some information about new vaccines released since the last version was authored;

Updated consideration of serological testing of dogs and cats to assist in vaccination-related decision-making;

A rewritten and extended section on vaccines in shelters and sanctuaries;

Further consideration of anatomical sites for vaccination of cats;

Inclusion of dozens of new references and removal of some older ones no longer deemed necessary in light of the many new additions; and

Inclusion of many new frequently asked questions (FAQs).

Previous versions of the WSAVA vaccination guidelines have been cited in the peer-reviewed scientific literature hundreds of times and downloaded by veterinarians many thousands of times. Wherever possible, recommendations are based on fundamental immunological principles and on good quality scientific evidence.

Explaining the Revised Definition of "Core" Vaccines

The next version of the WSAVA vaccination guidelines has not yet passed through formal peer review, so the document remains subject to possible change. Nevertheless, it is likely that the new version will include a revised definition of "core" vaccines. The proposed revision would be subtle but important. It would lead to the designation of vaccines intended to protect against canine leptospirosis as **core** *in many but not all parts of the world*. It would also lead to the designation of feline leukaemia virus (FeLV) vaccines as **core** in young cats and in older adult cats with outdoor access *in many but not all parts of the world*. Some knowledge of local disease prevalence (and in the case of leptospirosis, implicated serogroups) would be needed for veterinarians and veterinary associations in each country or region to designate vaccines correctly.

Core vaccines are defined in the 2016 WSAVA vaccination guidelines as *"those which ALL dogs and cats,* ***regardless of circumstances or geographical location****, should receive."* Core vaccines are defined similarly in guidelines published by other large veterinary organisations[2,3]. This definition poses problems because it is immediately qualified (indeed, it is contradicted) by stating that *"in countries where rabies is endemic, rabies vaccines are also core."* More recently, experts have suggested that vaccines intended to protect dogs against leptospirosis should also be designated as core in the many parts of the world where the disease is endemic. This is because canine leptospirosis is a zoonotic, potentially life-threatening, vaccine-manageable, infectious disease. A comparable recommendation has been made for FeLV vaccines in young cats (<1 year of age). The VGG fully supports these suggestions, especially as vaccination rates in countries where canine leptospirosis is endemic need to be improved substantially[4,5] and FeLV vaccination rates are also known to be low in some countries[6].

Another motivation is that designating a vaccine as "non-core" (i.e. using that descriptor) has been suggested to lead some veterinarians (and perhaps some pet owners) to view non-core vaccines as less important and perhaps dispensable, even when a vaccine protects against a potentially life-threatening or zoonotic disease. Devaluing non-core vaccines was never an intention of vaccination guidelines authors, but it may have been an undesirable, unintended consequence of this use of language.

With all of this in mind, the VGG proposes to remove *"regardless of geographical location"* from the definition of core vaccines. Core vaccines would be defined as those that ALL dogs and cats should receive, after considering the geographical areas in which they live or to which they may travel. Thus, according to this proposed new definition, some core vaccines would protect animals from potentially life-threatening diseases that have *global* distribution and others would protect against life-threatening diseases that are prevalent only in particular countries or regions. The self-contradiction in the current definition would be resolved. Core vaccines for dogs *in all parts of the world* are those that protect against canine distemper virus (CDV), canine adenovirus type 1 (CAV) and the canine parvovirus type 2 variants (CPV). Core vaccines for cats *in all parts of the world* are those that protect against feline parvovirus (FPV), feline calicivirus (FCV) and feline herpesvirus-1 (FHV). In areas of the world where rabies is endemic, vaccination against rabies virus should be considered essential for both dogs and cats (i.e. rabies vaccines are **core** in those places), even where there is no legal requirement for this. Leptospirosis in dogs is another life-threatening, zoonotic disease that is widely distributed around the world including in some arid areas. In countries or regions where canine leptospirosis occurs, where implicated serogroups are known, and where suitable vaccines are available, vaccination of all dogs against leptospirosis is highly recommended and the vaccines should be considered **core** in those places. In regions where FeLV is prevalent, all young cats < 1 year should all be vaccinated and older adult cats with outdoor access should also be vaccinated. Thus,

FeLV vaccines should be considered **core** for these cats in those regions and situations.

Vaccinate puppies and kittens with selected core vaccines at 26+ weeks of age rather than waiting until 12-16 months of age

The next, fourth version of the WSAVA vaccination guidelines has not yet passed through peer review, so the document remains subject to possible change. Nevertheless, it is probable that the previous recommendation to bring forward the so-called "first annual booster" to 26 – 52 weeks will be revised in the next version to "26 weeks of age or shortly thereafter". This is consistent with a 2020 recommendation made by AAHA/AAFP in their most recent feline vaccination guidelines, which itself built usefully upon the earlier recommendation by VGG[3].

Maternally derived antibodies (MDA) interfere with most currently available core vaccines that are administered to puppies and kittens early in life (CDV, CAV and CPV in puppies, FPV, FCV and FHV in kittens). MDA may prevent the young animal from mounting an active immune response. As the level of MDA varies substantially within and between litters, VGG recommends the administration of multiple core vaccine doses to puppies and kittens, with the final vaccine in the initial series being given no earlier than 16 weeks of age. Revaccination at or after 6 calendar months of age (rather than waiting until 12-16 months of age) is advised to successfully immunize the minority of animals that still had interfering MDA present at the time of their 16+ week vaccination. In situations where a pet puppy or kitten can only receive a single vaccination, that vaccination should be with the core vaccines at 16+ weeks of age.

The most fundamental concepts proposed by VGG are captured in the following brief statement:

We should aim to vaccinate every dog and cat with the core vaccines.

Selected non-core vaccines may be recommended after careful consideration of each pet's lifestyle and local prevalence of vaccine-manageable diseases.

Core and non-core vaccines should be stored and administered correctly, and only used as frequently as necessary to provide lifelong protection against the diseases that threaten our dogs and cats, wherever they live or travel.

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FELINE CHOLANGITIS & CHOLANGIO-HEPATITIS.

Andrea Johnston

LSU School of Veterinary Medicine, Veterinary Clinical Sciences, Baton Rouge, United States of America

Qualifications:

Andrea N. Johnston, DVM, PhD

Diplomate American College of Veterinary Internal Medicine (SAIM)

Associate Professor of Small Animal Internal Medicine

Louisiana State University School of Veterinary Medicine

johnston1@lsu.edu

FELINE CHOLANGITIS & CHOLANGIOHEPATITIS

Abstract: Feline cholangitis is an inflammatory process targeting the bile ducts / ductules expanding within the portal tract. The classification of cholangitis is based on the predominant cellular infiltrate and duration of illness. Common comorbidities include pancreatitis and inflammatory bowel disease. There are three main sub-types:

1. Chronic cholangitis (fluke associated)

2. Neutrophilic or suppurative cholangitis (acute and chronic)

3. Lymphocytic cholangitis

Fluke associated cholangitis is caused by trematodes from the Dicrocoeliidae (Platynosomum fastosum. (feline specific), Eurytremaprocyonis) and Opisthorchiidae (Opisthorchis spp., Amphimerus spp., Chlonorchis spp., and Metorchis spp.) families.

Platynosomum fastosum is reported most often. This species require two to three intermediate hosts, a snail, a terrestrial isopod, and a lizard, toad, gecko or skink (paratenic host). Cats are infected after ingesting the vertebrate host, the disease is also referred to as 'lizard poisoning'. Metacercariae excyst in the feline gastrointestinal tract and migrate to the common bile duct, hepatic bile ducts, and the gallbladder where the adult flukes reside. Once mature (12 weeks post infection), the flukes reproduce. Ova are shed intermittently in feces.

Clinical Presentation: Common in free-roaming cats in tropical and sub-tropical regions. Acutely, cats with fluke associated cholangitis may be asymptomatic or experience anorexia and lethargy. Chronic infections may cause cyclic abdominal pain, chronic mucoid diarrhea, and icterus. High fluke burden can result in severe inflammation, extrahepatic bile duct occlusion, and death.

Diagnosis

CBC abnormalities: Mild non-regenerative anemia, hypereosinophilia, and lymphocytosis

Biochemical abnormalities: Hyperbilirubinemia and hepatic transaminase elevations are present in severely infected cats

Fecal: Definitive diagnosis is through identification of fluke ova in feces (double centrifugation with Sheather's sugar flotation solution, formalin-ether sedimentation), but intermittent ova shedding may lead to a false negative result.

Diagnostic imaging: B-mode abdominal ultrasonography may identify hyperechoic / thickened gallbladder wall, double-rimmed gallbladder, and gallbladder sludge are common. Gallbladder distention or common bile duct dilation (> 4 mm) may be present if flukes are obstructing the biliary outflow tract.

Percutaneous ultrasound guided cholecystocentesis: Direct bile microscopy is the preferred diagnostic modality for ova detection and may also identify suppurative inflammation in neutrophilic cholangitis.

Histology: Hepatic histology in fluke infected cats has lymphoplasmacytic and occasional eosinophilic portal infiltrates. Severe fibrosing cholangitis, cholangiectasis, and bile duct hyperplasia may be observed. Adult flukes can be identified in the bile ducts.

Treatment: Fluke associated cholangitis is treated with praziquantel. High dose (praziquantel 20-25mg/kg q 24 h for 3 days) and low dose (Droncit®, Bayer, 5.75 mg/kg, PO repeated in 3 weeks) protocols are both reportedly effective. Response is measured by improvement of biochemical parameters, clinical signs, and negative fecal analyses (q3 months for 1 year).

Prognosis: Good if identified early in the course of disease

Acute and chronic neutrophilic cholangitis also has an infectious aetiology and is most commonly caused by bacterial infection and rarely protozoal (toxoplasmosis, hepatozoonosis) infection.

Infectious organisms cause direct injury to the biliary epithelium. Secondary induction of innate and adaptive immune responses targeted at clearing dead cells and eliminating the infection may perpetuate inflammation and tissue damage.

Clinical Presentation: Cats with acute neutrophilic cholangitis are often young with a short duration of illness. Clinical signs include abdominal pain, dehydration, fever, gastrointestinal signs, and jaundice. Chronic neutrophilic cholangitis affects cats of any age and shares clinical signs with waxing and waning clinical signs.

Diagnosis

CBC abnormalities: Approximately, one-third of cats with acute neutrophilic cholangitis have a neutrophilia with left shift and toxic change.

Biochemical abnormalities: Hyperbilirubinemia is the most common biochemical abnormality. ALT and AST are moderately to severely elevated. ALP and GGT may be mildly increased, but concurrent hepatic lipidosis will cause marked ALP elevations. Hyperglobulinemia is occasionally reported. Severe systemic illness can lead to electrolyte derangements, coagulopathy, pre-renal and renal azotemia.

Diagnostic imaging: B-mode abdominal ultrasonography may identify hepatobiliary abnormalities including heterogenous liver with hyperechoic periportal markings and hyperechoic gallbladder contents, but the majority of cats with neutrophilic cholangitis have normal hepatobiliary ultrasounds.

Percutaneous ultrasound guided cholecystocentesis: Bile samples can be collected for cytology, Gram stain, and aerobic/anaerobic bacterial culture.

Histology: Bile duct centric neutrophilic infiltrates are present in the within the portal tract. Lymphoplasmacytic inflammation may be present. Variable grades of periductal fibrosis is present dependent on chronicity. Bacteria are rarely visualized on histology.

Treatment:Broad-spectrum antimicrobial therapy. Bile/hepatic Gram stain or culture should guide antibiotic selection. Commonly isolated organisms include *Escherichia coli, Enterococus* spp., *Streptococcus, Clostridium, Bacteroides, Pseudomans* spp., *and Actinomyces.*

Antibiotic continued for a minimum of 4-6 weeks. Because antibiotics are often initiated prior to obtaining a culture, failure to identify the inciting organisms is possible but empiric antibiotic therapy is continued if cytologic or histologic evidence of neutrophilic cholangitis is present.

Aggressive supportive care: Treatment is targeted at achieving euhydration, correcting electrolyte derangements, and stabilize hemodynamic abnormities.

Impaired liver function may reduce hepatic capacity to metabolize lactate; therefore, isotonic crystalloids devoid of lactate buffer are used for volume replacement. Fluid administration rate is calculated based on lean body mass to avoid overhydration.

Crystalloids are supplemented with potassium based on basal electrolyte levels.

Fluids are supplemented with water soluble B-vitamin complex (2mL/L).

Vitamin K_1 (0.5-1 mg/kg SQ q 12h, 3 doses) is supplemented prior to invasive procedures such as fine needle aspirate.

Antioxidants Antioxidants are administered in the initial course of treatment (N-acetylcysteine, SAMe, Vitamin E, or Ursodeoxycholic acid) and continued dependent clinical response for 2-4 weeks. Prognosis: The prognosis is good for neutrophilic cholangitis if identified early in the course of disease.

Lymphocytic cholangitis may be due to an aberrant immune response or molecular mimicry resulting in adaptive immune response to a biliary epithelial epitope.

Clinical Presentation: Lymphocytic cholangitis is typically identified in middle-aged to older cats, but can occur at any age. There is no breed nor gender predisposition. Clinical signs include intermittent vomiting, diarrhea, anorexia, and jaundice.

Lymphocytic cholangitis is an immune-mediated disease targeting the biliary epithelium. This results in peri- and intraductal lymphoplasmacytic infiltration, leading to extracellular matrix deposition, and, in some cases, bile duct destruction.

Diagnosis

CBC abnormalities: Regenerative or non-regenerative anemia with poikilocytosis; White blood cell counts are not reliably elevated.

Biochemical abnormalities: Moderate to severe ↑ in ALT and AST are the most common biochemical abnormality. Relatively higher GGT to ALP ratios are consistent with cholangitis, but cholestatic enzyme elevations may or may not be present. Mild hyperglobulinemia is present in approximately 50% of cats. Hyperbilirubinemia is common but cyclic.

Diagnostic imaging: Abdominal ultrasound of the hepatobiliary system is usually normal, but intestinal and pancreatic co-morbidities may be identified.

Histology: Liver biopsy is required for the diagnosis of lymphocytic cholangitis. Cats with lymphocytic cholangitis have lymphocytic or lymphoplasmacytic duct centric infiltrates within portal tracts. Periductal fibrosis increases with chronicity. Bile ducts may involute (ductopenia), which marks a more serious disease process. Immunohistochemical staining and clonality testing may help to distinguish lymphocytic cholangitis from small cell lymphoma.

Treatment: Immunosuppression: Prednisolone, budesonide

If a clinical response is noted, glucocorticoid therapy is titrated to the lowest effective dose after the first 2-4 weeks of treatment.

If clinical response (improved clinical signs, normalization of bilirubin, reduction in ALT) is not achieved after 2 months, an additional immunosuppressive (chlorambucil 2mg PO q48-72h) is added.

CBC and chemistry: Rechecked monthly for the first 6 months after starting chlorambucil and then every 2-3 months

Ductopenic cats should be monitored closely for weight loss and signs of malabsorption due to insufficient bile acid release

Ursodeoxycholic acid is used in cats without ductopenia. SAMe and vitamin E can be added as additional or alternative antioxidants.

Modulation of gut flora is an important component of therapy. Historically, metronidazole was administered but probiotics are currently recommended

Cats with cholangitis often have concurrent inflammatory bowel disease & pancreatitis. Treat concurrently.

Prognosis: Lymphocytic cholangitis requires chronic therapy and monitoring. Many cats achieve long-term remission with immunosuppressive and antioxidant therapy, but relapse or progression to lymphoma eventually occur. Ductopenic cats have a poor prognosis.

Differential Diagnoses

Hepatic abscess, pancreatitis, or extrahepatic bile duct obstruction due to cholelithiasis, stricture, or neoplasia for neutrophilic and fluke-associated cholangitis.

Differential diagnoses for lymphocytic cholangitis include hepatobiliary neoplasia, chronic pancreatitis, or reactive hepatopathy.

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COGNITION IN SENIOR AND GERIATRIC PETS AND HOW TO REDUCE COGNITIVE DYSFUNCTION IN THE ICU

Maureen Mcmichael

Auburn University, Clinical Sciences, Auburn, United States of America

Qualifications:

Maureen Ann McMichael, DVM, M.Ed., DACVECC

Professor

mam0280@auburn.edu

Cognition in Older Pets and How to Reduce Cognitive Dysfunction in the ICU

Maureen McMichael, DVM, M.Ed., DACVECC

Auburn University, Auburn, AL

Introduction

Fluid Therapy

Dehydration, common in older dogs, can have significant effects on cognition. Significant changes in multiple organ systems in geriatric animals should be taken into account when selecting the type, dosage, and rate of fluid choices in this age group.

Myocardial fibrosis, valvular malfunction, and myocardial fiber atrophy seems to increase with age in geriatric pets. The decrease in ventricular compliance limits the volume that the geriatric animal can tolerate while paradoxically increasing its dependency on volume. Geriatric animals are highly dependent on end-diastolic volume to increase cardiac output and therefore do not tolerate volume depletion very well during times of stress (i.e., illness, anesthesia, etc.).

Renal changes such as the decreased ability to concentrate or dilute urine, decreased renal blood flow, and the limited ability to conserve sodium all limit the geriatric animal's ability to handle either volume depletion or volume overload.

Balanced isotonic crystalloids (i.e., LRS, 0.9% NaCl) are ideal for the dehydrated geriatric patient. Both natural (i.e., fresh frozen plasma) and artificial colloids (i.e., Hetastarch®) are additional options for hypovolemia but should be administered at a slower rate in geriatric animals due to their propensity for volume overload. Supplements such as potassium chloride, vitamin B complex, and dextrose are added as needed.

Pharmacology

Medications, particularly in the very young or very old, can have major effects on cognition since optimal dosing is unknown and overdosing may occur more easily than in younger animals . Aging imposes several changes in the absorption, distribution, metabolism and elimination of many drugs. Oral absorption may be decreased due to decreased GI function as the animal ages. The loss of lean body mass can alter IM route absorption.

If fluid retention is present (such as with congestive heart failure, cirrhosis, or renal failure) drugs that are distributed to extracellular water (e.g., penicillins, NSAIDS, aminoglycosides) will be altered in their distribution. Albumin, the protein to which many drugs bind, also decreases with age.

Drug metabolism may change as the geriatric patient experiences a decline in hepatic function. The mass of the liver decreases with age and decreases hepatic function. This could cause increased plasma half-life of drugs that depend on hepatic excretion, metabolism, or conjugation. Decreased function of phase I metabolism reactions in the liver appear to occur with age and cause decreases in oxidation, reduction, dealkylation, and hydroxylation reactions. Phase II reactions do not appear to be altered with age.

Drug elimination may be affected by a progressive decline in renal function with age. In geriatric people, there is a steady decline in renal function with approximately 40% of the nephrons becoming sclerotic by the age of 85 and renal blood flow and GFR decreasing by almost half. Due to the loss of lean body mass creatinine may remain normal (decreased production and decreased clearance). In dogs and cats approximately 15-20% are thought to suffer some degree of renal insufficiency as they enter the geriatric years.

In geriatric people, there is a progressive decline in the number of cardiac myocytes and in ventricular compliance. Autonomic tissue is replaced by fat and connective tissue and shows decreased responsiveness to autonomic drugs. It is likely that some decline of cardiac function occurs with age in animals and careful monitoring for specific endpoints is essential when prescribing cardiac drugs to geriatric animals.

Options for appropriate drug dosing in geriatric animals include measurement of renal function, therapeutic drug monitoring with frequent dosage adjustments, and dosage or interval reduction according to creatinine concentrations. The most practical and cost efficient of these options is dosage or interval reduction.

Nutrition in Older Pets

Maintenance energy requirements (MERs) decrease with age in dogs but appear to increase after the age of 12 years in cats. There may also be a decrease in the ability to digest fat and protein as cats age. These changes can lead to either weight gain (i.e., if an older dog is fed food with the same caloric content as it ages) or weight loss (i.e., if an older cat is fed food with the same caloric content as it ages) in the older pet. The reduced ability to digest fats can lead to deficiencies in fat soluble vitamins (e.g., vitamin E) along with water soluble vitamins (e.g., B vitamins) and electrolytes. In older dogs with a limited ability to digest fats due to a diminished ability to secrete pancreatic lipase or bile acids medium chain triglycerides may be beneficial as a concentrated and highly absorbable energy source.

Adequate protein intake is essential for optimal immune function and is critical in geriatric animals. Protein requirements actually increase in older dogs and the old dogma of protein restriction for kidney protection has been discounted.

Vision Changes

Vision changes are common in older pets and may mimic cognitive decline. Nuclear sclerosis (lenticular sclerosis) due to increased density of the lens, although common, usually has no effect on vision. However, loss of night vision is common as well as decreased tear production with age. Cataracts are more common with age with a mean onset of ~7-8 years and corneal deposits (e.g., calcium, lipids, cholesterol) also increase with age. Retinal degeneration is also common with age with a decrease in cones and rods seen. With diminishing vision comes reluctance to venture out or the get lost in the year and this may mimic cognitive decline. Adding a vaporizer, especially, during cold weather, may help mitigate the dry eyes that are common in this group.

Hearing Changes

Hearing loss is common in older humans and cochlear degeneration is seen in older dogs. Hearing is extremely important in dogs and loss of hearing is often the straw that broke the camel's back. When hearing loss becomes apparent it usually unmasks vision abnormalities as well since the pet cannot compensate. They may appear to ignore commands, or

respond inappropriately when hearing is compromised and this may mimic cognitive decline. N-acetylcysteine is used for hearing loss by the Navy when divers' hearing becomes damaged.

Cognition Dysfunction

Cognitive dysfunction syndrome (CDS) and Disorientation/Dysfunctions in Interaction, Sleep and Housetraining (DISH) are thought to occur in over 50% of dogs over 15 years of age. DISH resembles advanced dementia in humans and our patients may benefit from the new research in people. The recent discovery of the glymphatic (glial + lymphatic) system offers an exciting opportunity to optimize brain health in pets.

Why do we sleep?

Sleep is an extremely vulnerable state that can increase mortality so it must serve an important purpose. Recently, essential brain cleansing, has been documented to occur during certain phases of sleep. It has been shown that during deep sleep the brain "shrinks" up to ~60% in volume to allow for CSF "flushing" and clearance.

Glymphatic System

The glymphatic system uses an aquaporin (AQP4) dependent flow to clear debris (solutes) from the brain. Respiration moves CSF through the aqueduct and this occurs during the deep phase of sleep. Accumulation of these solutes is associated with neurodegeneration in humans and laboratory animals. Elimination of the waste does not occur in daylight hours (the off switch is thought to be mediated by norepinephrine).

Sleep disturbances are associated with dementia in humans and are common in aged animals. There was an 80% decline in glymphatic clearance in aged mice versus young mice and this is thought to be, partially, due to melatonin decreases with age. Sleep disturbances are also very common in hospitalized pets due to noise, stress/pain, loss of circadian rhythm, and lights. Blue light (high in LED and fluorescent lights) depress melatonin synthesis and should not be used after ~12 noon or so. In a traumatic brain injury model, CSF clearance was impaired for 28 days after injury.

Taurine, Not Just for the Heart!

Interestingly, one of the main determinants of success of CSF clearance is taurine, in the form of tauro-cholic acid. This bile acid is essential for the clearance of the solutes via conjugation and the limiting factor is taurine, an amino acid that we usually think of only for the heart.

Essential Strategies for Older Dogs

Vitamin B12, in the form of methylcobalamin or hydroxycobalamin, absorption declines with age in humans and is associated with cognitive decline. Providing subcutaneous injections may help to support cognitive health by providing this essential vitamin. Taurine supplementation, natural anti-inflammatory strategies (e.g., turmeric, low carbohydrate diet, etc.) and melatonin supplementation (e.g., 3-6 mg half an hour before bedtime) can all help to mitigate cognitive decline in older dogs and will be discussed in more detail during the presentation.

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CIVILITY SAVES LIVES: WHY BEHAVIOUR MATTERS AND HOW TO THRIVE AS A TEAM

Helen Silver-Macmahon

Being-Human Consulting Ltd, Director, Thurston, Bury St Edmunds, United Kingdom

Qualifications:

Mrs S. Helen Silver-MacMahon

MSc PSCHF, Cert VNECC, DipAVN (Surg), Cert SAN RVN

helen@being-human.co.uk

Incivility within veterinary practice can have a significant impact on various aspects of the workplace, including individual performance and patient safety. It is crucial to understand the consequences of such behaviour and explore strategies to address and improve incivility within the veterinary profession. In this session learn about the impact of incivility on our performance, how it affects patient safety, and importantly discover established tools to both challenge and improve incivility in the workplace.

Workplace incivility is a type of disrespectful and impolite behaviour that violates workplace norms. It can manifest in various forms, such as deliberately ignoring someone, aggressive body language, or shouting at others [2].

There are three key mechanisms that differentiate incivility from other forms of mistreatment in the workplace. Firstly, incivility is often perceived as minor or low-level, non-physical acts. These behaviours may not be as overt or extreme as other forms of mistreatment, which can make it challenging to recognise and address [9].

Secondly, incivility can be ambiguous in terms of intent to harm. For instance, an uncivil act like not responding to someone during a meeting might be due to the person being distracted rather than intending to be disrespectful. This ambiguity can make it difficult to determine the motives behind the incivility, further complicating the situation[9].

Thirdly, incivility goes against workplace norms for appropriate or polite behaviour. However, perceptions of what constitutes incivility can vary across contexts and individuals, making it a subjective experience [1].

Incivility can be categorized into two main types: active/direct and passive/indirect. Active or direct incivility involves the commission of disrespect, such as unpleasant comments or sarcasm. Passive or indirect incivility, on the other hand, involves the omission of respect, like ignoring a request via email[10].

Research into veterinary workplace incivility indicates that experiencing incivility from clients and co-workers can have an adverse impact on job satisfaction, and mental health, as well as increasing quitting intention and the risk of burnout for veterinary staff [4,5].

The research conducted by Riskin and colleagues in the field of human healthcare sheds light on the potential effects of incivility within healthcare teams. Their studies indicate that incivility can have various adverse impacts on teamwork, information sharing, and diagnostic performance[7]. Furthermore, it has been observed to reduce compliance with medication preparation and hand hygiene [8].

The authors propose that experiencing incivility can deplete cognitive resources, leading to a state of cognitive depletion. This, in turn, can negatively affect a range of cognitive processes, including decision-making and creativity[8]. Building upon this research, a study focused on paramedics suggests that experiencing incivility from both patients and co-workers can have detrimental effects on preferred work methods and diagnostic decision-making [3].

While these findings provide valuable insights into the potential impacts of incivility within healthcare teams, it is important to note that further research is needed to fully understand the extent and severity of these effects within veterinary healthcare teams.

Workplace incivility is a serious issue that can have detrimental effects on individuals and organisations. It is essential to understand how targets of incivility cope with such behaviours and how their coping responses may impact their well-being and work environment.

Cortina & Magley highlighted that targets of workplace incivility can use a variety of coping responses, and these responses can vary between individuals. Passive coping strategies, such as conflict avoidance, are often more common than active coping strategies, like confrontation. One reason for this preference for passive strategies could be the challenges associated with reporting low-level and ambiguous behaviours, making targets hesitant to take direct action.

Irwin et al.[4] found that veterinary staff tend to rely on social support and attempt to ignore uncivil behaviours, especially from clients. Seeking social support can be beneficial as it allows individuals to share their experiences, receive empathy, and gain practical advice from others, which may help them cope with the stress of incivility.

It's important to recognize that the effectiveness of coping strategies can vary depending on the context, the individuals involved, and the specific situation. Encouraging workplaces to create a culture that discourages incivility and supports open communication can help address this issue more effectively. Additionally, providing resources and training for employees on effective ways to respond to incivility can empower them to handle such situations more confidently.

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DIGITAL TOOLS FOR EVERYONE. BUSINESS AS A SERVICE MODEL

Alan Robinson

Vet Dynamics (UK) Ltd, Director, Swindon, United Kingdom

Qualifications:

Alan Robinson

B.V.Sc. MRCVS DMS

alan@vetdynamics.co.uk

Digital Tools for Everyone: business as a service model is about implementation of technology into practice – and why it is so difficult to achieve.

Staff is the #1 investment for practices in the next year to bring in staff and beat burnout with technology.

Veterinary professionals are struggling––burnout is rampant, staff turnover has reached epic proportions and vet staff are just all around overworked and under-satisfied. Everyone is looking for a solution and we have clear evidence how technology can open the door leading to a way out. With that said, if you want to retain your staff and keep burn out at bay, here are some points to consider:

Investing in technology is a smart choice to help reduce burnout, improve efficiency, and keep clients and staff happy while improving patient health.

Technology can help you recruit and retain talent. If you're not highlighting your technology resources in your practice, definitely start now. If you don't have anything to highlight in your practice around technology, figure out what makes sense for your practice and start changing things up.

Make sure to train staff properly on existing or new technologies. Staff want and need formal training to ensure everyone is comfortable with new or existing technology and will be more likely to adopt and use it.

Help your team streamline their pain points. Provide tools for client education and client communication that offers a better experience for pet owners, and for your veterinary teams.

If it's that easy - why is it so difficult to achieve...?

"Digital Tools for All" discusses various aspects of the veterinary business, focusing on challenges and paradoxes faced by professionals in the industry in the light of implementing technology into the practice. This emphasizes the need to address issues related to stress, burnout, and inefficiencies in veterinary practices. It explores the concept of paradoxes that arise from conflicting expectations, such as balancing compassion with detachment, or providing excellent client service while maintaining profitability.

We discuss the challenges faced by veterinary professionals and offer insights into potential solutions to improve their well-being and efficiency. The talk is divided into five parts, covering various aspects of the veterinary business and addressing the paradoxes that arise within the industry. It emphasizes the need for transformation, digital tools, and a holistic approach to ensure the success and sustainability of veterinary practices.

Part 1 highlights the importance of digital tools in today's rapidly evolving world, emphasising that the veterinary profession is not exempt from the impact of technological advancements. Some of the current challenges faced by the veterinary industry are issues related to economy, corporatization, demographics, recruitment, technology, sustainability, leadership and culture.

In their day to day activity in practice, veterinary professionals experience and need to solves a set of paradoxes such as the vet business paradox, veterinary professional myths, and the compassion paradox. This includes four veterinary business issues: lack of clarity of vision & purpose, the rejection of commercialism in favour of 'clinicalism', low mental & emotional resilience, and the lack of resources for learning. The various traits and roles of veterinary professionals are discussed, highlighting the need for balance in their characteristics and actions.

On a personal and individual level managers and leaders need to focuses on the emotional and psychological challenges faced by veterinarians, including stress, burnout, and feelings of disconnection. The paradoxes arising from their dedication to the well-being of animals and their roles in a commercial environment are examined. The concept of the "Pet vs. Profit" paradox is explored, along with the "Busy-Trap" paradox and the challenges it poses to veterinarians' well-being.

We suggest some strategies to overcome these challenges faced by veterinary professionals. We emphasizes simplifying outcomes to improve patient health and efficiency while reducing cognitive load. We advocate for reducing friction and increasing efficiency through business design processes and technology integration and enhancing client experience by managing demand, emotional load, and complaints. Furthermore, to optimise well-being and performance the importance of resilience, well-being, and performance optimization is emphasized, suggesting the fulfilment of basic needs, promoting autonomy, and fostering a healthy and productive work environment and team dynamics.

In the final section, the talk delves into the concept to foster change the importance f of personal decompression and provides a menu for health, self-regulation, and resilience. It suggests allocating time for various activities to promote well-being and intrinsic security needs.

Finally, we conclude with a focus on intrinsic motivation and the need for veterinary professionals to take care of their own well-being. The concept of "Flow" is introduced as a state of optimal experience and productivity. The talk offers a personal decompression menu for health, self-regulation, and resilience. It addresses intrinsic security needs, including safety, connection, and self-worth.

Overall, this provides valuable insights into the challenges faced by veterinary professionals and presents practical strategies to overcome them and where technology can helps. It emphasizes the importance of embracing digital tools and adopting a holistic approach to improve the well-being, efficiency, and sustainability of veterinary practices. By addressing the paradoxes and focusing on intrinsic motivation and self-care, veterinary professionals can thrive in their roles, ultimately benefiting both themselves and the animals they care for.

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FELINE AND CANINE LEISHMANIOSIS: SIMILARITIES AND DIFFERENCES

Gad Baneth

The Hebrew University of Jerusalem, The Koret School Of Veterinary Medicine, Rehovot, Israel

Qualifications:

Gad Baneth, DVM, PhD, Dipl. ECVCP

e-mail: gad.baneth@mail.huji.ac.il

Introduction

The leishmanioses are vector-borne-diseases caused by protozoan parasites of the genus *Leishmania* (order: Kinetoplastida, family: Trypanosomatidae) and transmitted by bites of female phlebotomine sand flies. Disease in humans is caused by more than 20 different species of *Leishmania* which are mostly zoonotic with animal reservoir hosts and is reported in 90 countries in the world. More than 70 species of animals have been reported to be infected with *Leishmania* spp. which affect domestic as well as wildlife animals and cause clinical disease in domestic dogs and cats.

Canine leishmaniosis caused by *Leishmania infantum*

Several species of *Leishmania* can infect and cause clinical disease in dogs, however, *Leishmania infantum* is the main agent of canine leishmaniosis which is a major disease of dogs and an important zoonosis. Dogs are considered the main reservoir for human *L. infantum* infection in most of the regions where it is present and canine leishmaniosis is a zoonosis endemic in more than 80 countries in an area which includes Southern Europe, Northern Africa, the Middle East, Central Asia, China, and Latin America. *Leishmania infantum* has also emerged in dogs in the USA and Canada, where transmission is thought to be mainly transplacental, rather than by sand flies. The travel and importation of infected dogs and cats makes the disease an important concern also in non-endemic areas, including regions with cold climate where vector sand flies are not present, such as northern Europe.

Leishmania infection causes a chronic and severe disease which can eventually be fatal in dogs. Nevertheless, only a small proportion of the infected dogs in endemic areas develop clinical disease while a larger part is infected sub-clinically. Longitudinal studies of dogs have shown that some sub-clinically infected animals eventually develop clinical disease, however the majority remain sub-clinically infected or resolve infection. It has been estimated based on serological surveys that 2.5 million dogs are infected with *L. infantum* in Portugal, Spain, France and Italy. Furthermore, several millions of dogs are infected in South America and other endemic regions. Genetic evidence suggested that the introduction of *L. infantum* to the Americas occurred by infected dogs during the Portuguese and Spanish conquest, and the diseases caused by this parasite established itself when infected animals were exposed to local sand fly vector species capable of transmitting the parasite.

The clinical history of dogs with canine leishmaniosis frequently includes the appearance of skin and ocular lesions, nose bleed (epistaxis), weight loss, and lethargy. Infected dogs may develop renal disease due to immune-complex glumerulonephritis and visceral disease sometimes with no dermal lesions. On physical examination, the main clinical signs associated with canine leishmaniosis are dermal lesions, lymphadenomegaly, splenomegaly, abnormal nail growth (onychogryposis) and poor body condition. The most common serum biochemistry abnormalities in dogs with canine leishmaniosis are hyperproteinemia with hyperglobulinemia and hypoalbuminemia resulting in a decreased albumin/globulin ratio. Proteinuria is frequently present in dogs with canine leishmaniosis and renal injury may eventually develop and is considered as the main cause of natural death in dogs with this disease. A mild form of papular dermatitis with no visceral involvement has also been described in dogs with *L. infantum* infection. A staging system for canine leishmaniosis composed by the Lesihvet group (https://www.leishvet.org/fact-sheet/clinical-staging/) divides the disease into four clinical stages based on clinical signs, clinicopathological abnormalities and level of anti-leishmanial antibodies. This system is helpful for decisions on therapy and consideration of prognosis.

Canine *Leishmania* infection is diganosed mainly by serology, cytology and PCR.

Cytology – *L. infantum* amastigotes can be demonstrated by cytology from the skin, lymph nodes, spleen or bone marrow stained with Giemsa stain or a quick commercial stain. Detection of amastigotes by cytology is frequently unrewarding due to a low number of detectable parasites present even in dogs with a full-blown clinical disease. *Leishmania* parasites may also be viewed in histophathologic formalin-fixed, paraffin-embedded biopsy sections of the skin or other infected organs. Definite identification of parasites within tissue macrophages may be difficult and an immunohistichemical staining method can be employed to detect or verify the presence of *Leishmania* in the tissue.

Serology - Various serological methods for the detection of anti-*Leishmania* antibodies are availbale. These include indirect immunofluoresence assays (IFA), enzyme-linked immunosorbent assay (ELISA), direct agglutination assays (DAT) and western blotting. In general, good sensitivities and specificities are gained with these methods for the diagnosis of clinical canine leishmaniosis cases.

PCR- Detection of parasite-specific DNA in tissues by PCR allows sensitive and specific diagnosis. Several different assays with various target sequences using genomic or kinetoplast DNA (kDNA) have been developed. PCR can be performed on DNA extracted from tissues, blood or even from histopathologic specimens. Assays based on kDNA appear to be the most sensitive for direct detection in infected issues.

The main drugs used for direct treatment of CanL include the pentavalent antimony meglumine antimoniate (Glucantime®) which selectively inhibits leishmanial glycolysis and fatty acid oxidation and allopurinol that acts by inhibiting protein translation through interfering with RNA synthesis. Miltefosine (Milteforan®) is an additional oral anti-leishmanial drug that can be used for the first month of treatment in combination with allopurinol instead of meglumine antimoniate. Treatment with these drugs is frequently combined with meglumine antimoniate and allopurinol or miltefosine and allopurinol administered for 4 weeks and then allopurinol is continued for a long term, usually at least for one year, and often longer than that.

Feline leishmaniosis

Domestic cats are hosts to several species of *Leishmania*. Feline leishmaniosis is increasingly being reported in areas endemic for human leishmaniosis in Europe, the Middle East and South America . The species of *Leishmania* affecting cats in the New World include *L. infantum*, *L. amazonensis, L. braziliensis* and *L. mexicana*. In the Old World, particularly in the Middle East, cats were reported to be infected with *L. infantum*, *L. tropica* and *L. Major.* Clinical signs associated with leishmaniosis in cats include skin lesions, lymphadenomegaly, ocular lesions, anorexia, severe weight loss and emaciation. Infection with the feline immunodeficiency virus (FIV) was determined as a risk factor for *L. infantum* infection in cats in several studies and surveys. Cats with leishmaniosis due to *L. infantum* have been shown to be infectious to sand flies in experimental studies and may therefore serve as reservoir hosts for this parasite.

The diagnosis of feline leishmaniosis is similar to the detection of infection in dogs employing the same techniques, and the treatment of infected cats resembles the treatment of dogs, although it may differ in the choice of drugs and their doses, with allopurinol being the main drug for cat treatment.

A comparison of the *L. infantum* blood parasite load of cats and dogs housed together in the same animal shelter showed that dogs had a significantly higher parasite load compared to cats, suggesting that the dog may be a more efficient reservoir host than the cat.

Prevention of canine and feline leishmaniosis

The use of topical insecticides against canine and feline leishmaniosis in collars or spot-on formulation containing pyrethroids has been shown to be effective in reducing disease transmission. Delthamethrin-impregnated collars and permethrin with imidacloprid spot on drops have been shown to significantly reduce the number of sand fly bites to dogs under experimental transmission and demonstrated decreased infection transmission in field studies. Topical insectides for cats are specific and potentially different from the formulations used for dogs as cats are particulary susceiptible to pytrethroids and may suffer a severe tocxicity.

Commercial vaccines against canine leishmaniosis are marketed in Europe and Brazil, however their efficacy is limited.

Further reading on canine and feline leishmaniosis

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A HOLISTIC APPROACH OF TRAP-NEUTER-RETURN IMPACT IN PORTUGAL COMMUNITIES

Alexandra Pereira

Institute for the Conservation of Nature and Forests, Companion Animal Welfare Department, Lisboa, Portugal

Qualifications:

Alexandra Maria Silveira Pinto Pereira

DVM MsCEAW CertAWSEL

alexandra.pereira@icnf.pt

The TNR (trap- neuter -return) programs in Portugal were regulated in 2017 and only for cats. However, even before 2017, several municipalities already had protocols with NGOs that were dedicated exclusively to TNR (eg Animais de Rua and Sintra Municipality in 2009; Animais de Rua and Lisbon Municipality in 2013).

Case study on the effectiveness of the TNR in Portugal

The Animal Welfare Community Project, a case study developed by the Animais de Rua in partnership with the Change for Animals Foundation, Dogs Trust, Faro City Council, Lusófona University, Mission Rabies and private Veterinary Clinics, which took place between 2013 and 2016, on the Faro Island, led to the conclusion that of the 162 cats intervened in 2016, only 50 were observed in 2022. That is, with the implementation of the TNR program there was a 69% reduction in 6 years. In parallel, the studied population was categorized by age, sex and presence of ectoparasites; potential relationships between Mycoplasma spp. infection and epidemiological variables were also investigated. Not only has this study contributed to increase the knowledge about hemotropic mycoplasmas infection in stray cats from Faro Island but also to demonstrate the effectiveness of the TNR and increase the program implementation across the country.

TNR regulation in Portugal

Since 2017, the law states that, as a way of managing the population of stray cats and in cases where this is justified, city councils, with the advice of the municipal veterinarian, may authorize the maintenance, in places specially designated for the purpose, of colonies of cats, within the scope of TNR programs, in the place of origin. It also foresees that these programs can be carried out with the initiative of the municipality or upon proposal of an animal protection organization to whom the municipality assigns the management of the TNR program.

It also provides that the entity responsible for the TNR must ensure a management plan for the colony and that the colony animals:

- are periodically evaluated from a clinical point of view;

- the ones that carry diseases transmissible to other animals or humans are removed from the colony;

- before rejoining the colony, they are handed over to the municipal animal shelter for verification of their suitability to engage the program;

- they are captured, neutered and marked with a small cut in the left ear, electronically identified and registered, dewormed and vaccinated against rabies or other mandatory prophylactic measures considered in the colony's management plan.

It is also envisaged that the intervened colony will be supervised by the municipal veterinarian, and the entity responsible for the program must ensure that adequate health care and food are provided to the animals, controlling the admissions and discharges of new animals, or any other factors that disturb the stability of the colony, security and public and neighborhood tranquility. Whenever city hall verifies that any one of these requirements has not fulfilled, it can determine corrective measures or the suspension of the TNR program and proceed to relocate the animals to the municipal shelter.

However, it will be important to work on the following aspects:

• Not to limit the program to cats only;

• The management plan will include records related to the TNR animals;

• Foresee mandatory training for everyone involved in the program;

• Clearly state who is responsible for the animals when unclear who the responsible entity is;

• Map cat colonies;

• Mitigate the running over of animals on national road networks;

• Draw up good practice manuals that address, namely, age at sterilization, surgical techniques and post-operative confinement period; type of feeding, watering and feeding stations/shelters; ways to reduce the impact of cats on biodiversity.

Diagnosis of the current situation

In 2021, with a view to an autonomous and reinforced treatment of the welfare of companion animals, there was a transfer of competences, in this matter, from the Ministry of Agriculture (General Directorate for Food and Veterinary) to the Ministry of Environment (Institute for the Conservation of Nature and Forests - ICNF).

However, before outlining long-term goals, we must have a diagnosis of the current situation, the size of our sample: how many stray cats are there? About 220 million are domestic and 480 million are wild or wild cats that live close to us, exploiting the resources that we make available, accidentally or intentionally. In urban areas, colonies can be found in places such as alleys, vacant lots, abandoned buildings, warehouses, factories, parks and backyards. The vast majority of feral cats are not entirely wild, as they depend on humans for their food. Very few survive exclusively from hunting.

From the analysis of the activity data by the municipal animal shelters, from 2018 to 2022, after the ban on the slaughter of animals, there is a sharp increase in the number of neutered animals that are not collected at the municipal animal shelter: TNR cats. In 2018, 35,733 animals were collected, 13,350 were neutered and 6,350 were euthanized. In 2022, 41,994 animals were collected, 54,827 were neutered and 2,378 were euthanized; in other words, TNR programs have been implemented at a national level. Since 2017, financial support from the State has been made available for the construction and improvement of facilities in municipalities and NGOs, which include support for the construction of operating rooms and shelters for animals involved in TNR programs; neutering and electronic identification. In 2022 alone, financial support was given for the construction of 57 operating and treatment rooms, 44,917 animals were neutered and 41,423 animals were identified. This year, the state made €13,200,000 available to promote animal welfare.

The "2023 Census" resulted from a protocol between the University of Aveiro and the ICNF, and will estimate the population of stray animals in Portugal, as well as their origin, characterize the attitudes, perceptions and behaviors of the population in relation to stray animals and their well-being and identify the main impacts of stray animals on wildlife.

National Strategy for Stray Animals

A Resolution of the Council of Ministers in 2021, approved a set of

measures for an autonomous and reinforced treatment in terms of the welfare of companion animals. This paradigm shift is based on five fundamental pillars:

• identification;

• neutering;

• adoption;

•education;

• participation.

All these pillars come together in a key instrument in the context of this change: the National Strategy for Stray Animals (NSSA).

With a view to determining this new policy framework, the ICNF prepared the NSSA, defining a management program for the stray animal populations. NSSA defines a new model based on a true national network of political and organizational responses, but also rational and scientific, considering the articulation between animal welfare, public health and population safety.

NSSA aims to reduce the number of stray animals, predicting that in 2030 the population of stray animals will be limited to cats integrated in TNR programs and has the following areas of intervention:

• Removing animals that live on the streets, namely by increasing the capacity of existing shelters;

• Prevent the increase of animals on the streets by fighting against abandonment and promoting responsible ownership;

• Preventing stray animals from breeding: TNR programs.

The operational objectives of the strategy are based on the following intervention vectors:

• Diagnosis of population dynamics of stray animals;

• Controlling access to resources in public spaces, defining places with suitable equipment for feeding stray animals and cat colonies managed within the scope of TNR programs;

• Identification and registration of animals;

• Animal health care and reproductive control, including neutering of animals not intended for reproduction;

• Development of a model of animal welfare centers, to replace municipal shelters, where stray animals can recover, in health and welfare;

• Monitoring conditions for breeding and selling companion animals;

• Ethological management;

NSSA includes an action and monitoring plan and is guided by an integrated approach to animal welfare, public health and the safety and tranquility of populations, valuing and empowering the different competent authorities and promoting their articulation.

Future prospects

What began as program, implemented in only a few municipalities, has gained momentum and at this moment, and only through the authorization for the use of traps to capture cats, is it possible to confirm that the TNR is being carried out in 50 municipalities.

All legislation for the protection of companion animals is being revised – General Regime for the Well-Being of Companion Animals. This new tool will already make it possible to clarify and resolve the problems listed in relation to current TNR programs.

The NSSA provides working groups whose objective is to draw up a good practice guide for the TNR programs. In addition, ICNF, in partnership with the University of Porto, started the first postgraduate course in Shelter Medicine and Companion Animal Welfare, this year, aimed at municipal veterinarians, with specific modules for the management of TNR programs.

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COMPARATIVE OBESITY AS A ONE HEALTH ISSUE

Tony Reed

Inspira Health, Executive Offices, MULLICA HILL, United States of America

Qualifications:

Tony S. Reed, MD, PhD, MBA

Board Certified in Family Medicine and Sports Medicine with a 20-year history of clinical practice in health, wellness, and medical issues affecting a healthy lifestyle.

reedt1@ihn.org

Humans and non-human animals share several physiologic characteristics in their metabolism and biochemical matrix. Diabetes, obesity, and metabolic syndrome all span across multiple mammalian species (1). As in humans, the prevailing belief is obesity genetics plays a role alongside environmental stimuli (2). Inflammatory changes of obesity have also been studied with similar cross-species results. Regardless of the cause, across species the results are identical: Shortened life expectancy, increased morbidity, and an anticipated self-propagating cycle. Regardless of the understood outcome, across the professions of veterinary and human medicine, physicians are hesitant and unprepared to discuss obesity and the ill effects with their patients and their companions (3).

As population obesity in humans has been increasing over the past 30 years, so has obesity in non-human animals. In the US, 42% of human adults are obese while approximately 50% of dogs and cats are documented as obese. These numbers were similar in the United Kingdom and Portugal with human obesity around 30-35% while cat and dog obesity were in the 40% range.

Foundationally, obesity and weight gain are the result of an imbalance of energy. More calories are consumed than are used, resulting in enhanced fat storage. Coupled with genetic predisposition through monogenic, syndromic, and multiple polymorphic nucleotide variants, lifestyle and activity combine to create an environmental structure conducive to obesity (4). The relative impact of environment versus genetic factors varies among both humans and non-human animals, making it necessary for highly specific treatment plans.

For companion animals, a relationship has been identified between owner obesity and canine obesity. Using a population on the Canary Islands in Spain, researchers determined that owner obesity was the greatest correlation in a multi-variate analysis (5). While correlation is not causation, it can be reasoned that diet and activity habits of the companion animal are dictated by the human owner. Limited studies on non-human companion animals have yielded a fundamental understanding of monogenic impacts on obesity, but nucleotide polymorphic variants are not fully elucidated (6). Currently, it appears genetic tendencies in the non-human companion are largely influenced by the environmental structure created by the human.

Health effects of obesity are far reaching in mammalian species. Chronic inflammation because of obesity is associated with insulin resistance, vascular damage, and end organ impacts in the kidneys, heart, and adrenals, among other organs. Human and canine studies have independently demonstrated effects on metabolic, endocrine, cardiovascular, pulmonary, and musculoskeletal conditions (5). Human studies have also demonstrated psychological impact from obesity.

Obesity management lends itself to the One Health concept of paired recommendations for humans and their companion animals. First, the human and veterinary physicians must learn to broach the subject of human and non-human obesity in empathetic, non-judgmental terms at a time when the human companion is prepared for the discussion. Then, by simultaneously prescribing a physical activity plan for the human and their companion, both can benefit in measured and immeasurable ways. Similarly, dietary changes prescribed for humans should be mirrored with similar recommendations for the non-human animal. Academically, much progress can be made in the understanding of obesity in both human and non-human animals by using the genetic information learned by studying each separately and in a companionship dyad. Future One Health partnerships in basic, translational, and clinical research will benefit all species.

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IT REALLY HURTS - PAIN MANAGEMENT IN SMALL ANIMAL DENTISTRY

Brook Niemiec

veterinary dental specialties, Dentistry, san diego, United States of America

Qualifications:

Brook A. Niemiec

DVM, DAVDC, DEVDC, FAVD

bniemiec@vdspets.com

Chronic pain

Veterinary patients with severe local manifestations of periodontal disease as well as those with unusual forms of periodontal disease (such as caudal stomatitis and CUPS) are suffering from chronic pain. Special preparation should be strongly considered when approaching these cases surgically. Recognizing not only the pain at the site of inflammation, but also the often neglected central pain mechanisms, is important when managing these patients. **Initiating acute surgical pain to chronically diseased painful tissue heightens the pain response creating a patient that is difficult to manage post-operatively.**

Creating acute, surgical pain in chronically diseased, painful tissue heightens the pain response creating a patient that is difficult to manage post-operatively. Therefore, preemptive analgesia is proven to be more effective than post-operative, and it is therefore important to administer the drugs **before** the painful procedure. Depending on patient health, a multimodal approach should be employed, as this provides superior analgesia.

Opioids

These are excellent pain medications and are safe for virtually all patients, including those with metabolic derangements (renal and hepatic disease). Furthermore, most opiates will decrease MAC and improve anesthetic safety. Morphine, hydromorphone, and buprenorphine are good opioid choices. We tend to utilize morphine in dogs and buprenorphine in cats. Buprenorphine is an excellent choice for dogs as well, but a very large volume is typically necessary. Butorphenol is known to only provide pain relief for approximately 30 minutes (range of 23-53 minutes, which is woefully inadequate for pain control. Furthermore, one study reported that butorphenol alone was no more effective than saline in controlling intraoperative pain.

Recent studies show that tramadol may be an effective and potentially safer premedication than true opioids.

Post-operatively a fentanyl patch may provide long lasting pain control without oral administration. However, studies show inconsistent results. Oral dosing of buprenorphine has been shown to be an excellent means of pain control in felines. In canines, oral codeine has been used with good success.

NSIADs

Non-steroidal anti-inflammatories are an excellent means of providing pain control for oral surgery. In fact, they have been shown in some studies to be superior to opioids for relief of surgical pain.

A major advantage to these medications is that they typically have a 24 hour activity. This is much easier than the BID to QID dosing of opioids. Moreover, the fact that the first 24 hours is covered by the pre-operative injection is especially advantages in the initial post-operative period when the patient may be anorectic.

NSAIDs need to be used with care in cases of metabolic disease, especially renal impairment. Pre-operative testing is critical to ensure that pre-existing renal disease is not present. This should include a complete urinalysis, especially in felines. This is true for several reasons. First, it is common for felines to have slightly elevated renal indices with concentrated urine. Second, urine Sp. Gravity and proteinuria are early markers of renal dysfunction. Close intraoperative blood pressure monitoring is critical, as decreased perfusion can potentiate the negative effects.

Regional nerve blocks

An additional, critical method of pain management is regional anesthesia (also known local nerve blocks). When correctly administered, regional nerve blocks provide not only elimination of pain perception in the innervated tissue but also positive systemic effects.

Intravascular administration must be avoided. Aspirating prior to injection will ensure extravascular placement of the agent. Excessive systemic uptake or intravascular administration could result in CNS, cardiovascular or vasopressive complications.

There are two agents in common usage for regional anesthesia, lidocaine and marcaine. Lidocaine has the advantage of fast onset (1-2 minutes) but only lasts 1-2 hours,and therefore does not provide adequate analgesic duration in lengthy procedures. In addition, it offers only minimal if any pain relief in the postoperative period. Conversely, bupivacaine's analgesic effect is significantly longer in duration (6-8 hours). The concern with its use has been that it was thought to have a longer onset of action, however, human studies reveal it may take effect in as little as 4.4 to 7.7 minutes. The desire of short onset with longer duration made combining the products a popular option. However, recent research has shown that the combination may result in decreased efficacy.

The addition of epinephrine to local agents has been shown to increase the activity by 50%. Furthermore, adding buprenorphine or morphine to a bupivacaine block may result in a duration of effect almost twice that experienced with bupivacaine alone.

Recommended infusion volumes vary from 0.1ml – 1.6 ml from small to large patients. As far as dosage of local anesthetics is concerned, the published recommended maximum total dose of local anesthetics is 2 mg/kg (single agent or combination). This level is easy to reach in small patients when utilizing 2% lidocaine in feline and small and toy breed dogs. For example, a 5 kg patient should receive a maximum dose of 0.5 cc of 2% lidocaine.

The three major blocks are the infraorbital, mental, and mandibular. Some dentists/anesthesiologists utilize the caudal maxillary block, but this author does not recommend it due to the increased possibility of orbital penetration. If properly performed, the infraorbital block can effectively anesthetize the entire ipsilateral maxillary quadrant.

The depth to which the needle is placed within the foramen is one of significant debate. Some dentists recommend that the foramen be barely or not entered, while others will place the needle very deep within the infraorbital canal to block the molar teeth. I tend to be somewhere in between.

Infraorbital block

The infraorbital block is effective for the ipsilateral maxilla, teeth, and associated soft tissues. The infraorbital canal runs rostrally just above the apices of the maxillary fourth premolar and exits the maxilla over the distal root of the third premolar. To approximate the dorso-ventral location it is helpful to imagine the fourth premolar as being approximately the same size mesio-distal as corono-apical. Therefore, measure the width of the tooth and then measure that distance dorsally from the cusp tip. The infraorbital canal is just apical to this point. The foramen is easily

palpated, especially in cats and large breed canines.

Manually retract the lip and the infraorbital neurovascular bundle dorsally. The neurovascular bundle is easily palpated as a band of tissue coursing rostral and slightly dorsal from the infraorbital foramen demonstrated beneath the vestibular mucosa. Advance the needle in a caudal direction close to the maxillary bone and ventral to the retracted bundle to a point just inside the canal. The needle should pass into the canal without engaging bone. Correct placement can be confirmed if desired, by gentle lateral movement of the needle allowing it to engage the canal wall.

In feline patients, the infraorbital canal is VERY short, which allows for orbital penetration. For this reason, barely enter the foramen and direct the needle ventrally. In dogs, do not advance past the medial canthus of the eye. The block will diffuse distally to the molars if a finger is placed over the foramen for 30-60 seconds after injection.

Mental Block:

The middle mental foramen is located apical to the mesial root of the second premolar in the dog, and in the midway in the diastema between the canine and third premolar in the cat. The canal is located approximately 2/3 down from the dorsal border of the mandible. The inferior alveolar nerve is blocked, which anesthetizes from the ipsilateral mandibular third premolar to the central incisor and the surrounding bone and associated soft tissue. Therefore, needle placement must be within the canal to properly anesthetize all tissue.

The mandibular labial frenulum is retracted ventrally and the needle is inserted at the rostral aspect of the frenulum and advanced at an approximate 45 degree angle along the mandibular bone to just enter the canal. Placement can be confirmed by moving the syringe laterally to encounter the lateral aspect of the canal.

Mandibular Block

The inferior alveolar nerve enters the mandibular foramen on the lingual aspect of the caudal mandible. The caudal mandibular block is performed by infiltrating the nerve at this level prior to its entry into the canal. This author tends to perform this block intraorally. The patient is placed in dorsal recumbancy and the mouth opened. With the index finger of the non-dominant hand, feel the notch on the ventral aspect of the caudal mandible. Then slide the finger a bit dorsally on the lingual aspect. Measure the width of the third molar and inter the mucosa right on the lingual aspect of the mandible at a point that far back from M3. Insert on a 45 degree angle advancing along the bone until the needle is felt moving through the tissues and inject at this point.

Exceedingly rarely, patients who are not monitored postoperatively can cause severe trauma to the tongue during the recovery period. Whether this is specifically associated with regional anesthesia or recovery from any procedure is not reflected in the literature.

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PREVENTING ANESTHETIC COMPLICATIONS

Tamara Grubb

International Veterinary Academy of Pain Management, Ivapm, Uniontown, United States of America

Qualifications:

Tamara Grubb

DVM, PhD, DACVAA, President International Academy of Veterinary Pain Management

tamaragrubb@wsu.edu

Nobody likes anesthetic complications. The most effective way to deal with anesthetic complications is to ***prevent them*** through appropriate 1) stabilization of the patient, 2) selection of type and dosage of anesthetic drugs, 3) preparation of anesthetic equipment, 4) physiologic monitoring and 5) pre-, post- and intra-operative support of the patient. If complications can't be prevented, they should be identified and corrected early - before they become emergencies.

Patient comorbidities can increase the risk of complications. Species, age, body weight & size and temperament can also contribute. Anesthesia causes depression of all organ systems but changes in the central nervous, cardiovascular and respiratory systems are the most immediately life-threatening. Thus, physiologic monitoring focuses on these systems. By supporting these systems and insuring appropriate anesthetic depth, blood pressure and blood oxygen content, we provide support for all of the other organ systems.

Physiologic monitoring is key to preventing/identifying complications. There are many very useful electronic monitors available but remember that machines are only as good as the person watching them. Thus, my favorite monitor is a **good technician/nurse!**

I. Central nervous system complications/emergencies

Excessive anesthetic depth is unfortunately common and can lead to excessive depression of the CNS, cardiovascular and respiratory systems.

Causes: Anesthetic drugs (side effects are largely dose dependent); age and health status of the patient (neonates, geriatrics, compromised patients require lower anesthetic drug dosage – don't overdose!); duration of surgery (surgery may be more invasive, patient keeps getting colder, etc); hypothermia (causes decreased need for anesthetic drugs).

Prevention/Treatment: Continually assess anesthetic depth using response to surgery, eye position, jaw tone, respiratory rate and rhythm, heart rate and rhythm, arterial blood pressure, etc… and challenge the anesthetic plane by decreasing the vaporizer % and reassessing the patient's responses. IMPORTANT: Use analgesics so that the patient can be maintained at a lower dose of inhalants. If the patient is too deep, decrease the inhalant or injectable dose. If dangerously deep, discontinue the maintenance drugs, empty the rebreathing bag of the inhalant and refill with pure oxygen and breathe (don't over breathe!) for the patient.

II. Respiratory complications/emergencies

Hypoventilation = impaired gas exchange (removal of CO_2/uptake of O_2). This can cause hypercarbia (end-tidal CO_2>45mmHg, up to 55 may be tolerable), which can cause respiratory acidosis, and/or hypoxemia (PaO_2 < 50-60 mmHg room air or <200 mmHg 100% O_2; SpO_2<90% room air,<95% 100%O_2), which can cause decreased tissue oxygen delivery with subsequent tissue ischemia.

Causes: Anesthetic drugs, patient physical impairment (eg, airway obstruction, abdominal distension against the diaphragm) or physiologic/health issues (eg, respiratory disease, CNS depression or disease) or equipment malfunction.

Prevention/Treatment: Hypercarbia is almost always due to hypoventilation but can also be due to failure to eliminate CO_2 due to exhausted CO_2 absorbent (rebreathing system) or inadequate oxygen flow (non-rebreathing system) and rarely production of excessive amount of CO_2. Hypoxemia is commonly due to hypoventilation but can be due to inadequate oxygen delivery either from equipment (eg, oxygen not turned on) or airway (eg, one-lung intubation, atelectatic lung). Prevent the need for high doses of maintenance anesthetics by using appropriate premedication sedatives and analgesics. Appropriate anesthetic depth, adequate ventilation and appropriate machine maintenance will generally prevent hypoventilation, hypercarbia and hypoxemia, but hypoxemia may require additional airway support.

III. Cardiovascular complications / emergencies

A. Hypotension (MAP<60 mmHg in small animals or <70 mmHg in horses [higher value to support muscle blood flow]) leads to decreased blood flow, and therefore decreased tissue oxygen delivery.

Causes: Decreased cardiac output (C) and/or systemic vascular resistance. CO is determined by heart rate (HR) x stroke volume (SV). SV is dependent on preload (circulating fluid volume), afterload (vascular tone) and myocardial contractility. Blood pressure is determined by COxSVR.

Prevention/Treatment: Contributing factors include anesthetic drugs and physical or physiologic issues in the patient. Many anesthetic drugs can contribute, especially the inhalants.**The degree of cardiovascular depression is dose-dependent for most drugs. Physical or physiologic issues that cause hypotension include anything that causes an impairment of

myocardial function (eg anesthetic drugs particularly inhalants, cardiac disease, arrhythmias, and many systemic diseases, eg, septicemia, hypothyroidism)

vascular tone (anesthetic drugs especially inhalant drugs as they cause profound vasodilation and and systemic diseases like septicemia).

circulating volume (intravascular fluid loss, eg, dehydration, hemorrhage, 'third-spacing' of fluid, evaporation of fluid from open body cavities and the respiratory tract, etc…).

Prevention/Treatment: Prevent the need for high doses of maintenance anesthetics by using appropriate premedication sedatives and analgesics. Continuously monitor blood pressure (BP). In addition to blood pressure (BP) monitor HR, quality/strength of pulse, mucous membrane color, capillary refill time (CRT<2 seconds) and SpO_2, which provides information not only on oxygenation but also on circulation. If hypotensive, DECREASE ANESTHETIC DEPTH. May need to increase fluid rate – give a bolus of crystalloids or colloids or both. Fix the heart rate (see next section). Administer positive inotropic drugs (eg, dopamine or dobutamine – the dose of both is roughly 1-10 microg/kg/min).

B. Arrhythmias ANY arrhythmia can occur during anesthesia but the most commonly occurring arrhythmias are bradycardia, tachycardia and ventricular premature contractions (VPCs). Arrhythmias are concerning not only because they could be a result of organic cardiac disease but also because they can contribute to hypotension and decreased organ perfusion.

Causes/Prevention/Treatment:

Bradycardia can be caused by some anesthetic drugs (eg, alpha-2 agonists, opioids and propofol) or by maneuvers that enhance **vagal tone** (eg, ocular or laryngeal procedures). Prevent or treat IF the patient is also hypotensive and/or if there is some other concurrent arrhythmia (like

second degree AV block). Remember that the alpha-2 agonists cause low heart rate with high blood pressure and using anticholinergics will cause an unnecessary increase in cardiac work.

Generally vagally mediated, treat with anticholinergics (0.04 mg/kg atropine; 0.01mg/kg glycopyrrolate).

If unresponsive try catecholamines, eg dopamine (1-10 mg/kg/min), epinephrine (0.1-1.0 microg/kg/min) or norepinephrine (0.5-1.0 microg/kg/min).

Occasionally, unresponsive bradycardia may occur due to cardiac disease, toxemia, profound hypothermia, profound hypoxia, a variety of systemic diseases, etc...

Tachycardia generally occurs secondary to an underlying conditions like pain, inadequate plane of anesthesia, excessive plane of anesthesia, high CO_2, cardiac disease, systemic conditions like hyperthyroidism and septicemia, etc… Generally, treat tachycardia by eliminating the underlying cause rather than the tachycardia itself. (RARELY beta-blockers will be administered to patients under anesthesia to decrease tachycardia from uncommon, uncontrollable causes like pheochromocytoma.)

Ventricular premature contractions (VPCs – or premature ventricular contractions, PVCs) can be caused or exacerbated by pre-existing myocardial disease, by some anesthetic drugs and by physiologic abnormalities like hypoxia, hypercarbia, acidosis and electrolyte abnormalities. A low number of VPCs are normal in some patients (eg, geriatric patients) and may not require treatment. Treatment should be initiated if the arrhythmia is affecting the blood pressure or if the number of VPCs is >20% of the total number of ventricular beats. The first line of treatment for **VPCs** is to eliminate all underlying causes (eg, treat electrolyte imbalances, improve oxygenation, etc…).

Lidocaine is generally the first choice for treatment of VPCs and the dose in dogs is 2-6 mg/kg IV (maximum 8 mg/kg during over 10 minutes) followed by 25-75 microg/kg/min infusion.

Lidocaine dose in cats is 0.2-0.5 mg/kg IV as an initial bolus followed by 10 microg/kg/min infusion.

Procainamide (not always available) dose in dogs is 10 (8-20) mg/kg IV bolus followed by 25-50 microg/kg/min infusion. The dose in cats is 1-2 mg/kg IV SLOW bolus followed by 10-20 microg/kg/min infusion.

Procainamide can cause profound negative inotropic effects and should not be administered to patients with impaired contractility. Arterial blood pressure should be monitored during the administration of procainamide.

IV. Thermoregulation*Hypothermia* is a common complication during anesthesia & causes a variety of complications including clotting dysfunction, increased risk of infection, tissue hypoxia, acidosis, abnormal cardiac electrical conduction, myocardial ischemia, etc... (Noble 2006). Hypothermia also causes cerebral effects that decrease the patient's anesthetic needs. Unfortunately, the decreased anesthetic need is not always recognized and the delivery of anesthesia is not changed, resulting in an overdosage of anesthetic drugs. Although shivering in recovery may increase the body temperature, the intense muscle movements associated with shivering causes discomfort and increases oxygen consumption by as much as 200% (Sessler 2002). *Causes*: Anesthesia induced vasodilation, muscle relaxation and decreased thermoregulatory control. Cold tables and rooms. Cold scrub solution and excessive patient wetting. Cold oxygen flowing through the airways. ANESTHESIA TIME.*Prevention/Treatment*:: Continuous monitoring is ideal but intermittent monitoring is acceptable. Core temperature as measured by an esophageal temperature probe is generally more accurate than rectal temperature (because feces is often present in the rectum). Use active warming in all anesthetized patients. Forced air blankets tend to be most effective. The biggest drop in temperature occurs right at/after induction as anesthetic drugs cause vasodilatory heat loss and the thermoregulatory center becomes less responsive to body temperature changes. Start warming right at induction. Small body-size patients suffer the worst heat loss and body temperature support should be 'aggressive' in these patients.

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VACCINATION CONTROVERSIES

Mary Marcondes

Sao Paulo State University, School Of Veterinary Medicine, Sao Paulo, Brazil

Qualifications:

Professor Mary Marcondes

DVM. MSc, PhD

marcondes.mary@gmail.com

Vaccine hesitancy refers to the delayed decision to accept or refuse immunisation when available. However, many pet owners choose not to vaccinate their pets without consulting a veterinarian. They neither delay nor refuse vaccination but avoid any discussion about it. Various factors, including beliefs, concerns, or preferences towards immunisation, can drive hesitancy and refusal. Communication plays a crucial role in vaccination uptake and addressing hesitancy and can positively impact vaccination rates. It's essential to build trust, talk about concerns comprehensively, and provide honest information about side effects to address vaccine hesitancy. Over the past 30 years, concerns have been raised about the safety of repeated vaccination in human and veterinary medicine. Veterinary professionals have responded by forming expert groups to create guidelines that promote a different approach to vaccination and consider how vaccination of companion animals might be performed more safely while still maintaining the protection of individual animals and herd immunity from vaccine-preventable infectious diseases. They encourage veterinarians to abandon a one-size-fits-all approach and consider local infectious disease risks when determining individual vaccination needs. While guidelines are not legally binding, they bridge the gap between current scientific understanding and historical advice provided during vaccine licensing. One example is that guidelines recommend vaccinating adult dogs against canine distemper virus (CDV), canine parvovirus (CPV), and canine adenovirus (CAV), and adult cats against feline parvovirus (FPV) every three years. Following a triennial revaccination protocol for these diseases with owners' informed consent is not controversial, even if the licensed products indicate a 1-year duration of immunity (DOI). Many studies have demonstrated that modified live virus (MLV) vaccines against CDV, CPV, CAV and FPV provide protection for extended periods, well beyond three years. Revaccination does not provide additional benefits to animals with existing protective antibodies. For many vaccines we use, there is a strong association between the presence of antibodies and protection. So, we can measure antibodies to determine if the animal is protected. This correlation is robust for CDV, CPV, CAV and FPV. Traditionally, to measure protective antibodies, we had to send blood samples to a laboratory to perform gold standard tests, which are the virus neutralisation test for distemper and adenovirus in dogs, and the hemagglutination inhibition test for parvovirus in both dogs and cats. However, in the past two decades, and sometimes even more recently, depending on the country, veterinarians have gained the ability to perform these tests in their practices using point-of-care (POC) test kits. When using a POC test to measure antibodies and determine protection, it's crucial to consider the test's specificity and positive predictive value (PPV). A high specificity (e.g., 95%) means a low chance of false-positive results (5% false positives). The PPV tells us how many of the positive results are true positives, and if this number is high (as close to 100 as possible), then it suggests that this test is doing as well as the gold standard. It is important to remember that a false positive result would suggest that an animal has antibodies and is protected. Because the result is a false positive, the animal should be revaccinated. So, we need to be careful when choosing a rapid test. Although this current generation of test kits is a significant advance, when selecting a test kit to use in practice, veterinarians should consider which kits have been independently validated, have published sensitivity and specificity relative to gold standard tests, and have a background of peer-reviewed scientific literature supporting the value of the test. We consider using POC kits (or gold standard tests) in different situations. The first is to know if a puppy or a kitten in early life has responded to the core vaccines (CDV, CAV, CPV and FPV). We can perform a titre test 4 weeks after the last vaccine dose. In this case, we will test at 20 weeks of age to see if a puppy has antibodies against CDV, CPV and CAV. At 20 weeks old, it would be highly unlikely that this pup still has antibodies from the mother. If this puppy is protected for the three antigens, you don't need to give the last vaccine at 26 weeks of age, and you can revaccinate against CDV, CAV and CPV no more often than every three years. If he has a negative result for one or more antigens, that animal may be unprotected, so we have to repeat vaccination once and repeat serology after four weeks. If he still has a negative result, this puppy may be a non-responder for this antigen and probably won't be protected, no matter how many doses you give him. Another situation is an animal adopted from the streets, and you have no idea of the vaccination history. Serological testing may also be helpful in determining whether an animal that has previously suffered an adverse reaction to vaccination requires revaccination that may trigger a further episode of disease. Instead of vaccinating dogs, we could use serologic testing every three years, or even every year, as part of the annual health check visit. These tests can help to make fundamental decisions about whether or not we are going to revaccinate this adult dog. And finally, we can use serology to manage infectious disease outbreaks in shelters – specifically for CDV, CPV and FPV outbreaks. Are companion animal vaccines safe? No human or animal vaccine can be guaranteed 100% safe for any individual – but vaccines are very safe products with a low prevalence of associated adverse reactions. A vaccine-associated adverse event (VAAE) is defined as any undesirable side effect or unintended effect associated with the administration of a vaccine. A range of VAAEs is reported in small companion animals. The most common is mild and transient pyrexia, anorexia and lethargy for a few days after vaccination (particularly in young animals). This effect is not 'adverse' because it simply reflects the initiation of the inflammatory and immune response to the vaccine. Vaccines are suggested to cause a period of transient post-vaccinal immunosuppression, but this effect is poorly investigated. Some vaccines may induce mild versions of the disease against which they are protecting if inappropriately administered. For example, modified live feline herpesvirus (FHV) and feline calicivirus (FCV) vaccines might induce respiratory signs if they are inappropriately aerosolised during administration or if they leak from an injection site and are groomed by the cat to an oronasal surface. Vaccines have the potential to cause rare but severe allergic reactions. One of the most common is type I hypersensitivity. The most significant allergens are often vaccine excipients, such as bovine serum proteins and some adjuvants. The actual virus that is the immunogen is rarely the source of the misdirected immune response. There is a range of clinical presentations, including angioedema and urticaria, and sometimes acute anaphylaxis presented with vomiting and diarrhoea, dyspnea, respiratory depression, hypotensive shock, cardiocirculatory collapse and death. Type II hypersensitivity is thought to underlie the proposed association between vaccination and the onset of immune-mediated haemolytic anaemia and immune-mediated thrombocytopenia, particularly in the dog. These autoimmune reactions are complex, and vaccines are just one of a range of predisposing and triggering factors that might underlie their onset. Type III hypersensitivity may be induced by vaccination. The deposition of immune complexes in tissues may cause local inflammation. Some rabies vaccines may induce local vasculitis in the skin resulting in ischemic dermatitis and local alopecia. Type IV hypersensitivity reactions may occur at the injection site in response to vaccination. The more common reaction is local granuloma formation that usually disappears in weeks or months. Under some circumstances, lack of efficacy is also considered an adverse event. This could happen due to inappropriate storage of the vaccine or use in animals unable to respond, such as those with immunosuppression or high levels of maternally derived antibodies (MDA). Adverse events are significantly influenced by breed/genetics, size/weight (small dogs) and number of vaccines administered per consultation. Overall, our best estimates are somewhere between 20–60 VAAEs for every 10,000 animals vaccinated; most of these will be mild and transient, non-life-threatening reactions. This low number reinforces the safety of canine and feline vaccines. The benefit of protection from life-threatening infectious diseases conferred by vaccination will always far outweigh the risk of VAAEs. The most severe small companion animal VAAE is the feline injection site sarcoma (FISS). The prevailing hypothesis

suggests that chronic inflammatory reactions may initiate the process of malignant transformation. Adjuvanted vaccines are known to induce intense local inflammation, and there have been suggestions that they would be linked to the development of FISS. Although the risk is likely lower with modified-live and recombinant vaccines, it's important to note that no vaccine is entirely risk-free. Prior to administration, vaccines should be brought to room temperature. If available, non-adjuvanted, modified-live, or recombinant vaccines should be preferred over adjuvanted vaccines. The incidence of FISS has been estimated at 1 to 4 in every 10,000 vaccinated cats in the US. This can vary depending on the country.

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CANINE CHRONIC HEPATITIS

Andrea Johnston

LSU School of Veterinary Medicine, Veterinary Clinical Sciences, Baton Rouge, United States of America

Qualifications:

Andrea N. Johnston, DVM, PhD

Diplomate American College of Veterinary Internal Medicine (SAIM)

Associate Professor of Small Animal Internal Medicine

Louisiana State University School of Veterinary Medicine

johnston1@lsu.edu

CANINE CHRONIC HEPATITIS

Abstract: Chronic hepatitis (CH) can only be diagnosed histologically, and is characterized by hepatocellular apoptosis or necrosis, a variable inflammatory infiltrate, regeneration, and fibrosis that may progress to cirrhosis. CH must be differentiated from inflammatory/degenerative change caused by extrahepatic disease (nonspecific reactive hepatopathy to systemic disease).

1. ***CH represents a diverse group of diseases***. Although there is evidence for infectious, metabolic, toxic, and immune causes of CH, most cases of CH in the dog are idiopathic.

2. ***Specific causes***

a. Infectious: Sporadic cases of CH have been associated with other infectious agents: Leptospirosis causes a pyogranulomatous inflammation. *Ehrlichia canis* and babesiosis has been associated with CH. Experimentally, anaplasmosis causes subacute hepatitis. Leishmaniasis is associated with granulomatous CH.

b. Drugs and toxins: The most common toxic injury causing CH in dogs is a consequence of hepatic copper (Cu) excess. Treatment with phenobarbital and lomustine can result in CH. Several other drugs or toxins including carprofen, aflatoxin, and cycasin may lead to CH although they more commonly cause acute hepatic injury. Don't forget about herbal and dietary supplements!

c. Immune-mediated CH: Specific criteria for the diagnosis of immune-mediated hepatitis in dogs have not been developed. A presumptive clinical diagnosis of immune-mediated CH in the dog requires elimination of other causes and a favorable response to immunosuppressive treatment. An immune basis in some dogs with idiopathic CH is suggested by lymphocytic infiltrates in the liver, abnormal expression of major histocompatibility complex class II proteins, positive serum autoantibodies, familial history of liver disease, association with other immune-mediated disorders, female predisposition, and favorable response to immunosuppression. The lack of commercially available tests to detect liver-specific antibody-antigen interactions or cell immunosensitization limits the definitive diagnosis.

B. ***Clinical Signs of CH***

1. Vague & episodic

2. Hyporexia / anorexia, fever, abdominal pain, unkempt appearance, vomiting ± diarrhea weight loss, polyuria / polydipsia lethargy, jaundice, weakness

C. ***Breeds of Dogs with Increased Prevalence of CH:***

1. Cocker Spaniel, Kerry Blue "Skye" Terrier, Standard Poodle, Jack Russel Terrier, Chihuahua, Beagle, German Shepherd Dog, Bernese Mtn Dog, Doberman Pinscher

2. *Copper associated hepatopathy*: Labrador retriever, Doberman Pinscher, West Highland White Terrier, Bedlington Terrier (COMMD1 mutation-genetic test available)

3. *Breeds with increased risk biopsy earlier*

D. ***Clinicopathologic Features***

1. ↑ Serum enzyme activity (ALP, GGT, ALT, AST);

a. ALT is the first enzyme to elevate

b. >12 weeks in duration

c. Cyclic enzyme activity

2. Initially, liver function tests are NORMAL

3. With chronicity, there is evidence functional disturbances:

↓Albumin, ↑Bilirubin, Coagulopathy, ↓BUN, ↓Fibrinogen, Hyperammonemia, ↓Cholesterol, ↓Glucose, ↑Bile Acids

4. Progressive disease ◊ cirrhosis, portal hypertension, hepatic encephalopathy, coagulopathy, ascites

E. ***Imaging***

1. Abdominal ultrasound is informative, but is operator dependent, has low sensitivity, and there are no pathognomonic changes of CH.

2. Ultrasound helps to identify complications associated with CH: acquired portosytemic shunts (APSS), ascites, splanchnic thrombi, and gastrointestinal ulceration.

3. Advanced imaging modalities (CT angiography) may be necessary to diagnose vascular anomalies like portal vein thrombi or APSS.

Liver Biopsy: Tissue Biopsy is the diagnostic gold standard; Cytology cannot confirm diagnosis of CH

1. Reasons for Liver Biopsy

a. Rule in or out neoplasia (discrete mass lesions visualized via US, diffuse infiltration)

b. Define extent of histologic abnormality

c. Metal Quantification: copper storage hepatopathy, iron accumulation: each augment oxidative injury

d. Bacterial aerobic & anaerobic cultures: rule out causal / complicating infections

e. Tissue response, monitors response to medical intervention (follow-up sampling).

Liver biopsy guidelines for dogs

Histology

15 portal tracts needed for accurate histologic evaluation

5 laparoscopic or surgical samples, multiple 14 – 16 G needle biopsies

Biopsy multiple lobes (n >,= 2)

Handle tissue carefully to avoid crush artifact & immediately place in neutral buffered formalin (10:1, fixative to tissue, No sample should be >0.5-1cm to ensure proper fixation)

Histology should include:

H&E stain,

Rhodanine or rubeanic acid stain – quantify & localize copper

Masson's trichrome or Sirius red – fibrosis

Reticulin stain – lobular architecture

Perls' Prussian blue stain – quantify and localize iron

Special stains added to identify infectious organisms if granulomatous or pyogranulomatous inflammation is present

Aerobic & anaerobic culture

Use appropriate transport media

Copper quantification (canine)

Dry weight atomic absorption spectrometry

20-40 mg of liver (wet weight)

Empty glass tube, if using red top tube do not allow sample to contact top it contains copper

Tissue can be frozen or extracted from paraffin block for copper quantitation later

*Cornell offers digital quantification from rhodamine stained slides

Normal hepatic copper quantification is less than 400 µg/g dry weight liver

G. ***Treatment:***

1. Response to treatment is variable and depends on the primary cause.

a**. Infectious hepatopathies** require antimicrobial treatment. In some cases, treatment of the inciting infectious agent may lead to clinical remission of CH, whereas in other cases full remission may not be achieved, possibly as a result of pathogen-induced self-perpetuating immune disease.

b. **Drugs and toxins:** suspected hepatotoxic drug or supplement exposure should be promptly discontinued. In most cases, antioxidant treatment is indicated.

c. **Immune-mediated hepatitis**: Immunosuppression with corticosteroids, azathioprine, cyclosporine, and/or mycophenolate in single or combined treatment protocols. At present there is no designated immunomodulatory protocol that can be recommended as "standard of care" for suspected immune-mediated CH in dogs without further focused studies.

d. **Copper-associated (Cu) CH:**

1. *Diet*: Treatment for CuCH involves lifelong dietary Cu restriction. Because most currently available Cu-restricted diets (Hill's L/d, Royal Canin Hepatic) are protein restricted, additional protein supplementation is advised.

2. Cu chelation (removal of Cu from the liver): D-penicillamine (D-pen) D-pen is given PO on an empty stomach because food decreases bioavailability. D-pen combined with dietary Cu restriction usually normalizes hepatic Cu concentrations as high as 1500 µg/g dw within 6 months. Normalization of serum ALT activity is used as a surrogate to estimate treatment success. ***Co-administration of vitamin B6*** (25mg PO q 24h) is recommended.

3. *Antioxidants*: During chelation treatment, antioxidant treatment (S-adenosylmethionine (SAMe) and vitamin E) is recommended because Cu causes oxidative liver injury.

4. Zinc gluconate or acetate: ***After completion of chelation,*** zinc may be administered to restrict enteral Cu absorption. Zinc must be given on an empty stomach. Plasma zinc concentrations should be measured to prevent toxic serum concentrations. Co-treatment with D-penicillamine and zinc is contraindicated because zinc is a divalent cation that binds D-penicillamine.

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HYPERCOAGULABILITY IN THE CRITICALLY ILL SENIOR/GERIATRIC

Maureen Mcmichael

Auburn University, Clinical Sciences, Auburn, United States of America

Qualifications:

Maureen Ann McMichael, DVM, M.Ed., DACVECC

mam0280@auburn.edu

Hypercoagulability in the critically ill senior/geriatric pet

Maureen A. McMichael, DVM, M.Ed., DACVECC

College of Veterinary Medicine

Auburn University

Auburn, AL, USA

Introduction

The coagulation system becomes more prone to clotting (prothrombotic) with age in humans and, likely, pets. A combination of toxin exposure (e.g., pollution, pesticides, chlorinated water, etc.), stress, poor diet, and oxidative stress contribute. This talk with start with a brief review of physiologic hemostasis, including an update on the new models of coagulation. We will discuss the aging changes that contribute to prothrombosis, detrimental effects (including hidden and micro-thrombosis) and will conclude with practical strategies to mitigate prothrombotic states in our pet patients.

Endothelial Review

Our research into the endothelium has evolved from the belief that it was an inert tube that carried blood all the way to today where it is a living, breathing (internal mitochondrial respiration), organ that is extremely heterogeneous, highly intelligent (endothelial cells sense what other endothelial cells upstream or downstream are reacting to), and absolutely essential for the health of every cell in the body.

The endothelium in health is a powerful antithrombotic surface. First, the glycocalyx, a hairy like covering of the endothelium, has a negative charge that repels cells towards the center preventing platelets from rolling on the endothelium. There is also constitutive expression of numerous substances including thrombomodulin, endothelial protein C receptor, heparan sulfate proteoglycan, tissue factor pathway inhibitor, nitric oxide, prostacyclin and ADPases (enzymes that break down ADP). These are all antithrombotic. Lastly, the endogenous prothrombotic substances (e.g., collagen, von Willebrand Factor, tissue factor) are sequestered from the flowing blood being contained in the subendothelium (collagen, vWF) and adventita (tissue factor).

Normal hemostasis is local – very important. We never want systemic clotting! During the process of physiologic hemostasis these three protections are removed – locally. For instance, when a needle penetrates the endothelium (e.g., phlebotomy) multiple mechanisms remove/inactivate thrombin diffusing away from a local clot. A breach in the endothelium does several things; it removes the negative charge, removes the anti-thrombotic substances, and exposes pro-thrombotic substances that are normally sequestered from flowing blood. This allows the creation of a local fibrin clot.

Healthy Endothelium

Prostacyclin & Prostaglandin

Prostacyclin (predominantly large vessels), and PGE_2 (predominantly small vessels) are constituitively expressed on the endothelium and are potent vasodilators. Importantly, these anti-thrombotics are inhibited via blocking of the COX enzyme system (e.g., NSAIDS), which is one way NSAIDS can lead to thrombosis.

Ectonucleotidases

Ectonucleotidases break down ADP (ADP; adenosine diphosphate) after it is released from platelets after platelet activation. ADP that diffuses away can lead to systemic platelet activation and these scavenge any ADP that diffuses away from a local clot.

HSPGs and HCII

Heparan sulfate proteoglycans repel platelets and are an integral part of the glycocalyx.

HSPGs are markers of GLX degradation.

Tissue Factor Pathway Inhibitor

This is a very important inhibitor of coagulation and it Inhibits initial steps in coagulation. It must then be overcome by thrombin to allow clots to form. TFPI-F10a complex inhibits TF-7a

Antithrombin

An important endogenous anti-thrombotic. It Must bind to cofactor, has a Pentasaccharide sequence, which is present on ~30% pharmaceutical grade heparin. And on endothelial bound HSPG, AT inhibitory activity enhances >1000 fold By binding to heparin

Protein C pathway

Thrombomodulin (TM) is expressed on the endothelium and any thrombin that diffuses away from local clot becomes bound in TM. Complex of TM-Thrombin activates protein C and becomes an antithrombotic powerhouse. Activated protein C (APC) inactivates F5&8. So the protein C pathway is an important endogenous anti-thrombotic.

Endothelial protein C receptor (EPCR) acts similar to APC but in different vessels.

Nitric Oxide Gas Diffusion

Because NO is a gas it has the ability to diffuse through the endothelial wall to the lumen, where it inhibits platelet reactivity and to the abluminal side, where it relaxes vascular smooth muscle and inhibits cell proliferation. This gas is crucial for blood vessel health! The precursor to NO is arginine and cats have a specific need for arginine in their diet. A study found that cats with thromboembolism were low in arginine compared with normal cats. (JVIM McMichael 2001).

Thrombosis

Thrombosis is defined as an unwanted clot (e.g., no breach in endothelium) that may be obstructive. Thromboembolism occurs after either dislodging of a local clot or the occurrence of systemic clotting (DIC – disseminated intravascular coagulation).

Hemostasis vs Thrombosis

The Inter-relationship between immunity and coagulation can be traced back to the beginning of evolution where one cell, the hemocyte, controlled immunity and hemostasis (invertebrates). This basic survival strategy walls off damaged, infected tissues in an attempt to limit infections. The coagulation system inhibits pathogens and the immune system sets off clotting. Platelets wall off pathogens, neutrophils extrude DNA in nets to limit pathogens and platelets extrude NETS too! Polyphosphate (PolyP) in bacteria and viruses sets off the contact pathway to trigger systemic clotting.

Thrombosis and Immunity

There is a clear crosstalk between the coagulation and the immune system and there is a significant morbidity from thrombosis with infection. Newer treatments address both

Virchow's Triad

The components of clot formation occur due to changes in blood flow (stasis), blood constituents (retention of procoagulant factors), and the endothelial wall (stretching or damage).

Blood flow changes that are associated with prothrombotic states in veterinary patients include stasis in the Left Atrium (cats with HCM) which often leads to arterial thromboembolism (e.g., saddle thrombus). Blood changes that can lead to prothrombotic state include increased viscosity (e.g., Polycythemia, Hypergammaglobulinemia).

Alterations in Endothelium

Damage leading to down regulation and/or elimination of antithrombotics along with up regulation or exposure of prothrombotic substances. Inflammation, hyperglycemia, oxidative stress, LA stretching, physical damage (e.g., Tumor), Infections (e.g., ticks, bartonella) and Dilation (e.g., DCM, enlarged LA) all contribute.

Antithrombin

Inhibits F10a, F9a, F11a, thrombin (2a), only free thrombin, not bound in clot

Inhibits leukocyte activation –rolling and adhesion. Blocks expression of proinflammatory cytokines. Exogenous heparin eliminates anti-inflammatory effects of AT.

Once thrombin is made it sets off coagulation & inflammation. This system is dysregulated in sepsis.

Tissue Factor

TF is a key initiator of hemostasis in vivo. It is likened to a hemostatic envelope surrounding blood vessels & surfaces – fibroblasts, pericytes, keratinocytes. It is bound to F7a/F7 in dermal vasculature. High TF lungs, brain (astrocytes), pancreas, heart, uterus/placenta/testes

Influenza A increases TF expression in mouse lungs. Should we consider anti-thrombotics with pneumonia? TF is not thought to flow freely in blood because it is highly prothrombotic. Studies of stagnant blood – no free TF but Studies of flowing blood – free TF found

Flow may "activate" TF and this is an active area of research. TF in blood likely inhibited or encrypted and needs activation or key. Blood-borne TF may contribute to thrombosis not hemostasis.

What Do Platelets Do? Maintain tight junctions, especially post-capillary venules. When platelet numbers go down capillary endothelial junctions open.

Anti-Platelet Medications to be discussed include aspirin and clopidogrel.

Thromboxane A2 - aspirin

P2Y12 receptor - clopidogrel

Hemolytic Uremic Syndrome (Alabama Rot)

What Does von Willebrand Factor Do? Protection of Factor VIII

ADAMTS13 & Thrombotic Thrombocytopenia will be discussed in the context of the recent cases in the UK.

JA Kremer Hovinga, JN George. N Engl J Med 2019;381:1653-1662.

Conditions Associated with Thrombosis

Senior, geriatric humans are more likely to experience thrombosis (heart attack, stroke). It is likely that dogs and cats are similar, they most likely suffer from microthrombosis (e.g., kidney disease, hepatic disease, arthritis, etc.)

IMHA – platelet reactivity, TF expression, MPs, inflammation, free heme scavenges NO

Cardiac – stasis, turbulence, endothelial injury, inflammation

PLN, PLE – loss of AT, endogenous anticoagulants, inflammation

Neoplasia – platelet reactivity, TF expression, inflammation, release TF + MV into circulation

Pancreatitis – inflammation, TF expression

Trauma – inflammation, TF expression

Summary – Thrombosis associated with…

Inflammation, cytokines, increased platelet reactivity

Increased TF expression monocytes & ECs

Alterations in blood flow (turbulence)

Vessel wall changes

Endothelial damage, ROS, inflammation, hyperglycemia

Coagulation changes in blood leading to Increased prothrombotic substances, decreased antithrombotic substances. All of these changes are more likely as an animal ages, particularly if there is chronic inflammation present.

Mitigation

Options for mitigation will be discussed in order of;

Lease likely to harm, low cost, may work

To More likely to harm, high cost, may work

Options to be discussed include arginine, methylcobalamin, N-acetylcysteine, dietary changes, microbiome enhancements, low dose aspirin, clopidogrel, factor X inhibitors, and others.

References available upon request

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ESCAPING THE BUSY TRAP: LEARNING HOW TO PRIORITIZE AND THRIVE

Helen Silver-Macmahon

Being-Human Consulting Ltd, Director, Thurston, Bury St Edmunds, United Kingdom

Qualifications:

Mrs Helen Silver-MacMahon

MSc PSCHF, Cert VNECC, DipAVN (Surg), Cert SAN, RVN

helen@being-human.co.uk

The veterinary profession is at a critical point in its evolution, shortages of both veterinary surgeons and veterinary nurses coupled with the number of new pets soaring during the pandemic, mean that veterinary services are in greater demand than ever before. When asked the question "how are you?" or "how is work?" the reply from veterinary professionals is generally the same… "busy!".

Research indicates that busyness may be connected to perceived self-worth and a lack of leisure time considered an aspirational status symbol[2]. Unfortunately, busyness can lead to stress, overwhelm and exhaustion and negatively affect the emotional and physical health of individuals. Whilst we consider the speed that work is performed at, the number of tasks we need to perform[1] and the level of meaning and enjoyment of work as relevant dimensions in conceptualizing busyness the level of productivity which results is not considered an indicator.

Whether organising your diary, an operating list or co ordinating a busy hospital, effective priority management can prevent individuals and teams from becoming overwhelmed and ensure that patient safety is not compromised.

Priority management includes identifying and prioritising goals, identifying the time and resources required to achieve these, and ensuring that they are completed in a timely manner.

Through understanding the cognitive capabilities and limitations associated with being human, including how we make decisions we can ensure that we remain rational and efficient in the face of high pressure, emergency, and stressful situations.

In this session we will consider how to implement priority management and increase efficiency in practice.

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INDEPENDENT PRACTICES. YES, THEY CAN!

Alan Robinson

Vet Dynamics (UK) Ltd, Director, Swindon, United Kingdom

Qualifications:

Alan Robinson

B.V.Sc. MRCVS DMS

alan@vetdynamics.co.uk

Independents, yes, you can - Enhancing Veterinary Practices with Practical Technology:

As veterinary professionals, providing exceptional care to our patients and ensuring a positive client experience are top priorities. In today's digital age, technology plays a crucial role in streamlining processes, improving communication, and enhancing overall practice efficiency. In this article, we will explore practical technology solutions that can be implemented in veterinary practices to optimize patient care, client interactions, and practice management.

Understanding the client experience: The foundation of a successful veterinary practice lies in understanding and addressing the client's needs and challenges. To enhance the client experience, start by analysing client feedback and identifying common pain points. Are there difficulties in appointment scheduling, long waiting times, or lack of transparency in treatment plans? Once identified, practical technology solutions can be integrated to resolve these issues.

Embrace the Power of Digital Platforms

In today's digital world, having a strong online presence is crucial for any business, including veterinary practices. Google My Business is a valuable tool to create a business profile and improve visibility on search engines. Ensure that the website is mobile-friendly, secure, and offers online booking and registration options. These features not only attract new clients but also provide convenience to existing ones.

• Use of Google My Business to create a profile, which boosts reputation and accessibility.

Utilizing Digital Triage and Digital Signage

Digital triage can significantly improve the efficiency of patient evaluation and ensure the most critical cases receive immediate attention. By capturing initial questions and guiding clients through necessary steps, unnecessary in-person visits can be reduced. Digital signage, on the other hand, provides an excellent opportunity for client education, promotes health plans, and reduces perceived waiting times.

• Implementing digital triage to manage client queries, reducing phone call times by up to 50%.

• Online booking features for convenient appointment scheduling.

The Power of Dictation and Digital Forms

Time is precious in a busy veterinary practice, and typing detailed patient notes can be time-consuming. Dictation technology allows the veterinary team to speak patient information, enabling faster documentation, saving valuable time, and improving accuracy. Digital forms further streamline the process by providing instructional forms and checklists, ensuring standardized care and efficient workflow.

• Adoption of mobile consultations, allowing clients to check-in digitally and receive instructions.

• Utilizing digital forms for medical history, instructions, and estimates, reducing paperwork and repetition.

Enhancing Client Interaction with Apps

Incorporating a client interaction app can revolutionize the way you communicate with pet owners. Such apps can send appointment reminders, allow clients to reschedule and confirm appointments, and gather post-appointment feedback. With the majority of people using mobile devices, these apps ensure effective communication and improve client engagement.

• Utilizing automated follow-up systems to increase compliance and patient satisfaction.

• Implementing a client interaction app for payment updates, consent forms, and appointment confirmations.

Simplifying Payment and Follow-Up

Implementing online payment solutions simplifies the payment process for clients, reducing billing fear and improving overall client satisfaction. Reminders for follow-up appointments can significantly reduce no-shows and improve compliance with treatment plans. Additionally, offering drop-shipping services for pet medications and supplies saves time and enhances convenience for clients.

• Offering online payment links for easy and secure transactions.

• Utilizing reminders to reduce no-shows, improve compliance, and enhance brand image.

• Utilizing digital shelf systems for automatic stock control, real-time ordering, and space-saving.

• Introducing drop-shipping for easy inventory management and reduced space constraints.

Gathering Feedback and Continuous Improvement

Online reviews hold immense influence over potential clients' decisions. Encourage satisfied clients to leave positive reviews, as these reviews act as powerful testimonials and enhance your practice's reputation. It is equally essential to address negative feedback promptly and privately to resolve any concerns. Feedback from clients is invaluable in identifying areas for improvement and maintaining a high standard of care. Utilize a feedback platform, either integrated into your practice management system or through an external vendor, to gather client insights and enhance the client experience.

• Implementing a feedback platform to gather detailed client reviews and improve services.

• Filtering and addressing negative feedback to resolve issues and maintain a positive reputation.

Conclusion:

Incorporating practical technology into veterinary practices can revolutionize the way we deliver care and interact with clients. From digital triage and online booking to client interaction apps and feedback platforms, each technology brings unique benefits that enhance efficiency and client satisfaction. By embracing these tools, veterinary professionals can ensure that their practices are at the forefront of modern and compassionate patient care.

Implementing practical technology is an ongoing process, and continuous evaluation and improvement will allow your practice to stay ahead in a competitive industry, providing the best care for beloved pets and their owners alike. Embrace the power of technology and elevate your veterinary practice to new heights of success and excellence.

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FELINE AND CANINE HEPATOZOONOSES: DIFFERENT PARASITES, DIVERSE PATHOLOGY

Gad Baneth

The Hebrew University of Jerusalem, The Koret School Of Veterinary Medicine, Rehovot, Israel

Qualifications:

Gad Baneth, DVM, PhD, Dipl. ECVCP

e-mail: gad.baneth@mail.huji.ac.il

Introduction

Hepatozoonosis is a vector-borne infection caused by apicomplexan protozoa. In contrast to most tick-borne pathogens which are transmitted via the tick salivary glands, *Hepatozoon* species infect vertebrates by ingestion of arthropod hosts containing infective sporozoites. *Hepatozoon* species infect a wide variety of amphibians, reptiles, birds, marsupials and mammals. Two different species of *Hepatozoon* infect dogs and three species are known to infect cats.

Canine hepatozoonosis

The two species of *Hepatozoon* that infect dogs are *H. canis* which is prevalent in tropical and sub-tropical regions in the Old and New Worlds, and *H. americanum* present in the southern USA. Clinically, *H. canis* infection varies between being asymptomatic in dogs with a low parasitaemia, to a severe disease with anemia, profound lethargy and cachexia in dogs with a large number of circulating parasites. *Hepatozoon.americanum* infection is manifested mainly by gait abnormalities and musculoskeletal pain with myositis and periosteal bone lesions. The main vector of *H. canis* is the brown dog tick *Rhipicephalus sanguineus* which is present in warm and temperate regions all over the world, making the potential distribution of *H. canis* wide. In addition, studies from Brazil have reported that *H. canis* is transmitted to dogs by the tick *Amblyomma ovale*.

The Gulf Coast tick *Amblyomma maculatum* is the vector of *H. americanum* in North America. *Amblyomma maculatum*'s distribution is limited to some parts of the Southeastern USA therefore restricting the spread of *H. americanum*. Both of the *Hepatozoon* species which infect dogs are transmitted transstadially in their tick vectors. In addition, *H. canis* has been shown to be transmitted transplacentally from the dam to its pups, whereas *H. americanum* is transmitted by predation and ingestion of tissue forms in small mammals tissues

Pathogenesis of canine hepatozoonosis

Hepatozoon canis and *H. americanum gamonts* infect blood monocytes and neutrophils. The meront and cyst stages of the parasite are found in infected tissues. *Hepatozoon canis* mainly infects the hemolymphoid organs including the bone marrow, lymph nodes and spleen, and also other parenchymal organs including the liver, kidneys and lungs. *Hepatozoon americanum* infects skeletal and cardiac muscular tissues and causes myositis and severe lameness. *Hepatozoon canis* appears to be well adapted to its canine host, and is often detected in necropsy or on a peripheral blood smear as an incidental finding. In contrast, *H. americanum* induces a violent course of disease in experimentally and naturally occurring infection.

Clinical and laboratory findings in canine hepatozoonosis

Hepatozoon canis infection varies from being sub-clinical to a severe disease in dogs with extreme weakness, weight loss and anemia. A mild disease is usually associated with a low level of *H. canis* parasitemia (1-5 %), while a severe illness is found in dogs with a high parasitemia sometimes approaching 100% of the peripheral blood neutrophils. High parasitemia rates are sometimes accompanied by extreme neutrophilia reaching as high as 150,000 leukocytes/ml blood. Concurrent *H. canis* infection with other canine pathogens is common. Co-infections with *H. canis* reported include: parvovirus, *Ehrlichia canis, Toxoplasma gondii* and *Leishmania infantum.* Immune suppression induced by an infectious agent, an immature immune system in young animals or immunodeficient conditions, influence the pathogenesis of new *H. canis* infections or the reactivation of pre-existing ones.

In contrast to the mild disease often found in *H. canis* infection, *H. americanum* infection frequently causes a severe disease that leads to debilitation and death. Most dogs diagnosed with *H. americanum* infection are presented with fever, gait abnormalities, muscular pain caused by myositis, generalized muscular atrophy and mucopurulent ocular discharge. Gait abnormalities include stiffness, hind limb paresis, ataxia and inability to rise. A marked neutrophilia is one of the consistent hematologic findings in *H. americanum* infection and leukocyte counts range from 30,000 to 200,000/ml blood. Serum biochemical abnormalities include increased alkaline phosphatase activity and hypoalbuminemia.

Diagnosis of canine hepatozoonosis

PCR: PCR for *H. canis* and *H. americanum* in the blood has been shown to be a sensitive diagnostic technique. A study from Turkey reported that the detection of *H. canis* by PCR is by far more sensitive than light microscopy of blood. The prevalence of hepatozoonosis among 349 dogs was 10.6% by blood smear micropscoipy and 25.8% by blood PCR.

Microscopy: *Hepatozoon canis* infection is often detected by microscopic evaluation of stained blood smears showing intracellular *H. canis* gamonts. The gamonts are found in the cytoplasm of neutrophils or monocytes, have an ellipsoidal shape and are about 11 by 4 micrometers. *H. canis* meronts found in infected tissues by histopathology contain elongated micromerozoites arranged in a circle around a clear central core. This form is often referred to as a "wheel spoke" meront.

Hepatozoon americanum parasitemia is rare and usually does not exceed 0.1% of the leukocytes. When suspecting *H. americanum* infection, several microspcopic fields of stained blood smears should be evaluated. Confirmation of infection can be carried out by muscle biopsy and demonstration of parasites in cysts or granulomas or by PCR of blood or tissue. Histopathology of skeletal muscles from dogs with *H. americanum* infection reveals pyogarnulomatous myositis and large round to oval cysts (250-500 micrometer diameter) containing a central nucleus surrounded by concentric rings of membranes. These cysts are sometimes referred to as having an "onion peel" appearance due to the structure of the membranes surrounding a core mass. Radiography of the long bones or pelvis demonstrating periosteal proliferation can be used as additional evidence when suspecting canine *H. americanum* infection.

Serology: Indirect fluorescent antibody tests (IFAT) for anti-*H. canis* antibodies was used for epidemiological studies in Israel and Japan. An ELISA for *H .canis* antibodies has also been developed and used for studies in Israel and Greece. The assays are not available commercially.

Feline hepatozoonosis

Hepatozoonosis of domestic cats has been reported from several countries in Asia, Europe, Africa and America. Most reported cases of feline hepatozoonosis were caused by *Hepatozoon felis*, However, *Hepatozoon silvestris*, originally reported from wild cats (*Felis silvestris*), has also been reported to be associated with severe disease in some cases of domestic cats in Europe, and it has been shown that *H. canis* also infects cats, but with no apparent clinical manifestations described so far. The vectors of all feline *Hepatozoon* species are currently unknown. Transplacental transmission from the queen to its offspring during pregnancy and also transmission by preying on other possible mammal hosts have been suspected as modes of transmission for *H. felis.*

Hepatozoon felis and *H. silvestris* infections are associated with infection of muscle tissue and their meronts have been identified in the myocardium and skeletal muscles of cats with hepatozoonosis. and elevated activities of the muscle enzyme creatinine kinase were reported in cats with hepatozoonosis in a retrospective study of this disease. The level of parasitaemia is usually low in cats with less than 1% of the neutrophils containing gamonts.

Treatment and prevention of hepatozoonosis

The current treatment protocol for *H. canis* infection is the administration of imidocarb dipropionate at 5-6 mg/kg every 14 days until gamonts are no longer detectable in blood smears. Elimination of *H. canis* gamonts from the peripheral blood may require many repeated treatments and PCR studies have indicated that complete elimination may not be feasible. The prognosis of treated dogs with a low *H. canis* parasitemia is generally good even if the decrease of parasitemia is slow and requires several repeated imidocarb treatments. The prognosis for dogs with a high parasitemia is guarded and it is sometimes associated with the outcome of a concurrent disease.

Hepatozoon americanum infection is treated with an initial combination oral therapy of trimethoprim-sulfadiazine (15 mg/kg every 12 hours), pyrimethamine (0.25 mg/kg every 24 hours), and clindamycin (10 mg/kg every 8 hours) for 14 days. After early relief from clinical disease signs is obtained, remission can be prolonged with the oral administration of the coccidiostat decoquinate at 15 mg/kg mixed in food every 12 hours for two years. Relapse of clinical disease is common following the discontinuation of treatment.

No controlled experiments have been published on the treatment of feline hepatozoonosis and the drugs used in some published cases of *Hepatozoon* spp. infection are used off-label. Imidocarb dipropionate at 6 mg/kg injected subcutaneously twice with an interval of 14 days in combination with doxycycline at 5 mg/kg orally for four weeks has been reported to be effective in a cat that recovered from *H. felis* infection. Another cat which recovered clinically was treated with primaquine, an anti-malarial drug, at 2 mg/kg orally once, and oxytetracycline at 50 mg/kg every 12 hours.

Prevention of *H. canis* and *H. americanum* infection consists of the use of topical acaricides and environmental parasiticides, prevention of oral ingestion of ticks, and of predation on potentially infected small mammal hosts. No commercial vaccines are available for canine or feline hepatozoonosis.

Further reading on canine and feline hepatozoonosis

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PROGRESS TOWARD A "SPAY SHOT" TO TRANSFORM ACCESS TO STERILIZATION

Valerie Benka[1], *Joyce Briggs*[2]

[1]Alliance for Contraception in Cats & Dogs, Director Of Programs, Ann Arbor, United States of America, [2]Alliance for Contraception in Cats & Dogs, President, Portland, United States of America

Qualifications:

Valerie Benka, MS, MPP

Director of Programs

Alliance for Contraception in Cats & Dogs

Joyce Briggs, MS

President

Alliance for Contraception in Cats & Dogs

Progress toward a "spay shot" to transform access to sterilization

After introducing the history, background, and context for non-surgical fertility control for cats and dogs, this presentation will review advances in non-surgical options, including those currently available and those in development. It will also address projects that ACC&D has initiated to ensure that as new generations of non-surgical sterilants become available, they are in the best position to succeed.

Background

The mission of the Alliance for Contraception in Cats & Dogs (ACC&D) is to advance non-surgical sterilants and contraceptives for cats and dogs, and to promote their global accessibility. The organization envisions a world in which dog and cat populations are effectively and humanely managed, improving the lives of dogs and cats and the people who care about them.

Although surgical spay/neuter is essential to veterinary medicine and animal welfare, traditional surgical sterilization cannot fully stem the numbers of unwanted litters of cats and dogs born. In addition, less invasive options represent medical progress if humane, safe, and effective.

Research on non-surgical sterilization for companion animal species extends back many decades.[1] More recently, in 2000, veterinary experts seeking to improve contraceptive technology for cats and dogs convened to form ACC&D. Since its nascency, the organization has been a unique bridge between the animal welfare, scientific, veterinary, and pharmaceutical communities. The work to develop safe, effective, affordable, and accessible non-surgical technologies received a major boost thanks to the Michelson Prize & Grants Program, which in 2009 offered a $25 million prize to the first entity to develop a non-surgical sterilant(s) effective in male and female cats and dogs, plus $50 million in grant funds to research such technologies.

Current non-surgical technologies

Interfering with any part of the hypothalamic-pituitary-gonadal (HPG) axis will affect reproductive capacity, albeit with different ancillary effects (e.g., hormone production). At present, a small number of products/formulations are approved in one or more countries (see below). Only Zeuterin is a permanent sterilant (versus temporary contraceptive), and it is no longer produced.

Dogs		Cats	
Female	Male	Female	Male
Delvosteron®, Covinan® (prolige-stone) Depo-Prove-ra® (MPA) Suprelorin®	Suprelorin®, Zeuterin™/ Esterisol™	Megestrol Acetate Depo-Prove-ra®	Suprelorin®

Hormonal contraceptives

Hormonal contraceptives typically consist of synthetic progesterone and can suppress fertility in females. Popularity varies based on the particular hormone and country. Medroxyprogesterone acetate (MPA, brand name Depo-Provera®) is an injectable contraceptive used in some communities without easy access to surgery. While it is largely effective at suppressing fertility in dogs, it is widely associated with serious and fatal complications, and ACC&D does ***not*** recommend its use.

Megestrol acetate (MA) is a synthetic version of progesterone that is wholly different from MPA. It is given on a daily or weekly basis; treatment must be ongoing to maintain contraception. MA has a history of use in cats, including free-roaming animals, as it is oral and can be mixed with food.

For several years, ACC&D was skeptical of MA's value given the frequent dosing and potential side effects. However, widespread reductions in veterinary capacity associated with COVID-19 prompted ACC&D to revisit ways in which MA might be used more safely, particularly during temporary surgical backlogs.

We believe that MA can likely be used relatively safely for *short* periods, and at *low* doses, in healthy animals without pre-existing conditions. Risks increase with long-term use, and MA also carries risk when used in free-roaming animals who can't be closely monitored. This means that it's not really a viable option for indefinite use—e.g., when surgery is just not available. The cost/benefit analysis for short-term use in animals whose health cannot be closely monitored is tricky and will likely be situationally dependent.

Suprelorin

Suprelorin (deslorelin acetate) suppresses fertility by down-regulating pituitary receptors for Gonadotropin hormone-releasing hormone (GnRH). This suppresses gonadotropins and sex hormones, and it therefore temporarily mimics surgical sterilization. Treatment is via a microchip-size implant.

Suprelorin was first approved for male dogs for 6 or 12 months of fertility suppression, depending on implant dose. It is approved for male dogs in nearly 50 countries, including Australia, Brazil, Canada, China, India, Mexico, and South Africa. In the EU and UK, the label claim was recently expanded to include male cats and prepubertal female dogs.

Suprelorin is interesting because it could have utility for several "groups" of animals. For example, it is a way to trial spay/neuter if someone is unsure whether surgery would affect their animal's personality or behavior, and it is also a way to temporarily prevent unwanted pregnancies among breeding dogs. It might also be used in animals who are part of a legal case and cannot be sterilized. Suprelorin has also been used in limited circumstances among free-roaming female dogs in remote regions; with short lifespans and high barriers to accessing surgery, it has been shown to be a good alternative.

Non-surgical technologies under development

Recent decades have seen significant research advances into dog/cat reproduction and non-surgical sterilant development. The following show particular promise for cat and/or dog sterilization.

AAV-AMH gene therapy for female cats and dogs

The most promising research funded by the MPG program is a gene therapy approach, where a single intramuscular injection delivers a gene expressing Anti-Mullerian Hormone (AMH). In female mammals, when levels of AMH rise, ovarian primordial follicles do not develop. This interrupts egg creation and the associated hormonal cascade, and it is expected to yield permanent sterility.

Cat studies have been ongoing for more than three years and have included breeding trials with no pregnancies.[2] Work is currently underway to pursue (initially) U.S. regulatory approval for this technology in cats. Dog studies have also begun.

Epivara estrogen implant

The company Epivara is developing a microchip-sized estrogen implant that can interrupt reproductive tract development and create infertility when administered soon after birth. The focus is puppies and kittens under 6–8 weeks old. Initial studies have shown safety and efficacy in females; there is promise for use in males, as well. The product has shown potential to be safe, permanent, affordable, and have a long shelf-life.

Additional projects

ACC&D focuses on ways to support implementing current and future technologies in ways that are safe, ethical, effective, and impactful and beneficial to communities. They will be briefly discussed, focusing on topics relevant to non-surgical fertility control, population medicine, and WSAVA attendees.

Marking non-surgically sterilized animals

For non-surgical sterilants to have optimal value, people must be able to identify treated dogs and cats. ACC&D is tackling the challenge of how to mark animals who have been non-surgically contracepted or sterilized, and/or vaccinated against diseases such as rabies. The need is particularly acute for free-roaming animals.

ACC&D is spearheading a project to create a tattoo delivered via microneedle patch. We have conducted studies applying the patch to both ear and abdomen to serve different needs and animal populations, with promising results.

"Smart TNR" population modeling

Trap-Neuter-Return (TNR) programs benefit individual cats. Many also strive to reduce numbers of cats at the community level. However, there is little information on the best way to reduce numbers of free-roaming cats and optimize cost-effective management policies.

To address this, ACC&D convened an expert team to build a bioeconomic model of cost and population impacts of different management approaches that incorporates "real world" variables and can incorporate profiles of new fertility control options.[3–5]

Health benefits & risks of surgical sterilization

Several studies have assessed risks and benefits of surgical sterilization in dogs, but there are unanswered questions and incomplete information about the relationship between sterilization and later health conditions. It is important to better understand health implications of surgical sterilization as a baseline against which to compare future non-surgical sterilants. This will support veterinarians and owners considering benefits/risks of new technologies, plus facilitate more individualized veterinary care.

ACC&D is collaborating with Banfield Pet Hospital, the leading provider of preventive care in the U.S., to analyze health outcomes of dogs seen at the practice. The first analysis focused on obesity, breed size, and age at sterilization;[6] other analyses are set to follow. Findings to date will be shared briefly.

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PASSIVE, ACTIVE OR COMBINED ORAL HYGIENE?

Jerzy Gawor

Klinika Weterynaryjna Arka, Dentistry Department, Krakow, Poland

Qualifications:

Jerzy Pawel Gawor

DVM PhD, Dipl AVDC, Diopl EVDC, FAVD

jgawor@pp.com.pl

Introduction

Homecare is a *critical* aspect of periodontal therapy. Plaque colonizes clean tooth surfaces within twenty-four hours of cleaning. Also, without homecare, gingival infection and inflammation quickly recurs. A recent study found that periodontal pockets become reinfected within two weeks of a prophylaxis if homecare is not performed. This same study showed that pocket depth returns to pre-treatment depths within 6 weeks of therapy.

Homecare discussion/instructions

The benefits of routine homecare must be conveyed to each client on a regular basis. Dental care (including homecare) should be discussed with the client on their ***first visit*** to the practice, which is often the well puppy/kitten or vaccination visit. This client education is of much greater benefit if it comes from the entire staff. The importance of homecare should be discussed again following each dental cleaning with detailed instructions provided.

Types of homecare

The two major types of home plaque control are active and passive. Both types can be effective if performed correctly and consistently, but active homecare is currently the gold standard. Active homecare involves the participation of the pet's owner, such as brushing or rinsing. Passive methods are typically based on chewing behaviours via treats or specially formulated diets. It has been shown that active homecare is most effective on the rostral teeth (incisors and canines). In contrast, passive homecare (chew based) is more effective on the distal teeth (premolars and molars).

Active homecare

Tooth brushing:

When properly performed, tooth brushing has been proven to be the most effective means of plaque control.

Materials and methods:

The only critical piece of equipment necessary is a tooth brush. There are numerous veterinary brushes available, and a proper brush should be selected based on patient size. The double sided as well as circular feline brushes are effective products and should be considered along with the standard veterinary brushes depending on patient size and temperament. "Finger brushes", gauze, and washcloths are not recommended as they do not effectively address the subgingival areas of the teeth, which are the most important areas to clean, and they increase the chances of the owner being bitten. In addition to the veterinary products, human tooth brushes may be substituted. A soft bristled toothbrush is always recommended. A child's toothbrush is often the correct size for small patients, and may be more effective than the larger veterinary version. An infant brush may work best for toy breed dogs, cats, or juvenile patients.

Mechanized brushes have been shown to be superior to standard brushes in human studies. These products are likely superior for use in veterinary patients as well, and should make the process more time efficient which is important in animal patients for acceptance reasons. The only negative aspect to these brushes is that the movement/vibration of these instruments can feel awkward and/or may scare the patients. Therefore, mechanized brushes should only be used patients with accepting temperament.

Pastes: There are a number of veterinary toothpastes available, and these products greatly increase the acceptance of the toothbrush by the pet. Toothpastes typically contain a calcium chelator which has been shown to decrease the level of calculus deposits on the teeth. The mechanical removal of plaque by the movement of the brush/instrument is the key to disease control. Consequently, palatability can be increased by using alternate flavorings. Tuna juice (especially for cats), garlic powder, and beef broth are all excellent means of increasing palatability, as is dipping the brush in the patient's favorite canned food.

Brushing technique:

The keys to compliance with brushing can be stated as follows. First, start early; because young patients are more amenable to training. Second, go slow; start with just holding the mouth and then progress to a finger and finally start brushing slowly. Next, be consistent; make this a learned behavior. And finally, make it positive; using food, treats, or playtime as a reward will greatly increase the likelihood of acceptance.

Proper tooth brushing technique begins with the brush held at a 45-degree angle to the long axis of the tooth. The brush is then placed at the gingival margin and moved along the arcades utilizing a rotary motion. The buccal surfaces of the teeth are the most accessible and fortunately are the most important, as these are the surfaces which generally have higher levels of calculus deposition. Make sure to council owners not to attempt to open the pet's mouth on first initiation to this procedure. Most veterinary patients greatly dislike their mouth being forced open, and this approach may result in increased resistance. Instead, clients should be instructed to begin by effectively brushing the buccal surfaces with the mouth closed. The distal teeth can be accessed by gently inserting the brush inside the cheek to reach these teeth, relying on tactile feel and experience to ensure proper positioning.

Frequency: once a day is ideal, as this level of care is required to stay ahead of plaque formation. Furthermore, every other day brushing was not found to be effective at gingivitis control. Three days a week is considered the ***minimum*** frequency for patients in good oral health. Brushing once a week is not considered sufficient to maintain good oral health. For patients with established periodontal disease (even gingivitis), daily brushing is required to maintain oral health, and twice daily may be recommended.

The two week post-surgical recheck is an excellent time to provide home care instructions to your clients. This will make it more effective, but also reinforce that you believe it is important. Having a technician demonstrate proper brushing procedures is an ideal technique.

Antiseptic rinses:

The traditional antiseptic of choice is chlorhexidine as there is no method of bacterial resistance to this product, and it is very safe. Chlorhexidine has been shown in numerous studies to decrease gingivitis if done consistently over time.Ideally, a small amount of the rinse should be directly applied to the surface of the teeth and gingiva.

An additional option for home oral care is the use of soluble zinc salts. One veterinary labelled oral zinc ascorbate gel has been proven to decrease plaque and gingivitis, and provides the additional advantage of being tasteless (which should improve acceptance, especially in cats). Furthermore, this product also contains ascorbic acid which has been shown to support/induce collagen synthesis, which may improve healing following dental scaling and/or oral surgery.

Passive Homecare

Passive homecare is an alternative for minimizing periodontal disease, and is achieved with special diets, chews and treats, and potentially water additives. Some of these methods are effective, but many are not. Some of the effective products are detailed below; however, there is not enough room here for a complete discussion of all products.

Tartar control diets:

Traditional dry dog food has only a slight benefit in comparison to moist foods in regards to improving oral health. However, there are currently several prescription diets available that do decrease tartar and plaque build-up. These products employ abrasives to scrape the teeth free of plaque. Additionally, the individual kibbles of these therapeutic diets tend to be larger than standard pet foods. This increases the amount of chewing performed and the efficacy of the abrasive aspects. Many of the products also contain a calcium chelator to further reduce dental calculus. One important point is that even though these products may decrease plaque and calculus, they are most effective on the areas around the cusp tips and not at the gingival margin. Of the available diets, only one has been clinically proven to decrease gingivitis. The main reason for this product's effectiveness lies in the fiber arrangement within the kibble.

Tartar control treats:

There are numerous treats available for passive home care. The original and most common being the biscuit style treats. Plain biscuits have not been shown to aid in the reduction of periodontal disease. A better choice appears to be biscuits coated with HMP, although there are studies that support and detract from their efficacy as well.

Over the last few years several new edible treats have been brought to market with varying efficacy. The most prevalent and proven effective products in this class are the rask type and rawhide chews. These products work similar to tartar control diets, with the abrasives cleaning the tooth surface, but additionally may include calcium chelators (such as sodium hexametaphosphate) or other substances to further increase their anti-plaque efficacy However, as with the diets discussed above, most of the beneficial effect is supragingival and on the cheek teeth. One important point to remember is that many chew treats which claim to help control dental disease are very hard in texture. The chewing of these products may (and often does) result in tooth fracture.

Water additives:

This is a relatively new area of home dental care, and there are several products avaliable in this category as well. While there are some studies on the human side which found that the active ingredients have some efficacy, there are currently minimal peer reviewed evidence that support their use in controlling periodontal disease in veterinary patients.

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UPDATES ON LOCAL ANESTHETICS AND LOCOREGIONAL BLOCKS

Tamara Grubb

International Veterinary Academy of Pain Management, Ivapm, Uniontown, United States of America

Qualifications:

Tamara Grubb

DVM, PhD, DACVAA, President International Academy of Veterinary Pain Management

tamaragrubb@wsu.edu

Update: The full power of local anesthetics is not always understood. Locoregional blockade provides analgesia both intra- and post-operatively AND improves anesthetic safety by allowing the patient to be maintained at a lower dose of inhalant, thus decreasing inhalant-mediated cardiovascular and respiratory depression. In humans, local blocks have been shown to decrease the likelihood of chronic pain development from the acute pain source (eg, incisional pain). Locoregional blocks should be used in every patient possible, including those undergoing what we may call 'routine' procedures. Pain is NOT routine to the patient. See more information and more block descriptions in the open access 2022 WSAVA Global Pain Council Pain Management Guidelines https://onlinelibrary.wiley.com/doi/epdf/10.1111/jsap.13566.

Dosages are: bupivacaine or ropivacaine (2-4 mg/kg dog, 1-2 mg/kg cat) OR lidocaine (4-6 mg/kg dog, 2-4 mg/kg cat). Many of the locations create a volume limitation (eg, most oral blocks) and in this instance, the approximate volume of injection will be listed. However, the full dose of local anesthetic should be calculated so that it is not exceeded if other blocks are added.

Testicular Block

This block should be done in both dogs AND CATS.

Draw up full dose of lidocaine, bupivacaine or ropivacaine.

NOTE on choice: Lidocaine has a shorter duration of action but is the only local anesthetic that can be administered IV and this is a highly vascular site so some people feel more comfortable with lidocaine.

The low end of the dose is generally adequate since the volume will be somewhat limited by space in the tissue.

Pluck or clip scrotal hair and do an initial GENTLE scrub if surgical site is scrotal. No prep necessary if surgical site is prescrotal.

Insert the needle fully into the body of the testicle, usually with the needle tip pointing towards the body of the spermatic cord.

ASPIRATE

Inject ½ of the drug into the body of each testicle until you feel 'pressure' or until the calculated dose has been injected.

The drug migrates up the spermatic cord so the area of crushing (PAINFUL!) is blocked.

For an incision directly over the testicle (cats), continue infiltrating as the needle exits the testicular body to block the skin and subcutaneous tissue. For an incision in another location (dogs), block the incision site.

Intraperitoneal Lavage for ovariohysterectomy (OHE), Abdominal Surgeries, and Cesarean Sections

Draw up full dose of bupivacaine, ropivacaine or lidocaine.

If necessary, dilute the drug with saline – the total volume needs to be 0.4-0.6 ml/kg to 'lavage' or 'bathe' the entire abdominal cavity.

This is generally not necessary with standard local anesthetic concentrations.

After opening the linea (preferred for efficacy) OR after completing the OHE (usually more practical so that the drug isn't absorbed by sponges used to absorb blood), insert the syringe (no needle!) through the incision into the abdomen and 'bathe' the peritoneal cavity with the mixture by instilling – literally squirting - it right into the abdomen. Complete the OHE or other surgery and close the incision as usual.

Publications are available in both dogs and cats for the efficacy of this block for OHE. In humans, the block is also used for abdominal exploratory surgeries and cesarean sections and this is recommended but not researched in veterinary patients. (Steagall PVM, et al. J Small Ani Pract 2020;61(1): 19-23.)

Sacrococcygeal Block for un-obstructing blocked cats, any other perineal surgery, anal gland removal, tail amputation, assisted delivery of pups/kittens, etc…). NOT JUST FOR CATS!!!

Draw up 0.1-0.2 ml/kg lidocaine, bupivacaine or ropivacaine.

Bupivacaine and ropivacaine have longer duration of action.

Place patient in sternal recumbency with rear-legs stretched caudally.

Locate the sacrococcygeal space (between the rigid sacrum and the movable coccygeal vertebrae) by palpating at the base of the tail while 'pumping' the tail up and down.

Shave and scrub injection site.

Place a finger on midline just in front of or behind the sacrococcygeal space.

Insert a 25-G 1-inch needle through the skin at about a 30-degree angle off vertical and right over the sacrococcygeal space.

If the needle encounters bone, back out slightly and redirect either a few degrees steeper (closer to perpendicular) or a few degrees flatter (towards a 45-degree angle from vertical).

Make small moves, you are using the needle as a probe to gently find the space.

When in the correct spot, the needle will advance deeper with no resistance.

Aspirate. Inject the drug(s) over roughly 5-10 seconds. Slow injection allows a more even spread.

Withdraw the needle and observe for tail and anus relaxation and decreased response to a light pinch.

If no relaxation in 5-10 minutes, repeat the process ensuring that the needle actually slides off the bone into a space – a subcutaneous injection will not be effective. In a large study, time to do the block was an average of 2 minutes, but two attempts were not uncommon (Pratt et al. JVECC 2020;30(2):170-178).

Coccygeal epidural with local anesthetic for catheterization and painmanagement in the treatment of feline urethral obstruction. O'Hearn M, Wright B. JVECC 2011;21(1) 2011:50–52.

Caudal Maxillary Block to desensitize the caudal molars for dental/surgical

procedures

The caudal maxillary approach is often preferred over the infraorbital approach because the field of desensitization is much larger. This block will desensitize all ipsilateral tissue from the caudal molars rostrally and from the skin to midline. Use this approach if working on the caudal molars or doing surgeries on the nares, nasal passages, sinuses, soft palate or any other structures of the maxilla. In cats and brachycephalic dogs, the distance from the infraorbital foramen to the pterygopalatine fossa (where the maxillary nerve and its branches enter the skull) is very short and caudal diffusion of drug injected at the infraorbital foramen may be adequate for blocking the caudal structures of the skull.

Extraoral approach 1 (extraoral, from zygomatic arch): Insert the needle percutaneously along the ventral border of the zygomatic arch approximately 0.5 cm caudal to the lateral canthus of the eye. The needle is kept horizontal and directed medially and slightly cranially (in an angle that would draw an imaginary line with the premolars on the opposite side of the head) until it hits bone. At this site, the maxillary nerve enters the pterygopalatine fossa.

Extraoral approach 2 (extraoral, from bony orbit): Approach the pterygopalatine fossa from the bony orbit. The needle is placed at the midpoint of the ventral rim of the bony orbit and inserted straight down between the globe and the bone.

Intraoral approach: Open the mouth as wide as possible. From inside the mouth, insert a short needle no more than 2-4 mm (to avoid being close to the globe) inside the mouth just caudal and medial to the last molar.

Infraorbital canal catheterization: A catheter is placed through the infraorbital canal to a distance that would reach the caudal aspect of the canal. Fizzano KM, et al. Am J Vet Res. 2017 Sep;78(9):1025-1035.

For all 4 techniques, aspirate and inject. Volume that will fit: approximately 0.1 to 1.0 ml, depending on the patient's size.

Mandibular nerve block for dentistry and mandibular surgery/trauma pain

The mandibular foramen or the mandibular nerve can often be palpated on the lingual side of the mandible just rostral to the angle of the mandible and just caudal to the last molar in approximately the middle 1/3rd of the mandible (as measured from top to bottom).

Regardless of whether or not the nerve or foramen can be palpated (often difficult in small patients), the landmarks described above are used as the injection site.

The nerve ENTERS the boney mandible at the mandibular foramen and cannot be blocked between the mandibular foramen and the mental foramen.

Intraoral technique: With the patient's mouth open and supported with a mouth gag, roll of tape or some other method to ensure that the patient doesn't close its mouth on your hand, direct the tip of the needle to the site described above.

REMEMBER: Rigid mouth gags should NOT be used in cats. They can cause occlusion of the maxillary artery with resultant blindness and/or neurologic complications.

Aspirate, then slowly infiltrate (0.2 -2.0 mls). The foramen cannot be entered so the drug is merely infused under the gingiva at the site of the nerve.

Extraoral technique:

Landmarks are the same as those described above but the approach is from the outside, through the skin at the angle of the mandible. This technique is easier than the intraoral technique in cats and in some small dogs.

Pass the needle through the skin along the medial aspect of the mandible to a point where the tip of the needle is at the site of the foramen (again, aiming for a site just caudal to the last molar on the lingual side of the mandible).

With a finger in the oral cavity the needle can be felt under the gingiva.

When the site near the mandibular foramen is reached, aspirate and inject the local anesthetic drug (0.2-2.0 mls).

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MULTIDISCIPLINARY CASE DISCUSSION: GALLBLADDER MUCOCELES - AN INTERNIST'S AND A SURGEON'S VIEWPOINTS

Andrea Johnston

LSU School of Veterinary Medicine, Veterinary Clinical Sciences, Baton Rouge, United States of America

Qualifications:

Andrea N. Johnston, DVM, PhD

Diplomate American College of Veterinary Internal Medicine (SAIM)

Assistant Professor of Small Animal Internal Medicine

Louisiana State University School of Veterinary Medicine

johnston1@lsu.edu

GALLBLADDER MUCOCELES: AN INTERNIST'S PERSPECTIVE

Abstract: Gallbladder mucoceles: abnormal accumulation of mucin and inspissated bile within the gallbladder lumen. Predisposing co-morbidities include dyslipidemia, endocrinopathy (diabetes mellitus, hyperadrenocorticism, and hypothyroidism), gallbladder hypomotility, and cholelithiasis. Potential predisposing factors have been identified for some breeds (Dietary gluten sensitivity - Border terriers, imidacloprid - Shetland sheepdogs) The exact pathogenic mechanism remains obscure, but excess secretion of an abnormal gel-forming mucin enriched with Muc5ac from the gallbladder epithelium results in gallbladder distension, inflammation, and gallbladder wall ischemia and necrosis. Obstruction of the cystic and common bile ducts may occur due to migration of mucin.

Clinical Charcterization:

Signalment: Middle age to geriatric, small to mid-sized dogs, but can occur in any age/breed.

Over-represented breeds: Shetland sheepdogs, Bichon Frise, Cocker spaniels, Chihuahuas, Miniature Schnauzers, Scottish terriers, Shih Tzu, and Pomeranians.

Clinical signs: Asymptomatic, anorexia, vomiting, diarrhea, cranial abdominal pain, or icterus.

Laboratory abnormalities:

Leukocytosis 50-70%

Neutrophilia with left shift

ALP elevation 80-100%

GGT elevation 65-80%

ALT elevation 75-90%

Hyperbilirubinemia 30-60%

**Total bilirubin concentration can be within reference interval even with gallbladder rupture! (Guess et al. 2015, Wilson et al. 2020)*

Differential Diagnosis: Cholecystitis, hemocholecyst, or accumulation of gravity independent gallbladder sludge due to outflow obstruction (cholelithaisis, neoplasia, bile duct stricture).

Diagnosis: Gallbladder mucoceles are diagnosed via ultrasonography or CT scan. Mucoceles are characterized by accumulation of intraluminal hypoechoic mucus adjacent to the gallbladder wall with central hyperechoic, non-gravity dependent biliary sludge. There may or may not be a stellate pattern (kiwifruit-like). Gallbladder rupture is suggested by discontinuity of the gallbladder wall, pericholecystic hyperechoic fat, or effusion.

Treatment:

Cholecystectomy is the only treatment option for dogs with ruptured gallbladder mucoceles. Surgery is indicated for symptomatic patients and those with moderate to severe biochemical derangements.

Pre-operatively, parental fluid therapy with a balanced electrolyte solution and parental pain control are the top treatment priorities.

Bacterial cholecystitis occurs concurrent to gallbladder mucoceles in ***9-35%*** of dogs. Broad spectrum antibiotics are administered pre-emptively to limit complications from septic peritonitis in patients with fever or CBC alterations consistent with infection. Antimicrobials are continued pending gallbladder wall culture results or 2 weeks beyond clinical signs

Vitamin K_1 (0.5-1 mg/kg SQ x 3 doses) is administered perioperatively in cases of bile duct obstruction.

Choleretics should ***not*** be administered pre-operatively in dogs with a compromised gallbladder wall or evidence of bile duct obstruction. Ursodeoxychoic acid may promote smooth muscle contraction of the gallbladder wall, potentiating rupture, and will increase bile flow, enhancing bile volume.

Clinicopathologic abnormalities will normalize within 2-3 weeks of surgery.

Medical management with ursodeoxycholic acid (ursodiol, UDCA, Actigall) may be attempted in asymptomatic or minimally affected patients (intermittent gastrointestinal signs, mild ALP/GGT elevations). *Ursodeoxycholic acid stimulates bile acid dependent bile flow (10 mg/kg q 12h with food). Choleresis is also stimulated with high dose S-Adenosyl-Methionine (SAMe, 40 mg/kg PO q 24h) through a non-bile acid dependent mechanism.*

Treat co-morbidities (e.g. dyslipidemias and endocrinopathies)

Serial re-assessment during medical therapy

CBC, chemistry, and recheck abdominal imaging every 1-2 months initially

Monitoring frequency is reduced if improvement in biochemical parameters & gallbladder ultrasonographic appearance are noted.

Cholecystectomy is recommended if no improvement occurs after 4-6 months of therapy or there are worsening clinical signs, biochemical parameters, or ultrasonographic changes.

Prognosis:

Reported post-operative survival following cholecystectomy ranges from 68-91%

Survival rates improve substantially in patients undergoing elective surgery

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CRITICAL CARE FOR THE SENIOR/ GERIATRIC PATIENT

Maureen Mcmichael

Auburn University, Clinical Sciences, Auburn, United States of America

Qualifications:

Maureen Ann McMichael, DVM, M.Ed., DACVECC

mam0280@auburn.edu

Critical Care for the senior/geriatric patient

Maureen McMichael, DVM, M.Ed., DACVECC

Auburn University, Auburn, AL

Introduction

The number of geriatric pets has increased considerably in the last 10 years. In 1995 in the United States 24% of pet cats were over 6 years. Today it is estimated to be approximately 47%. In Europe between 1983 and 1995 the number of geriatric cats increased by over 100% while the number of geriatric dogs increased by approximately 50% in that time period. This growing subset of the pet population has received very little scientific research and publications on geriatric critical care are extremely sparse.

Definition of Geriatric in Veterinary Medicine

The term geriatric is difficult to define in veterinary medicine because it differs between dogs and cats and between different breeds (i.e., Great Dane has a much shorter lifespan than a Chihuahua). In general animals older than 7 year of age are considered to be geriatric. A more specific definition has recently been proposed. Giant and large breed dogs are senior at 6-8 years and geriatric at 9 years or older. Medium and small breed dogs are senior at 7-10 years of age and geriatric when 11 years or older. Cats can be considered senior at 12-14 years of age and geriatric when 15 years or older.

Laboratory Values

The laboratory values of red blood cells, white blood cells, platelets and hemoglobin do not change with age in people at rest. There is a decrease in the ability of the bone marrow to increase neutrophil production in response to infection and to increase red blood cell production in response to anemia in geriatric people. Neutrophil function has also been shown to decrease with age in people.

There are no established reference ranges for geriatric small animal patients. This may be related to the fact that the term "geriatric" is difficult to define. In a study of age related variations in laboratory values in Beagles and Labrador Retrievers the geriatric category included all animals over 10 years of age. There were no differences between the "over 10 years of age" group and the rest of the adults. In an evaluation of age dependent changes in laboratory values before and after exercise in Beagles there were no significant differences in the laboratory values between 5 year old and 10 year old at rest. After exercise, however, there were significant differences in many of the parameters. There were lower hematocrits, red blood cell counts, and hemoglobin concentrations in the older dogs. The older dogs also had a significantly lower venous oxygen saturation and lower plasma glucose. Older dogs have also been shown to have a slower hematopoietic response to acute anemia (phlebotomy) than younger dogs.

Coagulation

There is a hypercoagulable shift as people age and the incidence of pulmonary thromboembolism is increased five-fold in people older than 85 years of age. Although changes in this system with age have not been investigated in small animal patients prophylactic treatment in geriatric animals at risk for hypercoagulability may be warranted in this age group.

Respiration

In people the thoracic cage becomes more rigid and the lungs lose elasticity with age. Respiratory muscle strength is decreased by 25% and the alveolar to arterial gradient increases significantly. Loss of diaphragmatic and intercostal muscle mass is thought to be responsible for the decline in respiratory muscle strength. These aging changes may result in a decreased $Pa0_2$ in older veterinary patients. Diseases such as pneumonia, pulmonary thromboembolism, or pulmonary edema place great pressure on the limited pulmonary reserves in this age group and are often more difficult to treat for these reasons.

Kidneys

There is a general decrease in renal function with renal blood flow, glomerular filtration rate, urine concentrating and diluting ability, and creatinine clearance all decreasing with age in people. Inability to conserve sodium or concentrate urine and decreased renal blood flow have been reported in geriatric small animals. This combination leads to the inability of the aged to respond to hypo- or hypervolemia and places severe restrictions on fluid therapy in this age group.

Imaging

Thoracic radiographs of geriatric dogs and cats are significantly different and will be discussed.

Fluid Therapy

Significant changes in multiple organ systems in geriatric animals should be taken into account when selecting the type, dosage, and rate of fluid choices in this age group.

Myocardial fibrosis, valvular malfunction, and myocardial fiber atrophy seems to increase with age in geriatric pets. The decrease in ventricular compliance limits the volume that the geriatric animal can tolerate while paradoxically increasing its dependency on volume. Geriatric animals are highly dependent on end-diastolic volume to increase cardiac output and therefore do not tolerate volume depletion very well during times of stress (i.e., illness, anesthesia, etc.).

Renal changes such as the decreased ability to concentrate or dilute urine, decreased renal blood flow, and the limited ability to conserve sodium all limit the geriatric animal's ability to handle either volume depletion or volume overload.

Nutrition

Maintenance energy requirements (MERs) decrease with age in dogs but appear to increase after the age of 12 years in cats. There may also be a decrease in the ability to digest fat and protein as cats age. These changes can lead to either weight gain (i.e., if an older dog is fed food with the same caloric content as it ages) or weight loss (i.e., if an older cat is fed food with the same caloric content as it ages) in the older pet. The reduced ability to digest fats can lead to deficiencies in fat soluble vitamins (e.g., vitamin E) along with water soluble vitamins (e.g., B vitamins) and electrolytes. In older dogs with a limited ability to digest fats due to a diminished ability to secrete pancreatic lipase or bile acids medium chain triglycerides may be beneficial as a concentrated and highly absorbable energy source. Adequate protein intake is essential for optimal immune function and is critical in geriatric animals. Protein requirements actually increase in older dogs and the old dogma of protein restriction for kidney protection has been discounted. Antioxidants are essential to combat oxidative stress, which has been shown to increase with age in many species.

Pharmacology

Aging imposes several changes in the absorption, distribution, metabolism and elimination of many drugs. Oral absorption may be decreased due to decreased GI function as the animal ages. The loss of lean body mass can alter IM route absorption. If fluid retention is present (such as with congestive heart failure, cirrhosis, or renal failure) drugs that are distributed to extracellular water (e.g., penicillins, NSAIDS, aminoglycosides) will be altered in their distribution. Albumin, the protein to which many drugs bind, also decreases with age. Drug metabolism may change as the geriatric patient experiences a decline in hepatic function. The mass of the liver decreases with age and decreases hepatic function. This could cause increased plasma half-life of drugs that depend on hepatic excretion, metabolism, or conjugation. Decreased function of phase I metabolism reactions in the liver appear to occur with age and cause decreases in oxidation, reduction, dealkylation, and hydroxylation reactions. Phase II reactions do not appear to be altered with age. Drug elimination may be affected by a progressive decline in renal function with age. In geriatric people there is a steady decline in renal function with approximately 40% of the nephrons becoming sclerotic by the age of 85 and renal blood flow and GFR decreasing by almost half. Due to the loss of lean body mass creatinine may remain normal (decreased production and decreased clearance). In dogs and cats approximately 15-20% are thought to suffer some degree of renal insufficiency as they enter the geriatric years. In geriatric people there is a progressive decline in the number of cardiac myocytes and in ventricular compliance. Autonomic tissue is replaced by fat and connective tissue and shows decreased responsiveness to autonomic drugs. It is likely that some decline of cardiac function occurs with age in animals and careful monitoring for specific endpoints is essential when prescribing cardiac drugs to geriatric animals.

Conclusion

Geriatric animals experience a decline of physiologic reserves which may not be apparent at rest. During times of ill health, however, when needed to meet the demands of the disease process, the geriatric animal cannot mobilize additional reserves and the illness may result in multiple organ failure.

Due to changes in the cardiovascular, renal, hepatic, nutritional and immune function the older animal will respond differently to both the stress of illness and its treatment than the young adult. It is essential that the critical care team be familiar with these changes in the older animal and be prepared for vigilant monitoring during diagnostics and treatment for the illness.

In critically ill geriatric people severity of illness has the biggest influence on outcome and this is likely to be similar in animals. Aggressive and appropriate treatment, careful monitoring, and of course TLC are essential to a successful outcome in the critically ill geriatric patient.

REFERENCES are available upon request

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PATIENT SAFETY – WHAT IS IT AND HOW TO MAKE IT HAPPEN!

Melinda Larson[1], *Lisen Schortz*[2], *Kathrine Blackie*[3]

[1]*Medical Quality at Blue Pearl, Director, Tampa, United States of America,* [2]*AniCura, Group Patient Safety Manager, Lincoln, Sweden,* [3]*Linnaeus, Quality Improvement Manager, West Midlands, United Kingdom*

Qualifications: Melinda Larson DVM, DACVIM Melinda. Gann@bluepearlvet.com

Abstract Body: OVERVIEW OF THE ISSUE Patient safety is the science of handling, learning from and preventing patient safety events (PSE's). PSEs are prevalent in human healthcare with the average ICU patient experiencing 1.7 errors in their care per day[1]. Patient safety events are the third leading cause of death in the US, behind cancer and cardiovascular disease.[2] We do not currently have a measure of the scope of these events in veterinary medicine as patient safety is still an emerging field. Healthcare is a high-risk work environment similar to the airline or automobile industries. Veterinarians and technicians/nurses are trained to do many specific tasks while under pressure with a high degree of accuracy. At the same time, medical professionals are expected to make complex decisions while handling multiple client/patient interactions. Medical training typically focuses on the cognitive aspects of clinical decision making with less focus on interactions with people and almost no focus on the riskiness of automatic behaviors.[1] A key reality in patient safety is that a large percentage of patient safety events are preventable, and we can work to make healthcare systems safer for patients. **OBJECTIVES OF THE PRESENTATION** Discuss and understand the: • Types of error and a systems-based approach to error • Incident reporting systems • Human factors and how it can prevent PSEs • Importance of a strong culture of safety • Impact of PSEs on healthcare teams/people and why peer support is critical**KEY DEFINITIONS FROM THE INSTITUTE OF HEALTHCARE IMPROVEMENT (IHI and WHO)***Adverse event/Medical Incident/Patient Safety Event*: (or harm) 'unintended physical injury resulting from or contributed to by medical care (including the absence of medical treatment) that requires additional monitoring, treatment, or hospitalization, or that results in death'. These adverse events can further be separated into preventable adverse events and nonpreventable adverse events.*Error:* 'an act of commission (doing something wrong) or omission (failing to do the right thing)'. It is important to note that many errors do not result in adverse events. These are often called '*near misses*' or '*no harm events*'*Patient Safety Event (PSE*): a term that includes both preventable adverse events and error that impacts patients **For the purpose of these patient safety presentations these terms will be used interchangeably***PATIENT SAFTEY & INCIDENT REPORTING SYSTEMS* Incident reporting systems play a vital role in organizations by providing a structured way for team members to systematically document any unwanted or unexpected events that happen in the workplace. An incident reporting system offers numerous benefits that contribute to overall safety, risk management, and organizational improvement. First and foremost, incident reporting systems enhance workplace safety by encouraging employees to promptly report potential events, both no harm and harmful events, as well as near-misses, ensuring that corrective actions can be taken to reduce the recurrence of future incidents. By collecting detailed information about each incident, these systems enable organizations to analyze trends, identify patterns, outliers, and implement proactive measures to mitigate risks effectively. Across an organization, data from individual units feeds into a whole that is even more powerful to analyse and learn from. Furthermore, these systems enhance communication and collaboration among different departments, as incidents can be tracked and shared across the organization, leading to increased awareness and a more holistic approach to problem-solving. A well-functioning IRS contributes to more safe and effective workplaces. **HUMAN FACTORS IN VETERINARY PATIENT SAFETY** Human factors (or ergonomics) is the study of all the factors that make it easier to do the work the right way. The two aims of human factors are improved system performance and optimised human wellbeing. Human factors principles can be used to design systems that fit the physical, cognitive and behavioural characteristics of humans, including our limitations. They can also help us understand why a system has produced an unwanted outcome, such as a patient safety event. HF principles for patient safety 1. Everybody comes to work to do their best. People do what makes sense to them at the time. Humans make decisions based on the information available to them and their understanding of it, the context and situation they are in and their goals. 2. People make mistakes. They are creative, adaptable and amazing at solving complex problems. But they are not machines and do not have machine-like reliability. This means errors are a normal part of the human experience, they are not unusual or unexpected. We cannot avoid making errors by deciding not to make errors and we cannot prevent other people from making errors by telling them not to. 3. Error is not a choice. An error is an unexpected outcome; therefore, it can't be a choice. If we knew what the outcome would be, we would not have acted in the way we did. When we blame someone for a mistake they made, we are making their error a choice and the implication is they did it wrong deliberately. 4. Blame fixes nothing. After an error or a poor outcome, it is easy to see where someone went wrong and blame them for the bad outcome. This leads to punishment. But it does nothing to change the outcome of the event, repair the damage, or make things safer for the future. It also removes the accountability of the larger system or the organisation which have usually played a part. 5. Context is important. Context matters because it drives behaviour. Systems are perfectly designed to get the outputs they get. If those outputs are errors or failures then the design of the system is at fault, not the person. Some situations make human error far more likely. For example, confusing equipment or lookalike medications. Individual and teamwork factors also increase errors, and it is important we recognise them as they too are signs that our systems are not working. Understanding patient safety events • People do what makes sense at the time. Try to put yourself in their shoes. **Why did they do what they did?** • What features of the task, job, equipment, environment or system **made the event more likely to happen? • Where could changes make the system more compatible** with the needs, capabilities and limitations of people?**CULTURE OF SAFETY** This concept stemmed from HROs or 'High Reliability Organizations' which includes organizations that have addressed their error problems effectively. Examples include the airline industry, nuclear power industry, and naval aircraft carriers1 . HROs are known for four core characteristics: 1. Preoccupation with failure - this is the acknowledgement that they are a high-risk organization and the focus on achieving consistently safe operations. 2. Commitment to resilience - the ability to detect threats before they cause harm, or to recover from them when they do. 3. Sensitivity to operations – being attentive to the issues facing frontline workers when analyzing mistakes and in making decisions about how to do the work. 4. A culture of safety – where people feel comfortable speaking up about potential hazard/unsafe conditions or actual error without fear of repercussions from leadership. A strong culture of safety within a hospital is one that is designed to support team members when patient safety events happen. It is also a culture that supports the reporting of errors and encourages teams to work together to focus on learning from these events to prevent them in the future. Human healthcare measures safety culture via survey and there are several different examples of these. Common questions within these surveys include areas such as whether staff members feel comfortable reporting PSEs, what the level of support is after reporting these events and whether they are part of the proactive discussions to prevent future events. Safety culture is the compass team members use to guide their behaviors, attitudes and perceptions on the job3 . o What will I get praised for? o What will I get reprimanded for? o What is the 'right' thing to do? There is a very strong link between culture, behavior on the job and patient outcomes. The stronger a safety culture is within a healthcare team, the better the outcomes of patient.3 Core aspects of safety culture include: o Communication patterns and language o Feedback, reward and corrective action practices o Formal and informal leader expectations and actions o Resource allocation practices o Error detection and correction systems**IMPACT OF PATIENT SAFETY EVENTS ON TEAMS** Patient safety has become an established priority in human healthcare for the past two decades. There is a large body of research in human medicine on the incidence of harm caused by healthcare, its impact, and interventions to prevent it. An important realization has been that the same errors that

harm patients also harm members of the healthcare team. Dr. Albert Wu, Director of Patient Safety at Johns Hopkins, has been instrumental in the movement to support healthcare workers going through PSEs. He coined the term 'second victim' syndrome, which is used to describe the impact of medical error on healthcare workers.4 In this definition, the patient and their family members are considered the 'first victims,' and healthcare workers are the 'second victims.' This phenomenon has also been referred to as secondary trauma. Healthcare workers involved in a medical error may feel a wide range of emotions, including shame, guilt, stress, anxiety, depression, and sadness. They may blame themselves if a patient is harmed from the error, which can lead to a loss of confidence or questioning of their own decision-making abilities. Over time, those experiencing second victim syndrome may feel professionally isolated, experience burnout, leave their team or department, or may even leave their profession completely.8 If a healthcare provider is involved in a medical error while working within a blame culture rather than a culture of safety, they may face unfair punishment or judgement from their team. They may subsequently fear reporting errors in the future, which further hinders patient safety.**PEER SUPPORT** According to Berwick, "in the moment of injury to a patient, there's an urgent emergent injury to the health care worker involved in that as well. We have to get in there and help them."5 Wu started a program called 'RISE', or 'resilience in stressful events' at Johns Hopkins which is a voluntary network of peers that are available to support people going through difficult PSEs. Research has shown that healthcare workers involved in PSEs will most likely seek support from peer groups as they have a shared understanding of the pressures associated with patient-related events.4 The RISE network has grown to include over 85 human healthcare groups in the United States. Even in the absence of formal training, a veterinary hospital can establish a peer support network of their own. Peers who have been through similar experiences are more likely to understand what the person is going through emotionally and mentally, and this understanding can reduce the feeling of isolation. They can share coping strategies and reduce the stigma associated with seeking help. If needed, a peer support network can provide additional resources or guide their coworker to more advanced support, such as a social worker. Long term, support from a peer can prevent long-term consequences of second victim syndrome and can further facilitate learning and quality improvement in healthcare settings.**POSITIVE IMPACT OF PATIENT SAFETY EVENT REPORTING** While medical errors can have negative impacts on our patients and veterinary teams, patient safety event reporting and a strong safety culture can have positive impacts as well. As mentioned throughout, patient safety event reporting is a quality improvement tool that can reduce the risk of recurrence of error, thus improving overall patient safety and outcomes. Understandably, this can lead to higher client satisfaction. But beyond this, empathetic handling of safety incidents supports both the wellbeing of providers and their care of their patients. A strong safety culture supports psychological safety, which is the comfort to speak up when needed without subsequent embarrassment, rejection, criticism, or punishment. This open and non-judgmental communication around medical errors can have a strong impact on an organization and has even been linked to less burnout in human healthcare providers.9 Psychological safety gives a voice to all team members, regardless of position, rank, or seniority. Anyone can speak up for patient safety. Therefore, psychological safety helps to flatten any perceived power dynamics that, when present, have been shown to lead to adverse events in healthcare.10 Lastly, a strong safety culture promotes continuous learning. Teams are constantly striving to be better for their patients. Moving away from an unrealistic expectation of perfection can open the conversation to how care can be provided in a different or novel, but safer, manner. Learning from prior events or reviewing RCAs can help to prevent future adverse events from recurring. **SUMMARY INCLUDING 5 KEY "TAKE HOME" POINTS** 1. Humans are fallible and error will happen – even in the veterinary medical profession. 2. It is essential to follow a 'systems based' approach to medical error/ adverse event resolution. 3. A strong patient safety culture is the key to people feeling comfortable reporting patient safety events. 4. People do not go to work wanting to commit errors. Healthcare is complex and the systems within which they work are imperfect – leading to weakness' within systems that can cause PSEs. Key tools can help to find these weak points so systems can be made safer. 5. Along with our patients and clients, we must support the health care team members that are most closely associated with patient safety events.**SUMMARY** Medical error has nothing to do with people not caring or not trying hard enough. People who work in veterinary medicine have immense empathy and passion for patients and their families. Simply put, humans are fallible, which means there will be times they get it wrong.7 Another key element of medical error is understanding that the root causes of errors in more than 90% of cases lie within the system that our teams work.6 Patient safety pioneer Don Berwick emphasizes, "…the vast majority of healthcare workers are trying hard to do the right thing. They go to work with goodwill and good intent. When a patient gets injured, it's not a result of their intention. It's a result of something around that set them up for the defect to occur." 7 To improve patient safety and limit medical error, we must focus on eliminating problems within systems that lead to error.**REFERENCES**

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BARKING UP THE RIGHT TREE: TIPS FOR VETERINARY CLINICS TO STAY INNOVATIVE EVEN IN SMALLER MARKETS

Bruno Farinha

Petable/Digitail, Founder & Ceo, Carnaxide, Portugal

Qualifications:

Bruno André Ribeiro da Silva Farinha

DVM

bruno@petable.care

Barking up the right tree: How can veterinary clinics stay innovative even in smaller markets

When we are discussing the future of veterinary practices and innovation in that space it is important to understand the role that the size of your local markets will have an impact on that.

In this lecture we are going to go through a bunch of different trends that are going to be central in shaping the veterinary medicine of the future, and how they will impact on smaller markets.

First we should consider the two bigger constraints that people associate with smaller markets:

-The relative size of the market (big countries vs small countries)

-Purchasing power (richer vs poorer).

Before diving into what we want to discuss as trends of the market, it is important to layout the most important ways in which those constraints directly affect the veterinary practices (other than the obvious: big markets tend to present more opportunities than smaller ones, and of course richer markets tend to present a *smoother* opportunity for businesses than smaller one.

Relative size:

-Main influence in tech or other products that tend to cater the whole market- that is where the relative size really takes its toll. For example if you create a business in Lisbon that caters to a specific local niche that tends to not be a big disadvantage vs a business in a city of that same size, let's say Austin for example, but if you are creating a business that wants to cater to the whole national market than that will be a huge difference between the Portuguese and the American market. The relative market share that you must have will have a huge impact in the choices you make. In terms of veterinary practices this will not have a huge impact since each individual practice is mostly a local business, but could have an impact if, for example, you are building a practice only for references.

-The relative size of the market will also impact, of course, on the Number of specialists that will be available on a specific field or area, and of course that can have an impact on your specific practice, or in the services you are able to provide.

-It will also affect the size of the overall talent pool, making it a little bit harder to hire, and find alternative options for your team

As for the purchasing power:

-Even in countries with a weaker purchasing power high converting and high paying niches still exist (of course that in bigger markets, with a weaker purchasing this is more true than in small markets with weak purchasing power) , and veterinary trends to be common across markets on those niches.

So, even before going into veterinary trends and innovation dynamics this is where my first 4 advices come in to place:

Understanding the Market is even more important in smaller markets:

Analyzing the local market dynamics and identifying the specific challenges and opportunities in smaller markets.

Conducting a comprehensive market analysis to assess the target audience, competition, and potential areas for growth.

Identifying emerging trends and demands in veterinary care within smaller markets.

Highlight the importance of understanding the unique characteristics of the local market, including cultural norms, pet ownership patterns, and specific pet care needs within the country.

Collaboration and Networking:

Emphasize the importance of collaboration and networking within the veterinary community in small country markets.

Encourage clinics to establish connections with other veterinary professionals, industry organizations, and regulatory bodies within the country.

Discuss the potential for sharing resources, knowledge, and best practices to drive innovation collectively and overcome common challenges.

Marketing and Branding:

Highlighting the importance of effective marketing and branding strategies to stand out in a smaller market.

Discussing digital marketing techniques, social media presence, and online review management to attract new clients.

Sharing successful case studies or examples of veterinary clinics that have implemented innovative marketing approaches.

Advocacy and Education:

Discuss the importance of advocacy and education initiatives in small country markets to raise awareness about responsible pet ownership, preventive care, and the value of veterinary services.

Encourage veterinary clinics to actively engage in educational outreach programs, partnerships with local schools or universities, and community events to promote animal welfare and veterinary care.

So let's dive a little bit into 4 specific trends that will shape veterinary medicine in the coming years, and how that will have a special impact in smaller markets.

AI

The emergence of AI is a trend that will without a doubt have an impact on the next decades of human existence. Veterinary Medicine will be no different.

It is important to find ways to incorporate AI into tools that consume time and effort, to reduce the number of hours spent of repetitive tasks. In Veterinary medicine AI will, without a doubt have an impact, in diagnostics and reporting, and in smaller markets, veterinary practices must take advantage of this.

Telemedicine

Depending on individual countries laws of telemedicine, and what those pertain, the global trend of the rise of telemedicine and telehealth should be put into the spotlight by veterinary practices. Especially in smaller markets, the ability to add value to customers with a small allocation of resources is extremely important.

Premiumization and Customer Centric Approaches

Even in markets with a weaker purchasing power, this trend will shape the coming years. Pet Owners are expecting a completely different experience nowadays, and the premiumization comes with the need to offer them the same responses that they expect from all businesses they interact with: availability, care and the need to see their pet as a part of the family. In small markets with weak purchasing powers of course the niche to cater to will be small, but this is a huge opportunity to move on, if the need still exists in your market.

Labour shortages

In many markets the overall scarceness of veterinarians is one of the main problems to address.

A lot has to be done to reshape the veterinary business as a whole, and of course smaller markets will be no exception.

Also, this makes markets with weaker purchasing power extremely vulnerable: we are seeing an exodus of the workforce into higher paying countries (in Europe Brexit kind of stopped the leak from being even bigger), because veterinarians are in high demand and there is an extreme difficulty to offer veterinarians competitive wages (smaller purchasing power on the market impacts how much people spend on their pets, which impacts wages).

How veterinary practices handle retention of their team is even more important. Build a brand for yourselves, creating employee retention policies, with financial and wellbeing benefits. Focus on providing the right number of services, for the right amount of hours per day, and not on providing all services all the time. Once again, focus on networking and on exchanging connections.

But…the need for veterinary businesses in small country markets to be adaptable and resourceful in order to optimize their operations and financial sustainability will create resiliency

Effectively managing costs, optimizing staff resources, and seeking out partnerships or funding opportunities to support innovation and growth, can help you absolutely leverage the right resources to make your business a success.

Don’t just be A veterinary practice CREATE THE veterinary practice

Don’t just be A place CREATE a brand

Don’t just be A visit CREATE an experience

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COMPARATIVE ASPECTS OF BABESIOSIS IN CATS AND DOGS

Gad Baneth

The Hebrew University of Jerusalem, The Koret School Of Veterinary Medicine, Rehovot, Israel

Qualifications:

Gad Baneth, DVM, PhD, Dipl. ECVCP

e-mail: gad.baneth@mail.huji.ac.il

Introduction

Babesiosis is a disease caused by protozoal parasites that infect erythrocytes and cause anemia. *Babesia* species are tick-borne apicomplexan parasites that infect a variety of domestic and wild animals and may cause moderate to severe disease. Babesiosis has a worldwide distribution and global importance. Hemolytic anemia with erythrocyte destruction and a systemic inflammatory response account for most of the clinical findings reported in canine and feline babesiosis.

Canine babesiosis

Babesia infection was identified in the past based on the morphologic appearance of the parasite in erythrocytes. All large forms of canine *Babesia* (2.5–5.0 µm) were designated *Babesia canis*, whereas all the small forms (1.0–2.5 µm) were considered as *Babesia gibsoni*. However, the development of molecular methods has demonstrated that more piroplasmid species than known before infect dogs and cause different diseases. *Babesia rossi*, *Babesia canis* and *Babesia vogeli* previously considered as *B. canis* and then as subspecies of *B. canis*, are identical morphologically but differ in the severity of clinical manifestations which they cause, their tick vectors, genetic characteristics, and geographic distributions, and are therefore currently considered as separate species. Another yet unnamed large *Babesia* sp. most closely related to *B. bigemina* was found to infect immunocompromised dogs in North America. The small *Babesia* species that infect dogs include *B. gibsoni*, *Babesia conradae* described from California, *Babesia vulpes* (previously termed *Babesia microti*-like; *Theileria annae*) and *Babesia negevi*. None of the *Babesia* species that infect dogs is known to be zoonotic.

The geographical distribution of the causative agents and thus the occurrence of babesiosis are largely dependent on the habitat of relevant tick vector species, with the exception of *B. gibsoni* where evidence for dog to dog transmission indicates that infection can be transmitted among fighting dogs breeds independently of the limitations of vector tick infestation. *Babesia vogeli* and *B. gibsoni* have wide distributions in both the Old and New World continents, whereas *B. rossi* has to date been mostly restricted to Africa and *B. canis* has mostly been reported mostly from Europe.

Clinical findings in canine babesiosis

In general, hemolytic anemia and the systemic inflammatory response syndrome leading to multiple-organ dysfunction syndrome are responsible for most of the clinical signs observed in severe canine babesiosis. Hemolysis may result in hemoglobinemia, hemoglobinuria, bilirubinemia and bilirubinuria. Thrombocytopenia is consistently observed in babesiosis and may be caused by immune mechanisms, splenic sequestration or coagulatory consumption of platelets from hemolytic or vascular injury. Tissue hypoxia may occur in severe canine babesiosis. It is caused by anemia, hypotensive shock, vascular stasis by sludging of erythrocytes, excessive endogenous production of carbon monoxide, and damage to hemoglobin. The central nervous system, kidney, and muscle are the organs most affected by tissue hypoxia. Tissue hypoxia, hypertensive shock, multiple organ dysfunction and potential mortality have been documented mostly in association with *B. rossi* and *B. canis* infections. Young pups and immunocompromised adult dogs, such as dogs with hyperadrenocorticism or treated with immunosuppressive therapy, may suffer a severe disease also with *B. vogeli* infection.

The spleen has an important function in controlling babesiosis. Splenectomy has been associated with natural canine and human babesiosis. Experimentally infected splenectomized dogs develop parasitaemia and clinical disease rapidly and may reach high parasitaemia levels.

Diagnosis of babesiosis

Detection of *Babesia* in stained blood smears by light microscopy is a standard diagnostic technique used since the discovery of babesiosis. This method is reliable when a moderate to high parasitaemia is present. However, a direct correlation between the level of *Babesia* parasitaemia and the magnitude of clinical signs is not always found and dogs suffereing severe disease may have very low parasitemia. A fresh smear is recommended for the accurate diagnosis of infection. Erythrophagocytosis with infected erythrocytes may be found in blood smears from infected dogs. The use of molecular diagnostic assays such as PCR is indicative in cases of low parasitemia including suspected carrier dogs or chronically infected animals as well as for the determination of the infecting *Babesia* species.

Treatment of canine babesiosis

Large *Babesia* spp. are commonly treated with imidocarb dipropionate with good clinical response while small *Babesia* spp. are resistant to the drugs that are effective against the large babesial spp. *Babesia gibsoni* infection is often resistant to imidocarb dipropionate and diminazene aceturate and is treated with the combination of the anti-malarial drug atovaquone and the macrolide azithromycin. However, complete clinical and parasitological cure are not commonly achieved in dogs treated for small babesial spp. infections and clinical relapses may occur. Atovaquone-resistant *B. gibsoni* infection is treated with cclindamycin with diminazene aceturate and imidocarb dipropionate. Medical management of infection may require supportive treatments including blood transfusions, intravenous fluids, and the use of anti-inflammatory drugs.

Feline babesiosis

Babesiosis in domestic cats is more rare in comparison with its canine counterpart. Large as well as small form *Babesia* species have also been described in domestic cats, as in dogs. Clinical babesiosis in domestic cats has mostly been reported from South Africa where infection is mostly due to *Babesia felis*, a small *Babesia* that causes a disease characterized by anemia and icterus. It also infects African wild felids including lions, cheetahs and servals. Reports of domestic feline babesiosis caused by other *Babesia* species have mostly been sporadic. *Babesia cati* was reported from a cat in India and a few cases of infection in domestic cats by unnamed *Babesia* parasites were reported in France, Germany, Thailand and Zimbabwe. *Babesia lengau*, a *Babesia* species which infects cheetahs in southern Africa, has been shown to cause severe fatal disease in domestic cats associated with cerebral babesiosis. A large form *Babesia*, *Babesia canis presentii*, was described in cats from Israel, *Babesia hongkongensis* was described from Hong Kong and *Babesia panickeri* was reported in a cat from southern India. *Babesia* Species Cat Western Cape and *Babesia leo* have been described to cause disease in cats from southern Africa. In addition to that, several canine *Babesia* species and some species that infect African wild felids have been described to infect domestic cats, often detected by molecular testing (PCR) with no obvious clinical manifestations.

Clinical findings in feline babesiosis

Hemolytic anemia is the most common clinicopathological abnormality observed in feline babesiosis. Coinfection with other pathogens such as retroviruses and hemotrophic mycoplasms are suspected to increase

susceptibility to *Babesia* infections by causing immunosuppression. Information on the clinical manifestations of domestic feline babesiosis is limited mostly to publications on *B. felis* infection in South Africa. *Babesia felis* infection is associated with anorexia, lethargy, a roughened hair coat, exercise intolerance, weight loss, weakness, tachycardia, tachypnea, pallor, icterus in about 20 % of cases, vomiting and diarrhea. *Babesia canis presentii* infection in a cat from Israel co-infected with FIV and *Candidatus* Mycoplasma haemominutum was accompanied by fever, icterus, moderate anemia and thrombocytopenia which resolved following anti-babesial therapy. Finally, *Babesia lengau* infection was associated with hemolytic anemia and cerebral beabesiosis in cats from South Africa.

Diagnosis of feline babesiosis

Detection of *Babesia* in stained blood smears has been the standard diagnostic technique for feline babesiosis for many years. A fresh smear is recommended for the accurate diagnosis of infection. Nevertheless, the detection of *Babesia* in blood smears is considerably less sensitive than detection of parasite DNA by molecular techniques. Therefore, the use of molecular diagnostic assays is recommended for the detection of infection and subsequently for species determination. Although it is relatively easy to distinguish between large and small form piroplasms under the microscope, distinction between species based only on morphology is not possible and molecular analysis such as PCR and sequencing is required for this purpose. Serology is not commonly used as a diagnostic tool in feline babesiosis. Positive serology can indicate a past or present persistent infection but false-negative results are possible in peracute or acute infections, and serology is unable to distinguish between different closely related cross-reacting piroplasms.

Treatment and prevention of feline babesiosis

Babesia felis is treated mostly with the anti-malarial drug primaquine phosphate, which reduces the level of parasitemia, and may often resolve the anemia and clinical signs of disease, but rarely eliminates infection. Therefore, post-treatment clinical relapses are evident. Large form *Babesia* such as *B. canis presentii* infection can be treated successfully with imidocarb dipropionate. Co-infection with other pathogens should be investigated and managed medically if present. Prevention of babesiosis relies mostly on topical acaricidal treatments aimed at reducing the exposure to vector ticks and pathogen transmission to the cat.

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IMPROVING ANIMAL WELFARE THROUGH TECHNOLOGY – AN UPDATE ON SMARTPHONE TECHNOLOGY FOR SPAY/NEUTER AND RABIES VACCINATION PROGRAMS

Amit Chaudhari

Humane Society International, Companion Animals & Engagement, Washington, United States of America

Qualifications:

Dr. Amitkumar Chaudhari,

BVSc

achaudhari@hsi.org

Abstract

In today's Artificial Intelligence (AI) era, technology is playing a wider role in human and animal science. Simple yet effective applications like mobile phone-based applications are a new way of collecting data and improving program outcomes. One such example in dog population management programs is the use of technology and GPS mapping to ensure street dogs are returned to the exact location from which they were caught following spay-neuter surgery. Street dog sterilization programs in India, particularly those operating on a large scale, often face a variety of challenges including limited resources, staffing, and less-than-ideal facilities. Recordkeeping is often a challenge as well, which can complicate the return of a sterilized dog to its location of capture. Street dogs are territorial, and the return of a dog to an incorrect location is fraught with various welfare issues as well as an increased risk of postoperative complications, including death. Humane Society International, a global animal welfare charity engaged in street dog management programs, developed a mobile phone-based application, 'HSIApps', drawing on years of field experience and data collection in street dog location recording as well as clinical and post-operative treatment. The use of HSIApps ensures dog welfare through its daily use and the generation of reports which maximize the efficacy and reliability of spay/neuter programs.

INTRODUCTION

Free-roaming dogs refer to dogs living on the street without immediate human supervision [1]. This includes owned dogs allowed to roam, street dogs, and dogs born and surviving on the street [2]. India has a significant population of free-roaming dogs, with an estimated 75.9 million dogs in total, including 62.1 million street dogs and 13.9 million owned dogs [3]. Street dogs face harsh conditions, lack veterinary care, and are at high risk of accidents, parasitic infections, and zoonotic diseases like rabies. They have a shorter life expectancy compared to owned non-roaming dogs. Street dogs breed during the post-monsoon season, leading to high juvenile: adult dog rates occurring from January to March. Their survival depends on food provisioning from people, which is a common practice in India [4-5].

Canine sterilization programs are crucial for controlling street dog populations, reducing human dog bites, zoonotic disease transmission, and improving animal welfare [6]. India has a high prevalence of rabies, with dogs being the primary reservoir. Human rabies cases are often a result of dog bites, which number over 17.4 million annually. Managing street dog populations is also important for their welfare and preventing conflict with humans in urban areas. However, animal welfare is often neglected in developing countries due to a lack of specific animal protection laws, awareness of existing laws, and poor legal implementation.

In India, local government authorities (municipalities) contract with animal welfare organizations (NGOs) to implement street dog sterilization and vaccination programs for a specific period, covering the per-dog surgical cost as a fixed amount. Such humane initiatives for managing the street dog population are replacing historic killing methods and have become popular and are in practice with varying success since the government of India passed a specific animal birth control (ABC) law in the year 2001 known as, ABC Rules 2001, which was further amended recently and is now also known as ABC Rule 2023. These programs, using the catch, neuter, vaccinate, and return (CNVR) method, require systematic and high dog sterilization rates to be effective [7]. Street dogs are territorial, and poorly implemented programs often fail to return sterilized dogs to their original territories. However, the use of smartphone-based applications can greatly enhance the data collection and management of these programs. Humane Society International (HSI) has been working with local and state governments in India since 2012, implementing evidence-based sterilization and vaccination programs. HSI developed HSIApps, a smartphone application and web-based backend dashboard, to improve data collection and analysis based on their experience [8].

The methods and data presented show the successful use of the HSIApps app for the implementation of dog sterilization programs and associated data collection. The advantages of such a platform and the specific insights gained from the exemplary evaluations of such a dataset (as obtained during HSI's India programs) are examined here.

DATA ANALYSIS

Table 1. Analysis of spay/neuter data across 3 Indian cities (Dehradun, Vadodara, Lucknow)

Program sites	n[1]	Surgery duration was not recorded (excluded from analysis)	Females n (%)	Duration of surgery, by sex mean (median) minutes		Adverse post-operation outcomes n (%)	
				Male	Female	Died	Complications
Dehradun	20365	39	10958 (53.9)	9.12 (8)	15.22 (12)	19 (0.09)	None recorded
Vadodara	19984	543	8884 (45.7)	6.60 (6)	12.07 (11)	23 (0.12)	77 (0.40)
Lucknow	21739	108	9951 (46.0)	10.41 (10)	16.98 (15)	43 (0.20)	300 (1.39)

Note that this table includes pregnant females. These were subsequently removed from analyses unless otherwise stated.

1 'n' is the number of dogs spayed or neutered at a particular program site.

The use of HSIApps allowed for the generation of meaningful reports which demonstrated what dogs were most at risk for surgical complications, and the average length of each surgical procedure. On average, dogs that experienced post-operative complications had undergone longer surgeries than those that did not have complications. Female dogs that died post-operatively, had undergone longer surgeries than those that did not; this was not evident in male dogs (see Table 2). As it pertains to the gender of the individual dog, we found that an increase and decrease in postoperative death and complications were significantly associated with sex (p-value <0.001 and 0.008), respectively. Females experienced a significantly higher proportion of deaths, whereas male dogs experienced a significantly higher proportion of postoperative complications. Within sexes, the only significant association of age with adverse post-operative outcome is that of post-operation complications in female puppies which are significantly more likely to experience post-operation complications than female young or adult dogs (Post-hoc test: X-squared = 3.824; p < 0.001; Table 3).

Finally, according to the data, the sterilization of pregnant females is no more or less likely to result in post-operation death or complications than the sterilization of non-pregnant females (X-squared = 1.7728, df = 1, p = 0.183 and X-squared = 1.6142, df = 1, p = 0.2039 respectively.

Table 2. The association between surgery and adverse post-operative complications

Surgery Duration versus:	Male	Female
Post-operative death	27 of 31605 (0.09%) W=449507, p=0.623 Not significant (Bonferroni correction)	58 of 28709 (0.20%) W=985691, p=0.014 Significant (Bonferroni correction)
Post-operative complications	222 of 31605 (0.70%) W=2196286, p < 0.001 Significant (Bonferroni correction)	152 of 28729 (0.53%) W=1385782, p<0.001 Significant (Bonferroni correction)

Table 3. Age-sex-associated post-operative complications and deaths

		n	of which pup (%)	of which young (%)	Pup (%)	Young (%)	Adult (%)	Association	
								X-squared	p-value
Male	Post-op death	31605	603 (1.9)	5811 (18.4)	1 (0.17)	1 (0.02)	25 (0.10)	4.1882 (df=2)	0.123
	Post-op complication				2 (0.33)	36 (0.62)	184 (0.73)	2.0441 (df=2)	0.360
Female	Post-op death	28709	431 (1.5)	8996 (31.3)	0	14 (0.16)	44 (0.23)	2.488 (df=2)	0.288
	Post-op complication				8 (1.86)	35 (0.39)	109 (0.57)	18.242 (df=2)	<0.001

Analysis of data recorded by HSIApps also allowed for the tracking of surgical procedures performed by veterinarians, which was significantly correlated with the number of post-operative deaths and complications. Figure 8 demonstrates that on average, surgeons who have completed more operations exhibit a lower rate of post-operative complications (rho = 0.586, S = 188.24, p = 0.0277) and patient deaths (rho = 0.838, S = 73.811, p < 0.001). However, note that operations performed prior to, or outside of, the HSI clinic records are not recorded. For these final specific analyses, trainee vets were excluded, since the small number of operations performed by trainees may lead to erratic post-op death or complication percentages (the result of each individual occurrence resulting in a comparatively large percentage difference). The larger (750+) number of total operations performed by each qualified vet ensures the post-operative percentages are reliable for correlation analyses.

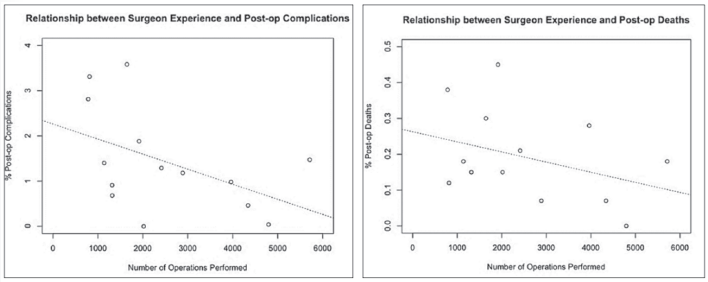

Figure 1. Relationship between total surgeries per surgeon and post-operative complications and deaths

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IMPACT OF ORAL ANTIBIOTICS ON THE GI MICROBIOME

Alison Manchester

Colorado State University, Clinical Sciences, Fort Collins, United States of America

Qualifications:

Full Name Alison C. Manchester

Qualifications DVM, MS, DACVIM (SAIM)

Email alison.manchester@colostate.edu

Introduction

Recent advances in analytic tools have led to a massive expansion of information regarding the gut microbiome. During this session, we will review current knowledge of the dog and cat microbiota, the effects of oral antibiotics on this "forgotten organ" and consider the justifications for using oral antibiotics, then apply this information to optimize antibiotic prescription.

Current knowledge – the gut microbiota in dogs & cats

The GI microbiota encompasses all the organisms present along the length of the GI tract, from mouth to rectum. For the purposes of this piece, we will focus on the bacterial component, but fungi, protozoa, and archaea also contribute to the richness of this complex ecosystem.

Sequencing techniques have advanced understanding of the complexity of the microbiota. Previous culture-based methods omitted many members of the microbiota, notably the obligate anaerobes dominating the distal gut lumen. Most of the work to date has analyzed bacteria present in fecal samples; bacteria present at the mucosal surface may be more relevant to the host, but these samples are quite challenging to obtain. Canine and feline fecal microbial populations are dominated by bacterial phyla including Firmicutes, Fusobacteria, and Bacteroidetes. Bacterial numbers increase moving aborad along the GI tract.

Determining which bacteria are present is only a starting point; more relevant information is gleaned from analysis of their functionality. This is typically inferred from bacterial gene analysis via sequencing or PCR. Bacteria serve many roles that are complementary to host activities ranging from breakdown of fibers to generation of essential nutrients to bile acid conversion to education of the intestinal immune system. The far-reaching capabilities of the GI microbiome have led some to refer to it as the "forgotten organ".

Effects of oral antibiotics on the gut microbiome

Oral antibiotics are efficacious provided adequate GI absorption, blood levels and perfusion to affected sites. Not surprisingly, gut bacterial populations are commonly perturbed; these alterations may be the primary reason for prescribing oral antibiotics in the case of certain GI diseases.

Several studies have examined the effects of oral antibiotics on the fecal microbiome of dogs. The author found that 7 days of oral tylosin caused marked decreases various anaerobic bacteria (e.g., Fusobacteriaceae) with concurrent expansions of Enterococcaceae in the fecal microbiome of healthy dogs[1]. A similar study of oral metronidazole identified similar decreases in diversity including significant decreases in Bacteroidetes and Fusobacteria with concurrent increases in Proteobacteria and Actinobacteria[2]. Both tylosin and metronidazole altered the fecal bile acid pool, with decreases in proportions of secondary bile acids and increases in primary bile acids. The influence of amoxicillin clavulanate[3] and clindamycin[4] have been evaluated in cats. Results again indicate reduced bacterial diversity, and expansion of Enterobacteriaceae in cats during administration of these broad-spectrum antibiotics. Healthy cats also had a high incidence of vomiting and diarrhea.

Some data is available regarding the impact of oral antibiotics on the microbiome of dogs with chronic enteropathy (CE), which is of clinical relevance. A small subset of dogs with CE has complete resolution of their clinical signs while receiving oral tylosin. Studies investigating the baseline and during antibiotic microbiota in these dogs have not been able to match a microbial "signature" to these dogs, and alterations in the fecal microbiome subside with tylosin discontinuation[5]. Results of this study must be interpreted with caution, however, as only *Enterococcus* spp. and lactic acid bacteria were evaluated. Full sequencing of the fecal microbiome might have resulted in different conclusions.

When considering these results, it's important to realize that the gut microbiome is a highly dynamic organization. Interventions ranging from diet to chemotherapy to exercise have been associated with "changes" in the gut microbiome, which is sometimes referred to as dysbiosis. Determining the physiologic relevance of these shifts is where clinicians and researchers should focus. Specifically, well designed studies should critically evaluate the state of the patient at the time of microbiota analysis and avoid assuming that any departure from the baseline state is bad. Existing evidence suggests that dogs with CE have heightened humoral reactions against their own gut bacteria[6]. Therefore, shifting GI bacterial populations could decrease the implicated antigenic stimulus and ameliorate disease severity. This could be a more direct way of managing CE as compared to bluntly suppressing the dog's immune system.

Oral antibiotic administration causes adverse effects in certain patients, ranging from more common GI disturbances to rare triggering of immune-mediated diseases. Other adverse consequences may be insidious, such as alteration of immune responses (both within and outside the GI tract) and promotion of antimicrobial resistance. More nuanced understanding of the myriad bacteria present at various body sites argues against the dogma that bacterial presence implies infection.

Bacterial roles in disease

Bacteria play diverse roles in disease pathogenesis. In some cases, bacteria are drivers of disease which need to be eradicated. This is the case for *E. coli*-associated granulomatous colitis in dogs, formerly referred to as boxer or histiocytic ulcerative colitis[7]. In these patients, periodic acid Schiff positive macrophages infiltrate the colonic mucosa concurrently with intracellular *E. coli*. Long-lasting clinical remission is associated with bacterial clearance. Unfortunately, multidrug resistant *E. coli* are increasingly common in colonic biopsy samples from these dogs, which has been linked with poor outcomes[8]. Other chronic GI conditions are less strongly linked to an underlying bacterial etiology. Dysbiosis has been documented in dogs with non-specific CE, but no individual or group of GI bacteria reliably distinguishes healthy dogs from dogs with CE.

Acute GI disturbances are commonly treated with oral antibiotics, despite the low likelihood of a bacterial impetus. Dogs with acute hemorrhagic diarrhea syndrome (formerly known as hemorrhagic gastroenteritis) show sudden onset illness, severe mucosal damage, and short disease course. However, the linkage with net-F producing *Clostridium perfringens* is not fully convincing[9], and most dogs recover spontaneously without systemic antibiotics. Acute non-specific diarrhea is even less well associated with a bacterial cause, and recent studies have shown similar outcomes in dogs receiving typical supportive care (e.g., bland diet, rehydration) with or without metronidazole[10].

Optimizing antibiotic use

As with any treatment intervention, caregivers strive to maximize the likelihood of positive outcomes while minimizing harm. To this end, techniques can be employed to optimize antibiotic treatment; these can be subdivided into two main categories: justification and implementation. These questions should be asked during the derivation of a treatment plan

for each patient.

Justification

§ What is the likelihood that this animal has a bacterial infection?

◊ revisiting differential diagnosis list – viral? inflammatory? parasitic? immune-mediated?

◊ what readily available diagnostics (e.g., cytology, careful history) can lend weight to the working diagnosis?

Implementation

§ Does this patient require **oral** antibiotics?

◊ [GI conditions] could antibiotic alternatives (e.g., probiotics, synbiotics, diet change, antidiarrheals) be successful?

◊ [Dermatologic conditions] could topicals be used instead of oral drugs?

§ Are we using the most targeted, least toxic antibiotic possible?

§ Are we treating for the shortest duration possible?

Conclusions

Antibiotics can be life-saving drugs but are by no means benign. The positive and negative, and obvious and subtle effects of antibiotics need to be weighed prior to each prescription. Going forward, we will hopefully have accurate tools that rapidly characterize the microbiome of various body sites, as well as the local host reaction, to help specifically guide what microbiome modulation (if any) would be most beneficial to the patient. Antibiotic alternatives and non-oral routes may help reduce unintended adverse drug effects.

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HOW TO SAVE ANTIBIOTICS - THE BENEFIT OF CUMULATIVE ANTIBIOGRAMS.

Babette Klein

Laboklin GmbH & Co. KG, Microbiology, Bad Kissingen, Germany

Qualifications:

Dr. Babette Klein

Veterinarian - 30 years of experience in veterinary laboratory medicine: microbiology, resistance monitoring

b.klein@laboklin.com

How to save antibiotics – the benefit of cumulative antibiograms

The emergence of antimicrobial resistance linked to possible treatment failure is one of the greatest threads to public health. Any use of antibiotics – even in the best manner – poses the risk of antibiotic resistance development (1).

Therefore, the **first and best measure** to save antibiotics is not to use them, if it is not necessary. There exist a lot of conditions which do not need an antibiotic therapy. These conditions are summarized for example on the posters available by the FECAVA (https://www.fecava.org/policies-actions/guidelines/) or BSAVA (https://www.bsava.com/resources/veterinary-resources/protect-me/). Some examples among a long list are: surgery of uninfected/uncontaminated tissue, routine dental descaling and polishing, before mating, feline lower urinary tract disease (FLUTD), juvenile vaginitis, acute conjunctivitis, rhinitis, acute canine cough, chronic bronchitis, feline upper respiratory viral infections and most gastrointestinal infections. Despite of the latter, 38 % of German pet owners in 2022 reported to have received an antibiotic treatment for their pet with acute diarrhoea (2).

FECAVA as well as BSAVA helps with posters or handouts developed for the owner to educate them about the relationship between antibiotic usage and emergence of resistances against these antibiotics – not only in general but even in the microbiome or their own pets. For German pet owners we present such educational handouts on our homepage (www.laboklin.de/de/fachinformationen/antibiose-und-resistenzen).

As the local administration of antibiotics does not affect the microbiome in the same way as systemic administration does, it should be used whenever the condition allows (e. g. most cases of otitis externa). Knowledge of current guidelines can be essential for saving antibiotics: In 2019 the new ISCAID guideline for management of urinary tract infections recommended especially for dogs a treatment trial with only nonsteroidal anti-inflammatory drugs for three to four days in cases of sporadic bacterial cystitis (3).

The **second measure** is to optimise antibiotic use by reserving our most powerful antibiotics. In this group we find fluoroquinolones and 3rd and 4th generation cephalosporins listed by the WHO as “Highest Priority Critically Important Antimicrobials (HP-CIA)”. But as well amoxicillin with clavulanic acid (amox/clav) or 1st generation cephalosporins. They should be preserved for severe or even life-threatening infections (4). Moreover, the use of these antibiotics is often associated with selection for multidrug-resistant bacteria.

With these two measures, already a lot can be achieved: Kurita et al. showed 2019 a significant decline of methicillin-resistant staphylococci (MRS) and extended-spectrum ß-lactamase (ESBL)-producing *E. coli* from 41.5 % to 9.3 % and from 29.5 % to 9.5 % respectively, for a veterinary clinic in Japan after restriction of antimicrobial use in that clinic (5). During the observation period of 4.5 years, there was no decrease in the rate of MRS or ESBL-producing *E coli* in the catchment area of the participating veterinary laboratory. Furthermore, it came to a significant decline in resistance rates to enrofloxacin and levoflocaxin in staphylococci and to cefazolin in *E. coli.* The applied program for the restriction of antibiotic use was based on the Danish Antimicrobial Use Guidelines.

In Germany, the prescription of antibiotics by veterinarians is regulated in the Regulation on Veterinary Pharmacies (Verordnung über Tierärztliche Hausapotheken, TÄHAV). Since 2018 it is stipulated by TÄHAV to conduct an antimicrobial sensitivity test (AST) in case of using 3rd or 4th generation cephalosporines or fluoroquinolones for dogs and cats. This led to a vast increase in ASTs in Germany and to a reduction in usage of the named antibiotic groups. Moerer et al. (6) investigated if the regulations by TÄHAV since 2018 influenced the occurrence of antimicrobial resistance in selected bacterial pathogens isolated from dogs and cats in Germany. They found a significant decline in resistance rates of *S. pseudintermedius* against penicillin G and ampicillin as well of *S. aureus* against enrofloxacin. Other results had to be stated as preliminary because they missed statistical significance yet. Similar studies showing declining effects on methicillin-resistant *S. pseudintermedius* (MRSP) in Germany assumed to be influenced by TÄHAV are ongoing.

Cumulative antibiograms prepared according to the Clinical and Laboratory Standards Institute are a summary of the results of ASTs from a particular institution in a defined period of time (an annual period is considered to be optimal) (7). They are used in hospitals to select an empirical therapy for humans and are considered to have a key function in the prevention of resistance (8). At least 30 strains of one species must be included and only the first isolate from a patient should be included (7, 8). The last criterion is controversially discussed, as it can lead to underestimation of the resistance rate against the pathogen under consideration in the hospital concerned (8). In veterinary medicine, it will be difficult to fulfil the intention of that last criterion anyway, since an AST is still very often initiated only after a therapy failure and thus in pre-treated animals.

Cumulative antibiograms are used in human medicine since decades and are part of the programs for antimicrobial stewardship (8). As in our laboratory more than one hundred thousand ASTs are conducted annually for a large number of animal species, the summarised presentation of these ASTs can provide important information for practising veterinarians. With these data, we demonstrate which antibiotics currently have the best prospects of success in empirical therapy for a given indication. If the antibiotic reaches a sensitivity rate of 80 % or higher, it can be recommended for empirical treatment (9). Antibiotics with a lower sensitivity rate should only be used based on the results of an AST.

We can show differences in the sensitivity of individual pathogens depending on the indication. And we demonstrate, that for many indications (e. g respiratory tract, wounds, urinary tract disease) fluoroquinolones and 3rd or 4th generation cephalosporins are not superior to “older” agents such as doxycycline, sulphonamide-trimethoprim-combinations or amox/clav (depending on the indication). This information supports the practitioner to preserve HP-CIA. We therefore, present indication-specific cumulative antibiograms available to all interested parties every three months on our website (www.laboklin.de/de/fachinformationen/antibiose-und-resistenzen). The limitation of this presentation is the lack of regional or even practice-specific differentiation as it is common practice in human medicine.

Iyori et al. (9) used a cumulative antibiogram of *S. pseudintermedius* isolates from cases of pyoderma and otitis externa in dogs to introduce strict antimicrobial prescribing criteria in a large Japanese clinic. After following the restrictions for one year they found a significant decline in MRSP and in resistance rates to cefpodoxime and minocycline. There was a decline in resistance rates to nearly all tested antibiotics but without proof of significance. The authors strongly recommended to regularly use cumulative antibiograms at veterinary clinics for the purpose of creating practice-specific guidelines to prevent future antimicrobial resistance in dogs. Such a clinic-specific programme can afterwards be adapted annually on basis of the next-year-cumulative-

antibiogram to a possible new situation.

Since the field of antimicrobial stewardship is still new in veterinary medicine (4) we only worked with a few practices to create their practice-specific cumulative antibiograms, in part followed by a restrictive antimicrobial prescribing program afterwards. We want to encourage practices and clinics to do so and we support them on their way by providing the necessary data.

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ANALGESIC INFUSIONS FOR EVERY PRACTICE

Tamara Grubb

International Veterinary Academy of Pain Management, Ivapm, Uniontown, United States of America

Qualifications:

Tamara Grubb

DVM, PhD, DACVAA, President International Veterinary Academy of Pain Management

tamaragrubb@wsu.edu

Constant rate infusions (CRI) of analgesic drugs have several advantages over multiple repeated injections for pain relief, including:

A more stable plane of analgesia with less incidence of break-through pain (which can be difficult to treat);

A lower drug dosage delivered at any given time, resulting in a lower incidence of dose-related adverse effects;

Greater control of dosing (easy to make small adjustments, both up and down);

Decreased need for stimulation of resting patients to repeatedly administer drugs; and

Decreased cost (when compared to technician time, needles and syringes required for repeat injections).

CRI drugs include opioids, ketamine, lidocaine, alpha-2 agonists and combinations of these drugs. See more information on analgesic infusions in the 2022 WSAVA Global Pain Council Pain Management Guidelines https://onlinelibrary.wiley.com/doi/epdf/10.1111/jsap.13566

Calculations of CRI dosages: Generally, patient-specific spread sheets should be used for CRI dose calculations and very useful spreadsheets or 'calculators' are available at multiple websites, including an excellent free calculator at **IVAPM.org.** Dosing charts (at end of notes) are also useful. If you WANT to calculate, this is an easy formula:

A = desired dose in microg/kg/min OR mg/kg/hr

B = body wt in kg

C = Diluent volume in mls

D = Desired fluid rate in mls/hr

E = Drug concentration in mg/ml

For microg/kg/min: A x B x C x 60 / D x E x 1000 = mls of drug to add to diluent

For mg/kg/hr: A x B x C / D x E = mls of drug to add to diluent

NOTE: If the dose at A is in mg/kg/hr, the two conversion factors in the formula (60 in the numerator and 1000 in the denominator) should be removed from the formula.

Loading doses: Administering loading doses of the drugs to be infused is important since the loading dose provides a rapid increase in the serum concentration of the drug. The loading doses are very low and extremely unlikely to cause adverse effects so, if in doubt, administer the dose.

How to deliver: Infusion pumps are the easiest, most efficient and most accurate way to deliver infusions. However, drugs can be easily administered by counting drops from fluid bags with the analgesic drug in the bag. When using a fluid bag, the bag is usually a separate bag from the regular IV fluids, at least intraoperatively. This prevents delivering a bolus of drugs to hypotensive anesthetized patients that need a bolus of IV fluids to support blood pressure. Ketamine may be an exception since the dose is so very low. Postoperatively or in any other stable patient (trauma patient that has been volume stabilized, patients with medical pain like pancreatitis, etc…) the drugs can be placed directly in the IV fluids if desired (Table 3)

When to start/stop: Start as soon as possible! As soon as a painful patient has an IV catheter in place, **consider** a CRI. The infusion can be stopped at the end of surgery if appropriate analgesia (eg, NSAIDs, local blocks, etc….) has been administered, or the infusion can be continued for several hours, overnight, or even several days.

TABLE 1: Dosages for constant rate infusions (CRIs) used in CATS. Administer all infusions in this table at 1 ml/kg/hr.

Drug	Loading Dose **mg/kg IV unless indicated**	CRI dose **mg/kg/hr unless indicated**	Quick Calculation* for **mg/kg/hr** unless indicated	Comments
Morphine (M)	0.10 IM	0.05-0.1	Add 30 mg for 0.06 mg/ kg/hr	Cat may need light sedation; can be combined with K &/or L
Hydro-morphone (H)	0.025	0.01-0.02	Add 5 mg	May cause hyperthermia; can be combined with K &/or potentially L
Fentanyl (F)	0.001-0.003	Intraop: 0.003-0.04 (0.05-0.7 mic/ kg/min; Postop: 0.002-0.010 (0.03-0.2 mic/kg/min)	Add 2.5 mg for 0.005	2.5 mg=50 ml F, remove 50 ml LRS before adding F; can be combined with K &/or L.
Methadone	0.1-0.2	0.12	Add 60 mg	MAY cause sedation; can be combined with K &/or potentially L
Butorphanol	0.1-0.2	0.1-0.2	Add 50 mg for 0.1	Only moderately potent & has ceiling effect - use as part of multimodal protocol
Ketamine (K)	0.5	0.12-0.6 (2 -10 mic/kg/ min) Intraop dose=10 mics	Add 60 mg for 0.12	Generally combined with opioids; might cause dysphoria (but unlikely)
Lidocaine (L) ***Controv-er-sial in cats**	0.25 Some recommend skipping loading dose in cats	1.5 (25 mic/kg/min) Some sources recommend ≤10 mic/kg/min in cats. Some recommend no lido-caine in cats.	Add 750 for 25 mic/kg/min and 300 for 10 mic/kg/min	750 mg=37.5 ml, remove 37.5 ml LRS before adding L; can be combined with opioid &/or K; **Controversial in cats due to cardio-vascular effects.**
Mede-tomi-dine (Med) or Dexmede-to-midine(D)	0.001-.005 Med 0.0005-0.002 D IV or IM	0.001-0.004 mg/kg/hr Med 0.0005-0.002 mg/kg/hr D	Add 500 mic Med or 250 mic D (0.5 ml of either) for low end dose	Provides analgesia and light sedation. Excellent addition to opioid CRI or can be administered as solo drug CRI.
Morphine / Ketamine	M: 0.10 IM K: 0.5 IV	0.05 M 0.12 K	Add 25 mg M & 60mg K	Can be administered up to 3 ml/kg/ hr but might cause dysphoria. Can substitute, F, or methadone for M.
Morphine / Lidocaine/ Ketamine (MLK)	M: 0.10 IM L: 0.25 or NONE K: 0.5	0.05 M 1.5 or 0.75 L 0.12 K	Add 25 mg of M, 750 mg (or 300 mg) L 60 mg K	Can substitute H, F or methadone for M.

*Any of the drug amounts in the bag of fluids can be decreased and the fluids administered at a higher rate if necessary. For example, for morphine, ketamine and morphine/ketamine infusions, 7.5 mg of morphine & 30 mg of ketamine can be used and the CRI administered at 2 ml/kg/hr if more fluids are needed.

TABLE 2: Dosages for constant rate infusions (CRIs) used in DOGS. Administer all infusions in this table at 1 ml/kg/hr.

Drug	Loading Dose **mg/kg IV unless indicated**	CRI dose **mg/kg/hr unless indicated**	Quick Calculation* for **mg/kg/hr** unless indicated	Comments
Morphine (M)	0.25 SLOWLY IV or 0.5 IM	0.12-0.3 mg/kg/hr (2.0 mic/kg/min- 5.0 mic/kg/min)	Add 60 mg for 0.12 mg/kg/hr	MAY cause sedation; can be combined with K &/or L.
Hydromorphone (H)	0.05-0.1	0.01-0.05 mg/kg/hr	Add 10 mg for 0.02	MAY cause sedation; can be combined with K &/or L.
Fentanyl (F)	0.002-0.005	Intraop: 0.003-0.04 mg/kg/h (0.05-0.7 mic/kg/min); Postop: 0.002-0.010 mg/kg/h (0.03-0.2 mic/kg/min)	Add 2.5 mg for 0.005	2.5 mg=50 ml F, remove 50 ml LRS before adding F; can be combined with K &/or L; Intra-op up to 0.02-0.04 mg/kg/hr
Methadone	0.1-0.2	0.12-0.3	Add 60 mg for 0.12	MAY cause sedation; can be combined with K &/or L.
Butorphanol	0.1-0.2	0.1-0.2	Add 50 mg for 0.1	Only moderately potent & has ceiling effect - use in multimodal protocol
Ketamine (K)	0.5	0.12-0.6 (2 -10 mic/kg/ min)	Add 60 for 0.12 and 120 mg for 0.24	Generally combined with opioids; may cause dysphoria; intra-op dose is high end of range
Lidocaine (L)	0.5 – 1.0	1.5-3.0 (25-50 mic/kg/min)	Add 750 mg for 25 mic/kg/min	750 mg=37.5 ml, remove 37.5 ml LRS before adding L; can be combined with opioid &/or K.
Medetomidine (Med) or Dexmedetomidine(D)	0.001-.005 Med 0.001-0.002 D IV or IM	0.001-0.004 Med 0.0005-0.002 D	Add 500 mic Med or 250 mic D (0.5 ml of either) for low end dose	Provides analgesia and light sedation. Excellent addition to opioid CRI, or can be administered as solo drug CRI.
Morphine / Ketamine	M: 0.25 slow IV or 0.5 IM K: 0.25-0.5 IV	0.12 M & 0.12 K	Add 60mg M & 60mg K	Can be administered up to 3 ml/kg/hr but sedation or dysphoria MAY occur. Can substitute H, F or methadone for M
Morphine / Lidocaine/ Ketamine (MLK)	M: 0.25 slow IV or 0.5 IM L: 0.5 K: 0.25-0.5	0.12 M 1.5 L 0.12 K	Add 60 mg of M, 60 mg K & 750 mg L	Can substitute H, F or methadone for M.

*Any of the drug amounts in the bag of fluids can be decreased and the fluids administered at a higher rate if necessary. For example, for morphine, ketamine and morphine/ketamine infusions, 30 mg of morphine & 30 mg of ketamine can be used and the CRI administered at 2 ml/kg/hr if more fluids are needed.

Table 3: SAMPLE Chart for adding analgesic drugs to IV fluids for dogs (appropriate if the IV fluid rate is unlikely to drastically change)

Amount of **lidocaine*** (20 mg/ml) to add to a 1-L fluid bag:

Fluid Rate:	Maintenance* (50 ml/kg/24hr)	1/2 Maintenance	2x Maintenance	Surgical (5-10 ml/kg/hr)
Lidocaine Dose:	Amount of **lidocaine** (20 mg/ml) to add to a 1-L fluid bag:			
25 microg/kg/min	36 mls	72 mls	18 mls	15 mls (5 ml/kg/hr) 7.5 mls (10 ml/kg/hr)
50 microg/kg/min	72 mls	144 mls	36 mls	30 mls (5 ml/kg/hr) 15 mls (10 ml/kg/hr)
75 microg/kg/min	108 mls	216 mls	54 mls	45 mls (5 ml/kg/hr) 22.5 mls (10 ml/kg/hr)

* Maintenance is generally considered as 40-60 mls/kg/24 hrs, with the lower end of that rate used in cats. If the infusion rate is halved, the amount of lidocaine in the bag should be doubled to keep the dose constant. †Volumes are rounded to nearest whole milliliter or to one decimal point if <1 ml.

Before adding the lidocaine, remove the same volume of LRS as you will be adding of lidocaine. Lower dosages (25-50 microg/kg/min) are used for analgesia while all 3 dosages are used for antiarrhythmic therapy.

QUICK CALCULATION: Split the difference on the two analgesic dosages and administer 36 microg/kg/min: add 50 mls of 2% lidocaine to 1-L of LRS and administer at 0.5 ml/kg/hr.

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OXIDATIVE STRESS & ANTIOXIDANTS IN CRITICAL PATIENTS

Maureen Mcmichael

Auburn University, Clinical Sciences, Auburn, United States of America

Qualifications:

Maureen Ann McMichael, DVM, M.Ed., DACVECC

mam0280@auburn.edu

Oxidative Stress and Select Antioxidants in Critical Patients

Maureen McMichael, DVM, M.Ed., DACVECC

Auburn University

Objectives

In this talk I will cover options to consider for your aging small animal patients to optimize health using anti-oxidants. Specifically, ubiquinol (heart failure, neuropathy, muscular degeneration, aging), N-acetylcysteine and SAMe (liver disease, detoxification, lung disease), curcumin (ingredient in turmeric; neurological diseases, aging, inflammation, brain health), alpha-lipoic acid (general health, cognitive decline), DMSA (much less smell than DMSO; joint disease, arthritis), methylene blue and melatonin will be discussed and dosages given. New research on taurine and the glymphatic system will be covered in the cognition talk.

Measurement of Oxidative Stress is Problematic

Oxidative stress (OS) is a continually evolving state that is associated with numerous diseases and conditions in humans and animals. It is defined as reactive species (RS) in excess of antioxidant defense mechanisms. Antioxidants (AO) are defined as substances that can delay or prevent oxidation of a target molecule. OS can occur due to an excess of RS, a reduction in AO or both. Physiological levels of RS interact with the redox state and play essential roles in cell signaling and may be necessary to induce adaptive responses through antioxidant defense. Pathological levels of RS result in oxidative damage and activate cell death pathways. Elucidating the specific damage caused by RS and measuring the effect of treatment with exogenous substances is challenging. There is a significant drawback to *in vitro* testing in that cell culture is exposed to significantly more oxygen (environmentally) than most cells *in vivo. In vivo* testing has also been associated with significant issues including a lack of sensitive & specific, non-invasive, standardized tests to evaluate damage done by RS. Because of this lack of standardization, the clinical pharmacology of AO has not been effectively studied. In addition, much of the research on OS involves methodologies that are either not directly applicable or are not practical in clinical situations. Newer diagnostics that are more sensitive & specific are promising. Treatment of OS has not been rewarding and it is thought to be due to most studies using a single antioxidant. Newer treatment modalities include targeting the mitochondrial (MT) AO and using multiple AO that are synergistic. This review will cover new findings in OS in relation to specific disease states, the mitochondrial theory of aging, and normal antioxidant defense mechanisms.

Normal anti-oxidant defense mechanisms

In health, the major source of RS formation in cells (in the mitochondria) is electron leakage from electron transport chains with ~90-95% of the oxygen converted to water and the remaining 5-10% is reduced, creating RS. The generation of RS is kept to a minimum by the high efficiency of electron transfer and sequestration of metal ions. Separate microenvironments exist for the MT, the lysosome, and the peroxisome; each contains a RS-generating system coupled to immediately adjacent antioxidant defense mechanisms. Three additional (non-MT) sources of RS are the xanthine oxidase system, NADPH oxidase, and uncoupled nitric oxide. Once formed, RS can either react with another radical to form a covalent bond or, more commonly, react with a non-radical. When a free radical reacts with a non-radical, the non-radical loses an electron, transforming into a free radical. This is the essence of the chain reaction that propagates extensive damage to cell membranes. When the radical combines with another radical the product can be more damaging than the original radical. An example is when nitric oxide (NO) combines with superoxide (O^{-}) creating peroxynitrite ($OONO^{-}$), which is 2,000 times more damaging than hydrogen peroxide (H_20_2). Alternatively, the reaction of two radicals can result in a termination of the cascade. The interaction of RS with lipids in the presence of free iron results in lipid peroxidation. Production of RS is balanced with endogenous AO defenses with the AOs controlling *levels* of RS, not eliminating them. RS appear to play essential roles in vivo including redox regulation of gene expression. Cells exposed to RS may undergo proliferation, senescence, apoptosis, or necrosis. The level of RS that causes cells to change from proliferation to any of theses appears to be cell type specific.

Types of Antioxidant Defense

In general, there are three lines of AO defense against damage caused by RS. AO proteins, such as albumin, haptoglobin, ferritin, and ceruloplasmin are abundant in plasma. Intracellular enzymatic AO include superoxide dismutase (SOD), catalase, and glutathione peroxidase. These are expressed in most mammalian cells and prevent the generation of RS. Small molecule AO are divided into water-soluble and lipid-soluble categories. Water-soluble AO include ascorbic acid (vitamin C), uric acid, bilirubin, glutathione (GSH), zinc and selenium. Lipid soluble AO include tocopherols (vitamin E), b-carotene, ubiquinol (co-enzyme Q; CoQ), and lycopene. Cell membranes contain tocopherols and b-carotene within their lipid layer and these can act to quench chain reactions of lipid peroxidation. Extracellular fluids contain molecules with AO properties (ascorbic acid, bilirubin, transferrin, haptoglobin, albumin, urate).

Glutathione peroxidase, synthesized in mammalian cells, is generally considered the first line of defense against RS formation. It is a sulfur-containing tripeptide (glycine, cysteine, glutamine) that reduces H_20_2 to water, using GSH as a substrate. OS has been shown to be associated with a depletion of GSH and this has been shown to induce apoptosis of hepatocytes. Vitamin E, the 2nd line of defense, inhabits the lipophilic interior of the cell membrane, where the PUFAs are located, and is a chain-breaking scavenger, halting lipid peroxidation. When a wave of lipid peroxidation reaches vitamin E it is oxidized to a free radical, sparing any adjacent PUFAs from oxidation. Vitamin C then combines with the E radical forming a poorly reactive, water-soluble, vitamin C radical, and regenerating vitamin E. Vitamin C is the most abundant water-soluble antioxidant and it can directly scavenge RS or regenerate vitamin E.

Mitochondrial Theory of Aging

The mitochondria (MT) play a central role in the generation of RS and OS has been shown to damage mitochondrial DNA (mtDNA). This may lead to lower numbers of mitochondria per cell with age or more dysfunctional MT. MT, the chief source of ATP, are considered the energy centers of the cell. MT damage is thought to contribute to the negative effects of aging. Numerous experimental studies correlate increased MT AO with prolonged lifespan. In mice overexpression of MT catalase extended lifespan, a MT targeted AO (SkQ1) prolongs lifespan, and a mutation associated with decreased MT RS generation increased lifespan. A premature aging phenotype mouse model correlated aging with mtDNA deletions and MT respiratory chain failure occurred with high loads of mtDNA deletions. Age related conditions such as muscle and hearing loss have been associated with increased levels of MT OS. Mice with increased MT RS had accelerated hearing loss while mice with increased Mt AO had improved hearing compared with aged controls.

Oxidative Stress and the CNS

The CNS, due to its high oxygen demand, high level of polyunsaturated fatty acids, high levels of iron, and low level of endogenous AO, is quite

vulnerable to OS. Increased MT OS is well documented in numerous CNS conditions including Alzheimer's, Parkinson's and Huntington diseases as well as multiple sclerosis. The amyloid plaques seen in Alzheimer's inhibit MT function by inhibition of the electron transport chain which leads to increased RS production. Overexpression of catalase in mice MT decreased amyloid toxicity and extended lifespan in a mouse model of Alzheimer's. There is substantial evidence for a central role of MT in the pathogenesis of Parkinson's, again with overexpression of MT catalase showing a protective role. *In the cognition talk I discuss more about the CNS and sleep! Really important!*

Treatment of oxidative stress

Most treatment of OS involves blocking the formation of RS, scavenging RS after they are formed or augmenting AO. Alpha lipoic acid is protective for diabetic neuropathy. Coenzyme Q (CoQ) reduced diastolic dysfunction in children with cardiomyopathy. The reduced form of CoQ10 is called ubiquinol and is associated with greater OS reduction. Resveratrol prevented LV hypertrophy, diastolic dysfunction, and interstitial fibrosis in a mouse model of the metabolic syndrome. Quercetin reduced systolic BP and oxidized LDL in overweight humans and improved cardiac function in rats. It is likely that the best treatments will encompass a combination of drugs that target several steps in the OS injury cascade.

Blocking Formation of RS

Glutathione can act both as a chain breaking antioxidant, inhibiting lipid peroxidation, and as a metal chelator, preventing formation of the hydroxyl radical.

Vitamin E, composed of 4 tocopherols and 4 tocotrienols, is a lipid-soluble vitamin that antagonizes the peroxidative injury of membrane lipids and inhibits propagation of cell membrane destruction.

Scavenging RS

Several antioxidants work to scavenge RS and these will be discussed.

than DMSO.

References available upon request

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PATIENT SAFETY – USING HUMAN FACTORS TO IMPROVE PATIENT AND VETERINARY TEAM OUTCOMES

Melinda Larson[1], *Lisen Schortz*[2], *Kathrine Blackie*[3]

[1]*Medical Quality at Blue Pearl, Director, Tampa, United States of America,* [2]*AniCura, Group Patient Safety Manager, Lincoln, Sweden,* [3]*Linnaeus, Quality Improvement Manager, West Midlands, United Kingdom*

Qualifications: Melinda Larson DVM, DACVIM Melinda. Gann@bluepearlvet.com

Abstract Body: Overview of the Issue Patient safety is the science of handling, learning from and preventing patient safety events (PSE's). PSEs are prevalent in human healthcare with the average ICU patient experiencing 1.7 errors in their care per day1. Patient safety events are the third leading cause of death in the US, behind cancer and cardiovascular disease.2 We do not currently have a measure of the scope of these events in veterinary medicine as patient safety is still an emerging field. Healthcare is a high-risk work environment similar to the airline or automobile industries. Veterinarians and technicians/nurses are trained to do many specific tasks while under pressure with a high degree of accuracy. At the same time, medical professionals are expected to make complex decisions while handling multiple client/patient interactions. Medical training typically focuses on the cognitive aspects of clinical decision making with less focus on interactions with people and almost no focus on the riskiness of automatic behaviors.1 A key reality in patient safety is that a large percentage of patient safety events are preventable, and we can work to make healthcare systems safer for patients.Objectives of the Presentation Discuss and understand the: -Types of error and a systems-based approach to error -Incident reporting systems -Human factors and how it can prevent PSEs -Importance of a strong culture of safety -Impact of PSEs on healthcare teams/people and why peer support is criticalKEY DEFINITIONS FROM THE INSTITUTE OF HEALTHCARE IMPROVEMENT (IHI and WHO)Adverse event/Medical Incident/Patient Safety Event: (or harm) 'unintended physical injury resulting from or contributed to by medical care (including the absence of medical treatment) that requires additional monitoring, treatment, or hospitalization, or that results in death'. These adverse events can further be separated into preventable adverse events and nonpreventable adverse events.Error: 'an act of commission (doing something wrong) or omission (failing to do the right thing)'. It is important to note that many errors do not result in adverse events. These are often called 'near misses' or 'no harm events'Patient Safety Event (PSE): a term that includes both preventable adverse events and error that impacts patients *For the purpose of these patient safety presentations these terms will be used interchangeablyPATIENT SAFTEY & INCIDENT REPORTING SYSTEMS Incident reporting systems play a vital role in organizations by providing a structured way for team members to systematically document any unwanted or unexpected events that happen in the workplace. An incident reporting system offers numerous benefits that contribute to overall safety, risk management, and organizational improvement. First and foremost, incident reporting systems enhance workplace safety by encouraging employees to promptly report potential events, both no harm and harmful events, as well as near-misses, ensuring that corrective actions can be taken to reduce the recurrence of future incidents. By collecting detailed information about each incident, these systems enable organizations to analyze trends, identify patterns, outliers, and implement proactive measures to mitigate risks effectively. Across an organization, data from individual units feeds into a whole that is even more powerful to analyse and learn from. Furthermore, these systems enhance communication and collaboration among different departments, as incidents can be tracked and shared across the organization, leading to increased awareness and a more holistic approach to problem-solving. A well-functioning IRS contributes to more safe and effective workplaces. HUMAN FACTORS IN VETERINARY PATIENT SAFETY Human factors (or ergonomics) is the study of all the factors that make it easier to do the work the right way. The two aims of human factors are improved system performance and optimised human wellbeing. Human factors principles can be used to design systems that fit the physical, cognitive and behavioural characteristics of humans, including our limitations. They can also help us understand why a system has produced an unwanted outcome, such as a patient safety event. HF principles for patient safety 1. Everybody comes to work to do their best. People do what makes sense to them at the time. Humans make decisions based on the information available to them and their understanding of it, the context and situation they are in and their goals. 2. People make mistakes. They are creative, adaptable and amazing at solving complex problems. But they are not machines and do not have machine-like reliability. This means errors are a normal part of the human experience, they are not unusual or unexpected. We cannot avoid making errors by deciding not to make errors and we cannot prevent other people from making errors by telling them not to. 3. Error is not a choice. An error is an unexpected outcome; therefore, it can't be a choice. If we knew what the outcome would be, we would not have acted in the way we did. When we blame someone for a mistake they made, we are making their error a choice and the implication is they did it wrong deliberately. 4. Blame fixes nothing. After an error or a poor outcome, it is easy to see where someone went wrong and blame them for the bad outcome. This leads to punishment. But it does nothing to change the outcome of the event, repair the damage, or make things safer for the future. It also removes the accountability of the larger system or the organisation which have usually played a part. 5. Context is important. Context matters because it drives behaviour. Systems are perfectly designed to get the outputs they get. If those outputs are errors or failures then the design of the system is at fault, not the person. Some situations make human error far more likely. For example, confusing equipment or lookalike medications. Individual and teamwork factors also increase errors, and it is important we recognise them as they too are signs that our systems are not working. Understanding patient safety events -People do what makes sense at the time. Try to put yourself in their shoes. Why did they do what they did? -What features of the task, job, equipment, environment or system made the event more likely to happen?-Where could changes make the system more compatible with the needs, capabilities and limitations of people?CULTURE OF SAFETY This concept stemmed from HROs or 'High Reliability Organizations' which includes organizations that have addressed their error problems effectively. Examples include the airline industry, nuclear power industry, and naval aircraft carriers1. HROs are known for four core characteristics: 1. Preoccupation with failure - this is the acknowledgement that they are a high-risk organization and the focus on achieving consistently safe operations. 2. Commitment to resilience - the ability to detect threats before they cause harm, or to recover from them when they do. 3. Sensitivity to operations – being attentive to the issues facing frontline workers when analyzing mistakes and in making decisions about how to do the work. 4. A culture of safety – where people feel comfortable speaking up about potential hazard/unsafe conditions or actual error without fear of repercussions from leadership. A strong culture of safety within a hospital is one that is designed to support team members when patient safety events happen. It is also a culture that supports the reporting of errors and encourages teams to work together to focus on learning from these events to prevent them in the future. Human healthcare measures safety culture via survey and there are several different examples of these. Common questions within these surveys include areas such as whether staff members feel comfortable reporting PSEs, what the level of support is after reporting these events and whether they are part of the proactive discussions to prevent future events. Safety culture is the compass team members use to guide their behaviors, attitudes and perceptions on the job3. -What will I get praised for? -What will I get reprimanded for? -What is the 'right' thing to do? There is a very strong link between culture, behavior on the job and patient outcomes. The stronger a safety culture is within a healthcare team, the better the outcomes of patient.3 Core aspects of safety culture include: -Communication patterns and language -Feedback, reward and corrective action practices -Formal and informal leader expectations and actions -Resource allocation practices -Error detection and correction systemsIMPACT OF PATIENT SAFETY EVENTS ON TEAMS Patient safety has become an established priority in human healthcare for the past two decades. There is a large body of research in human medicine on the incidence of harm caused by healthcare, its impact, and interventions to

prevent it. An important realization has been that the same errors that harm patients also harm members of the healthcare team. Dr. Albert Wu, Director of Patient Safety at Johns Hopkins, has been instrumental in the movement to support healthcare workers going through PSEs. He coined the term 'second victim' syndrome, which is used to describe the impact of medical error on healthcare workers.4 In this definition, the patient and their family members are considered the 'first victims,' and healthcare workers are the 'second victims.' This phenomenon has also been referred to as secondary trauma. Healthcare workers involved in a medical error may feel a wide range of emotions, including shame, guilt, stress, anxiety, depression, and sadness. They may blame themselves if a patient is harmed from the error, which can lead to a loss of confidence or questioning of their own decision-making abilities. Over time, those experiencing second victim syndrome may feel professionally isolated, experience burnout, leave their team or department, or may even leave their profession completely.8 If a healthcare provider is involved in a medical error while working within a blame culture rather than a culture of safety, they may face unfair punishment or judgement from their team. They may subsequently fear reporting errors in the future, which further hinders patient safety.PEER SUPPORT According to Berwick, "in the moment of injury to a patient, there's an urgent emergent injury to the health care worker involved in that as well. We have to get in there and help them."5 Wu started a program called 'RISE', or 'resilience in stressful events' at Johns Hopkins which is a voluntary network of peers that are available to support people going through difficult PSEs. Research has shown that healthcare workers involved in PSEs will most likely seek support from peer groups as they have a shared understanding of the pressures associated with patient-related events.4 The RISE network has grown to include over 85 human healthcare groups in the United States. Even in the absence of formal training, a veterinary hospital can establish a peer support network of their own. Peers who have been through similar experiences are more likely to understand what the person is going through emotionally and mentally, and this understanding can reduce the feeling of isolation. They can share coping strategies and reduce the stigma associated with seeking help. If needed, a peer support network can provide additional resources or guide their coworker to more advanced support, such as a social worker. Long term, support from a peer can prevent long-term consequences of second victim syndrome and can further facilitate learning and quality improvement in healthcare settings.POSITIVE IMPACT OF PATIENT SAFETY EVENT REPORTING While medical errors can have negative impacts on our patients and veterinary teams, patient safety event reporting and a strong safety culture can have positive impacts as well. As mentioned throughout, patient safety event reporting is a quality improvement tool that can reduce the risk of recurrence of error, thus improving overall patient safety and outcomes. Understandably, this can lead to higher client satisfaction. But beyond this, empathetic handling of safety incidents supports both the wellbeing of providers and their care of their patients. A strong safety culture supports psychological safety, which is the comfort to speak up when needed without subsequent embarrassment, rejection, criticism, or punishment. This open and non-judgmental communication around medical errors can have a strong impact on an organization and has even been linked to less burnout in human healthcare providers.9 Psychological safety gives a voice to all team members, regardless of position, rank, or seniority. Anyone can speak up for patient safety. Therefore, psychological safety helps to flatten any perceived power dynamics that, when present, have been shown to lead to adverse events in healthcare.10 Lastly, a strong safety culture promotes continuous learning. Teams are constantly striving to be better for their patients. Moving away from an unrealistic expectation of perfection can open the conversation to how care can be provided in a different or novel, but safer, manner. Learning from prior events or reviewing RCAs can help to prevent future adverse events from recurring.Summary including 5 KEY "TAKE HOME" POINTS 1. Humans are fallible and error will happen – even in the veterinary medical profession. 2. It is essential to follow a 'systems based' approach to medical error/adverse event resolution. 3. A strong patient safety culture is the key to people feeling comfortable reporting patient safety events. 4. People do not go to work wanting to commit errors. Healthcare is complex and the systems within which they work are imperfect – leading to weakness' within systems that can cause PSEs. Key tools can help to find these weak points so systems can be made safer. 5. Along with our patients and clients, we must support the health care team members that are most closely associated with patient safety events.Summary Medical error has nothing to do with people not caring or not trying hard enough. People who work in veterinary medicine have immense empathy and passion for patients and their families. Simply put, humans are fallible, which means there will be times they get it wrong.7 Another key element of medical error is understanding that the root causes of errors in more than 90% of cases lie within the system that our teams work.6 Patient safety pioneer Don Berwick emphasizes, "…the vast majority of healthcare workers are trying hard to do the right thing. They go to work with goodwill and good intent. When a patient gets injured, it's not a result of their intention. It's a result of something around that set them up for the defect to occur." 7 To improve patient safety and limit medical error, we must focus on eliminating problems within systems that lead to error.REFERENCES 1. Wachter R and Gupta K. Understanding Patient Safety 3rd Ed. McGraw-Hill Education 2018. 2. Anderson J and Abrahamson K. Your Health Care May Kill You: Medical Errors. Stud Health Technol Inform. 2017; 234:13-17. 3. 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WELLBEING APPOINTMENTS IN AGING CATS: WHAT TESTS AND WHEN?

Nathalie Dowgray

International Cat Care, International Society Of Feline Medicine (isfm), Salisbury, United Kingdom

Qualifications:

Nathalie Dowgray

BVSc, MRCVS, MANZCVS (feline), PGDip IAWEL, PhD

Nathalie.Dowgray@icatcare.org

The pattern of cats attending veterinary clinics has a trend for more frequent visits as a kitten, reducing from 1-2 years of age and then an increasing when the cat is 'old'. In running a feline specific senior health clinic, the goal is to encourage cat owners to bring their cat into the clinic before the cat becomes old. We have an opportunity to diagnosis and manage age related diseases before they start to have a significant impact on the cat's health and welfare.

When do cats become at risk of age related diseases?

Ageing categories in cats have traditionally called cats Senior from 11 years of age and Geriatric from 15 years. Cats aged 7-10 are considered mature. However, if we consider the literature on age related disease (summarised in the table below) age related diseases do start to occur in cats of this age range and the pathophysiological changes that lead to the development of these diseases will be occurring for some time prior to clinical disease becoming apparent. Additional in a study of 206 cats aged 7-10 years of age, 45% were overweight or obese, 29% had a heart murmur, 5% had elevated systolic blood pressure, 54% had dental disease , 58% had abnormalities on orthopedic examination, 10% were azotemia, 3% were and hyperthyroid only 12% were 'Healthy' of 176/206 that were completely examined (1). So ideally a feline ageing cat clinic should be inviting cats aged 7 years and over.

Disease	Effect of age on Prevalence of disease
Chronic Kidney Disease	Increases with age in cats over 8-10 (White *et al.*, 2006) Prevalence's of 37.4% in cats aged 0-4.9yrs, 40.9% in cats aged 5-9.9yrs, 42.1% in cats aged 10-14.9yrs and 80.9% in cats 15-20yrs (Marino *et al.*, 2014) Between 18-30.5% of a geriatric cohort (9yr+) develop azotaemia within a year (Jepson *et al.*, 2009; Finch, Syme and Elliott, 2016)
Hyperthyroidism	UK prevalence of 2.5% raising to 8.7% in cats 10yr and over (Stephens *et al.*, 2014) 6% in cats over 10 years also in the UK (Wakeling *et al.*, 2009) 3.89% in cats over 10 in Hong Kong (De Wet *et al.*, 2009) 8.9% in cats over 9yr in Japan (Miyamoto *et al.*, 2002)
Hypertension	Prevalence of hypertension is higher in cats aged over 10yrs (Bodey and Sansom, 1998; Sansom, Rogers and Wood, 2004) Secondary hypertension is commonly associated with CKD and hyperthyroidism (Kobayashi *et al.*, 1990; Syme *et al.*, 2002) Cats show a significant increase in systolic blood pressure with age over a 12 year period (Bijsmans *et al.*, 2015)
Diabetes Mellitus	6yrs and over was determined as a risk factor for disease (O'Neill *et al.*, 2016)
Osteoarthritis/ DJD	Overall prevalence of 92% with a least one joint affected by OA with each year of additional age being associated with a 13.6% increase in their arthritis score (number of joints affected and severity of lesions (Lascelles *et al.*, 2010) Over all prevalence of 61% of at least one joint with OA and 48% with more in one joint in cats 6 years and older (Slingerland *et al.*, 2011) 33.9% prevalence in a group of cats with average age 6.5yrs (Clarke and Bennett, 2006) 90% prevalence in a group of cats with average age 15.2yrs(Hardie, Roe and Martin, 2002)
Heart Murmurs and Hypertrophic Cardiomyopathy (HCM)	Prevalence of heart murmurs; 24.1% in cats 6-12 months, 37.5% n cats 1-3yrs, 44.1% in cats 3-9yrs and 59.8% in cats over 9yrs. Prevalence of HCM; 14.7% across a population of 780 cats rising 29.4% in cats over 9yrs. Presence of a heart murmur and increasing age significant risk factors for HCM (Payne, Brodbelt and Luis Fuentes, 2015)
Weight and Body Condition	Cachexia (loss of lean body mass) is associated with a number of the age related diseases in cats (Wakeling, Elliott and Syme, 2011; Freeman *et al.*, 2016) Sarcopenia (Loss of lean body mass in the absence of disease) is associated with ageing in cats (Laflamme, 2015) Body Condition tends towards obesity between 7-13 yrs of age (Perez-Camargo, 2010)
Dental disease	A higher prevalence of tartar and periodontal disease is reported in cats over 3yrs of age then cats under 3yrs of age with an overall prevalence of 68% (Banfield Pet Hospital, 2016)
Cancer	12.3% of cats over 5yrs of age die due to neoplasia (O'Neill *et al.*, 2015) The frequency of tumour development increases with age in all types and locations (Graf *et al.*, 2015)

How often should cats be attending an ageing clinic? The individual cat's disease status should always be taken into account as this is often the main factor to determine the frequency of visits. It's important to realise that we really don't know how frequently healthy cats should be visiting the clinic. Guidelines produced are based on the best evidence available and that evidence is poor. Geriatric or cats with a known age-related disease probably should be visiting the vet every 3 months. With a healthy geriatric (super-senior's) then a longer visit every 6 months and a shorter weight check every 3 months could be considered. For senior cats every 6

months is likely to be the most appropriate and for mature cats an annual vet visit with a short 6m weight check should be suitable.

Key points for Clinical Exam

Weight the cat at **every** appointment and record the body condition score.

Record of the muscle condition score. This may be a formal muscle condition score system or just a descriptive note of what you are seeing.

Always look in the cat's mouth, dental disease in cats is very common.

Palpate for a goitre.

Listen to the heart on 2-3 different occasions during the exam as the presence of a murmur in cats will vary with the heart rate, listen when they first arrive and then later when they are settled and again if they get upset during the exam.

Have a good look at the coat and note any areas of over or under grooming. During your history and exam try to observe the cats walking around the room as well and perform an orthopaedic examination if indicated.

Diagnostics

Blood Pressure: Ideally this should be part of an annual exam from 7 years of age and at every appointment for cats who are hyperthyroid or have chronic kidney disease (CKD). Blood pressure will increase with age so starting from 7 will get cats use to the procedure and hopefully reduce white coat effect. Cats with a reading over 140mmHg (if they have CKD) or over 160mmHg should have their retinas examined for signs of hypertensive retinopathy. Record the site the blood pressure was recorded from, the cuff size used and the temperament of the cat during the measurement.

Urine Sample: Ideally collect a urine sample annual in cats over 7 years and more frequently in cats over 10 years of age. Test urine specific gravity, do a dipstick for blood and bilirubin and a sediment exam for crystals and inflammatory cells.

Blood Sample: Blood sampling could be included as part of a standard senior health check package on an annual or bi-annual basis, alternatively you may choose to do bloods when there is an indication to do so. The tables below summarise clinical indications for blood tests and what should be included in a minimum database.

Clinical Indication	What routine blood samples should be run
Owner observed PU/PD	Minimum database +/- T4
Reduction in weight / BCS/Muscle condition /development of entropion	Minimum database +/- T4
Dental disease	Minimum database pre GA
Hypertension	Minimum date base +/- T4
New heart murmur / increasing grade of murmur	T4 and PCV
Palpation of a goitre	T4
Abnormal renal palpation	Minimum database
Arthritis diagnosed and NSAID are prescribed	Minimum database
Urine specific gravity under 1.035 without dietary explanation	Minimum data base +/- T4

Test	Components
Haematology	Packed Cell Volume, Total Protein, Smear elevation Or Full CBC if clinically indicated
Biochemistry	Albumin, Total Protein, Urea, Creatinine, Phosphate, ALT, ALKP, glucose and electrolytes if clinically indicated.

Summary

Weigh the cat at every appointment; always try to record the 'normal' for the individual cat. This will make it easier to identify changes when they occur. Develop a general structure for your clinic but always be prepared to modify it for the individual.

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FELINE INAPPETENCE - TIPS FOR THE CLINIC AND THE HOME

Sam Taylor[1], *Vicky Halls*[2]

[1]*International Society of Feline Medicine, Isfm, Wiltshire, United Kingdom,* [2]*International Cat Care, Cat Welfare Team, Wiltshire, United Kingdom*

Qualifications:

Samantha Taylor BVetMed(Hons) CertSAM DipECVIM-CA MANZCVS FRCVS

sam.taylor@icatcare.org

Vicky Halls RVN Dip Couns

Vicky.halls@icatcare.org

The human-cat bond and how it influences feeding behaviour

There is often a strong association between feeling love for an animal and feeding, the major motivation being 'sympathy and love of animals'[1]. Owner personality is also significantly related to eating habits in cats. 'Needy' owners (those scoring high in the trait of neuroticism) spend more time feeding and encouraging cats to eat, so if their cats lose their appetite or become fussy over food this is a major concern[2]. Owners can inadvertently reduce appetite in elderly cats by tempting them with food of ever-increasing palatability instead of their normal cat food. Cats then ignore their familiar food as they learn that, by doing so, more palatable food will always be provided[3].

The inappetent cat at home

When a cat returns from a visit to the clinic it can be a stressful experience for both the cat and the owner. If the condition being treated is associated with inappetence then this failure to eat normally may continue when a cat returns home.

Good communication between the veterinary team and the owner is key to providing the best possible care for the cat whilst also helping to remove some of the anxiety that the owner may be feeling when their cat is unwell. Understanding the owner's concerns and providing easy to follow instructions will all help to allay those concerns and ensure that the patient's care is optimised and any necessary further interventions are timely and appropriate.

Any instructions or suggestions given to the owner about care at home will only be followed if they are:

- Achievable

- Practical and reasonable

- Understandable

- Specific

- In written form

Clarity over what to look out for and report back to the veterinary team is essential, such as:

- Being specific about food intake

- Being observant

- Keeping a food diary

The veterinarian needs to monitor progress to treat any underlying illness causing inappetence and to prescribe medication to assist the cat to eat while waiting for results or for treatment to be effective.

There are many reasons why a cat may not be eating normally at home, including factors affecting both their physical health and mental wellbeing. Owners may benefit from information on how to recognise pain, nausea, distress and food aversion.

What can cause distress in the home?

Cats are very susceptible to becoming distressed due to numerous factors, both relating to the physical environment and to the people and animals within it. Causes of distress include:

- Other cats in the home

- Cats outside the home

- The return of a cat after a period of absence

- Changes to the home environment

- Owner behaviour*

*During inappetence, the natural desire to tempt a cat to eat (as appetite is so closely associated with wellness) adversely affects owner behaviour from the cat's perspective, as, without being consciously aware of the fact, owners change their routines and behave unusually around food - this alone can cause the cat distress and deter it from eating.

Encouraging the cat to eat at home

In those instances when the cat is inappetent once it returns home, it will be necessary to give the owner some advice if the clinical judgement is to tempt appetite before exploring the need for further treatment. Owners will need advice on feeding in detail, including what to feed, how much, how often, how and where.

As cats are opportunistic feeders[4] it can be attractive to some for their owners to hide dry food in novel locations. This may be sufficient to stimulate a cat to eat. For cats with limited mobility, food may be brought to them, or food bowls raised.

The veterinary team may also wish to discuss some other practical aspects of the feeding process, such as

- Type of bowl

- Food preparation

- Opportunity to eat with or without company

- Fluid intake

Hiding medication in food, a method to which many owners resort, can deter a cat from eating. It is important therefore to avoid putting medication in a cat's main meal.

Monitoring the cat's weight at regular intervals is something straightforward for the owner to do that will help to plot the cat's progress.

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Inappetence in the clinic

Cats are strict carnivores, with a lack of enzymatic adaption to dietary protein intake. This means they cannot adjust the rate of protein breakdown according to intake, eg during periods of reduced food intake cats will breakdown muscle stores to provide energy. When cats are underfed, starvation has negative consequences that are more profound in sick cats. Such consequences include reduced wound healing, muscle loss, changes in microbiome, increased gastrointestinal permeability, susceptibility to infection and given that for many cats their main water source is their food, dehydration and constipation. Whatever the cause, it is important that inappetence is promptly addressed.

Causes of inappetence

Besides a primary underlying cause (eg pancreatic, GI, liver disease), other factors contribute to inappetence, particularly in hospitalised patients including stress, pain, ileus, nausea, dehydration, adverse taste/effect of medication, electrolyte abnormalities and constipation. All need to be addressed to promote optimal nutrition. Importantly, there should be no delay in provision of nutrition to promote recovery from illness.

Nutritional assessment

Nutritional status should be evaluated in every patient, with particular importance in critically ill and hospitalised patients. Nutritional assessment allows identification of cats in need of nutritional support and aids in decision making of type of intervention. Nutritional assessment includes:

- Taking a dietary history

- Clinical history

- Physical examination including body and muscle condition scoring

- Previous and current body weight recording

- Specific clinicopathological parameter assessment (eg albumin)

Reduction of stress

In the clinic many things contribute to stress and are discussed in detail in the 2022 Cat Friendly Clinic guidelines: https://journals.sagepub.com/doi/full/10.1177/1098612X221106353.

Appetite stimulants

Appetite stimulants can be helpful for increasing caloric intake, but it is important these medications are not used to replace a diagnostic work up or management of pain and nausea for example. Their use should also not delay implementation of nutritional support eg feeding tubes. Indications include:

- Short term use during a diagnostic work up

- Behavioural or environmental cause of inappetence

- Supportive care in acute or chronic disease

- If placing a feeding tube is not an option

Contraindications include:

- Critical illness

- Vomiting or nausea

- Pain inadequately managed

- Presence of ileus

- Physical impedance to prehension or ingestion

Oral or transdermal mirtazapine is most frequently chosen and has evidence of efficacy in various conditions.

Feeding tubes

Enteral nutritional support is most commonly provided by naso-gastric/naso-oesophageal (NG/NO) or oesophagostomy (O) tubes. There are advantages and disadvantages of each tube type which will be discussed in this talk. NG/NO tubes provide short-term nutritional support for sick cats, generally for less than 5 days and limitations include narrow bore and hence limited choice of diets and inability to administer all but liquid medications. O tubes allow provision of different diets and medications for longer-term, although they can be removed at any time. They are placed under anaesthesia which may but contraindicated in very sick patients. Complications include tube dislodgement and obstruction, and for O tubes; stoma site infection and occasionally Horner's syndrome.

Feeding tubes should be placed proactively, if patients have been consuming ≤ resting energy requirements for 3 days or more, have predicted inappetence and opportunity to place a feeding tube (eg surgery for biopsies), for provision of medications (eg longer courses and multiple medications as for mycobacteriosis) or cases of oral surgery/trauma for example.

To avoid overnutrition or refeeding syndrome in general feeding should start at 1/3 RER day one, 2/3 day 2 and full RER (for body weight) on day 3. This may need to be reduced for cats with prolonged undernutrition and divided into several meals. Patients should be fed for current body weight and weighed regularly with feeding adjusted as required.

Tips for comfortable cat friendly tube feeding

Hospitalised cats can be fed in the cage or moved to a quiet treatment area or consulting/examination room, depending on their perceived preference. Avoid any contact with dogs and other cats (sight, sound, smells)

Allow the cat to relax before starting to feed. Provide a comfortable place to settle, allowing the cat to hide if they want to (eg, igloo bed, under a loose blanket), maintaining a sternal or upright position, or with the head slightly elevated (Figure 19)

Use gentle support and avoid enforced restraint. If a cat resents handling, review analgesia, antiemetic and anxiolytic medications promptly, and delay the feed to allow effect.

If absolutely necessary, the cat could be gently controlled in a soft, thick towel, or placed into a cat carrier or bed to restrict movement

Feed slowly, watching for signs of physical or emotional discomfort, nausea or pain (lip licking, excessive swallowing, backing away)

Reassure the cat by speaking quietly and calmly. Stroking, if actively accepted by the cat, may be beneficial (desist if not)

Do not rush the procedure; rapid feeding or rushed handling may cause negative associations with both feeding and handling.

Food should be warmed to body temperature before administration, and mixed well to avoid 'hot spots'.

Ensure appetite has returned consistently for 3–5 days before removing O and gastrostomy tubes. NO/NG tubes may need removal to fully assess appetite (their presence may deter the cat from eating in some cases); replace if voluntary intake is inadequate

Calculating RER

All hospitalised cats should have RER calculated and intake monitored. Keeping a chart of the calorie content of regularly used foods in the ward saves time and allows easy calculation of proportion of RER consumed. The equation RER = 70 x $BW(kg)^{0.75}$.

Further reading on this topic is available in the 2022 ISFM Guidelines on Management of the Inappetent Hospitalised Cat: https://journals.sagepub.com/doi/full/10.1177/1098612X221106353.

Tube feeding for owners:

https://icatcare.org/advice-cat-carer-guides/

Owner care guide: Inappetence

https://icatcare.org/app/uploads/2022/05/Managing-the-cat-that-wont-eat.pdf

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CLINICAL CASES IN ORTHOPEDICS - WHAT IS YOUR APPROACH?

Carlos Adrega

AniCura - CHV, Surgery, Porto, Portugal

Qualifications:

CARLOS MANUEL ADREGA TEIXEIRA DA SILVA

DVM (DIPLOMATED IN VETERINARY MEDICINE)

DECVS (DIPLOMATED EUROPEAN COLLEGE OF VETERINARY SURGEONS)

MRCVS (MEMBER OF ROYAL COLLEGE OF VETERINARY SURGEONS)

CARLOSADREGA@HOTMAIL.FR

Clinical cases in orthopedics - what is your approach?

Diaphyseal fractures are usually secondary to high-energy trauma and therefore the initial assessment should be focused on rapid evaluation of life-threating respiratory, circulatory, or neurological conditions before embarking on any specific treatment of a fracture.

Orthogonal radiographic views are essential for precise determination of fracture configuration. Preoperative radiographs of the contralateral limb can help with pre-surgical planning.

The surgeon´s strategy when treating diaphyseal fractures should be not to compromise the fracture biologically unless the intervention will contribute to a biomechanical improvement.

The infinite variations in fracture configuration and orthopaedic apparatus available, combined with the need to consider the demands of repair on an animal while conforming to rigid anatomical and biomechanical guidelines, can make fracture repair a daunting prospect. By pausing and thinking about the fracture in a stepwise and logical manner, the choices can be greatly simplified, and the prospect of a successful outcome significantly increased.

In most cases, there are several options available to achieve the desired reduction and stabilisation of a fracture. The final decision is usually based on the surgeon's experience and preference, and the implants available. Final selection of one technique over another can also be influenced by cost and the different requirements of postoperative management (eg, ESF versus plate and screws). It is useful to have a 'back-up' or plan B in mind before going into theatre, as unforeseeable factors may be encountered, despite meticulous planning.

Fracture treatment should always be regarded as a challenge between fracture healing and fixation failure. During this time, the orthopaedic surgeon must apply a balanced concept of fracture treatment. Extensive efforts to reconstruct comminuted fractures may compromise the vascular supply of intermediate fragments and diminish their contribution to fracture healing. On the other hand, surgical techniques that focus too much on preservation of soft tissues may be unsuccessful if the mechanical stabilization required for fracture repair is underestimated.

Postoperative assessment

Clinical and radiographic assessment during the healing period is essential to assess for expected limb function and fracture healing. The timing of follow up is dependent on many factors including the nature of the injury, apparatus used, expected healing time as well as financial constraints. Most animals will require strict confinement during healing, and radiographs are typically taken every four weeks until clinical union has occurred.

Each radiograph should be examined for the following three As:

 ALIGNMENT: Check that the bone fragments and joints are aligned and that this alignment is identical to the postoperative radiograph. Check that the desired fragment apposition has been achieved and is maintained;

 APPARATUS: Check for signs of implant loosening, breakage, infection, and so on, all of which may indicate potential problems in the future or explain deterioration in limb use;

 APPOSITION: where the fracture has been anatomically reconstructed, accurate apposition of the fracture fragments is imperative. Poor fracture reduction and small gaps at the fracture site, whilst appearing innocuous, have the potential to result in premature implant failure. When a comminuted fracture is stabilized using bridging osteosynthesis, apposition can be substituted for adjacency; too large a gap may prevent fracture healing

When assessing follow-up radiographs, in addition to the three As, the addition of a fourth A is beneficial.

 ACTIVITY: Check for evidence of bone healing activity, some of which should be seen within the first four to eight weeks. Delayed union or non-union should be monitored. Also check for signs of loss of bone density and muscle mass, which are suggestive of poor limb use. Limb use is essential for joint health and will stimulate bone healing and remodeling.

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FIP - DIAGNOSTIC CHALLENGES

Sam Taylor

International Society of Feline Medicine, Isfm, Wiltshire, United Kingdom

Qualifications:

Dr Samantha Taylor

BVetMed(Hons) CertSAM DipECVIM-CA MANZCVS FRCVS

sam.taylor@icatcare.org

How to make a confident diagnosis of feline infectious peritonitis (FIP)

Feline coronavirus (FCoV) causes FIP but only in a small proportion of infected cats. FCoV is ubiquitous worldwide and in most cases causes no clinical signs or mild diarrhoea. In a small proportion of infected cats, systemic spread and consistent replication in macrophages likely due to viral mutations and the cat's individual immune responses, results in serositis, vasculitis and pyogranulomatous lesions associated with FIP. Diagnosis, in some cases is straightforward, but other cases can be complex and with the availability of treatments we must balance a confident diagnosis with the costs of therapy.

Risk factors for FIP

Several risk factors have been identified including young age, male gender, pedigree breed, genetic susceptibility (related individuals) and stress (eg rehoming, neutering, multicat homes). However, any cage of cat can develop FIP and a second peak around 10 years of age has been reported.

Pathogenesis

Ongoing work hopes to fully establish pathogenesis which remains not fully understood. Viral factors play a role, with some viral strains of higher potential virulence, but mutation within the cat to support replication within monocytes/macrophages is crucial to developing FIP. Infected macrophages interact with endothelial cells leading to granulomatous phlebitis and periphlebitis which are hallmarks of FIP.

Clinical signs

Clinical signs of FIP can be diverse. In general cases are classified as effusive or non-effusive but in reality many cases have features of both and overtime 'dry' FIP cases will develop effusions and many effusive cats can have for example, ocular or neurological involvement. The range of clinical signs can include those resulting from cavity effusions (dyspnoea with thoracic effusion, abdominal distension with ascites, hypotension with pericardial effusion), and related to the location of granulomas (eg neurological signs, uveitis, renomegaly). General signs may also include pyrexia, pallor, mild jaundice, weight loss, lethargy and inappetence. Rare signs such as cutaneous lesions and scrotal oedema in entire males can be seen.

Diagnosis of FIP

Very detailed discussion of diagnosis can be found in the 2022 AAFP guidelines on the diagnosis of FIP at https://journals.sagepub.com/doi/10.1177/1098612X221118761. In this talk we will be discussing some pros and cons of various diagnostic tests including:

- Biochemistry and haematology classically revealing hyperglobulinaemia, non-regenerative anaemia, lymphopenia and neutrophilia

- Serology is not recommended for the diagnosis of FIP as it indicates exposure only with high titres found in cats without FIP, additionally around 10% of cats have negative serology due to peracute infection or immune-complex formation.

- Imaging and identification of high protein effusions and other lesions

- Advanced imaging for neurological cases (CT, MRI)

- Elevated acute phase proteins (eg AGP – although not specific for FIP)

- Cytology/histology revealing pyogranulomatous inflammation

- Molecular diagnostics including PCR testing on effusions, fine needle aspirates, histology samples, CSF and aqueous samples

- Immunostaining for coronavirus antigen in effusions and other samples

Pitfalls of diagnosis can include failure to analyse effusions, interpretation of serology or faecal shedding, misdiagnosis of other alternative conditions such as other systemic infections (mycobacteriosis, toxoplasmosis) neoplasias (lymphoma) or inflammatory conditions (lymphocytic cholangitis). Molecular diagnostics can have false negative results and in times where treatments are available, trial treatments may be indicated as rapid improvements tend to be seen with nucleoside analogues.

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NEW OPPORTUNITIES FOR THE MANAGEMENT OF FIP

Sam Taylor

International Society of Feline Medicine, Isfm, Wiltshire, United Kingdom

Qualifications:

Samantha Taylor

BVetMed(Hons) CertSAM DipECVIM-CA MANZCVS FRCVS

sam.taylor@icatcare.org

Can we cure it? Update on novel therapies for FIP in 2023

The UK and Australia have had nucleoside analogue antivirals legally available to veterinarians for the treatment of feline infectious peritonitis (FIP) in cats since 2021. During that time, many cats and kittens have been treated successfully; however, our knowledge is constantly evolving as are our recommended protocols. The drugs remdesivir and GS-441524 have been successfully exported to other countries although in many, the only options are illegally sourced by clients.

Initially, when only injectable remdesivir was available, protocols were based on using remdesivir for 12 weeks only. With the subsequent availability of oral GS-441524, protocols evolved to include an initial period of injectable remdesivir (from a few days to 2 weeks) before a switch to oral GS-441524 to complete the 12-week course. Although injectable remdesivir is still useful for the treatment of extremely dehydrated sick cats that cannot tolerate receiving oral GS-441524, treatment courses comprising only oral GS-441524 for the full 12-week course are now being increasingly used with success.

Recommended drug dosages (Table 1) depend upon clinical presentation; that is, whether there is an effusion present or not and whether there is ocular and/or neurological involvement – this is due to variation in the tissue penetration of the drugs. Where there is doubt, use of the higher dosage is preferable. Dose must be adjusted according to response. Serum testing of GS-441524 levels can help tailor dosage.

The dosages provided below are based on experience using a reputable legal oral preparation of known GS-441524 content. Extrapolation is not applicable to other oral preparations where the active component and/or its concentration are not known or given by the manufacturer. Note that evidence is emerging that the dose of GS benefits from dividing and being given twice daily.

Table 1: Summary of dosage recommendations for remdesivir and GS-441524

Clinical presentation	GS-441524 – oral	Remdesivir – by intravenous or subcutaneous injection
Cats with effusions and without ocular or neurological signs	10–12 mg/kg q24h	10 mg/kg q24h
No effusion and without ocular or neurological signs	10–12 mg/kg q24h	12 mg/kg q24h
Ocular signs present (effusive and non-effusive)	15 mg/kg q24h	15 mg/kg q24h
Neurological signs present (effusive and non-effusive)	10 mg/kg q12h (ie, 20 mg/kg/day given as a divided dose)	20 mg/kg q24h

Combined injectable and oral treatment protocols:

Cat has very severe disease *(eg, anorexic, dehydrated, cat usually will be hospitalised to allow for appropriate supportive care to be given)*

Initial treatment can be given with once daily intravenous remdesivir (Table 1) for a few days. This provides a loading dose of the drug in cats that cannot receive oral medications or are too dehydrated to receive subcutaneous injections. On each day, dilute the remdesivir dose required to a total volume of 10 ml with saline and administer *slowly* over around 30 mins manually or with a syringe driver.

It is possible to change to once daily subcutaneous remdesivir at the same dosage (Table 1) once the cat is hydrated but still not able to accept oral medications

Remdesivir can be given for the number of days that medication using injectables is needed. More recently this has comprised just a few days early in treatment; for example, first 2–3 days of treatment given IV.

Change to oral GS-441524 (Table 1) as soon as oral medication can be tolerated and continue until at least day 84. However, injectable remdesivir (usually switching from intravenous to subcutaneous administration when cat is rehydrated) can be given for the full 84-day treatment course, if this is the only antiviral available and/or oral medication is not possible.

Less severe disease *(normal hydration, eating)*

If an injectable is required but the cat has less severe disease, treatment can be started with once daily subcutaneous remdesivir (Table 1) and continued for the duration that injectables are needed. Subcutaneous remdesivir is given as the formulation in the vial – no dilution is required.

Change to once daily (or twice daily if very high neurological dosage is needed) oral GS-441524 (Table 1) as soon as oral medication can be tolerated and continue until at least day 84.

Protocols of all oral GS are now regularly used with success.

Potential adverse effects of remdesivir

Remdesivir seems well tolerated; however, the following adverse effects have been reported:

Transient local discomfort/stinging on injection (see later on prevention).

Development/worsening of a pleural effusion (not always proteinaceous) in the first 48 h of treatment, sometimes requiring drainage.

Cats may seem depressed or nauseated for a few hours after IV administration.

Increases in alanine aminotransferase (ALT) enzyme activity have been reported but seem to resolve when treatment is stopped.

Mild peripheral eosinophilia and lymphocytosis have been reported.

In the first 2–5 days you should see an improvement in demeanour, appetite, resolution of pyrexia and reduction in abdominal or pleural fluid if an effusion is present (note that drainage of pleural effusion may be needed over the first few days of therapy.) Effusion typically resolves by 2 weeks.

If an effusion is still present at 2 weeks, consider increasing the dosage (by 3–5 mg/mg if possible) to one that is greater than that being used; for example, increasing the dosage from that used for cats with effusions only.

Serum albumin increases and globulin decreases (ie, they normalise) over 1–3 weeks but note that globulins can initially increase when a large volume effusion is absorbed and globulin is the slowest parameter to resolve.

Lymphopenia and anaemia may take longer to resolve, up to 10 weeks, and a lymphocytosis can be seen as a result of treatment.

Mild peripheral eosinophilia is a common finding and may be a favourable marker for disease resolution, as it is in COVID patients.

Mild elevations of ALT and, less frequently alkaline phosphatase, may be documented during treatment and should resolve once treatment is completed.

Lymph node size reduces over a few weeks.

If progress is not as expected, consider reviewing the diagnosis (see below) and/or increasing the dosage.

Monitoring during treatment

Ideally, serum biochemistry and haematology after 2 weeks and then monthly; alpha-1 acid glycoprotein (AGP) may be useful to predict remission (by returning to normal if elevated before treatment).

However, for cost limited clients, monitoring weight, demeanour, effusions (eg, by in-house scanning [although abdominal girth measurement is a crude alternative for monitoring abdominal effusions]), neurological signs and/or key biochemical abnormalities only (eg, measuring just globulin, bilirubin and/or spinning microhaematocrit tube for packed cell volume/total proteins/colour of plasma) is adequate.

Point-of-care ultrasonography (POCUS) to monitor for effusion resolution and/or lymph node size is useful if available and affordable.

When do I stop treatment?

Current recommendations are for 84 days of treatment but this may reduce as evidence evolves.

Confirm resolution of previous abnormalities (clinically, POCUS, serum biochemistry [including albumin to globulin ratio of >0.6 and normal AGP if possible] and haematology). Note that there is some evidence that milder lymph node changes can persist despite cure.

Only stop treatment once the cat has been normal (clinically and on serum biochemistry and haematology) for at least 2 weeks.

If I am seeing no response or a partial response to treatment, what do I do?

Ensure that you are still confident that the cat has FIP – review the diagnosis, look for additional pathology, consider repeat sampling (eg, external laboratory analysis of any fluid; cytology or biopsy of lymph nodes) and AGP. Dosage may require increasing and course lengthening.

In the event of relapse

Relapse can occur in any form (around 10% of cases) - neurological presentation being the most common and relapse is most frequent during or imediately after therapy. Ensure that you are still confident that the cat has FIP – review the diagnosis, look for additional pathology, consider repeat sampling (eg, external laboratory analysis of any fluid; cytology or biopsy of lymph nodes) and AGP.

If relapse occurs during treatment, increase the dosage of GS-441524 or remdesivir by at least 3–5 mg/kg per day and monitor as above, dividing the dose twice daily (GS-441524) ensuring treatment is not stopped before the cat has been normal for at least 2 weeks. The increased dosage used will depend on the dosage the cat is on at the time of the relapse, the nature of the relapse and finances but can be up to that recommended for neurological FIP (see Table 1).

If relapse occurs after completion of treatment, restart treatment with GS-441524 or remdesivir at a higher dosage (3–5 mg/kg per day higher than used previously) and treat for another 12 weeks.

If it is not possible to increase the dosage of GS-441524 or remdesivir (eg, the highest neurological dosage is already in use), consider adding in mefloquine as an adjunct treatment (see above).

Neutering, parasiticides and vaccination during or after treatment for FIP

Neutering is ideally performed a month after treatment is completed if the cat has responded well. However, if leaving the cat unneutered is causing stress (eg, attempts to escape or distress when queens are on heat), neutering during therapy may be preferred, ideally when the cat is doing well on treatment with at least another 4 weeks of treatment remaining. Some measure AGP to confirm it is normal before neutering.

There is no contraindication to routine worming and flea treatment for cats on GS-441524 or remdesivir.

No information is available on vaccination of cats receiving treatment for FIP although analysis of treated cases suggests that cats can be safely vaccinated after or during successful treatment without causing relapse. Vaccines should be administered as is normally recommended for the cat depending on its environment and risk (see WSAVA Vaccination Guidelines for general guidelines on vaccination). If urgent vaccination is required while the cat is being treated owing to the risk of infectious disease, vaccines can be given if the cat is well as vaccination is still likely to be protective. If only two vaccines have been given, consider providing a third dose of vaccine after completion of FIP treatment.

If veterinary visits and procedures are necessary, clinic stays should be minimised, and Cat Friendly Clinic protocols and handling implemented to reduce stress to the cat.

Adjunctive treatments

If the cat is on prednisolone treatment, this should be stopped while giving GS-441524 or remdesivir, unless it is required for short-term management of specific immune-mediated disease arising as a result of FIP (eg, haemolytic anaemia).

Supportive therapies such as antiemetics, appetite stimulants, fluid therapy and analgesics can be given with GS-441524 or remdesivir as required.

Trial treatment with GS-441524 or remdesivir?

Now that effective antivirals are available for the treatment of FIP, they can be used as trial treatments in cases in which FIP is highly suspected rather than confirmed. Although confirmation of a diagnosis of FIP is always preferable, the costs and invasive nature of some diagnostics (eg, collecting biopsies) mean that trial treatment is being increasingly used in the field, especially as treatment should be started as soon as possible.

Potential future updates

We are constantly learning about treatment with these drugs and advice may change in time. Other agents, for example, protease inhibitors (eg, GC374) and other nucleoside analogues (eg, molnupiravir) have also been trialled in cats but are not commercially available at this time in the UK. How these agents and other immunomodulatory agents (eg, polyprenyl immunostimulant, interferon omega) will fit into a future protocol is unknown at this time.

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VETERINARY SOCIAL WORK: AN INTERDISCIPLINARY APPROACH TO SUPPORTING TEAMS & CLIENTS.

Angie Arora

Seneca College, School Of Community Services, Toronto, Canada

Qualifications:

Angie Arora

MSW, RSW (Veterinary Social Worker, Certified Compassion Fatigue Specialist)

angie@angiearora.com

Veterinary Social Work: An Interdisciplinary Approach to Supporting Teams & Clients Angie Arora, MSW, RSW

What is Veterinary Social Work While social workers have attended to the human needs arising from human-animal interactions for decades, the concept of Veterinary Social Work as a professional discipline was coined in 2002 at the University of Tennessee by Dr. Elizabeth Strand.

According to the International Association of Veterinary Social Work, "veterinary social work is an area of social work practice that supports and strengthens interdisciplinary partnerships that attend to the intersection of humans and animals."

The traditional understanding of Veterinary Social Work rest on four pillars: animal-related grief and bereavement, animal-assisted interactions, the link between human and animal violence, and compassion fatigue and conflict management. This has resulted in social workers practicing in veterinary hospitals, shelters and rescue, veterinary colleges, zoos, wildlife organizations, non-profit organizations, research, academia, and private practice. More recently, pet health equity, access to veterinary care, one health, climate change, and diversity, equity and inclusion have become issues Veterinary Social Workers have become more actively involved in.

For the purposes of this presentation, we will focus on the role of Veterinary Social Work as an interdisciplinary component of hospital practice.

Interdisciplinary Nature of Veterinary Medicine

The goal of integrating Veterinary Social Workers into hospitals is to promote interdisciplinary care, that is, an approach that "involves team members from different disciplines working collaboratively, with a common purpose, to set goals, make decisions and share resources and responsibilities" (Victoria Department of Health). While in some parts of the world integrating social workers into human medicine has become common place, such an approach to patient and client care remains an untapped source of potential across global veterinary practices.

The idea here is that with collaborative expertise, patients, clients, and employees can achieve optimal outcomes based on their respective needs.

Veterinary Social Worker & the Veterinary-Client-Patient Relationship

The primary goal of hospital Veterinary Social Workers is to provide emotional and psychological support to both clients and hospital employees. While this can be seen to improve outcomes for each party, holistically the entire VCPR (veterinary-client-patient relationship) improves.

When working with clients, Veterinary Social Workers provide:

-Short-term counselling, often with a focus on grief and bereavement.

-Support groups for clients anticipating or experiencing the loss of a companion.

-Emotional and psychological support with end-of-life decision making.

-Discuss aftercare options with clients.

-Support parents on how to discuss loss and grief with children.

-Support and advocacy for clients' access to care issues.

-Referrals to community resources (pet loss, mental health supports, caregiver support groups, pet cemeteries and crematories, etc.).

This not only meets the psycho-emotional needs of clients, but it also frees up time and energy of veterinary professionals to work within their scope of practice to improve patient outcomes. It also reduces the stress that veterinary professionals are exposed to which can prevent some conditions of burnout, secondary traumatic stress, and compassion fatigue.

When working with hospital employees, Veterinary Social Workers provide:

-Coaching and/or counselling for personal and/or professional matters.

-Psycho-educational training for staff (wellbeing, burnout, secondary traumatic stress, compassion fatigue, grief, conflict management, moral distress, etc.).

-Facilitate rounds on non-technical matters (e.g., conflict, client communication, cyberbullying, impacts of medical errors, etc..

-Critical incident debriefing to reduce impacts of exposure to trauma.

-Develop and/or implement wellbeing strategy and practices within the hospital.

-Referrals to community resources (mental health resources, grief support, trauma support, etc.).

Given the intensifying nature of mental health and wellbeing issues for veterinary professionals, this tailored and targeted support not only provides direct support but also improves client and patient outcomes by ensuring the person caring for them is also being cared for. Much of our work is relational and to foster relationships, each party's needs must be attended to.

In addition, Veterinary Social Workers often act as a liaison between the client and practice team to help communicate client's questions, concerns to the veterinary team, while also helping to ensure information presented by the veterinary team is clearly understood by the client.

While many Veterinary Social Workers are hired to be both client and employee facing, more anecdotal research is demonstrating that to avoid conflicts of interest and promote greater ethical practice, a different Social Worker is hired for each important client group.

Challenges & Opportunities

Because the education for Veterinary Social Workers is only formally offered in the United States, there remains a small and localized hiring pool. While some of this programming is available online, international students may experience barriers to access. However, there is now a growing interest in finding collaborative ways to expand this education through creative partnerships with other academic institutions.

It is important to note that many Veterinary Social Workers have degrees in Social Work and through experiential learning and upgrading

knowledge and skills, practice in this space without a Veterinary Social Work certificate. The profession is in a growth period where there is a combination of Social Workers formally trained in Veterinary Social Work alongside others who have 'learned on the job' because it is not a regulated title. Regardless of which path a Veterinary Social Worker pursues, they can benefit from the International Association of Veterinary Social Workers which provides members with continuing education and networking events while also focussing on research and advocacy within the field.

There is a high degree of flexibility in how Veterinary Social Workers can be hired from full-time, part-time, to consultative and we are now beginning to see the slow emergence of 'mobile' services where a Social Worker may rotate amongst different hospitals, with a part-time commitment to each. There are pros and cons to such flexible arrangements. On the one hand, hospitals can utilize support at the level they require and can afford, while some Social Workers prefer this flexible nature of work. On the other hand, having someone part-time or mobile means the practioner may not be present in moments of crisis, and part-time work can create unstable working conditions for the social worker. It's important that if a practice is considering hiring a Veterinary Social Worker, all these factors are taken into consideration.

Conclusion

Veterinary medicine is on the cusp of a major transformation when it comes to building interdisciplinary teams integrating social workers. As awareness of the benefits grow, there are many factors to consider including: the readiness of educational institutions around the world to train social workers to work at the cross-section of human-animal relationships, the readiness of veterinary hospitals to invest in Veterinary Social Workers, and the ability of veterinary hospitals to create conditions that will set veterinary social work up for success in its practice. Dialogue is an important part of this process and the veterinary community is encouraged to engage in meaningful dialogue to be part of this important systemic change.

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HOW TO TURN ON YOUR HAPPY BRAIN CHEMICALS TO FEEL GOOD NOW

Eli Kalemtzaki

VetConsultancy, Management, Athens, Greece, Greece

Qualifications:

Elli Kalemtzaki

DVM, Certified Coach & NLP Practitioner

e.kalemtzaki@gmail.com

The human brain is a complex and fascinating organ that plays a crucial role in our overall well-being and happiness. Within this intricate network of neurons and neurotransmitters, there exist a set of chemicals commonly referred to as "happy brain chemicals." These chemicals, including dopamine, serotonin, endorphins, and oxytocin, are responsible for regulating our mood, motivation, pleasure, and social connections. [1][2][3] Understanding how these chemicals work can empower us to take control of our own happiness and lead more fulfilling lives. [2][3]

During this talk, we will delve into the science behind these happy brain chemicals, explore their functions, and provide practical strategies for boosting their production naturally.

Happy brain chemicals, act as messengers between neurons, transmitting signals and influencing our thoughts, feelings, and behaviours. Some of the key happy brain chemicals include:

Dopamine: This neurotransmitter acts as a reward system in our brain, responsible for feelings of pleasure, motivation, and desire. Whether it's that satisfying sense of accomplishment after completing a task or the anticipation of a delicious treat, dopamine is there, urging us forward and making life enjoyable. However, imbalances in dopamine levels can lead to addiction, impulsivity, and even mental health issues.

While dopamine is often associated with external stimuli like tasty food, thrilling activities, or even winning a game, there are also internal factors at play. Sleep, exercise, and building meaningful connections with others can all contribute to healthy dopamine levels. On the other hand, stress, lack of sleep, and certain addictive substances can disrupt this delicate balance. [1][2] Understanding these factors allows us to take charge of our dopamine production and ensure a steady supply of motivation to live our life to the fullest.

Serotonin: Imagine serotonin as your very own mood stabilizer, working diligently behind the scenes to keep your emotional state in check. This neurotransmitter plays a vital role in regulating mood, preventing depression, and promoting feelings of well-being and happiness. [5] Receiving respect also triggers the production of serotonin. [2][6][7[In mammals, the stronger member in a herd usually has better access to food and mating opportunities and this triggers the release of serotonin. [1] [2][7]

Low serotonin levels are often associated with mood disorders, anxiety, and feelings of sadness. [5] How can we elevate our serotonin levels?

Regular exercise, getting enough sunlight, practicing mindfulness, and engaging in activities that bring joy and fulfilment can all contribute to a serotonin surge. Additionally, maintaining a balanced and nutritious diet, rich in foods like bananas, walnuts, and dark chocolate, can also support serotonin production.

Endorphins: These remarkable chemicals, produced by our pituitary gland and nervous system, serve as natural painkillers, bringing relief and a sense of euphoria. Endorphins function by binding to specialized receptors in our brain, reducing pain signals and promoting a pleasurable state. [1][2][4] So, how can we tap into this natural source of comfort?

Engaging in physical activities like exercise, laughter-inducing moments, and even enjoying a spicy meal can trigger endorphin release. Dancing, listening to music, and engaging in creative pursuits can also elevate endorphin levels.

Oxytocin: Oxytocin, often referred to as the "love hormone," plays a crucial role in forming social connections and building trust. When released, oxytocin promotes feelings of warmth, trust, and empathy towards others. It helps us forge strong bonds with our loved ones and enhances our capacity for emotional intimacy.

To elevate your oxytocin levels, engage in activities that promote positive interactions and deepen your connections with others. Spend quality time with loved ones, engage in acts of kindness, and express gratitude regularly. Physical touch is also known to stimulate oxytocin release.

These brain chemicals work together in complex ways, influencing our emotional states and responses to various experiences. While they are often called "happy brain chemicals," it's essential to recognize that their roles are diverse, and an appropriate balance of these chemicals is crucial for maintaining emotional well-being and mental health. Factors such as genetics, lifestyle, environment, and experiences all play a role in the production and regulation of these neurotransmitters. [4][6]

Wouldn't it be great if you could turn on your happy chemicals in new ways? You can do this if you learn what turns on happy chemicals in nature and how the brain replaces old habits with new ones.

Establishing a new habit means creating new neural pathways and this requires courage and focus. [1][2] Why is starting a new habit not very pleasant? Your old habits are like a well-travelled highway in your brain. New behaviours are difficult to establish because they are like narrow paths in your brain. Unknown paths may seem dangerous and tedious, so we tend to stick to the familiar highway.

Here are some practical ways to boost your happy brain chemicals:

Exercise and Activities to Increase Dopamine Levels

Engage in activities that bring you joy and a sense of accomplishment. Challenge yourself with new hobbies or set achievable goals. Exercise regularly to get those endorphins flowing and boost dopamine levels. Don't forget to celebrate your achievements along the way!

Nutrition Strategies for Enhancing Serotonin Production

When it comes to serotonin, the "feel-good" neurotransmitter, a balanced diet plays a vital role. Incorporate foods rich in tryptophan, such as turkey, eggs, nuts, and seeds, which are known to promote serotonin production. Additionally, complex carbohydrates like whole grains and legumes can enhance serotonin levels.

Triggering Endorphin Release Through Exercise and Laughter

Endorphins, the body's natural painkillers and mood enhancers, can be activated through exercise and laughter. Engaging in physical activities you enjoy, whether it's dancing, jogging, or playing a sport, can release a surge of endorphins. Laughter, too, triggers their release. Find reasons to laugh and get moving to tap into those natural bliss-inducing chemicals.

Building Trust and Connection to Stimulate Oxytocin Production

To elevate oxytocin levels, focus on building trust and deepening your connections with others. Engage in open and honest communication, actively listen, and show empathy. Acts of kindness and expressions of gratitude can also foster trust and strengthen relationships, ultimately leading to increased oxytocin production. Remember, love and connection are powerful catalysts for happy brain chemicals!

Exercise: A Key Player in Happy Brain Chemicals

Exercise goes beyond just physical fitness; it plays a significant role in promoting happy brain chemicals. Regular physical activity, whether it's cardio, strength training, or yoga, can increase dopamine, endorphin, and serotonin levels.

The Impact of Nutrition on Neurotransmitter Function

Nutrition isn't just about fuelling your body; it can also have a profound impact on your brain chemistry. Consuming a balanced diet rich in essential nutrients supports optimal neurotransmitter function.

Cultivating Gratitude and Positive Social Connections

Practicing gratitude is a simple yet effective way to boost your happy brain chemicals. By focusing on the positives in your life and expressing gratitude, you can increase dopamine and serotonin levels. Keep a gratitude journal, share what you're thankful for with loved ones, or simply take a moment each day to reflect on your blessings. Your brain will thank you!

In conclusion, our brain chemistry plays a significant role in shaping our happiness and well-being. By understanding the science behind happy brain chemicals such as dopamine, serotonin, endorphins, and oxytocin, we can actively work towards increasing their production and experiencing more joy in our lives. [1][2][4] From engaging in activities that boost dopamine levels to fostering positive social connections that stimulate oxytocin release, we have the power to activate our happy brain chemicals and cultivate a greater sense of happiness and fulfilment.

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NUTRITIONAL THERAPY FOR CANINE AND FELINE LIVER DISEASE

Marge Chandler

Vets Now Referrals, Nutrition, Lasswade Midlothian, United Kingdom

Qualifications:

Marjorie Chandler

DVM, MS, MANZCVS, DACVIM (SA Internal Medicine and Nutrition), MECVS

chandlermarge05@gmail.com

The nutritional status of liver disease patients is often compromised by anorexia, nutrient malassimilation, and decreased hepatic nutrient synthesis or storage. Most hepatopathy patients benefit from nutritional therapy. It is the primary treatment for feline hepatic lipidosis (HL).

NUTRIENTS

ENERGY (CALORIES)

Most hospitalized patients should receive RER; in anorexic patients this is reached over several days to decrease gastrointestinal (GI) signs and prevent re-feeding syndrome. Pets at home should be fed at MER.

Minimize fasting for procedures and avoid starvation, which compromises all body systems and is a risk factor for feline HL. Fasting is a "high protein diet" due to catabolism of endogenous proteins for energy.

PROTEIN

Protein supports hepatic regeneration and decreases negative nitrogen balance. Excess protein is converted to urea via ammonia. In liver failure the conversion to urea may be decreased resulting in increased ammonia concentrations.

Liver disease may result in increased protein requirements [1]. Protein restricted diets should be initiated only if signs of encephalopathy exist. Inadequate intake causes muscle catabolism and negatively affects all organs.

Highly digestible proteins, especially vegetable and dairy-based proteins, improve signs of canine HE[2]. Most dogs can be managed with 3-4 g protein/100 kcal. Cats without HE require 6-8 g protein/100 kcal. With HE restriction to 4 g protein/100 kcal may be needed, although provide as much as tolerated[3].

Commercial liver disease diets may be protein deficient for growth. Protein supplementation helps although the diet may still be deficient in calcium and other minerals. Renal disease diets are not recommended.

Protein deficiency may play a role in feline HL development[4]. Cats are not efficient at sparing protein during starvation, and methionine and arginine become limiting. Protein or amino acid deficiency may induce hepatic lipid accumulation by limiting lipoprotein synthesis needed for hepatic lipid metabolism and transport[5].

CARBOHYDRATE AND FIBRE

Hepatogenic hypoglycaemia from decreased hepatic glycogen can occur in dogs with cirrhosis, congenital PSS, fulminate hepatic failure, and extensive liver neoplasia[3] . Feeding small meals frequently may help.

Dietary fibre decreases calories/g of food, but has benefits, e.g. binding GI bile acids and promoting their removal. Fermentation of soluble fibre generates short-chain fatty acids which impair intestinal ammonia uptake. Fibre enhances colonic transit, giving toxins less time for absorption[6]. Soluble fibre, e.g. psullium (ispaghula) can soften the stool. Some soluble fibre sources, (e.g. beet pulp), may decrease of amino acids use for gluconeogenesis by increasing utilization of short-chain fatty acids[7].

DIETARY FAT

Hepatic lipid metabolism includes synthesis (cholesterol, phospholipids, fatty acids, triglycerides, bile salts) and lipoprotein metabolism. Beta-oxidation and ketone body production from fat provides energy. The liver has a large bile acid synthesis capacity so fat malabsorption is uncommon, although can occur with longstanding biliary obstruction.

Dietary fat restriction is not needed unless pronounced cholestasis or fat malassimilation is present. Fats increase palatability and caloric density, provide essential fatty acids, and have a protein sparing effect[6]; however, even when malabsorption is not apparent, fat digestion may be reduced. In dogs with PSS, fat digestion decreased from 92% to 85%[8]. Colonic microflora ferment undigested fats producing hydroxy-fatty acids which can cause diarrhoea.

VITAMINS AND MINERALS

Vitamin and mineral deficiencies may occur from inadequate intake, malassimilation, and decreased hepatic B vitamin reserves. A B-vitamin complex can be added at 1-5 ml/l to intravenous fluids or given orally. Vitamins should be protected from heat and light as they otherwise will degrade in hours.

COBALAMIN

Cobalamin (Vitamin B12) is likely deficient in cats with HL, pancreatitis or intestinal malassimilation[9]. Suggested subcutaneous dose is 250 µg/injection in cats and 250-1500 µg/injection in dogs, depending on size, weekly for four weeks (then q 2-4 weeks)[10], although this may be insufficient with hypocobalaminaemia[11]. Daily oral dosing of cobalamin is effective as parenteral forms[12].

Hypercobalaminaemia can be present with liver disease, some cancers, and kidney disease. A functional cobalamin deficiency can occur with high serum concentrations. In liver disease, a functional deficiency causes altered delivery to cells and increased homocysteine (HCY) and/or methylmalonic acid (MMA)[13]. In dogs with hepatopathies, 37.5% had hypercobalaminaemia and 26.7% had elevated serum MMA[14]. In cats with hepatopathies, the odds ratio of hypercobalaminaemia is 9.91[15]. Hypercobalaminaemia is a biomarker for functional cobalamin deficits and can indicate an underlying disease.

THIAMINE

Vitamin B1 (thiamine) supplementation is recommended in liver disease, especially in cats as they are particularly sensitive to thiamine deficiency. A deficiency can mimic hepatic encephalopathy signs. Dosage for cats is 10-25 mg SQ or IM q12-24 hr; for dogs is 50-250 mg/dog IM, SQ or PO q 12-24 hr, given until signs resolve[10].

VITAMIN C

Vitamin C is produced by the liver; supplementation at 25 mg/kg PO/day may be beneficial[13]. It may function as a pro-oxidant when present with high concentrations of metals (e.g. iron or copper); supplementation should be avoided in copper associated hepatotoxicity.

FAT SOLUBLE VITAMINS

Uptake of fat-soluble vitamins (A, D, E, K) can be reduced with decreased bile acid flow (e.g. cholestasis), enterohepatic bile acid circulation, or intestinal fat absorption. Vitamins A and D are rarely deficient.

Liver vitamin K stores are rapidly depleted in liver disease, although intestinal bacteria producing vitamin K can maintain concentrations for

about a month[3]. Bleeding in hepatic disease is more commonly due to the decreased synthesis of clotting factors as their function is lost before vitamin K stores are depleted[16]. If indicated, vitamin K1 is given at 1-3 mg/kg SQ or 5 mg/kg PO. In cats, overdosing can cause haemolysis and hepatic necrosis[10].

Vitamin E helps protect the hepatocyte cell membrane phospholipids from oxidative radicals[17]. It may slow hepatic fibrosis. Doses are empirical and range from 10 u/kg-100 IU/kg PO q 24 hr. In cats with HL, vitamin E at 100mg/day/cat is recommended. Very high doses could theoretically impair prothrombin activity and inhibit absorption of other fat-soluble vitamins, though toxicity is uncommon and no adverse effects have been reported[17].

Vitamins D and A have several roles in hepatic inflammation and fibrosis. Parenteral dosing of Vitamin E, A, and D q 3-4 months has been suggested[1]; however, they can cause toxicity in high doses. Hypervitaminosis A from a raw liver diet caused hepatic fibrosis in a cat[18].

ZINC ACETATE OR GLUCONATE

Zinc stimulates transcription of the copper binding protein, metallothionein, in the GIT and hepatocytes. Metallothionein has greater affinity for copper than zinc. Copper is bound in enterocytes and excreted into faeces. Zinc has anti-oxidant and free radical scavenging properties, protectant effects against many hepatoxins, and roles in urea formation, glutathione concentration and immune function[19]. Serum zinc concentrations should be determined prior to supplementation; values of >800ug/dl can cause haemolysis. Dosages are based on amount of elemental zinc, and range from 50-200 mg/day/dog in divided doses, given 30 minutes before feeding[10]. Repeat serum concentrations 2-4 weeks after treatment.

COPPER

Hepatic copper accumulation may be caused by breed related defects decreasing biliary excretion, e.g. Bedlington and West Highland White terriers, altered excretion of copper due to hepatic inflammation, fibrosis, cholestasis, and excessive dietary intake. In Labrador retrievers, genetic predisposition plus dietary copper may result in accumulation[19, 20]. Copper and iron may accumulate in the inflamed liver (i.e. secondary copper accumulation) and either can cause damage. Copper hepatopathy has been recognized occasionally in cats [21].

Dietary copper has been suggested to cause increasing cases of copper hepatopathies. FEDIAF nutritional guidelines canine legal upper limit (not nutritional) is 2.8 mg/100 g dry matter[22]. A retrospective study reported 17 copper associated hepatopathies cases over 7 years; about half in breeds at risk[23]. Research is needed to determine optimum dietary copper concentrations.

Hepatic copper accumulation treatment includes copper chelation, copper restricted diet (<5ppm or mg/kg), supplemented zinc, pyridoxine and vitamin E. Avoid liver and organ meats which are high in copper. Commercial copper restricted diets contain about 1.3 + 0.3 mg copper/1000 kcal[20] but may be more protein restricted than needed by dogs without HE. Copper restricted diets with added zinc treated Labrador retrievers with subclinical hepatic copper accumulation and with copper-associated chronic hepatitis[20]. Zinc acetate decreased and preventing hepatic copper accumulationin Bedlington and West Highland White terriers with chronic hepatopathies[24].

NEUTRACEUTICALS USED IN LIVER DISEASE

S-ADENOSYL-L-METHIONINE (SAME)

SAMe, synthesized by cells from methionine and ATP, is essential for hepatic biochemical pathways. SAMe is replenishes hepatocyte GSH and has cytoprotective, analgesic, and anti-inflammatory actions[17]. A dose of 18 mg/kg/day on an empty stomach has been recommended[25].

SILYMARIN (MILK THISTLE)

Silymarin (silybin), (from milk thistle), is an antioxidant, anti-inflammatory, antifibrotic, and choleretic, enhances protein synthesis, inhibits hepatotoxin binding, increases GSH concentrations, and chelates iron[26]. Suggested doses are 50-250 mg/day. Low oral bioavailability is increased when complexed with phosphatidylcholine [27]. In dogs with idiopathic liver disease, supplementation with a commercial product containing silybin decreased activity of serum liver markers and improved liver function indices [28].

CARNITINE

L-carnitine supplementation during weight loss in obese cats decreases risk of HL and is useful in its treatment. Liver and skeletal muscle L-carnitine is lower in cats with HL than healthy cats[29]. If not in the diet, supplement carnitine at 250-500 mg/cat for HL [30].

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NUTRITION FOR THE GI PATIENT CANINE CHRONIC GI DISEASE-WHAT TO FEED?

Minna Rinkinen

IVC Evidensia, Tammisto Veterinary Hospital, Vantaa, Finland

Qualifications:

Minna Rinkinen

DVM, PhD, Adjunct professor

Finnish Veterinary Specialist in Small Animal Medicine

Evidensia Veterinary Hospital Tammisto, Vantaa, Finland

minna.rinkinen@evidensia.fi

Choosing the diet for a dog with chronic GI disease can be puzzling. Before addressing the diet, it is crucial to identify and treat the underlying cause of the chronic diarrhoea. Conduct a thorough physical examination, obtain a detailed history from the pet owner, and perform any necessary diagnostic tests to determine the specific cause, such as faecal analysis, blood work, and imaging. A comprehensive diet history is essential.

Food-responsive enteropathy

Food-responsive enteropathy (FRE) is the most common chronic enteropathy in dogs. The diagnosis of FRE is confirmed if the clinical signs resolve or significantly improve within a couple of weeks after starting a diet trial with either a limited-ingredient novel protein and carbohydrate source (commercial or homecooked diet) or a hydrolysed protein diet[1].

If the dog is kept on a strict diet the response is usually excellent. Commercial hydrolysed protein diets are documented to have a good long-term response and are considered the first choice by many. However, some dogs may be sensitive to the protein source despite hydrolysation. Therefore, a poor clinical response to one diet does not exclude the possibility of remission with another type of hydrolysed protein diet[1].

Challenge

When clinical signs have resolved with elimination diet a challenge with new protein sources is recommended.

For the challenge, one novel protein source is chosen. A small amount is mixed with the elimination diet and the amount of the novel protein is gradually increased. If the patient shows no GI signs for one week, the protein source is acceptable, and a new trial with a new protein source can be performed. If the chosen protein source is not tolerated, the signs (vomiting, diarrhoea, inappetence…) usually appear within 12-48 hours. With that, the challenge is stopped and only elimination diet is fed until the signs resolve. When the dog is clinically normal, another new protein source can be tried. However, the owner may choose not to challenge. In that case the elimination diet (balanced, complete) can be continued[1].

Fibre-responsive diarrhoea

Fibre-responsive diarrhoea (FRD), also known as fibre-responsive colitis, is a common gastrointestinal disorder in dogs characterized by recurrent or chronic diarrhoea that shows a positive response to a high-fibre diet[3].

The exact underlying cause of FRD is not fully understood. The inclusion of higher levels of fibre in the diet helps normalize colonic function and reduce the severity of symptoms. For most FRD dogs a combination of both soluble and insoluble fibre works best. However, determining a patient's exact needs of the amount and types of fibre may involve trial and error.

Insoluble fibres (e.g., cellulose) increase faecal bulk and thus can stimulate GI motility and increase intestinal transit time.

Soluble fibres (e.g., pectins, gums) have a greater capacity to absorb water and tend to be highly fermentable. Highly fermentable fibres are rapidly converted by colonic bacteria to short-chain fatty acids (SCFAs). SCFAs have several important roles in maintaining gut health: energy source for colonocytes; improved gut barrier functions; anti-inflammatory functions; regulation of bowel motility, and nutrient absorption[4].

Protein-losing enteropathy

Protein-losing enteropathy (PLE) is a severe small bowel disease characterised by hypoalbuminemia. The cornerstone of PLE treatment is dietary management with a high-protein, low-fat diet (≤20 g fat per 1,000 kcal). PLE is not a specific disease per se, but a syndrome with multiple possible aetiologies, including dietary sensitivity[1,4]. Unfortunately, no markers can currently predict food-responsiveness in dogs with PLE (FR-PLE).

Lymphangiectasia

Traditionally, low-fat diet is advocated for intestinal lymphangiectasia as restricting the dietary fat intake prevents lacteal dilation and lymph leakage.

There is no consensus for the ideal amount of fat in the diet, but 20% fat on a ME basis is considered to be suitable. If there is no response to low fat diet, a change to ultra-low fat diet (less than 15% fat on ME basis) is warranted[4].

Chronic pancreatitis, EPI

No studies have assessed the most optimal nutrition for dogs with chronic pancreatitis. However, a low or moderate amount of fat in the diet seems suitable for most cases.

There is no specific nutritional recommendation for dogs with EPI, and thus the dietary plan must be tailored to meet the individual needs.

Probiotics

Probiotics, defined as live microorganisms with proven beneficial health effects, could in theory be helpful in CE therapy. Unfortunately, the evidence-based data to support the benefits of probiotics in CE therapy is limited.

Commercial or home-made?

There are several commercial prescription diets available with various carbohydrate and protein sources, including hydrolysed protein. The benefits of choosing a commercial diet include that the food is complete and balanced, and easy to use. A home-made diet can be formulated very low-fat or based on novel protein source[4].

If no commercial diet is appropriate, a homemade diet may be required. It is strongly recommended that a veterinary nutritionist is consulted when a home-made diet is chosen.

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INFECTIOUS AND NON-INFECTIOUS DISEASES IN NEONATES

Sabine Schaefer-Somi

Platform AI and ET, Vetmeduni Vienna, Small Animals And Horses, Vienna, Austria

Qualifications:

Sabine Schäfer-Somi, Prof.

sabine.schaefer@vetmeduni.ac.at

1. Non-infectious diseases in neonates

The incidence of mortality among neonates is high (5-35%) and non-infectious causes are frequent. Hypoxia is the most frequent cause of loss during the first 10 days of life. The problem frequently entails hypoclycemia, dehydration and hypothermia; however, this can also be caused by infections or management problems. Other causes of neonatal morbidity are traumas, malformations and genetic diseases and non-infectious diarrhoea; all these diseases can promote bacterial infections and sepsis; early diagnosis and treatment is therefore essential.

Hypoxia, hypothermia, hypoglycemia

Hypoxia occurs due to prematurity, lack of surfactant factor (respiratory distress syndrome; RDS), prolonged delivery or dystocia, late opening of the amniotic sac and aspiration of amniotic fluids as well as non-ventilated areas of the lung. In one study, 92.7% of puppies died because of hypoxemia during the first 48 hours of life (1). Sometimes it is just obstruction of the upper airways or bronchia, sometimes other problems like low birth weight or non-ventilated lung areas impede the clinical symptoms. Preterm puppies have a low birth weight, which is 25% under the average weight of the respective breed. The fur is very fine and mostly lacking at the breast, abdomen and inguinal region. The forehead typically is prominent. Many preterm neonates are born with severe respiratory distress syndrome (RDS) due to unripe lung or develop problems in the following 48 h. In addition, the low birth weight and low glycogen reserves cause problems; low birth weight puppies have higher mortality rates than those with normal birth weight and this was shown to be related to serum-glucose concentration (2). Correct evaluation of the degree of distress and proper treatment of critical neonates will help to decrease mortality rate; for this purpose, a score was adapted from human medicine (APGAR-score; (3) table 1), considering vital parameters like respiratory rate, motility, reflex irritability, colour of mucous membranes and heart rate. This score should be done within 5 minutes after delivery.

Table 1. APGAR scoring system (Veronesi et al 2009[3])

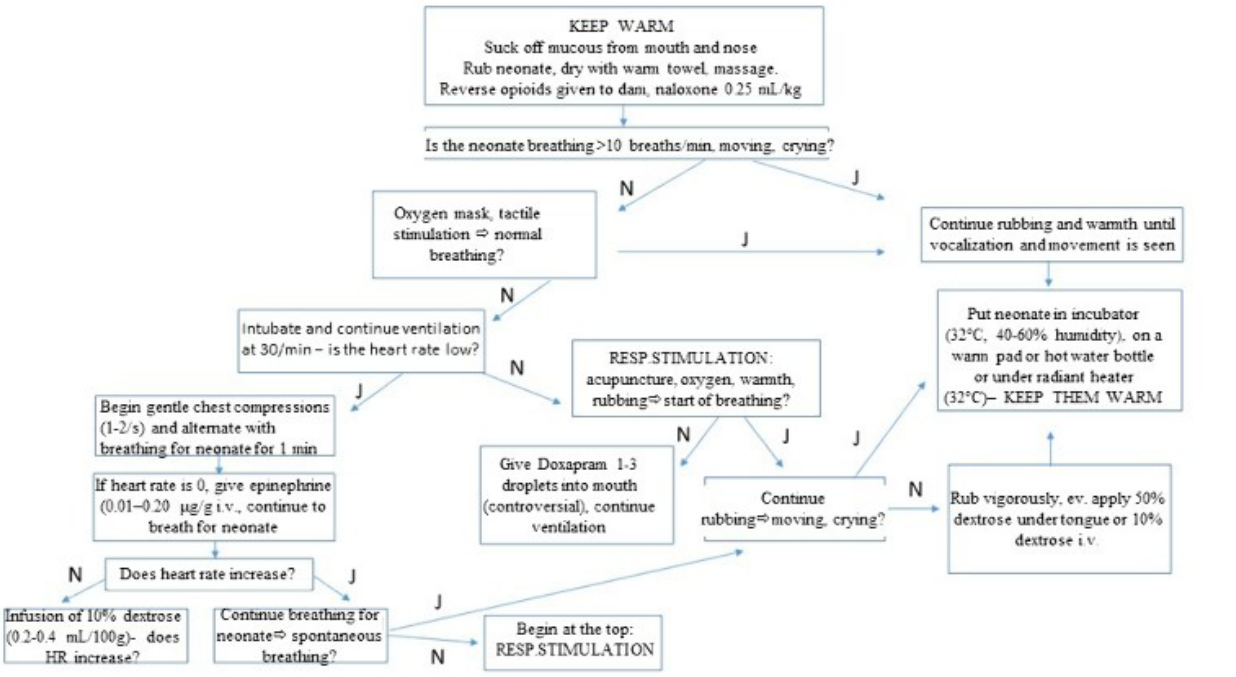
Parameter	Score		
	0	1	2
Heart rate	< 180 bpm	180-220 bpm	> 220 bpm
Respiratory effort	No crying/<6 rr	Mild crying/6-15 rr	Crying/> 15 rr
Reflex irritability	Absent	Grimace	Vigorous
Motility	Flaccid	Some flexions	Active motion
Mucous colour	Cyanotic	Pale	Pink

rr= respiratory rate

Significantly more neonates with APGAR 0-3 (severely distressed) or 4-6 (moderately distressed) died withing 2 hours (h) compared to those with APGAR 7-10 (not distressed). A decrease in APGAR-score below 7 is frequently combined with a decrease in mammary gland searching or suckling, aggravating hypoglycemia and weakness (3). The puppies are jeopardized if not treated properly. In another study, APGAR £ 6 within 8 h was found to increase the mortality risk within the following 24 h. Blood-glucose concentration of £ 92 mg/dl increased the mortality risk between day 1 and 21 of neonatal life. And both combined in a puppy with low birth weight even more increased mortality risk (2). The APGAR score was recently refined according to breed body size (4). In this study, the percentage of severely distressed puppies of smaller breeds (£ 10 kg) was higher than the same percentage in the group of large breeds (> 20 kg); however, in the small breeds, more puppies were still alive after 24h then in the large breeds ($p<0.01$). The APGAR-score cut-off values were adapted and new cut-off values suggested: for moderately distressed puppies APGAR 4 in small breed puppies and APGAR 4-5 in large breeds (4). Additional measurement of serum-glucose concentration and weighing will improve the estimation of mortality risk in the first days of life.

Clinically, in case of low-grade hypoxia, puppies show slow or irregular breathing, low muscle tone and decreased reflexes, the mucous membranes (mouth) are pale to cyanotic and in case of fluid aspiration, bubbles can emerge from the nostrils. They are mostly hypothermic (<34.4°C) and hypoglycemic (<30-40 mg/dl), especially in case of low birth weight, and have a high-grade persisting acidosis. In severe cases of hypoxia, especially when combined with hypothermia, puppies are not able to compensate as the heart rate decreases and consecutively the peripheral perfusion leading to cardiopulmonary failure. Resuscitation is obligatory in all cases of respiratory distress and should consider application of warmth (32°C, 40-60% humidity), patent airway (“A”), enable breathing for ventilation (“B”) and circulation for cardiac oxygenation (“C”) ((5)). Only thereafter treatment with medicaments will be useful (6). Oxygen application should not exceed 40-60% to prevent oxygen toxicity. Severe hypovolemia and hypoglycemia can best be treated by i.v. application of a sodium chloride / dextrose solution (1:1, 2.5% dextrose, 1 ml/30g body weight; 23-25 gauge i.v. catheter; (5)). Some authors recommend prophylactic application of antibiotics (1). Hypothermia must be slowly compensated before the first feeding, especially in case of tube feeding; otherwise, due to decreased intestinal motion the milk will stay in the stomach and may cause severe illness or regurgitation and aspiration pneumonia. The recommended measures in relation to degree of distress are shown in the flow chart (6) (Figure 1). Puppies should be well observed during the first 10 days of life since some may develop anorexia, weight loss and lethargy due to infectious or non-infectious causes (fading puppy syndrome). They can be introduced with signs of hypothermia (<35.6°C at day 1-3; <37.2°C at 1 week), hypoglycemia and dehydration. Clinical signs are unspecific and include weakness, anorexia and weight loss, restlessness, crying, cool skin, tremors or lethargy. Underlying causes can be trauma, genetic metabolic disease, hypoxic tissue lesions or infections. Infectious causes can be ruled out by swabs from affected areas (1).

Figure 1. Resuscitation – Flow Chart



HR=heart rate, N=No, Y=Yes, Resp.= Respiration,

(modified; Traas 2008, Davidson and Cain 2023)

Non-infectious diarrhea

Diarrhea frequently occurs in neonates and can quickly cause a life-threatening condition due to hypoglycemia and dehydration. Non-infectious diarrhea can among others be caused by dysbacteriosis of the developing intestinal microbiome, milk replacer and wrong feeding management. In utero and during the first weeks of life, the neonates' intestinal microbiome develops due to contact with the mother's bacteria and those in the surroundings which is important for the normal development (7). Neonatal mice that already had physiological contact to bacteria in the uterus, placenta and amniotic fluid, were shown to have better defense mechanisms against inflammatory diseases and penetration of intestinal bacteria (8). The neonatal, fecal microbiome changes constantly during the first week of life, therefore a bacteriological examination in case of diarrhea is of limited value and should be restricted to special cases (9). Despite, the feeding management should be questioned. The milk replacer is a frequent source of problems; some are less digestible, and most cause diarrhea when not dissolved properly or when the temperature is not well-chosen. Too much feeding can cause obstruction and thereafter diarrhea. However toxic compounds in the mother's surroundings or medicaments delivered through the mother's milk must be considered as well. A thorough case history comprising previous treatments, deworming and signs of illness in the mother is therefore obligatory. Gynecological examination inclusive sonographic examination of the uterus in the mother is indicated in all cases of neonatal disease. Treatment mainly comprises warm keeping, fluid replacement and careful feeding of a proper milk replacer, eventually containing medicaments against gas in the intestines (10)

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CANCER GLOSSARY AND SURGICAL ONCOLOGY CHECK LIST

Nick Bacon[1], *Jolle Kirpensteijn*[2]

[1]*AURA Veterinary, Surgical Oncology, Guildford, United Kingdom,* [2]*Hill's Pet Nutrition, Cvo, Topeka, United States of America*

Qualifications:

Nicholas Bacon MA Vet MB CertVR CertSAS DipECVS DACVS FRCVS

Jolle Kirpensteijn DVM PhD DipECVS DACVS

ACVS Fellows, Surgical Oncology

nickb@auravet.com

jolle_kirpensteijn@hillspet.com

WSAVA ONCOLOGY GLOSSARY AND SURGICAL ONCOLOGY CHECKLISTS

WSAVA's Oncology Glossary Paves the Way for Informed Veterinary Care

In the intricate realm of veterinary oncology, complexity can confound understanding and so the World Small Animal Veterinary Association (WSAVA) Oncology Working Group (WOW) has pioneered a beacon of clarity: the Oncology Glossary. This seminal initiative, inaugurated in the year 2021, aims to empower both veterinary professionals and discerning pet owners with the lingua franca necessary to navigate the difficult landscape of cancer. The glossary elucidates and demystifies the terms that envelope the diagnosis, management, and treatment within small animal oncology.

Cancer demands a lexicon of its own. Through careful deliberation, the WOW Group identified an urgent need to bridge the communication gap between veterinary practitioners and pet owners. The result: the Oncology Glossary, a compendium of clear and concise definitions, which embolden owners to engage in meaningful dialogues with veterinary professionals, empowering owners to understand the choices they face and participate meaningfully in their pet's well-being.

The initial outcome of the WOW Group's strategy, the Oncology Glossary is just the start of a broader mission. Dedicated to disseminating cutting-edge insights into cancer therapy and advocating global best practices, the WOW Group is focussed in its mission to elevate the standard of care for animals. The compendium highlights terms used to describe the progression, diagnosis, and treatment of animal cancers. It offers not only written descriptions, but helps understanding with illustrative images. This approach ensures accessibility and breaks down linguistic barriers by offering translations in various languages.

Every term within the Oncology Glossary is significant, providing clarity in the otherwise convoluted world of veterinary oncology. The terms encompass the fundamental pillars of cancer for example:

1. Tumor: An abnormal collection of tissues or cells, benign or malignant, forming a lump or swelling.

2. Neoplasia/Neoplasm: Uncontrolled cellular growth leading to a mass, which can be benign or malignant.

3. Benign: A non-spreading neoplasm that can often be cured through complete removal.

4. Malignant: A neoplasm that can metastasize, spreading to distant parts of the body.

5. Cancer: The unchecked division, invasion, and potential metastasis of cells or tissues.

6. Oncology: The comprehensive study of cancer's causes, diagnosis, treatment, and prevention.

Beyond these foundational definitions, the glossary navigates through the technical terrain, often highlighting critical topics:

- Biopsy: A test to determine the nature of a mass—neoplastic, inflammatory, or infectious—often crucial for diagnosis.

- Fine Needle Aspirate (FNA): A specific biopsy technique that extracts cells or fluid from a tumor.

- Cytology/Pathology/Histopathology: The study of cells and tissues to diagnose and grade tumors.

- Sarcoma/Carcinoma/Round Cell Tumor: Categorizing cancers based on origin to inform tailored treatment.

- Lymph Node: A vital immune cluster indicating metastasis and prognosis.

- Cancer Grade/Stage: Assessing tumor aggressiveness and extent of spread.

- Metastasis: The spread of cancer cells to distant organs.

- Curative/Palliative/Immunotherapy: Strategies for treatment and comfort, focusing on remission and quality of life.

- Median Survival Time/DFI/Prognostic Factors: Estimations of disease course and response.

- Surgery/Radiotherapy/Chemotherapy: Core treatments to excise or combat cancer.

- Imaging Techniques (CT/MRI/Radionuclide Scan): Advanced tools to detect cancer's location and spread.

Empowering Pet Owners:

The Oncology Glossary's significance to veterinary professionals extends its reach to owners around the world who are striving to understand their pet's health journey. By deciphering the intricate jargon, it equips owners with the knowledge to comprehend diagnoses, treatment options, and prognoses. Armed with this newfound clarity, pet owners can actively engage with veterinarians in informed discussions, making well-considered decisions for their companions' well-being.

Furthermore, the WOW Group's commitment doesn't end with the glossary. They will regularly update the glossary. Additionally, they are diligently developing user-friendly tools to help veterinarians navigate the ever-evolving field of oncology. The group's unwavering dedication to spreading awareness and supporting veterinary professionals underscores their crucial role in enhancing the lives of our cherished animal companions.

Conclusion: A Shared Tool for a Brighter Future

The Oncology Glossary is more than a compilation of definitions; it's a testament to the profound impact collaboration between veterinary professionals and diligent pet owners can achieve. In a world where cancer's complexity threatens to overwhelm, the glossary stands for clarity, fostering understanding and communication. As the WOW Group advances their mission to promote best practices, it serves as a reminder that through shared knowledge, dedication, and empathy, we can navigate the uncharted waters of veterinary oncology with a brighter outlook for our animal companions.

The entire Glossary is available at https://wsava.org/committees/oncology-working-group/ in English, plus Spanish, Catalan, French, Bulgarian, German, Finnish, Korean, Romanian, Ukrainian, Greek, Norwegian, Chinese, Russian, Italian and Portuguese.

The committee would be interested in talking to veterinary colleagues willing to translate the Glossary into additional languages to above.

Surgical Oncology Checklists

Title: Enhancing Surgical Safety in Veterinary Medicine: The Importance of Surgery Checklists

Introduction: Surgical procedures in veterinary medicine are intricate processes that demand meticulous coordination among the surgical team. Despite the significant risks involved, the use of surgery checklists in veterinary surgery remains uncommon. This essay explores the importance of implementing surgery checklists in veterinary medicine, highlighting their benefits, the role of teamwork, the influence of the World Health Organization (WHO), the structure of the checklist, and the impact of checklist implementation on veterinary professionals.

The Value of Surgery Checklists: Surgery is a collaborative effort that involves various professionals, including surgeons, anesthesia specialists, nurses, and technicians. To ensure a safe and efficient surgical environment, the entire team should embrace the use of surgery checklists. These checklists offer a systematic approach to enhance patient safety by reducing the likelihood of errors, complications, and avoidable risks.

The Influence of the World Health Organization: The World Health Organization's "Safe Surgery Saves Lives" initiative has pioneered the use of surgery checklists as a vital tool to improve patient outcomes. While initially developed for human surgery, the principles are equally applicable to veterinary medicine. This initiative emphasizes the need for adherence to essential safety steps that minimize common and preventable surgical risks.

Structure of the Surgery Checklist: The surgery checklist, designed to be concise and straightforward, divides the surgical procedure into four phases, each corresponding to a specific time period in the surgical workflow: 1. Sign In: Before induction of anesthesia 2. Move In: Before patient movement in the operating room 3. Time Out: Before surgical incision 4. Sign Out: During or after wound closure but before patient removal from the operating room Each phase involves a checklist coordinator who verifies the completion of tasks before progressing to the next stage. This structured approach ensures that critical safety steps are consistently followed.

Benefits of Checklist Implementation: A survey of veterinary professionals revealed that a significant percentage (67%) were already using surgery checklists, while others had not yet adopted this practice. However, it was found that many of the individual steps in the checklist were already considered routine in facilities globally, albeit often not followed comprehensively. This underscores the need for implementing surgery checklists to ensure consistency and adherence to these vital safety measures.

Impact on Veterinary Professionals: The survey results provide insights into the impact of checklist implementation on veterinary professionals. The findings suggest that surgery checklists contribute to improved communication, reduced work pressure, enhanced teamwork, and better training. A majority of professionals reported feeling comfortable asking questions when something is amiss and believed that patient care information was communicated effectively. However, there were still concerns about missing key information when needed, indicating room for improvement. Moreover, the survey revealed that teamwork and training improved after checklist implementation, with a substantial percentage feeling that their facility did a good job communicating information affecting patient care. However, issues such as feeling rushed while taking care of patients and the adequacy of orientation and refresher training for new staff require attention.

Conclusion: In conclusion, the implementation of surgery checklists in veterinary medicine is essential for ensuring patient safety and minimizing avoidable risks. The World Health Organization's emphasis on safe surgery has paved the way for the adoption of surgery checklists, which offer a structured approach to enhancing communication, teamwork, and training among veterinary professionals. The survey results underscore the benefits of checklist implementation, while also highlighting areas that require further attention.

As the WSAVA Oncology Working Group prepares to launch the WoW Cancer Surgery Checklist, the veterinary community has the opportunity to enhance surgical safety and patient outcomes through the comprehensive use of surgery checklists.

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PASSIVE, ACTIVE OR COMBINED ORAL HYGIENE?

Brook Niemiec

Veterinary Dental Specialties, Dentistry, San Diego, United States of America

Qualifications:

Brook A. Niemiec

DVM, DAVCD, DEVDC, FAVD

bniemiec@vdspets.com

Home plaque control

Introduction:

Homecare is a *critical* aspect of periodontal therapy. Plaque colonizes clean tooth surfaces within twenty-four hours of cleaning. Finally, without homecare, gingival infection and inflammation quickly recurs.

Types of homecare:

The two major types of home plaque control are active and passive. Both types can be effective if performed correctly and consistently, but active homecare is currently the gold standard. Active homecare involves the participation of the pet's owner, such as brushing or rinsing. Passive methods are typically based on chewing behaviours via treats or specially formulated diets. It has been shown that active homecare is most effective on the rostral teeth (incisors and canines). In contrast, passive homecare (chew based) is more effective on the distal teeth (premolars and molars)

Active homecare:

Active homecare is defined as the client actively participating in the removal of plaque from the tooth surface. This can be achieved either by brushing or by rinsing/applying antiseptic/antiplaque solutions.

Tooth brushing:

When properly performed, tooth brushing has been proven to be the most effective means of plaque control.

Materials and methods for tooth brushing:

Brushes (figure 1): The only critical piece of equipment necessary is a tooth brush. There are numerous veterinary brushes available, and a proper brush should be selected based on patient size. This author does not recommend the "finger brushes" as they do not effectively address the subgingival areas of the teeth.

In addition to the veterinary products, human tooth brushes may be substituted. A soft bristled toothbrush is always recommended. A child's toothbrush is often the correct size for small patients, and may be more effective than the larger veterinary version.

Mechanized brushes have been shown to be superior to standard brushes in human studies. In addition to the numerous human product options, there is currently a mechanized veterinary brush available.

Pastes: There are a number of veterinary toothpastes available, which greatly increase the acceptance of the toothbrush by the pet. Toothpastes typically contain a calcium chelator which has been shown to decrease the level of calculus deposits on the teeth. It is important to note however, that calculus itself is largely non-pathogenic.

Antimicrobial preparations (see chlorhexadine rinses below) are also available. These products will improve plaque and gingivitis control beyond that of pastes when used with brushing, and therefore should be considered instead of toothpaste in high-risk patients and in cases of established periodontal disease. Human tooth pastes and products such as baking soda (sodium bicarbonate) are **not** recommended as they contain detergents or fluoride which may cause gastric upset or fluorosis if swallowed.

Brushing technique:

The ideal technique to safely and effectively initiate tooth brushing in veterinary patients is described in the following text. Keep in mind, however, the ideal technique may only be possible in the most agreeable patients. Clients should be encouraged to work toward this level of care, but to accept any degree of homecare success as valuable. Forcing homecare on a patient is counterproductive and may decrease the client-animal bond.

Proper tooth brushing technique begins with the brush held at a 45-degree angle to the long axis of the tooth. The brush is then placed at the gingival margin and moved along the arcades utilizing a rotary motion. The buccal surfaces of the teeth are the most accessible and fortunately are the most important, as these are the surfaces which generally have higher levels of calculus deposition. Make sure to council owners not to attempt to open the pet's mouth on initiation of this procedure. Most veterinary patients greatly dislike their mouth being forced open, and this approach may result in increased resistance. Instead, clients should be instructed to begin by effectively brushing the buccal surfaces with the mouth closed. The distal teeth can be accessed by gently inserting the brush inside the cheek to reach these teeth, relying on tactile feel and experience to ensure proper positioning.

Regarding the frequency of brushing, once a day is ideal, as this level of care is required to stay ahead of plaque formation. Furthermore, every other day brushing was not found to be effective at gingivitis control. Three days a week is considered the ***minimum*** frequency for patients *in good oral health*. Brushing once a week is not considered sufficient to maintain good oral health. For patients with established periodontal disease (even gingivitis), daily brushing is required to maintain oral health, and twice daily may be recommended.

Antiseptic rinses:

The other option for active homecare is the application of antiseptic/antiplaque solutions. There are numerous products available, and it is recommended that veterinary professionals review the literature.

The traditional antiseptic of choice is chlorhexidine. Chlorhexidine has been shown in numerous studies to decrease gingivitis if applied consistently over time. Chlorhexidine reportedly has a quick onset and minimal systemic uptake, making it an excellent choice for oral disinfection.

An additional option for home oral care is the use of soluble zinc salts. In vitro studies showed that these products can be effective in decreasing plaque. One veterinary labelled oral zinc ascorbate gel has been proven to decrease plaque and gingivitis, and provides the additional advantage of being tasteless. Furthermore, this product also contains ascorbic acid which has been shown to support/induce collagen synthesis.

Passive Homecare:

Passive homecare is an alternative for minimizing periodontal disease, and is achieved with special diets, chews and treats, and potentially water additives. Some of these methods are effective, but many are not. Some of the effective products are detailed below; however, there is not enough room here for a complete discussion of all products. Practitioners should perform their own research and utilize the Veterinary Oral Health Council (VOHC®) to form proper client recommendations, rather than simply reading the marketing hype.

Since passive homecare requires no work by the owner, compliance is more likely. Compliance is especially important since long term consistency is the key factor in the efficacy of home dental care. It has been shown that the compliance rate with toothbrushing with *highly motivated* pet owners is only around 50% after 6 months. In fact, one study showed that passive homecare may be superior to active homecare simply due to the fact that it is actually performed.

The downfall of all chew-based passive homecare products involves the fact that pets typically do not chew with the entire mouth and therefore areas will be missed. Passive homecare is most effective on the carnassial and surrounding teeth, and in contrast, active homecare is superior for the incisor and canine teeth. Therefore, a combination of active and passive homecare is best.

Tartar control diets:

It has long been thought that traditional dry dog food is good for oral health, and one study appeared to support these claims. However, an additional study showed that dry food was **not** superior to moist foods in regard to improving oral health. There are, however, several diets that decrease tartar and plaque build-up. These products employ abrasives to scrape the teeth free of plaque. Additionally, the individual kibbles of these therapeutic diets tend to be larger than standard pet food. This increases the amount of chewing performed and the efficacy of the abrasive aspects.

Numerous products have received the VOHC® seal as effective in tartar (and in some cases plaque) reduction. One important point is that even though these products may decrease plaque and calculus, they are typically most effective on the areas around the cusp tips and not at the gingival margin. Remember, supragingival plaque and calculus is generally non-pathogenic, and therefore minimal control of gingivitis is gained by calculus control

Tartar control treats:

Over the last few years several new edible treats have been brought to market with varying efficacy. Many of the studies are unpublished; however there are several products with VOHC approval in this class. The most prevalent and proven effective products in this class are the rask type and rawhide chews, which work similar to tartar control diets, with the abrasives cleaning the tooth surface.

One important point to remember is that many chew treats which claim to help control dental disease are very hard in texture. The chewing of these products may (and often does) result in tooth fracture. A good rule of thumb is that if you cannot make an indentation into the product with your fingernail, it is too hard. Also, just because a product is effective for dental disease, does not necessarily mean it is safe. Owners must be aware of the choking/obstructive possibilities of many treats. For this reason the VOHC has recently modified its requirements to include evidence of safety as well.

Water additives:

This is a relatively new area of home dental care, and there are several products avaliable in this category. While there are some studies on the human side which found that the active ingredients have some efficacy, there are currently minimal to no peer reviewed evidence that support their use in controlling periodontal disease in veterinary patients. One product with xylitol was shown to decrease plaque and calculus in one study.

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MULTIDISCIPLINARY CASE DISCUSSION: GALLBLADDER MUCOCELES - AN INTERNIST'S AND A SURGEON'S VIEWPOINTS

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

amsingh@uoguelph.ca

Relevant Surgical Anatomy

The hepatobiliary system is most commonly evaluated at the time of celiotomy through a ventral midline approach. This organ system is found in the cranial abdomen sandwiched between the diaphragm and the gastrointestinal tract, and can be thoroughly inspected via palpation and gross visual appearance at the time of surgery.

A large volume of blood continuously flows through the liver at low pressures filtering through the hepatic sinusoids, eventually emptying into the hepatic veins and caudal vena cava. To prevent collapse of the liver lobes and subsequent vascular occlusion, the liver is required to be stiff in its material property. As a result of its stiffness, the liver is friable and easily fractured after trauma. Fortunately, the liver is protected by the caudal aspect of the ribcage in the cranial abdomen and further protected by a cushion of falciform ligament fat ventrally and a dome shaped diaphragm cranially. The liver has seven major lobes or processes: right lateral and medial, left lateral and medial, quadrate and caudate which has a caudate and papillary process. Deep fissures of the liver lobes allow them to collapse on top of each other or slide in a side-to-side fashion depending on movements of the animal. The liver is only partially fixed at its cranial extent where it surrounds the caudal vena cava. Triangular ligaments of the right and left liver lobes are attached to the peritoneal surface of the diaphragm. Histologically, the hepatic lobule is the structural unit of the liver. The lobule consists of hepatocytes arranged in a hexagon surrounding a central hepatic vein. A portal triad is found in each corner of the hexagon that is comprised of a bile duct and terminal branch of the portal vein and hepatic artery.

The biliary system begins as microscopic cannaliculi in the hepatic lobule, which eventually coalesce into larger bile ducts that enter the extra-hepatic biliary system. This system consists of hepatic ducts, common bile duct, cystic duct and gall bladder. Upon entering the gall bladder, bile is concentrated and upon stimulation primarily by the hormone cholecystokinin, released into the cystic duct and eventually empties into the duodenum via the common bile duct. The gall bladder is found centrally in the liver, bordered by the quadrate lobe and right medial liver lobe.

There are key differences in the anatomy of the common bile duct between dogs and cats that explain the pathophysiology of various hepatobiliary diseases. In dogs, the common bile duct enters the dorsal wall of the duodenum and opens into the lumen at the major duodenal papilla alongside the pancreatic duct. The larger accessory pancreatic duct opens at the minor duodenal papilla, which is found a few centimeters aborad from the major duodenal papilla. The pancreas is intimately associated with the common bile duct, and inflammation/swelling can result in extra-hepatic biliary obstruction (EHBO). The feline common bile duct conjoins the only pancreatic duct in this species prior to entering the major duodenal papilla. Due to the fusion of the common bile and pancreatic ducts, the feline is at increased risk of ascending infection of the pancreas.

Extra-hepatic Biliary Obstruction

Extra-hepatic biliary obstruction leads to severe metabolic derangement in multiple organs, and often requires immediate surgical treatment. EHBO is caused by either intra-luminal common bile duct disease or extra-luminal compression. In dogs, extra-luminal compression is the most common cause of EHBO and diseases that can cause this include gall bladder mucocele and pancreatitis. Diseases leading to intra-luminal pathology include cholelithiasis (gall bladder stones), choledocolithiasis (stones in the common bile duct) and biliary sludge. Inflammatory diseases such as cholangiohepatitis, cholecystitis and pancreatitis are the most commonly implicated diseases leading to EHBO in cats. It has been suggested that the most common cause of feline EHBO is cholangiohepatitis.

Reviewing the pathophysiology of biliary obstruction is pivotal in understanding why patients with EHBO can have severe systemic compromise. One of the major functions of bile salts is to initiate lipid absorption in the small intestine. This includes fat-soluble vitamins A, D, E and K. The coagulation factors II, VII, IX, X are vitamin K dependant, therefore, biliary obstruction leading to deficiency in vitamin K can cause coagulation derangements. This can be evidenced by increases in activated clotting time, prothrombin time and partial thromboplastin time. In health, bile acids are conjugated to bile salts in hepatocytes and secreted continuously into bile canaliculi and eventually into the duodenum. Approximately 95% of bile salts are re-absorbed in the ileum and then transported to the liver for re-secretion. With EHBO, the liver's ability to conjugate bile acids is impaired leading to increased levels of unconjugated bile acids in circulation. These substances are cytotoxic and can lead to tissue inflammation in various organs. The intestinal mucosa is highly sensitive to the effects of unconjugated bile acids and increased levels can lead to intestinal mucosal injury and increased permeability. The latter allows bacterial translocation into the systemic circulation resulting in endotoxemia. Furthermore, reduced bile acids within the intestine leads to bacterial over-growth further compounding endotoxemia. In experimental studies performed in mice, EHBO has led to increased sensitivity of the body to endotoxin leading to a severe pro-inflammatory response predisposing the animal to systemic inflammatory response syndrome and multi-organ failure.

Abnormalties in laboratory tests are common in patients with EHBO. These include leukocytosis, hyperbilirubinemia, increased serum alkaline phosphatase, increased serum alanine aminotransferase and increased gamma-glutamyl and prolongation in clotting times. PT and proteins induced by absence of vitamin K test are the most sensitive coagulation tests, however, is not detected until 14 days post-EHBO. The clinician should keep in mind that while increased liver enzyme values are common in cases of EHBO, they are not specific for biliary obstruction.

Abdominal ultrasonography is a valuable imaging modality for evaluating the hepatobiliary system in small animals. Ultrasound can evaluate the gall bladder and the size and tortousity of the intra-hepatic biliary tree and the common bile duct. Progressive distention of the biliary tract viewed with ultrasound is consistent with EHBO. An enlarged gall bladder with a non-mobile stellate appearance (also termed the "kiwi" gall bladder) is characteristic of gall bladder mucocele. The Cocker Spaniel and Shetland Sheepdog appear to be overrepresented in cases of this disease. Ultrasound is also very useful for evaluating the biliary tract for choleliths and particular attention should be paid to the area surrounding the major duodenal papilla. Finally, ultrasound can also be used to evaluate the regional anatomy of the hepatobiliary system for predisposing causes of EHBO (e.g. pancreatitis).

Exploratory celiotomy is an important diagnostic procedure in cases in which imaging has provided equivocal results yet clinical and laboratory findings are consistent with EHBO. At the time of celiotomy, the gall bladder and the common bile duct can be visually inspected for enlargement/distention and palpated for choleliths/choledocoliths. The gall bladder can also be expressed to determine patency of the extra-hepatic biliary tree. A duodenotomy can be performed for retrograde catheterization of the common bile duct or normograde catheterization

can be performed following cholecystotomy.

As previously discussed, most patients with EHBO present in the later stages of disease and are systemically compromised at the time of presentation. Prior to surgical intervention many patients require aggressive hemodynamic resuscitation. Intravenous (IV) fluid therapy should be initiated following calculation of fluid deficit and administration rate will depend on the clinical assessment of the patients as some patients may present with hypovolemic shock. Several types of bacteria have been cultured from prations with EHBO including *E. Coli*, *Clostridium* spp., *Enterococcus* spp., and *Bacteroides* spp. An empirically selected antimicrobial with broad-spectrum activity should be administered promptly following diagnosis of EHBO. A second generation cephalosporin (Cefoxitin 15-20 mg/kg IV q8hrs) is preferred by the author and ampicillin (22 mg/kg IV q8hrs) can also be added to increase coverage to include *Enterococcus* spp. In cases where coagulation deficiencies are present, vitamin K supplementation (0.1-0.2 mg/g SQ q12hrs) should be administered. Furthermore, fresh frozen plasma transfusion can also be considered for these patients.

The goal of surgical treatment of patients with EHBO is to re-estrablish biliary drainage into the intestinal tract as continued obstruction will lead to progressive metabolic derangements and eventually death. The most common surgical interventions include cholecystectomy (gall bladder removal) in cases of gall bladder mucocele or cholecystitis or a biliary re-routing procedure (cholecystoenterostomy – attaching the gall bladder to either the duodenum (cholecystotoduodenostomy or jejunum (cholecystojejunostomy)) for pathology of the common bile duct. The surgeon should keep in mind that these procedures can be technically demanding and are associated with high mortality rates (28-64%) despite improvements in surgical technique and post-operative supportive care. Refractory hypotension in the intra-operative period has been linked to a higher incidence of post-operative mortality. It has been suggested that the presence of circulating unconjugated bile acids decreases the effect of vasopressors, which leads to the refractory hypotensive state during surgery. Other negative prognostic indicators include azotemia, coagulation deficiencies and septice bile peritonitis.

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SURGICAL TIPS FOR SKIN TUMORS

Jolle Kirpensteijn

Hill's Pet Nutrition, Cvo, Topeka, United States of America

Qualifications:

Jolle Kirpensteijn, DVM, PhD, Diplomate ACVS & ECVS

Chief Veterinary Officer, Hill's Pet Nutrition US, Home address: 4501 Broadmoor Drive, Lawrence KS 66047, USA; jolle_kirpensteijn@hillspet.com @jollenl @gvetsx @purrpodcast

Jolle Kirpensteijn graduated from the Utrecht University Faculty of Veterinary Medicine, Holland in 1988 and finished an internship in small animal medicine and surgery at the University of Georgia in the United States of America in 1989. After his internship, he completed his residency training in small animal surgery and a master's degree at Kansas State University, USA. The residency was followed by a fellowship in surgical oncology at the Colorado State University Comparative Oncology Unit, USA. In 1993, Jolle returned to Europe to accept a position in surgical oncology and soft tissue surgery at Utrecht University. In February of 2005, he was appointed Professor in Surgery at the University of Copenhagen and in August 2008 Professor in Soft Tissue Surgery at Utrecht University. Jolle is a Diplomate of the American and European College of Veterinary Surgeons. Jolle received the title Founding Fellow in Surgical Oncology (2012) and Minimally Invasive Surgery (Small Animal Soft Tissue; 2017) of the American College of Veterinary Surgeons (ACVS). In September 2013, Jolle accepted the Chief Professional Relation Officer position at Hills Pet Nutrition in the USA. Here, he played an integral role as the interface between the company and the profession at large. In 2018, he was promoted to the Chief Professional Veterinary Officer position in the US and in 2022 to Global Chief Veterinary Officer. Jolle has published over 125 peer-reviewed articles, given more than 250 lectures worldwide and has received the prestigious BSAVA Simon Award in 2007, Hills Voorjaarsdagen Excellence in Healthcare Award in 2009, WSAVA President's Award and honorary membership to the Netherlands Association of Companion Animal Medicine (NACAM) in 2017. His main interests are DE&I, professional social media and digital innovation, surgical oncology, and reconstructive surgery. Check out his podcasts at purrpodcast.net and globalveterinarysurgery.net. In 2021, Jolle started the @ArtVetNow movement on Facebook to promote veterinary artists worldwide.

Skin Tumours in Veterinary Medicine: Diagnosis, Treatment, and Prognosis

Introduction: Skin tumors are prevalent neoplasms in dogs and cats, with 28% of dogs and 18% of cats being affected. Their superficial location facilitates early detection and intervention. Fine-needle aspiration biopsy (FNAB) plays a crucial role in diagnosing skin tumors and determining appropriate therapeutic strategies. Definitive diagnosis is achieved through histological examination of surgical biopsy specimens. Surgical

Approach: In line with tumor treatment strategies in other locations, surgery remains the primary choice for therapy. However, radiation therapy has gained significance in managing malignant skin tumors like mast cell tumors. For skin tumors of unknown biological behavior, surgery mandates margins of at least 2-3 cm of healthy surrounding skin. Cryosurgery is indicated for certain tumor types in animals with high anesthetic risks. While most skin tumors are benign in dogs (70-80%), cats tend to present with malignant tumors (50-65%).

Epithelial Tumours:

1. Papilloma: Common in dogs and rare in cats, papillomas are typically multiple in young animals and singular in older dogs. Surgery or cryosurgery is seldom needed, as papillomas often regress over time.

2. Basal Cell Tumour: Frequently observed in both dogs and cats, basal cell tumors are mostly benign and occur on the head, neck, and shoulders. Surgical removal is the preferred treatment, and metastasis is extremely rare.

3. Squamous Cell Carcinoma (SCC): Predominant locations for SCC in dogs include the head, scrotum, and nail bed. In cats, they occur around the nose, ears, and eyes. SCC prognosis in cats depends on surgical excision possibilities. Radiotherapy is also effective in treating SCC.

4. Adenoma/Adenocarcinoma: Sebaceous gland adenoma is common in dogs, while apocrine sweat gland tumors are more frequent in cats. Distant metastasis is rare in dogs but more common in cats.

5. Circumanal Gland Tumour: Common in older intact male dogs, these tumors can appear around the perianal region, tail, and penis. While most are benign, malignant perianal adenocarcinomas can occur. Castration often leads to regression.

6. Anal Sac Tumour: Almost always malignant, anal sac tumors are more prevalent in female dogs. Resection and radiation therapy offer good local control, but metastases are common.

Mesenchymal Tumours:

1. Fibrosarcoma: Found in both dogs and cats, fibrosarcomas can occur anywhere and are locally aggressive. Surgery combined with radiation therapy is the mainstay of therapy.

2. Malignant Peripheral Nerve Sheath Tumours (PNST): Aggressive and rarely metastasizing, PNST often occur in the subcutaneous tissues of distal extremities. A CT scan or MRI is recommended before surgery.

3. Haemangiopericytoma (HPC): Similar to PNST, HPC often grows slowly but is locally aggressive. Radiation therapy may be beneficial.

4. Lipoma: Benign fat tumors, or lipomas, are easily removed when necessary. Infiltrative lipomas are more challenging to resect, and liposarcomas are malignant and carry a poor prognosis.

5. Round Cell Tumours: Histiocytomas are common in young dogs and typically regress. Cutaneous plasmacytomas are usually benign, while malignant histiocytosis of Bernese Mountain Dogs has a grim prognosis.

6. Melanoma: Melanomas are variable in behavior. Wide surgical excision is crucial, and oral and subungual melanomas require attention due to higher metastatic potential.

7. Mast Cell Tumour: The most common canine skin tumors and second most common in cats, mast cell tumors vary in prognosis based on histologic grading. Surgical excision with margins and adjunctive therapies, when needed, are crucial for treatment success.

Conclusion: Skin tumors are a prevalent concern in veterinary medicine, necessitating a tailored approach to diagnosis and treatment. Surgical intervention remains a primary therapeutic strategy, with advancements in radiation therapy offering additional options. A comprehensive understanding of tumor types, their locations, biological behaviors, and appropriate treatment modalities is essential for achieving successful outcomes and ensuring the well-being of our animal companions.

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CLINICAL CASES IN ORTHOPEDICS - WHAT IS YOUR APPROACH?

*David Vicente[1], **Carlos Adrega**[2]*

[1]Egas Moniz School of Health & Science, Veterinary Medicine, Almada, Portugal, [2]AniCura - CHV, Surgery, Porto, Portugal

Qualifications:

David Vicente

DVM, MVSc, PhD, MRCVS

Assistant Professor in Veterinary Surgery

David.g.vicente@gmail.com

Clinical cases in orthopedics - what is your approach?

Diaphyseal fractures are usually secondary to high-energy trauma and therefore the initial assessment should be focused on rapid evaluation of life-threating respiratory, circulatory, or neurological conditions before embarking on any specific treatment of a fracture.

Orthogonal radiographic views are essential for precise determination of fracture configuration. Preoperative radiographs of the contralateral limb can help with pre-surgical planning.

The surgeon´s strategy when treating diaphyseal fractures should be not to compromise the fracture biologically unless the intervention will contribute to a biomechanical improvement.

The infinite variations in fracture configuration and orthopaedic apparatus available, combined with the need to consider the demands of repair on an animal while conforming to rigid anatomical and biomechanical guidelines, can make fracture repair a daunting prospect. By pausing and thinking about the fracture in a stepwise and logical manner, the choices can be greatly simplified, and the prospect of a successful outcome significantly increased.

In most cases, there are several options available to achieve the desired reduction and stabilisation of a fracture. The final decision is usually based on the surgeon's experience and preference, and the implants available. Final selection of one technique over another can also be influenced by cost and the different requirements of postoperative management (eg, ESF versus plate and screws). It is useful to have a 'back-up' or plan B in mind before going into theatre, as unforeseeable factors may be encountered, despite meticulous planning.

Fracture treatment should always be regarded as a challenge between fracture healing and fixation failure. During this time, the orthopaedic surgeon must apply a balanced concept of fracture treatment. Extensive efforts to reconstruct comminuted fractures may compromise the vascular supply of intermediate fragments and diminish their contribution to fracture healing. On the other hand, surgical techniques that focus too much on preservation of soft tissues may be unsuccessful if the mechanical stabilization required for fracture repair is underestimated.

Postoperative assessment

Clinical and radiographic assessment during the healing period is essential to assess for expected limb function and fracture healing. The timing of follow up is dependent on many factors including the nature of the injury, apparatus used, expected healing time as well as financial constraints. Most animals will require strict confinement during healing, and radiographs are typically taken every four weeks until clinical union has occurred.

Each radiograph should be examined for the following three As:

 ALIGNMENT: Check that the bone fragments and joints are aligned and that this alignment is identical to the postoperative radiograph. Check that the desired fragment apposition has been achieved and is maintained;

 APPARATUS: Check for signs of implant loosening, breakage, infection, and so on, all of which may indicate potential problems in the future or explain deterioration in limb use;

 APPOSITION: where the fracture has been anatomically reconstructed, accurate apposition of the fracture fragments is imperative. Poor fracture reduction and small gaps at the fracture site, whilst appearing innocuous, have the potential to result in premature implant failure. When a comminuted fracture is stabilized using bridging osteosynthesis, apposition can be substituted for adjacency; too large a gap may prevent fracture healing

When assessing follow-up radiographs, in addition to the three As, the addition of a fourth A is beneficial.

 ACTIVITY: Check for evidence of bone healing activity, some of which should be seen within the first four to eight weeks. Delayed union or non-union should be monitored. Also check for signs of loss of bone density and muscle mass, which are suggestive of poor limb use. Limb use is essential for joint health and will stimulate bone healing and remodeling.

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CANINE LYMPHOMA - TREATMENT AND PROGNOSIS

Ann Hohenhaus

Animal Medical Center, Oncology, New York, United States of America

Qualifications:

Ann Hohenhaus

DVM, Diplomate, ACVIM (Oncology & Small Animal Internal Medicine

ann.hohenhaus@amcny.org

Canine lymphomas are a group of approximately 25 different diseases commonly diagnosed in dogs; each form of lymphoma has its own treatment and prognosis. Lymphoma can be classified by anatomic location, immunophenotype, histological subtype or grade, all of these being important for prognosis and treatment.

In this review we will discuss the most important prognostic factors and treatment options for each type of the most common anatomic forms of lymphoma. Clinical signs, diagnosis and staging have been covered in another session.

If there are unfamiliar terms in this document, such as median survival, the WSAVA Oncology Working Group has prepared an Oncology Glossary to facilitate understanding of these terms. The Oncology Glossary is available in 16 languages and can be found at Glossary-WOW-13.11.2021.pdf (wsava.org) in English and other languages at Oncology Working Group (wsava.org).

Multicentric lymphoma.

This is the most common anatomical presentation of lymphoma in dogs. Stages I to IV seem to have similar prognosis and only stage V has been associated to worse outcome in some studies and substage-b has been associated with a worse prognosis[1].

Multicentric lymphoma with better prognosis

Immunophenotype (B versus T cell lymphoma) has also been traditionally linked to prognosis[2] with a better prognosis for B-cell lymphoma compared to T cell lymphoma; although this is not strictly correct.) There is a subtype of T-cell lymphomas, called indolent or low grade lymphomas with better outcome[4]. The most common indolent lymphoma is T-zone lymphoma (T-cells) which in the USA is very common in Golden retrievers. In dogs with high grade multicentric B cell lymphoma, low expression of Ki67 was not associated with a better prognosis[7].

Multicentric lymphoma with a poor prognosis

Multicentric T cell lymphoma is associated with a survival time of approximately 6 months likely due to a less robust response of T-cell lymphomas to doxorubicin. [3] A histologic subtype that seems to have a poor prognosis is the diffuse small B-cell lymphoma[5]. The reported median survival in dogs with diffuse small B-cell lymphoma is 140 days. Within this subtype, proliferation markers as Ki67 can help to recognize dogs with better prognosis[6].

Treatment of multicentric lymphoma

Regarding treatment, multicentric B cell lymphomas are usually treated with CHOP (cyclophosphamide, doxorubicin, vincristine and prednisone) based protocols. One method to optimize response to CHOP is to adjust the protocol during treatment to improve response and survival. [8] In Stage V lymphoma (cases with bone marrow involvement), addition of cytarabine can improve the response and prognosis[9]. High grade T-cell lymphomas seem to have a better outcome when treated with protocols that include lomustine and different studies[10,11] have shown a good response rate (90% complete remission) and median survivals similar to B-cell lymphomas treated with CHOP. Lomustine containing protocols are considered by someas first line therapy for this type of lymphoma. Finally, if indolent T-cell lymphomas require treatment, prednisone and chlorambucil are commonly used[4].

New treatments for B-cell lymphoma include rabacfosadine[12] or verdinexor[13] but these may not be widely available yet.

Mediastinal lymphoma

Mediastinal lymphoma is almost exclusively of T phenotype and may produce pleural effusion or paraneoplastic hypercalcemia. It has a poor prognosis with a median survival time of six months[14]. However, including of lomustine in the treatment protocol could potentially improve the response or survival, but more studies are needed to confirm this. Control of hypercalcemia may require adjunctive treatments such as zoledronate.

Gastrointestinal lymphoma

Intestinal lymphoma is an uncommon presentation in dogs compared to cats. Most of the cases in dogs are diagnosed as high-grade and have a median survival of 62 days[16]. Less than 10% of dogs with intestinal lymphoma live more than one year, even with treatment. Lomustine chemotherapy may result in longer survival than CHOP based protocols although the difference was not statistically significant. Dogs with rectal[17] or colorectal[18] lymphoma have a good response to therapy and good prognosis and a median survival of over 4 years. Unlike cats, low-grade gastrointestinal canine lymphomas are rare but have a fair prognosis with median survival times from 14 to 20 months[19,20].

Cutaneous lymphoma

The prognosis of cutaneous lymphoma is generally good with long survivals but depends on the extension of the disease and treatment response[21]. Cases diagnosed with localized lesions, specially mucocutaneous lymphoma, have a better prognosis (median survival 850 days) compared with cases with multiple lesions or lesions of the haired skin (median survival 240 days). When treated, cases achieving a complete remission live longer (median survival 400 days) than cases without response (110 days). Treatment is usually based on lomustine, but for cases that do not respond isotretinoin can be used also[22] with a response rate of 58%. Oclacitinib has been used as a treatment for this form of lymphoma. In dogs with localized lymphoma lesions, radiation therapy maybe of benefit to control clinical signs.

Splenic lymphoma

Occasionally the spleen is the only organ involved. Splenic marginal zone lymphoma is an indolent type of B-cell lymphoma with a good prognosis even when are treated only with surgery. A study with 34 dogs[23] showed a median survival time of 383 days. Cases that were asymptomatic lived longer (1,153 days) that dose with clinical signs secondary to the lymphoma (309 days). Other factors as lymph node involvement, hemoabdomen or the use of chemotherapy did not have an impact on prognosis.

Hepatosplenic lymphoma

This uncommon presentation of T-cell lymphomas has a poor prognosis with most cases having a survival of only days to weeks[24,25]. It has two different clinical presentations but prognosis is poor for both[26]. No effective treatments have been reported to date.

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FELINE LYMPHOMA- FREQUENTLY ASKED QUESTIONS.

Antonio Giuliano[1], *Ann Hohenhaus*[2]

[1]*Jockey Club College of Veterinary Medicine, City University of Hong Kong, Department Of Veterinary Clinical Sciences,, kowloon, Hong Kong PRC,* [2]*Animal Medical Center, Oncology, New York City, United States of America*

Qualifications:

Dr. Antonio Giuliano,

DVM , MS, PgCert(CT), GpCert(SAM) Dip. ECVIM(Oncology), MRCVS

agiulian@cityu.edu.hk

How has lymphoma changed over the last three decades

Since the mid-1980s, the major change especially in USA and EU a has been the decline of FeLV+ cases of lymphoma which was associated with many cases of multicentric and mediastinal lymphoma.[1] However in other countries like Brazil FeLV related lymphoma is still high[2]. Opposite of the decline of FeLV+ lymphoma, FeLV- lymphoma of the gastrointestinal tract has dramatically increased. The indolent small cell gastrointestinal lymphoma was described in the early 2000s as a separate entity from the rapidly progressive large cell gastrointestinal lymphoma.[3]

What hasn't changed in feline lymphoma?

The chemotherapy drugs used in the treatment of feline lymphoma have not changed much since chemotherapy protocols were first reported 30 years ago. Cyclophosphamide, vincristine, glucocorticoids and later doxorubicin was added to chemotherapy protocols. Because treatment has not changed, the prognosis and survival time are also unchanged except for cats diagnosed with nasal and small cell gastrointestinal lymphoma.

What is the difference between small cell and large cell lymphoma?

Valli et al described over 600 cases of feline lymphoma and found in the intestinal tract a predominance of lymphoma cells about the same size as a red blood cell.[3] These cells invaded the mucosa and submucosa, but did not typically form a mass like is found in feline large cell intestinal lymphoma. Several clinical papers followed showing prolonged survival of these cats with minimal treatment compared to traditional multiagent chemotherapy protocols.[4]

Is surgery indicated for the treatment of intestinal lymphoma?

This question is difficult to answer. The answer would require a randomized controlled clinical trial where some cats are allocated to a group that receives only chemotherapy and another that has their intestinal mass removed and then receives chemotherapy. Since that is not likely to happen, we rely on retrospective data. Once concern is if chemotherapy is successful and kills the tumor cells, will the intestinal wall perforate? Every oncologist has seen one or two cases perforate following chemotherapy, but in a study compiling cases from three speciality clinics, only 4 cases were identified. Perforation can also occur at presentation, due to the cancer growth and necrosis, before any administration of chemotherapy. Anecdotal reports indicate some cats have longer survivals following resection and anastomosis from intestinal lymphoma, but surgery is not curative.[5]

What is the best treatment for feline lymphoma?

This is the question that has no answer. What is clear from the available studies is single agent doxorubicin is not effective in feline lymphoma like it is in canine lymphoma.[6] The other point that is clear is that small cell gastrointestinal lymphoma needs much less treatment than large cell gastrointestinal lymphoma, but the optimal treatment for small cell gastrointestinal lymphoma has not been defined.4 Whether COP or CHOP should be the standard of care in cats is unknown.[7,8] Assessment of the data is complicated by the fact that many of the studies analyzing these two protocols have included both small and large cell lymphoma as discussed above, the prognosis of these two forms of lymphoma are vastly different. A limited amount of data suggests radiation therapy may be useful in relapse abdominal lymphoma.

What is the prognosis for large-cell lymphoma?

The main prognostic indicator for large cell lymphoma is the response to treatment. Cats achieving a complete response can enjoy a good quality of life (considering all forms of lymphoma) for an average of 9–12 months, with some cases living longer than 2 years.[7,8] Cats not achieving response and progressive disease live only days to weeks, while cats achieving partial response live only a few months.[7,8] Another important prognostic factor is the type or location of the lymphoma. Cats with nasal tumors can live longer than 2 years, while cats with CNS lymphoma only live for days or weeks.[8,9] However, the location is often influenced by the response rate, and cats with nasal or mediastinal forms tend to live longer but also achieve a high complete response rate compared to other forms. Some specific types of lymphoma, like large granular cell lymphoma, tend to also have a low response rate and poor survival.[11]

How do cat owners feel about chemotherapy in their cats?

Cat owners are generally positive about their experiences with chemotherapy in their cats. Over 80% would give chemotherapy to another cat if needed. About 70% felt chemotherapy improved their cat's quality of life. Owners define a good quality of life as a good appetite during chemotherapy treatment. Over 90% expected toxicity from chemotherapy.[12,13]These last two pieces of information indicate veterinarians must address their plan to manage chemotherapy induced anorexia to meet owner expectations regarding quality of life.

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MANAGEMENT AND DIAGNOSIS OF FELINE SMALL CELL LYMPHOMA.

Antonio Giuliano[1], *Ann Hohenhaus*[2]

[1]*Jockey Club College of Veterinary Medicine, City University of Hong Kong, Department Of Veterinary Clinical Sciences,, kowloon, Hong Kong PRC,* [2]*Animal Medical Center, Oncology, New York City, United States of America*

Qualifications:

Dr. Antonio Giuliano,

DVM ,MS, PgCert(CT), GpCert(SAM) Dip. ECVIM(Oncology), MRCVS

agiulian@cityu.edu.hk

Disease evolution

In the feline leukemia virus era which occurred prior to the mid 1980's, most lymphoma was found in young cats and involved the cranial mediastinum. With the advent of FeLV testing and vaccination programs, gastrointestinal lymphoma has become the most common form of feline lymphoma. Around 2000, several research publications identified a cluster of lymphoma in the small intestine composed of small lymphocytes infiltrating the intestinal wall.[1,2,3] This lymphoma was slowly progressive and minimal treatment appeared to result in prolonged survival.[4]

Small cell gastrointestinal lymphoma

Multiple terms have been used to describe small cell gastrointestinal lymphoma

:

Small cell GI lymphoma

SCGL

Low grade alimentary lymphoma

Mucosal [T cell] lymphoma

Intestinal small cell lymphoma

Intestinal T cell lymphoma

Epitheliotrophic small T cell lymphoma

Enteropathy associated T cell lymphoma type II

EATL II or EATL 2

Based on a recent publication from Japan, small cell gastrointestinal lymphoma currently appears to be the most common form of feline lymphoma.[5]

Clinical presentation

The typical cat with small cell gastrointestinal lymphoma has a median age of 12y and there may be a male predilection for the disease. The clinical signs of small cell gastrointestinal lymphoma are vague and nonspecific. The clinical signs of small cell gastrointestinal lymphoma also mimic signs of common feline diseases such a chronic kidney disease, hyperthryroidism, pancreatitis and inflammatory bowel disease.

Clinical signs: **56 cats small cell gastrointestinal lymphoma Pope 20156**	
Vomiting	24%
Weight loss	21%
Anorexia	20%
Diarrhea	10%
Lethargy	9%
Increased LEs	5%

Physical examination will reveal weight loss and possibly thick GI loops and rarely abdominal mass, commonly mild to moderately enlarged lymph nodes.

Diagnostic Evaluation

The purpose of the diagnostic evaluation of a cat suspected to have small cell gastrointestinal lymphoma is three fold:

Rule out common causes of clinical signs

Intestinal parasites

CKD

Hyperthyroidism

Pancreatic disease

Provide supporting evidence of a diagnosis of small cell gastrointestinal lymphoma

Obtain a definitive diagnosis of small cell gastrointestinal lymphoma

Components of a diagnostic evaluation

CBC

Biochemical profile

Urinalysis

T4

Fecal

Trypsin like immunoreactivity

Feline pancreatic lipase

B12, folate

Retroviral testing

Diagnostic imaging

Histopathology

Immunohistochemistry IHC)

PCR for Antigen Receptor Rearrangement (PARR)

Obtaining a biopsy

Tissue samples adequate to diagnose small cell gastrointestinal lymphoma can be obtained via endoscopy, laparoscopy or exploratory laparotomy. The key to making a diagnosis is to sample as many segments of the bowel as possible since small cell gastrointestinal lymphoma is not uniformly distributed throughout the intestine. Most common locations are jejunum and ileum. The jejunum cannot be reached via endoscopy. Thus, if endoscopy is used to obtain biopsies, both upper and lower intestine should be biopsied. Endoscopic biopsy's primary drawback is the superficial sample that is obtained. Early lymphoma may go misdiagnosed since the majority of these lymphomas originate from the muscularis layers and endoscopic biopsy frequently only collect mucosal tissue. The diagnostic precision of endoscopic biopsies is also constrained by small sample sizes and crash artifacts. While veterinarians worry about post-operative complications from intestinal biopsies in cats with intestinal neoplasia, reports of complications are uncommon.[7]

Interpreting the biopsy

In some cats, routine H&E staining will be sufficient to differentiate inflammatory bowel disease from small cell gastrointestinal lymphoma. In others, the pathologist will recommend additional testing usingIHC and/or PARR. PARR does not determine phenotype, but instead identifies clonal rearrangements of the T cell receptor gamma gene or the immunoglobulin heavy chain gene. Clonal or oligoclonal rearrangements of the T cell receptor gamma gene are found in small cell gastrointestinal lymphoma, but often not in inflammatory bowel disease.

Treatment of small cell gastrointestinal lymphoma

The goals of treatment are twofold.

Treat the lymphoma

Manage associated conditions such as pancreatitis, microbiome changes, hypocobalaminemia, hypereosinophillia

The optimal treatment for small cell gastrointestinal lymphoma is unknown but by convention, prednis(ol)one and chlorambucil are administered. Current wisdom on treatment suggests a 12 month course of therapy.[6] If the small cell gastrointestinal lymphoma appears to be in remission, then a drug holiday is prescribed with careful monitoring and treatment again at the time of relapse.

Chlorambucil is traditional chemotherapy drug of the alkylating agent class. Administration to cats has been associated with bone marrow suppression, including irreversible thrombocytopenia, Fanconi syndrome and myoclonus. Glucocorticoid therapy has been associated with an increased risk of infection, diabetes and congestive heart failure. Compounded chlorambucil is not recommended unless no other treatment options are available.[8]

Optimal dosing of chlorambucil and prednisone have not been studied. Common doses of chlorambucil include 1.4 mg/kg given q 14 days or divided over 2-3 days per week. A dose of 20 mg/m^2 q 14 days, 4 mg x m^2 once daily or every other day or simply 2 mg tablet 2-3 times per week have also been recommended.[1,2,3] A CBC should be monitored every 4-6 weeks while the cat is being treated with chlorambucil with particular attention paid to the platelet count. Biochemical profile should be monitored approximately every 3 months unless the clinical condition requires more frequent monitoring. Consideration should be given to monitoring B12 and abdominal ultrasound every 6 months for monitor response to therapy and define remission.

Remission and survival

Defining remission is difficult in small cell gastrointestinal lymphoma and is based on resolution of clinical signs, weight gain and resolution of intestinal thickening or lymphadenopathy based on palpation or ultrasound. Cats that have resolution of clinical signs are the cats most likely to have prolonged survival. Reports of median survival typically exceed 2 years.[1,2,3,6]

Management of Relapse

Because common feline diseases can mimic relapse of small cell gastrointestinal lymphoma, recognition of relapse can be complicated. When clinical signs recur or diagnostic testing reveal relapse, chemotherapy is reinstituted. Many cats on a drug holiday will respond to chlorambucil a second time. Oral cyclophosphamide and lomustine have also been used in relapsed cases. The ultimate cause of death in cats diagnosed with small cell gastrointestinal lymphoma is more often than not a second tumor, another chronic feline disease and much less often small cell gastrointestinal lymphoma.

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HEALTHY PETS, HEALTHIER COMMUNITY - BUILDING CAPACITY IN LOW-INCOME COMMUNITIES OF SOUTH AFRICA

Katherine Polak, *Amit Chaudhari*

Humane Society International, Companion Animals & Engagement, Washington DC, United States of America

Qualifications:

Katherine Polak, DVM, MPH, MS, DACVPM, DABVP (Shelter Medicine Practice)

Humane Society International, Washington DC, US, kpolak@hsi.org

Amit Chaudhari, BVSc

Humane Society International, Washington DC, US, achaudhari@hsi.org

INTRODUCTION

The African continent is home to 54 countries, many of which face challenges related to free-roaming dogs. These dogs, often found wandering the streets, suffer from poor nutrition, communicable diseases, injuries, and neglect. While formal suburbs and cities in South Africa exhibit pet ownership patterns similar to those in Europe and North America with many owners embracing their pets as family members kept inside the home, informal settlements across the country have significant populations of free roaming dogs. There are many negative outcomes associated with such free-roaming community dogs, including dog bites, environmental pollution, cruelty, and commercial exploitation.

Despite efforts of local animal welfare organizations, dogs and cats in South Africa suffer from a multitude of welfare issues including but not limited to overbreeding, starvation, accidents, fighting, disease, parasitic infections, inadequate housing, intentional abuse, and general neglect. Due to the scarcity of suitable homes, tens of thousands of healthy animals are euthanized annually in South African animal shelters. Deliberate acts of cruelty towards animals often go unreported and unpunished. Neglect of basic care standards, such as shelter and physical welfare, is prevalent in many communities leading to avoidable suffering. Additionally, unmanaged dog populations in urban areas pose risks to people, including possible zoonotic disease transmission, dog bites, and injuries from animal-related incidents. Moreover, the presence of sick and injured animals in communities can normalize poor animal welfare condition and suboptimal animal care practices.

DEVELOPING AN EVIDENCE-BASED COMPANION ANIMAL WELFARE PROGRAM

The implementation of a scientific and evidence-based program aimed at improving the welfare of cats and dogs begins with obtaining baseline information in a systematic way. Before any intervention is developed, information on the target animal population, the community, and dynamics between companion animals and people must be assessed. This helps foster a detailed understanding the local pet ownership culture and issues facing companion animals, which can vary dramatically from community to community. Data can be collected through Knowledge, Attitude, and Practice (KAP) surveys of pet owners, and surveys of both owned and free-roaming dogs and cats to estimate of the total numbers of animals present. KAP surveys specifically can help identify knowledge gaps and behavioural patterns among different sociodemographic groups towards animals that many need to addressed by the animal welfare intervention.

ASSESSING SURVEY RESULTS

In June 2022, international NGO Humane Society International conducted baseline surveys to guide the planning of an intervention in South Africa to improve the welfare of dogs and cats. A household KAP questionnaire and a street count of free-roaming dogs was performed in two towns (Bredasdorp and Struisbaai), located in Cape Agulhas Municipality, the southernmost province in South Africa. This area was chosen as a possible program site because of the animal welfare need, coupled with the presence of motivated stakeholders interested in improving animal welfare.

The survey revealed varying dog and cat ownership practices at each site, with dog ownership being more common (59% of respondents) compared to cat ownership (32% of respondents). In terms of reasons for owning a dog, respondents in the areas of Bredasdorp East and Struisbaai North were more likely to cite personal protection as a motive for owning a dog, in addition to companionship. These two sites were also home to a significant number of free-roaming dogs. In Bredasdorp East and Struisbaai North as compared to Struisbaai Town and Bredasdorp West, which are higher income communities, the percentage of sterilized dogs was lower and dogs tended to be younger. Average dog age and sterilization rates are important indicators of dog population turnover, spay/neuter accessibility, and general animal keeping practices.

The surveys also identified animal welfare issues including frequent tethering of dogs, malnourishment, lack of available spay/neuter services, and tick infestations of individual animals. Identification of these issues is important to help determine the most impactful programmatic activities that should be considered as part of a wider initiative.

Based on the survey results, the estimated owned dog population across all four sites was approximately 7,000 dogs, which is important for understanding the need for spay/neuter services.

PROGRAM DESIGN

In an effort to create sustainable change and serve as a model for other municipalities in South Africa, a comprehensive animal welfare program was developed. The program aimed to deliver the following:

Low-cost veterinary services. Similar to many communities around the world, affordable and accessible veterinary services are lacking. As a result, many sick and injured animals end up in shelters or go untreated. To address this need, periodic high-volume spay-neuter clinics can provide desperately needed access to surgical and treatment services. Giving priority to female dogs for sterilization is a wise use of limited resources, from a dog population management perspective. Despite field-like conditions, mobile spay/neuter clinics were designed to ensure high-quality high-volume services through ensuring surgical sterility, use of gas anaesthesia, multimodal pain management, and tattooing every animal following spay/neuter surgery for permanent identification. In addition to mobile surgical clinics, animal health days in the community were designed to help reach animals in need of preventive care and provide treatment for flea and tick infestations.

Humane education. There in increasing recognition of the role education and community engagement plays in improving animal welfare. Research has shown that humane education has a wide range of positive social and educational outcomes. A Training of the Trainers (ToT) model was developed to create a pool of competent instructors at local schools who can then teach animal welfare material to other teachers and students, creating broader reach.

Law enforcement training and municipal by-law reform. Strengthening companion animal-specific laws and training law enforcement officials is essential to prevent animal cruelty. Advocating for regulatory provisions that control the breeding of companion animals, whether for profit or as a result of unwanted pregnancies is a critical part of the program.

Ongoing monitoring and evaluation. Implementing robust monitoring and evaluation systems allows NGOs to assess the impact of their programs, identify areas for improvement, and make data-driven decisions. By collecting and analysing accurate data on program outcomes, NGOs

can determine their progress toward achieving targets and adapt their strategies accordingly

STAKEHOLDER ENGAGEMENT

To ensure long-term programmatic success and impact, strategic approaches must be employed that promote sustainability and empower local stakeholders as champions of the program. Building collaborative partnerships is essential to leverage resources, knowledge, and expertise, to help animals most effectively. By partnering with relevant government agencies, local communities, and other animal welfare charities, organizations can maximize their resources and impact. In South Africa, the Healthy Pets, Healthier Community program aims to support the efforts of local animal welfare and humane education organizations, while working with local law enforcement and the public to promote humane animal welfare practices, ensuring that interventions have a long-term impact.

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MULTIDISCIPLINARY CASE DISCUSSION: WHEN AND HOW TO USE ANTIBIOTICS IN DOGS AND CATS WITH SKIN DISEASES (PART 1)

Susan Paterson[1], *Luca Guardabassi*[2]

[1]*Virtual Vet Derms, Vet Derm, New Hutton Kendal, United Kingdom,* [2]*University of Copenhagen, Veterinary And Animal Science, Frederiksberg, Denmark*

Qualifications:

Susan Paterson, MA Vet MB DVD Dip ECVD FRCVS

spatersonvetmb1959@btinternet.com

Luca Guardabassi, DVM, PhD, ECVM

lg@sund.ku.dk

The frequency of infections that are resistant to first line antimicrobials and require last resort treatments has significantly increased in recent years. At the same time the discovery of new antimicrobials has significantly slowed down and the few drugs that may be discovered in the years to come will be reserved for human use. Therefore, preserving the efficacy of the current arsenal of veterinary antimicrobials has become of paramount importance. This requires veterinarians to prescribe, dispense and use antimicrobial products appropriately and minimize the use of systemic antibiotics, as their use reduces their efficacy over time favouring selection of resistant strains. Various guidelines have been published over the last years detailing appropriate protocols for the use of systemic antibiotics in dermatology (1-3). Important steps in conscientious antibiotic stewardship include:

Confirm if infection is present

Identify the causative pathogen

Decide if systemic antibiotics are necessary

Prescribe antibiotics based on guidelines or culture and sensitivity

Treat any underlying disease process to prevent recurrence of infection.

During this multidisciplinary discussion, a dermatologist and a microbiologist will duet using a series of clinical cases to compare their views on the use of antibiotics in canine and feline skin infections. The first part is dedicated to diagnosis of infection (bullets 1-2). The learning objectives are i) to correctly diagnose infection using clinical signs, cytology and culture, and ii) to understand the limitations of culture and susceptibility testing.

1. Confirm if infection is present Traditionally pyoderma has been classified based on the depth of infection as either surface, superficial or deep. Although the clinical signs may be highly suggestive of infection, there are numerous non-infectious dermatological diseases that can mimic pyoderma. A definitive diagnosis should therefore be made using cytology and where necessary bacterial culture and antibiotic sensitivity testing (e.g. presence of Gram-negative rods by cytology)(2). Systemic antibiotics should never be prescribed on the basis of clinical signs alone.

The four principal cytological techniques to identify infection are adhesive tape strips; direct impression smears, indirect impression smears and fine needle aspirates see Table 1.

Table 1. Diagnostic techniques for pyoderma

Techniques	Methodology	Indications
Adhesive tape strip	A clear, good quality adhesive tape (Scotch 5-M) is applied to lesional skin using firm digital pressure. Tape stained with modified Wright-Giemsa stain e.g. Rapi-Diff/Diff-Quik. Use eosinophilic and basophilic stains on tape strip, all 3 stains on others. After staining place tape adhesive side down on slide to examine.	Greasy, dry, erosive lesions e.g. intertrigo.
Direct impression smear	Apply firm downward pressure with a clean microscope slide onto the lesion. Air dry the slide and stain (see above)	Moist lesions e.g. erosions, papules, pustule and underside of crust.
Indirect impression smear	Collect material from lesion using a cotton bud, spatula or scalpel blade. Roll material gently along the slide, air dry and stain (see above)	
Fine needle aspirate	Insert a 21 gauge needle attached to a 2ml syringe into mass. Aspirate material using continuous gentle suction whilst repositioning the needle within mass. Remove needle, pull plunger out to fill the syringe with air. Reattach needle and expel material onto clean slide. Smear, air dry and stain (as above)	Cutaneous masses and and enlarged lymph nodes.

2. Identify the causative organism

Cytology is a key test for ascertaining the presence of bacteria, whether there is an inflammatory infiltrate and the type of inflammatory infiltrate that is present. Where a Wright-Giemsa stain is used, it is impossible to differentiate Gram negative from Gram positive organisms, therefore identification at this stage can only be made on the basis of morphology (i.e. cocci or rods). Only culture can provide this information along with the strain's antimicrobial susceptibility profile. Susceptibility testing is the only diagnostic approach available to predict the clinical outcome of antibiotic treatment.

Several recommendations have been made regarding how often clinical specimens should be sent to the diagnostic microbiology laboratory for culture and sensitivity testing. Beco et al. (2013) suggest that empirical systemic therapy for infection may be considered when specific criteria are met (e.g. non-life-threatening infection; first episode of skin disease; clinical lesions consistent with a surfaced or superficial pyoderma; cytology consistent with a staphylococcal pyoderma and no reason to suspect antibiotic resistance). Others claim that routine culture and susceptibility testing has become a necessity when systemic therapy is required. This is due to high frequency of resistance towards the two classes of first line antibiotics recommended for treatment of pyoderma, lincosamides and penicillase-resistant β-lactams (e.g. amoxicillin clavulanate and first generation cephalosporins), which makes prediction of treatment outcome extremely virtually impossible without the support of this diagnostic tool. In settings with low MRSP prevalence, regular susceptibility testing would enable to maximize the use of lincosamides, thereby minimizing MRSP selection by extensive use of β-lactams. Additionally, regular susceptibility testing is instrumental for implementing antimicrobial stewardship programs at the clinic level. During the session, insights into the cases will be used to show the

validity of this diagnostic approach in both settings with low and high prevalence of MRSP.

Despite its usefulness in clinical practice, *in vitro* susceptibility testing has intrinsic limitations that should be considered when evaluating treatment outcome, for example if the clinical conditions of the patient improve after initiation of empirical therapy despite the laboratory reported the suspected causative strain as resistant to the antibiotic selected for therapy. As any other *in vitro* tests, susceptibility tests do not consider *in vivo* factors that influence the outcome of antimicrobial therapy such as the host immune response, presence of co-morbidities, strain virulence, drug administration route and dosage as well as compliance. This is why infections caused by strains categorized as susceptible are associated with a small percentage of treatment failure due to lack of clinical cure (approximately 10%). Similarly, the resistant category does not unequivocally predict treatment failure but a reduction of therapeutic success with a cure rate up to 60%. This is referred to as the "90–60% rule". Based on this rule, it is generally recommended to evaluate the clinical outcome of therapy before changing antibiotic prescription.

The long turnaround time (at least 48 h) and the additional cost incurred to pet owners for this laboratory analysis are a major disincentive for the use of bacterial culture and susceptibility testing in small animal veterinary practice. According to a European survey among small animal practitioners (n=3,004), cheaper testing and rapid results are the two main factors that would increase use of susceptibility testing according to 73% and 68% of the respondents, respectively (4). The high price (EUR 100-300) of susceptibility tests is largely due to the markup applied by clinics. We need to make the price affordable by pet owners. The lack of profit derived from a substantial reduction of the markup would be compensated by an increase in the volume of samples. One possible solution to reduce turnaround times and costs is the use of Point-of-Care (PoC) tests, which are rapid diagnostic tests that can be performed in the clinic without the need for culture (5). The main disadvantages associated with direct AST on clinical specimens is that the inoculum might be polymicrobial, leading to problems in the interpretation of the results and possible false resistance reporting. The risk of sample contamination with commensal bacteria can be mitigated by collecting specimens from intact pustules or underneath crusts, or in the event of deep pyoderma, deep sampling from draining fistulas, as recommended by current guidelines (1-3). On the other hand, PoC tests may be useful for rapid detection of negative samples and susceptible strains, avoiding the time and the cost of laboratory analysis.

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MULTIDISCIPLINARY CASE DISCUSSION: WHEN AND HOW TO USE ANTIBIOTICS IN DOGS AND CATS WITH SKIN DISEASES (PART 2)

Susan Paterson[1], *Luca Guardabassi*[2]

[1]*Virtual Vet Derms, Vet Derm, New Hutton Kendal, United Kingdom,* [2]*University of Copenhagen, Veterinary And Animal Science, Frederiksberg, Denmark*

Qualifications:

Susan Paterson, MA VetMB DVD DipECVD FRCVS

spatersonvetmb1959@btinternet.com

Luca Guardabassi, DVM, PhD, ECVM

lg@sund.ku.dk

The frequency of infections that are resistant to first line antimicrobials and require last resort treatments has significantly increased in recent years. At the same time the discovery of new antimicrobials has significantly slowed down and the few drugs that may be discovered in the years to come will be reserved for human use. Therefore, preserving the efficacy of the current arsenal of veterinary antimicrobials has become of paramount importance. This requires veterinarians to prescribe, dispense and use antimicrobial products appropriately and minimize the use of systemic antibiotics, as their use reduces their efficacy over time favouring selection of resistant strains. Various guidelines have been published over the last years detailing appropriate protocols for the use of systemic antibiotics in dermatology (1-3). Important steps in conscientious antibiotic stewardship include:

1) Confirm if infection is present

2) Identify the causative pathogen

3) Decide if systemic antibiotics are necessary

4) Prescribe antibiotics based on guidelines or culture and sensitivity

5) Treat any underlying disease process to prevent recurrence of infection.

During this multidisciplinary discussion, a dermatologist and a microbiologist will duet using a series of clinical cases to compare their views on the use of antibiotics in canine and feline skin infections. The second part is dedicated to therapy of infection (bullets 3-5). The learning objectives are i) to understand how to implement rational antimicrobial use in veterinary dermatology including decision making around topical versus systemic therapy, and ii) to raise awareness of the latest guidelines and policies on the use of antimicrobials in companion animals.

3. Decide if systemic antibiotics are necessary

Topical therapy is recommended for all types of pyoderma. After cytology has established that a pyoderma is present, the clinician must decide if therapy should be limited to topical products or complemented with systemic antibiotics. Topical products containing antiseptics or antibiotics can be used as the sole form of treatment in surface pyoderma and in most cases of localised and generalised superficial infections. In cases of deep pyoderma, topical antimicrobials should be used as adjunct therapy to accelerate the process of clinical resolution and reduce the duration of systemic therapy. Systemic antibiotics are only recommended for deep pyoderma or in rare cases of superficial pyoderma where topical therapy alone has shown not to be effective or is not feasible due to owner or patient limitations. Three weeks of topical antimicrobial therapy are recommended before response to treatment is assessed.

A wide range of topical products are available. Shampoo therapy is most suitable for treatment of widespread lesions or larger body areas, whereas sprays, foams, ointments, wipes and creams are suitable for localised lesions, typically recommended for use 1-2 times daily. The most common ingredients of topical antiseptic products include acetic acid, benzoyl peroxide, chlorhexidine, ethyl lactate, hypochlorous acid and sodium hypochlorite (1, 2). Chlorhexidine has been shown to have good residual effects when used topically and at concentrations of between 2-4% has a broad-spectrum activity (3). Hypochlorous acid has also recently been shown to be useful in the management of both Gram negative and positive infections.

4. Prescribe antibiotics based on guidelines or culture and sensitivity

When systemic therapy is needed, the antibiotic should be selected according to national or international guidelines (4-5), and preferably guided by the results of antimicrobial susceptibility tests, especially in areas with high prevalence of methicillin-resistant Staphylococcus pseudintermedius (MRSP) or in dogs with a history of previous systemic antimicrobial treatment. Staphylococcus susceptibility testing can also be usefully performed when antibiotics are prescribed empirically to verify if the target pathogen is not resistant to the prescribed antibiotic and to adjust therapy if necessary. For empirical treatment, the antibiotics of first choice are lincosamides (e.g. clindamycin), first generation cephalosporins (e.g. cefalexin) and amoxicillin clavulanate, all of which have an excellent antimicrobial activity against the most common causative agent in canine pyoderma, Staphylococcus pseudintermedius. Ideally, lincosamides should be preferred to reduce the risk of MRSP selection since MRSP are by definition resistant to β-lactams such as first generation cephalosporins and amoxicillin clavulanate. Critically important antibiotics such as 3rd and 4th generation cephalosporins (e.g. cefovecin and cefpodoxime) and fluoroquinolones (e.g. enrofloxacin and marbofloxacin) should only be prescribed when susceptibility test show they are the only effective veterinary drugs available for treatment (4).

Empirical antibiotic selection for systemic therapy is always contraindicated when MRSP infection is suspected based on historical factors due to the typical multidrug resistance profile of these bacteria (6). Possible choices to manage MRSP infections include doxycycline and potentiated sulfonamides, antibiotics with inconvenient administration interval (td) such as chloramphenicol, or more toxic drugs such as rifampicin and gentamicin. Human reserve antibiotics such as linezolid, fosfomycin and vancomycin have been recently restricted to human use only in the EU (7) and should never be used unless the infection cannot be managed otherwise. Although MRSP are defined as resistant to all veterinary β-lactams, a recent study has shown that MRSP infections caused by strains with low MIC of oxacillin can be successfully treated with cefalexin or amoxicillin clavulanate (8). Effective management of these infections with β-lactams can have positive public and animal health consequences as it addresses the shortage of effective systemic antimicrobials for managing severe MRSP infections, while reducing the use of toxic, inconvenient, or critically important antimicrobials.

The latest recommendations regarding duration of systemic therapy indicate 2 weeks for superficial pyoderma and 3 weeks for deep pyoderma, followed by re-evaluation to establish whether an appropriate therapeutic response has occurred or whether treatment should be extended or changed. Systemic antimicrobial therapy can be stopped when skin lesions associated with infection have resolved or when progress has plateaued, and resolution of infection can be confirmed cytologically. There is no evidence to support extending systemic antimicrobial therapy beyond clinical resolution. Any antibiotic used beyond this point only promotes the selection of antimicrobial resistance without providing any benefit to the patient.

5. Treat any underlying disease

Diagnostic investigations into underlying primary causes should be initiated as early as possible as their correction ensure speedy cure and contribute to prevent recurrence of infection. The most common

primary causes for canine pyoderma include trauma (e.g. abrasions, cuts), ectoparasite infestations (e.g. fleas; mites), allergic skin disease (e.g. atopic dermatitis) and endocrinopathies (e.g. hypothyroidism; hyperadrenocorticism). If a cause cannot be identified, repeated diagnostic testing should be considered every 6-12 months.

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CHOOSING THE BEST DIET WHEN YOU SUSPECT A CUTANEOUS ADVERSE FOOD REACTION IN CATS

Cecilia Villaverde

Expert Pet Nutrition, Clinical Consultant, Fermoy, Ireland

Qualifications:

Cecilia Villaverde

BVSc, PhD, DACVIM (Nutrition), DECVCN

cvillaverde@expertpetnutrition.com

Adequate nutritional management is very important in cats with dermatologic conditions, to ensure healthy skin and a functioning barrier function. Defects in this barrier are one of the factors associated with atopic dermatitis (AD), in humans and rodent models although data is still limited in dogs[1,2] and cats.

The skin is the largest organ in the body and it has a high turnover rate. As a result, several nutrient deficiencies manifest in the skin[3,4], such as protein, some amino acids, vitamins (A, B group), minerals (iodine, zinc, copper, etc.), and essential fatty acids omega 6 (linoleic acid). While some studies support that nutritional intervention can contribute to skin barrier improvement in dogs with AD, there is still a lack of evidence in this area in cats. In any case, ensuring the diet is complete and balanced is important to ensure all needed nutrients for skin health are present.

In cats with non-seasonal pruritus, a dietary elimination and challenge trial is the gold standard to rule in or out cutaneous adverse food reactions (CAFR)[5] (Figure 1). The elimination trial consists of feeding diets with reduced allergenicity (that the pet has never been exposed to). This diet should be fed exclusively for at least 12 weeks and care should be taken to avoid other sources of potential antigens, such as treats, table scraps, flavoured medications, etc.

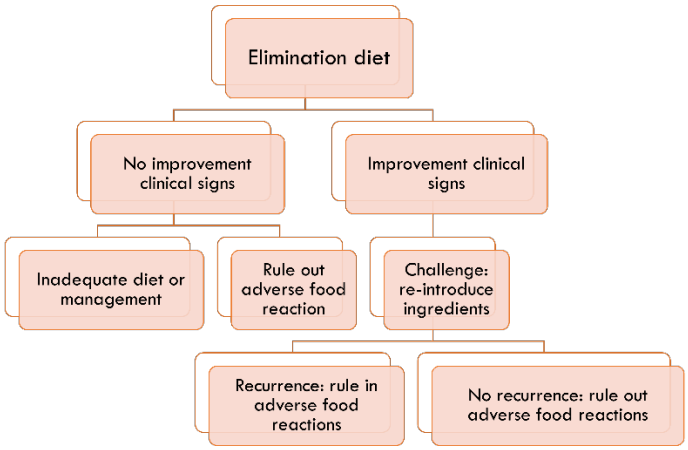
It is important to choose a commercial veterinary diet where the manufacturer checks that there are no undeclared ingredients present, as this can happen[6], and could be attributed to cross contamination.

Elimination diets can be based on uncommon ingredients, to maximize the chance that the diet will be novel for a particular individual. It is important to perform a nutritional evaluation[7], including a diet history, to identify which ingredients might be novel to each patient and be able to identify a commercial diet that would be adequate for the trial. Novel ingredient diets can also be home prepared. These can be complete or not, with the former providing all essential nutrients[4]. Commercial diets tend to be more convenient and, in most cases, more cost-effective. Sometimes a homemade diet might be preferred, in some co-morbidities, or for palatability issues, or to avoid additives. These have associated problems, like cost, time-investment, and nutritional inadequacy issues[8,9]. If used, it is recommended to consult with a veterinary nutrition specialist to obtain a complete customized diet.

The second group of elimination diets are hydrolysed diet[10], where the protein size has been reduced to modify its allergenicity. There are also diets based on amino acids that follow the same principle. These diets are only commercially available, and have some benefits, including that they are a good option when the diet history is unknown, and identifying a novel ingredient is not possible.

If the patient improves with the elimination diet, then a challenge with previous ingredients should be performed to both confirm the CAFR and identify the triggers. Then, a long-term diet must be chosen, avoiding those triggers. The elimination diet, if complete, can be used for long term management. Many elimination diets are complete and include other strategies that can enhance barrier function (like omega 6 fatty acids) and omega 3 fatty acids, which can help manage inflammation.

Figure 1: elimination and challenge dietary trial



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CANINE LYMPHOMA- TYPES AND DIAGNOSIS.

Martin Soberano, *Natalia Ignatenko*

Red Oncológica Veterinaria CRABA, Oncology, Ciudad de México, Mexico

Qualifications:

Dr. Martin Soberano, DVM

martinsoberano@hotmail. com

Dr. Natalia Ignatenko, DVM

natali.ignatenko@gmail.com

Canine lymphoma types and diagnosis

N.Ignatenko, M.Soberano.

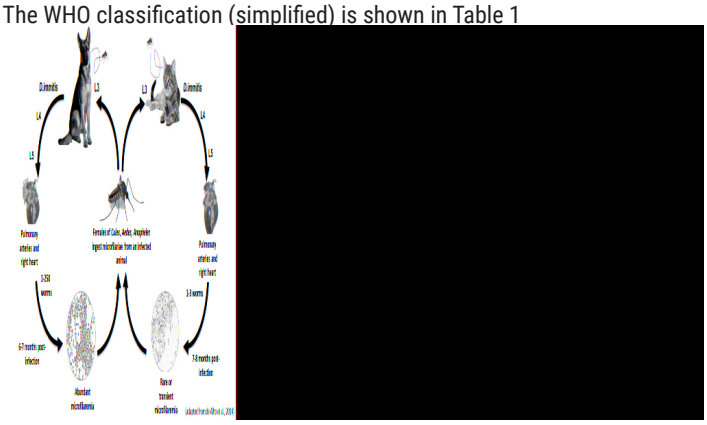
Lymphoma in dogs, on the one hand, is the most studied oncological pathology, in which chemotherapy is most often performed by veterinarians around the world. But, on the other hand, hand on heart, we can answer that when treating our patients in the 21st century, we still often focus only on cytological examination in making a diagnosis and consider the response to chemotherapy to be decisive for the prognosis.

Key points: Lymphoma is not a single disease, but a whole group of heterogeneous diseases with different morphological structure, clinical manifestations, response to therapy and prognosis.

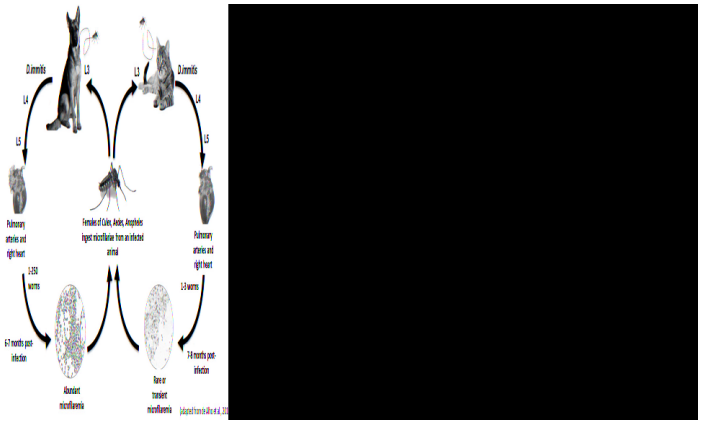
Veterinary classification

There have been multiple attempts to classify lymphomas along the lines of medical classifications (NCI-WF, Kiel, modified Kiel, and others), but none of the classifications had advantages in determining prognostic criteria, which is one of the main goals of the classification. The 2001 updated WHO classification of neoplasms of the hematopoietic system and lymphoid tissues for the first time reached consensus among 20 leading pathologists from Europe, Asia and America with a comparability of more than 80%. Understanding the subtypes of lymphoma allows us as clinicians to choose the best treatment option and have better prognosis information.

The WHO classification (simplified) is shown in Table 1



In Table 2, we can see how life expectancy differs in dogs with different types of lymphoma.



Diagnostic:

What do we use for diagnosis?

Cytological examination of fine-needle aspirates of lymph nodes. The most common form of lymphoma in dogs is multicentric (by anatomical characteristics) diffuse large B-cell (morphologically) form of lymphoma, the cytological diagnosis of which is not difficult for an experienced clinical pathologist. The advantage of the method: fast, inexpensive, in most cases does not require sedation for the selection of material.

Disadvantages: not all types of lymphomas can be diagnosed (for example, small cell or intermediate cell lymphomas)

Immunocytochemical investigation is an inexpensive minimally invasive diagnostic method, the material can be a fine-needle material taken earlier for cytological diagnostics, which in some cases makes it possible to differentiate B and T-cell lymphomas. However, it is not a method confirming the diagnosis of lymphoma. It is not a test to differentiate a reactive lymph node from a neoplastic lesion.

Histological examination: Some types of lymphoma, particularly indolent forms (small or intermediated sized) such as T-zone lymphomas, are best diagnosed by histological examination, although an experienced clinical pathologist may suspect them cytologically. For histological examination, it is better to send the entire lymph node, avoiding transverse core biopsies.

Disadvantages: requires general sedation, more expensive, takes more time to diagnose. It does not allow diagnosing all subtypes of lymphoma.

Immunohistochemical examination does not make it possible to make a diagnosis of lymphoma on its own, but, supplementing the histological examination, it allows subclassification of lymphomas.

Flow cytometry: This diagnostic method allows not only to diagnose lymphoma, but also to determine its phenotype.

Advantages: allows to differentiate many types of lymphoma (small cell, T-zone lymphoma, marginal form of lymphoma). Its results are comparable with the immunohistochemical diagnostic method;

Disadvantages: Requires living cells for diagnostic tests.

PARR: This method is used to determine whether lymphocytes originate from one cell clone (neoplastic lymphocytes) or from several - polyclonal (in reactive processes) in the case when cytological or histological examination does not give a definite answer.

Advantages: sensitivity: 70-90%

Disadvantages: false positive results in the case of some infectious diseases: leishmaniasis, borreliosis, ehrlichiosis, as well as in histiocytomas, thymomas and hepatitis due to hypersensitivity to drugs. False-negative results in NK-lymphomas with aberrant lymphoid receptors.

Circulating nucleosome detection: used as a screening test to detect certain types of cancer in a population of healthy animals.

Advantages: nucleosome levels are 6.8 times higher in patients with lymphoma than in healthy dogs. Higher in dogs with B cell lymphoma. The sensitivity of modern methods is 80.2%, the specificity is 94%. In the future, this method is also proposed to be used to assess the state of remission in a patient with lymphoma.

Disadvantages: severe inflammation, sepsis, acute and chronic enteropathies, trauma, IMHA can also cause an increase in the level of circulating nucleosomes.

In addition to morphological classification, anatomical localization also plays a role, for example, with Dogs with multicentric lymphoma respond better to therapy and live longer than dogs with gastrointestinal lymphoma.

The substage of the disease is also important: clinically well animals tolerate chemotherapy better and live longer than patients who do not feel well.

Although we know that achieving remission is possible in both patients with stage 1 and 4 lymphoma, the authors recommend (if owners agree) that patients with lymphoma be staged. This allows not only to find out if there is involvement of internal organs (most often, the spleen and liver), but also to exclude comorbid conditions (other neoplasms, systemic diseases), the presence of which can affect the general well-being of the patient, response to treatment and prognosis for a dog with lymphoma in general.

Therefore, routine tests are useful in patients in whom we suspect lymphoma: a biochemical blood test or complete blood count does not make a diagnosis of lymphomas or suspect cancer, but is very important for assessing the patient's health status in order to choose the optimal protocol, considering possible limitations (chronic renal insufficiency or dysfunction of the liver, the presence of thrombocytopenia, anemia or neutropenia are factors limiting the conduct of chemotherapy. The neutrophils lymphocytes ratio in the complete blood count is of prognostic value in patients with lymphoma.

Imaging diagnostic methods such as abdominal ultrasound and X-ray of the thorax can be not only additional methods for determining the stage of the disease, but help to exclude comorbid conditions. CT is more accurate, but significantly more expensive imaging modality.

A bone marrow biopsy can rule out stage 5 lymphoma with a poor prognosis.

The morphological diagnosis and the stage of the process allow us to choose the best treatment tactics for our patients and have objective information about the prognosis.

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CPR: WHAT IS NEW AND DIFFERENT IN THE 2023 RECOVER GUIDELINES?

Veronica Salazar

Alfonso X El Sabio University, Anesthesia Section, Villanueva de la Canada, Spain

Qualifications:

Verónica Salazar Nussio

LV, MSc, PhD, DipACVAA, DipECVAA, RECOVER Certified Instructor

vsalanus@uax.es

The development of specific, evidence-based clinical recommendations for cardiopulmonary resuscitation (CPR) in human medicine by the International Liaison on Resuscitation (ILCOR) has allowed human health professionals to have consistent and standardized training during the last decades. This has probably contributed to a continuous evolution and improvement of CPR outcomes in human patients over the years. However, in veterinary medicine information with similar characteristics was not available until 2012, since no veterinary clinical recommendations had ever been issued. Therefore, up until 2012, CPR training in veterinary medicine lacked standardization and consensus since there were no veterinary clinical guidelines to be followed.

To fill this gap in veterinary emergency medicine, the Reassessment Campaign on Veterinary Resuscitation (RECOVER) developed the first evidence-based consensus recommendations for CPR in small animals. As a result, 101 clinical recommendations were obtained and published in 2012. The release of the RECOVER 2.0 Guidelines is now expected to take place at the end of 2023.

The goal of this lecture is to emphasize the new features of the 2023 clinical guidelines. Therefore, this preliminary document aims to summarize the most clinically relevant features of the previous 2012 guidelines and to serve as an easily accessible review for the audience.

The ability to quickly diagnose a cardiopulmonary arrest (CPA) in a nonresponsive patient is based on clinical evaluation of unconsciousness, absent spontaneous breathing, and absent pulse. A standardized approach must always be adopted based on the evaluation of the Airway, Breathing (respiration) and Circulation. This initial ABC approach must be quick and systematic. Since the benefits of initiating CPR in CPA patients are significantly greater than the risks of initiating CPR in a non-CPA patient, initiation of CPR as soon as possible is recommended for any suspected CPA patient. If CPA cannot be reliably ruled out, it is recommended to start CPR instead of continuing to try to diagnose CPA. The diagnosis of CPA should not take more than 5-10 seconds.

Basic life support (BLS) should be started as soon as possible once CPA is diagnosed/not ruled out. Chest compressions should be performed in lateral recumbency with a compression depth of 1/3-1/2 the patient's chest and at a frequency of 100-120 compressions per minute. Total recoil of the thorax should be allowed between compressions. Chest compressions should be performed in uninterrupted two-minute cycles, and a new compressor should take over from the previous one at the end of each cycle. Interruptions between cycles minimum and cycles should be 2 minutes long. The compressor's hands must be interlocked, elbows extended and locked in a straight line from shoulders, elbows and hands. Compressions should be performed by bending at the waist level directly over the hands, being the core muscles of the trunk the ones exerting all force. In cats and small dogs, compressions can be performed either using two hands, as previously described, or using only one hand (by placing the hand that exerts the compression around the sternum and exerting pressure simultaneously on both sides of the thorax). Circumferential chest compressions using both hands may also be considered.

Based on the size and the morphological conformation of the patient's thorax, compressions should be exerted with hands placed on different areas of the chest. Thus, in medium- and large-sized canine patients (e.g. Labrador retriever) the chest should be compressed at the highest point of the chest wall when the patient is in lateral recumbency, since blood flow is generated by the thoracic pump theory. In patients with a very narrow and keel-shaped thoracic cavity (e.g. Greyhound) compressions should be exerted directly on the heart, since blood flow is generated by the cardiac pump theory. In patients with a large, round, barrel-shaped chest cavity (e.g. English bulldog), direct compressions on the sternum with the patient in dorsal recumbency are more effective in activating the cardiac pump theory. Finally, most cats and small breed dogs have a relatively narrow thoracic cavity and are highly compliant, so cardiac massage can be performed using the cardiac pump mechanism.

If an endotracheal tube (ETT) and laryngoscope are available, the patient should be intubated as soon as possible. Small animals can be intubated in lateral recumbency, so that compressions do not have to be interrupted. The ETT should be attached to the snout and the cuff should be inflated to provide a sealed airway. Ventilation must be performed at a frequency of 10 breaths per minute, a tidal volume of 10 ml/Kg and an inspiratory time of approximately 1 second. High respiratory rates, high tidal volumes, and prolonged inspiratory periods should be avoided, since they create a very high positive intrathoracic pressure that decreases cardiac output.

Once basic life support has been established, advanced life support must be initiated. Emergency drugs are preferably administered intravenously (IV) or intraosseously (IO). The administration of reversal agents in patients that received anesthetic/analgesic drugs, should always be considered. Naloxone at a dose of 0.01 mg/Kg IV/IO can be administered for opioid reversal, flumazenil at a dose of 0.01 mg/Kg IV/IO for benzodiazepine reversal, and atipamezole at 0.1 mg/Kg and yohimbine at a dose of 0.1 mg/Kg IV/IO for the reversal of α-2 agonist agents.

Cardiac output is reduced during cardiac massage, even in the presence of optimal chest compressions, therefore the diversion of blood from the periphery towards the vital organs (heart, brain and lungs) is essential to guarantee its perfusion. Epinephrine is an α1, β1 and β2 adrenergic receptors agonist catecholamine. It is recommended to administer low doses 0.01 mg/Kg IV/IO every other cycle. Vasopressin is a peripheral V1 receptors agonist that can be administered at a dose of 0.8 IU/Kg IV/IO every other cylce. Atropine is an anticholinergic drug that has been extensively studied in the field of CPR. Despite there being only a few studies that demonstrate the beneficial effects of this drug in CPR situations, there is no evidence of negative effects. The administration of atropine at a dose of 0.04 mg/kg IV/IO can be considered reasonable in small animals with asystole or pulseless electrical activity (PEA) associated with elevated vagal tone.

Pulseless ventricular tachycardia (pulseless VT) and ventricular fibrillation (VF) without associated perfusion should be treated as soon as possible with electrical defibrillation. However, in situations where arrhythmias are refractory to defibrillation, patients may benefit from amiodarone at a dose of 2.5-5 mg/kg IV/IO. If amiodarone is not available, lidocaine can be administered at a dose of 2 mg/kg IV/IO as a slow bolus.

The routine use of high-dose corticosteroids in CPR situations is not recommended since no beneficial effects have been proven after their use while the risks derived from the administration of high-dose corticosteroids are well documented. The routine administration of sodium bicarbonate is not recommended. A dose of 1 mEq/Kg IV, diluted and administered as a slow bolus can be considered in prolonged arrests (more than 10-15 minutes).

The routine use of fluid therapy in euvolemic or even hypervolemic patients is not recommended in CPA situations. However, its administration is justified when hypovolemia is suspected.

Early electrical defibrillation in patients with VF has been shown to be associated with a high degree of ROSC and hospital discharge, as well

as achieving superior results to antiarrhythmic medical therapy. The objective of defibrillation is to stop the disorganized contractions of the ventricular myocardial cells, making them all enter the refractory period simultaneously. In this way, internal pacemakers are allowed to initiate coordinated contractions. If the duration of VF is less than 4 minutes, it is recommended to continue cardiac massage while charging the defibrillator and defibrillate immediately. However, if more than 4 minutes have elapsed since the start of VF, it is recommended to complete a full cycle of cardiac massage (2 uninterrupted minutes) before defibrillating. After defibrillation, chest compressions should be resumed immediately and completed one full cycle (2 uninterrupted minutes) before reassessing the ECG.

Many of the routinely used clinical monitors have limited or no utility in CPA settings. In fact, the presence of movement artifacts (during cardiac massage) as well as the lack of adequate perfusion make determinations and/or readings impossible to perform. Among the monitors with low efficacy during CPA situations are the pulse oximeter and indirect blood pressure monitors. The only useful monitors in CPA situations are the electrocardiogram (ECG) and the capnograph (EtCO2).

The ECG is an essential tool for guiding ALS therapy, as it helps diagnose the arrest rhythm: asystole, pulseless electrical activity (PEA), ventricular fibrillation (VF) or pulseless ventricular tachycardia (pulseless VT). The ECG should be evaluated during compressor change at the end of a complete 2-minute cycle (this interruption should not be longer than 5-10 seconds).

Monitoring EtCO2 levels is recommended during CPR situations, as it serves multiple purposes. The presence of EtCO2 levels above 15 mmHg has been proven to be a prognostic indicator of successful outcome. It can also be used as an indicator of the effectiveness of chest compressions. Finally, a sudden and significant rise inEtCO2 is an unequivocal indicator of ROSC during CPR.

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ANESTHETIC MANAGEMENT OF RESPIRATORY EMERGENCIES: AIRWAY OBSTRUCTION, THORACIC TRAUMA, AND OTHER

Veronica Salazar

Alfonso X El Sabio University, Anesthesia Section, Villanueva de la Canada, Spain

Qualifications:

Veronica Salazar Nussio

Dip ACVAA, Dip ECVAA, RECOVER Certified Instructor

vsalanus@uax.es

Many respiratory conditions require emergency anesthesia/sedation in order to properly diagnose and/or treat them. In general, these conditions can be divided in upper airway diseases that result in an inability to, mainly, ventilate and primary lung conditions associated with an inability to oxygenate. In addition, some animals suffer intrathoracic disease (e.g., diaphragmatic hernia) and have difficulty with both oxygenation and ventilation. Animals should be handled slightly differently depending on their condition. However, their management shares some common features: most patients may need supplemental oxygen and patient manipulation should occur with minimum stress or excitement.

PRINCIPLES OF CLINICAL AND PHARMACOLOGIC MANAGEMENT

Anesthetic and sedative drugs

Most anesthetic and sedative agents cause respiratory depression to some degree, and this should be taken into consideration before administration.

Premedication or sedation with acepromazine is useful in patients in which stress and excitement should be avoided. A dose of 20-40 mcg/kg IM could be administered if no contraindications are present. It has minimal effects on the respiratory control system in unanesthetized patients. Alpha-2 agonists may also have at least some respiratory-depressant effects in dogs and cats, although they appear to be minimal when sedative agents are used alone. The respiratory-depressant effects of the alpha-2 adrenergic agonists are likely to be exaggerated when used in combination with other anesthetic/analgesic agents. Benzodiazepines are associated with minimal respiratory effects in small animals. Ketamine may be used as a premedication/sedation agent in cats with respiratory disease. It is particularly interesting in cases of feline asthma due to its bronchodilator effects.

Most pure mu opioids depress ventilation via effects at mu-opioid receptors. These dose-dependent effects can be seen as a reduction in respiratory frequency, tidal volume, or both and are more pronounced with the pure mu-opioid receptor agonists when compared to the mixed agonist–antagonists or partial agonists.

Potent respiratory depressants should be avoided when intubation may be difficult/impossible. Induction with small boluses of propofol and midazolam (0.2-0.5 mg/kg) may be useful. Alternatively, ketamine (2-4 mg/kg) and midazolam may be used.

Oxygen supplementation

Oxygen supplementation, either as part of stabilization or preoxygenation, is extremely important in patients in respiratory distress. Criteria for O2 supplementation is based on the presentation of cyanosis, since it is a clear sign of an oxygenation crisis that warrants immediate O2 supplementation. In fact, cyanosis indicates that approximately 5 g of hemoglobin (Hb) is in the reduced form (not carrying O2). However, it can be challenging to visually determine cyanosis in certain situations such as in darkly pigmented patients or in poor lighting conditions.

Oxygen can be administered via a number of different ways such as face mask, nasal cannula or the use of an O2 chamber. However, inspired levels of O2 may vary considerably among these different techniques of administration and they may not reach an FiO2 of 100%. In fact, it has been proven that nasal insufflation with 100% O2 only resulted in a range of 32–61% FiO2 and that it was dependent on several factors such as insufflation, respiratory rate or tidal volume. On the other hand, it is important to emphasize the fact that mask oxygenation should not be forced on the patient if the process is going to stress the patient, increasing its O2 demands as a result of struggling.

The rationale behind preoxygenation is that it prolongs the time before a patient becomes hypoxic during apneic periods. In fact, supplementation with O2 delivered at an FiO2 of 100% fills the alveoli with a higher than normal O2 concentration. Therefore, if the patient becomes apneic or if tracheal intubation is delayed, higher than normal O2 is then available to oxygenate the arterial blood. However, it takes multiple minutes of preoxygenation to effectively wash out the gases normally found in the alveoli and replace them with a higher O2 concentration. Usually around 3 to 5 minutes. In fact, a study has proven in dogs that 3 min of O2 supplementation through a face mask increases the time for Hb to desaturate from approximately 70 s (when breathing an FiO2 of 21%) to 298 s (when receiving O2 supplementation) after propofol induction. It has to be reminded that any break in the breathing of the supplemental O2 will require restarting of the oxygenation procedures.

Patient positioning

Patient positioning may also be significantly important in most cases, especially in cases such a patient with a diaphragmatic hernia. In general, sternal recumbency should be tried to be maintained at all times, since it helps the patient preserve its maximum functional residual capacity. In case of thoracic cavity content conditions such as hemothorax or pneumothorax, the animal's least affected lung should be kept side up to aid in ventilation. In more specific situations such a diaphragmatic hernia, the animal should try to be kept in sternal recumbency with a 30 degree angle (being the chest positioned higher than the abdomen in an effort to facilitate gravitation of abdominal viscera out of the thorax).

Difficult airway management

Anesthetizing an animal that cannot ventilate because of airway obstruction is among one of the most potentially catastrophic clinical events that a clinician can face. In fact, it should never be assumed that intubation is possible, and the clinician should plan and be ready for the management of a difficult airway scenario after induction. In fact, if a difficult intubation is anticipated, all equipment that may be required should be set up ahead of time. Assorted endotracheal tubes should be available (including some additional smaller ones), laryngoscope, stylets and/or guide tubes (including a polyethylene urinary catheter or more specific equipment such as a pediatric airway exchanger or a pediatric intubation catheter), should also be available. Finally, a surgical kit for emergent tracheostomy should be readily available.

Different intubation techniques can be attempted when dealing with a difficult airway:

- Routine intubation should be attempted initially after removing any fluid accumulation in the oropharynx. If intubation is unsuccessful, intubation with a smaller size ETT may be possible. If intubation is still unsuccessful, introduction of a stylet should be attempted in order to have a regular ETT passed over the stylet and introduced blindly into the trachea. Finally, if all attempts are still unsuccesfull, the use of an airway exchanger or intubation catheter should be used.

Alternative techniques should be required if all efforts are still unsuccessful, such as

- Nasal Intubation: the use of a nasopharyngeal airway can be a useful adjunct in some patients; however this technique is performed usually in species with larger nasal cavities and nostrils. Regardless, nasal tubes used in veterinary patients usually do not permit an airtight seal of the trachea but are still useful at providing a good alternative for oxygen administration.

- Needle Cricothyroidotomy: in cases of emergencies or severe respiratory distress, there may be no time for preparation to perform a tracheostomy, so an alternative that is fast and simple is warranted. By performing a needle cricothyroidotomy, oxygen can be provided via a large-gauge needle or catheter once it is inserted through the cricothyroid membrane or through the tracheal wall. This technique is only a temporary clinical maneuver.

- Fiberoptic-Assisted Intubation: the fiberoptic scope is introduced into the caudal oropharynx, permitting visualization of the laryngeal cavity and endotracheal intubation.

- Retrograde Intubation: it requires retrograde placement of a guidewire or catheter via the cricothyroid membrane into the trachea and rostrally into the oropharynx. An endotracheal tube (or fiberoptic bronchoscope via the suction port, or a tube exchanger followed by an ETT) is then threaded over the guidewire and into the trachea. The guidewire is removed once the endotracheal tube is in place.

- Cricothyroidotomy: it can be used to secure the airway for patients with severe facial trauma. Compared with a tracheotomy, it is probably less time consuming and easier to perform. It is associated with fewer complications, and more likely to result in a patent airway.

- Tracheostomy may be indicated for potentially life-threatening upper airway obstruction, oral or pharyngeal surgery, or long-term ventilator support in critically ill patients.

Monitoring

Respiratory rate and depth, as well as mucous membrane color, should be watched carefully in patients that are suffering a critical or emergent respiratory condition. Pulseoximetry is a noninvasive monitor readily available in most clinical settings. It measures oxygen saturation of the blood by measuring the differential transmission of light at two different wavelengths. Oxygen saturation should remain greater than 95% in patients on 100% oxygen. An oxygen saturation of 90% is roughly equivalent to an arterial oxygen tension of 60 mm Hg. The most common site for probe placement in anesthetized animals is the tongue, although the ear, flank, tail base, and rectum may also be used if the patient is only mildly sedated. If the patient is anesthetized and intubated, measurement of end-tidal carbon dioxide (EtCO2) with a capnograph is helpful in assuring adequate ventilation. Arterial blood gas analysis may be helpful in assessing respiratory status in complex clinical scenarios, since it provides information related to the arterial partial pressure of oxygen and CO2 (as well as pH).

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GASTROINTESTINAL DISEASES IN BRACHYCEPHALIC DOGS; DIAGNOSIS AND (MEDICAL AND SURGICAL) TREATMENT

Gert Ter Haar

AniCura Specialistische Dierenkliniek Utrecht, Surgery, Utrecht, Netherlands

Qualifications:

Gert ter Haar

DVM, PhD, DECVS

gert.terhaar@anicura.nl

Many anatomical malformations of the gastrointestinal tract that are thought to contribute to regurgitation, vomiting and dysphagia have been described in brachycephalic dogs. One retrospective study found that almost 75% of the brachycephalic dogs that presented for respiratory problems actually had significant gastro-intestinal signs. Furthermore, 80% of all the dogs that presented with severe gastrointestinal signs, were diagnosed with respiratory disease with the highest clinical grade (e.g. severe), further stressing the relationship between the two types of clinical signs.

The English bulldog is presumed to be predisposed to esophageal deviation associated with shortening of the chest, but it has also been documented in French bulldogs. Gastro-oesophageal reflux with distal oesophagitis and cardial atony is seen in nearly all of the brachycephalic dogs presenting for respiratory surgery, even in absence of gross macroscopic abnormalities. It is thought that high positive abdominal pressure generated by recurrent vomiting and the negative intrathoracic pressures generated by increased inspiratory effort are at least in part responsible for the reflux.

Congenital forms of hiatal hernia have been previously described in the Shar Pei, the English bulldog and the chow chow. However, the axial hiatal hernias described in French bulldogs appear to have an acquired origin relating to the previously mentioned positive abdominal and low intra-oesophageal pressures. A congenital form of pyloric stenosis has been described in boxers and Boston terriers. In one large study around 27% of brachycephalic patients, most of which were French Bulldogs, were found to have presumed acquired pyloric stenosis and 86% of all dogs in the study had pyloric mucosal hyperplasia.

In the author's experience, upper airway surgery with rhinoplasty and staphylectomy, significantly reduces the frequency and severity of gastrointestinal signs in about 80% of the French Bulldogs, but not in English bulldogs or Pugs. Therefore, it is reasonable to follow a step-wise diagnostic work up approach in French bulldogs and start by pursuing an active reduction of upper airway resistance with BOAS surgery and medical management of the gastrointestinal signs. If this approach does not improve the gastrointestinal signs, further work-up and even surgery, such as correction of hiatal hernia with herniorrhaphy, oesophagopexy and/or gastropexy are warranted. In English bulldogs and Pugs, significant gastrointestinal signs do not appear to be alleviated by upper airway surgery and therefore a specific diagnostic work up for these GI problems is advised.

The definitive diagnosis of hiatal hernia and reflux oesophagitis can be challenging, but video-fluoroscopy, increasing intra-abdominal pressure whilst taking radiographs, closing the endotracheal tube temporarily, oesophagoscopy and pH-measurements inside the esophagus are helpful. During abdominal exploration, generally some tortuous vessels can be seen around the gastric cardia and often several fingers can be introduced into the thoracic cavity within the hiatus. Combined herniorrhaphy, esophagopexy and gastropexy are the most commonly performed procedures with reasonable to good reported outcome. Laparoascopic execution of these procedures has been reported as well.

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COMPARATIVE MEDICAL AND PARASITOLOGIC ASPECTS OF HEARTWORM DISEASE IN DOGS AND CATS

Luís Madeira De Carvalho

[1]. CIISA – Centre for Interdisciplinary Research in Animal Health, Faculty of Veterinary Medicine, University of Lisbon, Portugal. [2]. Associate Laboratory for Animal and Veterinary Sciences (AL[4]AnimalS), Lisbon, Portugal., Animal Health, Lisboa, Portugal

Qualifications:

Luís Manuel Madeira de Carvalho

Full Professor of Parasitology and Parasitic Diseases

madeiradecarvalho@fmv.ulisboa.pt

1.Introduction

In 16th century the first heartworm was found in a horse (London) and in 17th century in dogs (Italy) and named *Dirofilaria immitis* only in the 19th century, after the first official cases in dogs in South America (1847) and southeastern coast of United States. *Dirofilaria immitis* (Leidy,1856), is a Nematode of the Family Onchocercidae and recognized as the cause of canine heartworm disease (CHD). *Dirofilaria immitis* can also infect wild and exotic species, and accidentally, humans, being a zoonosis. The first case of feline heartworm disease (FHD) was only reported in 1921 (Brazil) and FHD is seldom found due to the difficulty of its diagnosis and a smaller number of cats accessed. CHD has been reported for around 400years, while FHD only for the last 100years, explaining the great discrepancy of produced literature, awareness and successful treatment between the two heartworm diseases[1,2,3,4].

2.Biology

Dirofilaria spp. are mosquito borne agents and *D. immitis* is transmitted by Culicidae mosquitoes, namely *Aedes*, *Anopheles* and *Culex,* as intermediate hosts (IH). The life-cycle of *D. immitis* is heteroxenous, with five larval stages, three in the IH and the remaining two in a mammal definitive host (DH)[4] (Fig. 1).

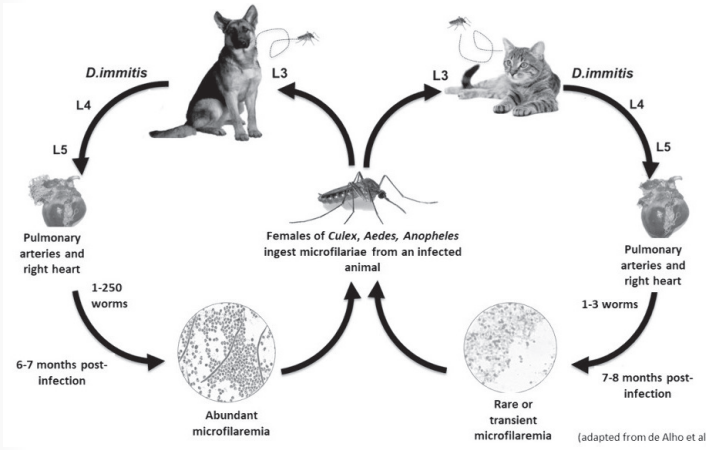

Fig. 1 - *Dirofilaria immitis* life-cycle in canines and felines.

Female mosquitoes are infected with blood mf when they perform hematophagy on an infected dog and reach Malpighian tubules after 24 hours, where they molt to L2 in 8-10 days post-infection (dpi) and then to L3 in 3 dpi. L3 migrate to the vector's mouthparts, being deposited in a drop of hemolymph on the DH's skin in the next blood meal and penetrate connective tissues and muscles. The molts to L4 occur 3-12dpi and to L5 at 50-70dpi. L5 reach the heart through the venous circulation, passing to pulmonary arteries where they settle at 70-85dpi. Adults can be found in the right ventricle and atrium, vena cava and hepatic vein. At 120dpi, they mature, mate and females produce mf reaching blood after 6-9 months post-infection (mpi). In canids, the adult *D. immitis* female measures 250-300 mm in length and the male 120-200 mm in length with a spiral-shaped posterior end. Mf measure 290-330 µm in length, with a tapered cephalic end and a straight, pointed tail. Adults can live more than 7years and mf up to 2years. Some canids don't show mf in the blood, due to single-sex infection, female immaturity or host immune response.[4,5,6]

In cats, the adult parasites are smaller, with the female measuring 220 mm and the male 150 mm in length. The maturation of adult *D. immitis* extends to 8mpi with a shorter lifespan (2years), generally do not produce microfilaremia and if present, it is transient and of low intensity (Figure 1).[4,5]

3.Epidemiology

D. immitis is found in warm/temperate areas with sufficient humidity to allow larval development in vectors[4]. In the last 30years, an increasing incidence of animal and human dirofilariosis has been observed worldwide and heartworm cases appeared in areas free of the disease, like in central and northern Europe. CHD prevalence is increasing due to climate change, artificial ecological changes, globalization, emergence of new species of competent vectors, resistance to insecticides and wild sentinel hosts. Regarding FHD, there are not many data, however it tends to be detected in the same areas of CHD, but with prevalence of 5-20% of those found in canids[2,4,5,6,7].

4.Pathology

CHD has a chronic progression, initially affecting the arteries, lung parenchyma and heart. Adult worms cause trauma to pulmonary vessels, triggering the release of inflammatory mediators causing a proliferative pulmonary endarteritis. Changes in the endothelium and luminal stenosis, induce pulmonary thromboembolism, with pulmonary hypertension, *cor pulmonale* and right congestive heart failure. *D. immitis* can also cause severe renal lesions, like glomerulonephritis resulting from immunocomplexes and mf. The most serious condition is the Vena Cava Syndrome (VCS), due to a displacement of a mass of adult worms, from the pulmonary arteries to the right ventricle, resulting in valve obstruction. A volume and pressure overload occur in the right atrium and caudal vena cava, causing death by hemolysis and disseminated intravascular coagulation. Some dogs are asymptomatic for months/years, while others present a chronic, non-productive cough that increases with exercise and disease progression, leading to more exercise intolerance, cachexia, weakness and sudden death[5,7,9].

FHD ranges from asymptomatic infections, respiratory (dyspnea, tachypnea, chronic cough) or even digestive signs (chronic vomiting and diarrhea). There may also be ocular (blindness) and neurological signs (ataxia and vestibular changes), due to erratic migrations of L4, or even sudden death. The "Heartworm Associated Respiratory Disease" (HARD) in felines, clinically similar to asthma, is an acute inflammatory response caused by *D. immitis* larvae in the pulmonary vessels. HARD is caused by pulmonary intravascular macrophages found in the cats' pulmonary capillaries. Its activation triggers an exacerbated pulmonary reaction, with infiltration of smooth muscle cells around the bronchioles, reduced lumen and acute respiratory distress. Cases progress to chronic respiratory disease, with respiratory and gastrointestinal signs, followed by severe organic degradation and cachexia[5,6,8,9].

Gram-negative bacteria *Wolbachia pipientis,* are obligate endosymbionts of *D. immitis* and have important consequences in the pathogenesis and immunology of heartworm infection[7].

5.Diagnosis

CHD can be detected with blood tests demonstrating circulating mf or adult antigens in serum or plasma samples. Blood samples should be examined after concentration by the Knott or the filtration test and morphological identification performed. Wet blood smears do not allow genus/species identification and a negative test for mf does not mean the animal is negative, since they are not always present (occult infection), like for cats, where mf detection is unlikely to be successful. Blood/serological tests for antigens are important due to their high specificity, but even then, some yield false-negatives (low worm burdens or presence of only male/immature worms). A negative test does not mean the animal is not infected and heat treatment of serum prior to antigen testing may increase the sensitivity of antigen testing in cats[7,10].

Thorax X-ray and echocardiography are useful in CHD and FHD, particularly in this last one. Cardiac ultrasound allows direct visualization of the parasites in the right atrium and ventricle, pulmonary artery and main branches. The specificity is almost 100%, the sensitivity in cats is very high and cardiac ultrasonography should always be performed when FHD is suspected[7].

6.Control

The specific treatment of CHD and FHD is based mostly in three approaches: a) control of *Wolbachia pipientis* by antibiotic therapy (doxycycline); b) adulticidal therapy, based on arsenical compound melarsomine, or surgical removal of adults; c) preventive treatment based mostly on macrocyclic lactones (MLs), like Avermectins (ivermectin, eprinomectin, abamectin, selamectin) or Milbemycins (milbemycin oxime and moxidectin) and seldom on Non-MLs (diethylcarbamazine)[3,7,9].

Regarding FHD, there is no registered, safe and effective adulticide for cats. Decreasing doses of prednisolone are advised in cats in order to relieve respiratory distress, but if they present severe HARD, high doses of prednisolone are recommended[7].

Control strategies for dogs and cats rely mostly on MLs administered monthly throughout the transmission season, which are effective against *D. immitis* L3 and L4 developed within the previous 30 days. Monthly prevention with MLs, should start before the mosquito season in spring and continue until late autumn, but in hyperendemic areas, a year-round preventive therapy is recommended, together with products designed to prevent mosquito biting, namely repellents[7].

7.Acknowledgements

CIISA/FMV Project UIDB/00276/2020 and LA/P/0059/2020—AL4AnimalS (both funded by FCT). Professor Jane Sykes for the invitation and Dr. Aviva Kovo for all the help provided by the organizing committee.

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RECOGNIZING HEARTWORM DISEASE: CLINICAL AND LABORATORY CLUES

Luís Madeira De Carvalho

[1]. CIISA – Centre for Interdisciplinary Research in Animal Health, Faculty of Veterinary Medicine, University of Lisbon, Portugal. [2]. Associate Laboratory for Animal and Veterinary Sciences (AL[4]AnimalS), Lisbon, Portugal., Animal Health, Lisboa, Portugal

Qualifications:

Luís Manuel Madeira de Carvalho

Full Professor of Parasitology and Parasitic Diseases

madeiradecarvalho@fmv.ulisboa.pt

1.Introduction

Heartworm Disease is a mild/severe, but sometimes life-threatening condition for pet carnivores, most prevalent in dogs, less prevalent but very serious in cats and rarely seen in ferrets. It is also referred in humans, being a zoonosis. The nematode *Dirofilaria immitis* (Leidy, 1856) is the cause of Canine Heartworm Disease (CHD) and Feline Heartworm Disease (FHD), being transmitted by Culicidae mosquitoes and with a cardiopulmonary location[1,2,3].

D. immitis has an heteroxenous life-cycle and its epidemiology is profoundly affected by environmental factors and its vectors distribution, being present in warm/temperate areas with relevant moisture to allow mosquito reproduction and larval development in vectors[4]. In the last three decades, an increasing incidence of animal and human dirofilariosis has been observed worldwide and heartworm cases appeared in areas free of the disease, like in central and northern Europe. CHD prevalence is increasing due to climate change and urban ecosystems with "islands of heat" favoring insect development, but also due to globalization, emergence of new species of competent vectors, resistance to drugs for filariids and insect control and wild sentinel hosts. Regarding FHD, it tends to be detected in the same areas of CHD, with prevalence 5-20% of those found in canids[3-7].

Being a very prevalent cardio-pulmonary parasite, dependent of specific environmental conditions favoring the activity of the mosquitoes and with a potential expansion trend of 50% expected for the next 50 years for some of its vectors, this will increase the risk of dog and cat infection with *D. immitis*. Therefore, small animal practitioners must be aware of the major aspects regarding its precocious detection based on clinical and laboratory approaches, its differential diagnosis regarding other cardiopulmonary parasites, aiming its timely control[1,4,8].

2.Biology vs. Clinical Signs

Infected mosquito females ingest blood form a dog/cat and at the same time they deposit infective larvae (L3) over the surface of the host's skin. The L3 then actively penetrate the host's body through the mosquito bite wound and start their migration to the right heart and pulmonary arteries, where they reach sexual maturity approximately 120 days post-infection (dpi). Fertilized females release microfilariae in the bloodstream 180 dpi, allowing them to be ingested by another female mosquito to complete the cycle, making the prepatent period of 6-7 months[9]. During their development, the Gram-negative bacteria *Wolbachia pipientis* are obligate endosymbionts of *D. immitis* and have an important role on its molting process and embryogenesis, but also with important consequences in the dog/cat immunology and pathogenesis of heartworm infection[4,5,7].

CHD has a chronic evolution, initially affecting the pulmonary arteries and later the lung parenchyma and the heart. Adult worms' trauma to the pulmonary vessels wall triggers inflammatory mediators and causes hypertrophy of the endothelium (proliferative pulmonary endarteritis). Changes in the endothelial wall and luminal stenosis, induce pulmonary thromboembolism, with pulmonary hypertension, *cor pulmonale*, right congestive heart failure and oedema, together with severe renal lesions, such as glomerulonephritis due to deposition of immunocomplexes and microfilariae (mf). The most serious condition, frequently observed in small dogs, is the Vena Cava Syndrome (VCS), resulting from a displacement of adult worms from the pulmonary arteries to the right ventricle, resulting in valve obstruction. Volume and pressure overload occur in the right atrium and caudal vena cava, causing death by hemolysis and disseminated intravascular coagulation. Some dogs may show eosinophilic pneumonia or lesions in brain, liver, eye, peritoneal cavity, due to erratic migrations. Many dogs are asymptomatic for months and years, while others present a chronic, non-productive cough, that increases with exercise and disease progression. Other signs include exercise intolerance, cachexia, weakness and less frequently hemoptysis and sudden death[4,5,7].

However, the way the clinical condition evolves, its prognosis and therapeutic approaches depends on the ranking of CHD after its diagnosis and it is based on clinical examination, blood and urine analysis, and the dog's radiographic findings (Table 1). These clinical diagnostic examinations are routinely performed by veterinarians in day-by-day practice. Besides, differential diagnosis should be performed with the other canine cardiopulmonary parasite, *Angiostrongylus vasorum*, which is less prevalent, but can also induce respiratory, neurological and blood/coagulation signs[1,4,10-12].

In FHD, the clinical presentation is diverse, ranging from asymptomatic infections, respiratory (dyspnea, tachypnea, chronic cough) or even digestive signs (chronic vomiting and diarrhea). There may also be ocular signs (blindness) and neurological signs (ataxia and vestibular changes), due to erratic migrations of L4, or even sudden death. The "Heartworm Associated Respiratory Disease" (HARD) syndrome in felines, an acute inflammatory response caused by the arrival of *D. immitis* larvae in the pulmonary vessels and their death by the host's defenses. This syndrome is caused by pulmonary intravascular macrophages (PIMs) found in the pulmonary capillaries of cats. Its activation triggers an exacerbated pulmonary reaction, with infiltration of smooth muscle cells around the bronchioles, reduced lumen and acute respiratory distress. Cases may evolve to chronic respiratory disease, followed by severe organic degradation and cachexia. In cats, HARD syndrome must be differentiated from other clinical conditions and parasites causing serious respiratory conditions, eg., asthma, *Toxocara cati* and *Aelurostrongylus abstrusus*. It should be emphasized that cats with FHD are much less immunologically tolerant than dogs and low-level infections can be fatal[4-6,10-12].

Table 1 - Ranking of HWD in dogs (reviewed by 10. SPASOJEVIĆ KOSIĆ & LALOŠEVIĆ, 2020)

Class 1: Asymptomatic to mild HWD	Class 2: Moderate HWD	Class 3: Severe HWD	Class 4: Caval syndrome
a) Clinical signs absent or occasional cough	a) Clinical signs: occasional cough, exercise intolerance, abnormal lung sounds, mild loss of body condition	a) Clinical signs: persistent cough, constant fatigue, dyspnea, abnormal heart and lung sounds, hepatomegaly, syncope, ascites, jugular distension and pulse, death	a) Clinical signs: sudden onset of severe lethargy and weakness accompanied by dark red to black coffee coloured urine
b) Radiographic sighs absent	b) Radiographic signs present: RV enlargement, mild PA enlargement, circumscribed perivascular infiltrates and/or mixed alveolar/ interstitial infiltrates	b) Radiographic signs present: RV and RA enlargement, severe PA enlargement, circumscribed to diffuse mixed patterns of pulmonary infiltrates, signs of pulmonary embolism	b) Cardiac ultrasound: numerous short, white, parallel lines within the right atrium, ventricle and tricuspid orifice
c) Laboratory parameters normal	c) Laboratory parameters abnormal: mild anemia, with or without mild proteinuria	c) Laboratory abnormalities: anemia, other hematological abnormalities or proteinuria	c) Laboratory abnormalities: hemoglobinemia, hemoglobinuria, proteinuria, bilirubinuria, mf (occasionally) in urine sediment

RV – right ventricle; PA – pulmonary artery; mf – microfilariae

3.Laboratory Diagnosis

CHD can be detected with blood tests demonstrating circulating mf or adult antigens in serum or plasma samples. Blood samples should be examined after concentration by the Knott or the filtration test and morphological identification of mf performed (Table 2). Wet blood smears do not allow genus/species identification and a negative test for mf does not mean the animal is negative, since they are not always present

(occult infection), like for cats, where mf detection is unlikely to be successful[7,11,13].

Knott test	Ag test	Interpretation	Comment
--	--	Negative	False negatives for both tests include young parasites or young animals. Repeat after 7 months.
+	+	Positive	Rx and echocardiography should be carried out for clinical staging.
+	--	Positive	False negatives for Ag tests include low mature female worm burden; Rx and echocardiography should be carried out for clinical staging.
--	+	Positive	False negatives for mf include unisex infections and the use of macrocyclic lactones (MLs); Rx and echocardiography should be carried out for clinical staging. If history and/or clinical picture are poorly compatible with HW, rule out *A. vasorum*,

Blood/serological tests for antigens are important due to their high specificity, but even then, some yield false-negatives (low worm burdens or presence of only male/immature worms). A negative test does not mean the animal is not infected and heat treatment of serum prior to antigen testing may increase the sensitivity of antigen testing in cats (but not in dogs) and for FHD, antibody tests are of choice. Interpretation of test results can be complex and it is strongly recommended to test for both microfilariae and antigens/antibodies, for maximum diagnostic performance (Table 3)[7,11,13,14].

Table 3 - HOW TO INTERPRET TEST RESULTS (European Society of Dirofilariosis and Angiostrongylosis (ESDA), 2017)

Knott test	Ag test	Interpretation	Comment
--	--	Negative	False negatives for both tests include young parasites or young animals. Repeat after 7 months.
+	+	Positive	Rx and echocardiography should be carried out for clinical staging.
+	--	Positive	False negatives for Ag tests include low mature female worm burden; Rx and echocardiography should be carried out for clinical staging.
--	+	Positive	False negatives for mf include unisex infections and the use of macrocyclic lactones (MLs); Rx and echocardiography should be carried out for clinical staging. If history and/or clinical picture are poorly compatible with HW, rule out *A. vasorum*, *S. lupi*. If prevalence in the area is very low, consider repeating using a different Ag test and/or both Knott and Ag test 3 months later.

Acknowledgements

CIISA/FMV Project UIDB/00276/2020 and LA/P/0059/2020—AL4AnimalS (both funded by FCT). Professor Jane Sykes for the invitation and Dr. Aviva Kovo for all the help provided by the organizing committee.

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NAVIGATING PITFALLS AND PERILS IN THE DIAGNOSIS OF CANINE LEISHMANIOSIS

Guadalupe Miró

Veterinary Faculty - UCM, Animal Health Dept., Madrid, Spain

Qualifications:

Guadalupe Miró

Full Professor, DVM, PhD, Dipl. EVPC

gmiro@ucm.es

"Navigating pitfalls and perils in the diagnosis of canine leishmaniosis"

During my talk, I will talk about challenges in diagnosing Canine leishmaniosis (LCan) where many concepts have changed. Perhaps the first one is to define what we mean by a positive case. Macianti's 1988 classification of "asymptomatic", "oligosymptomatic" and "polysymptomatic" dogs, based solely on clinical signs of infected dogs, is now obsolete. Nowadays, a comprehensive diagnosis based on the joint interpretation of epidemiological history, compatible clinical signs, and laboratory results (quantitative serology, parasitological diagnosis and CBC, biochemical profile and urinalysis abnormalities) is necessary. Recently serum protein electrophoresis has been considered a good tool with a high predictive value on the diagnosis of CanL.

Clinical classification of patients is a standard practice in human medicine: from HIV to asthma, including transmissible diseases such as dengue or hydatid cyst, neoplasias and neuropathies. We have progressed in this direction in veterinary medicine and have useful clinical classifications of essential diseases such as canine heartworm, demodicosis, atopic dermatitis, renal disease, and many others.

The LeishVet group published the first clinical guidelines making a clinical classification of dogs with CanL into four stages (I-IV) based on the results of physical examination, quantitative serology and laboratory findings. This clinical classification represents a significant advance in the clinical management of these patients and allows for evidence-based prognosis and decision-making related treatment.

In endemic areas, there are two types of patients: clinically healthy infected dogs (up to 60%. Demonstrated by PCR) that develop an active Th1-type cell-mediated immune response and show no clinical signs or laboratory abnormalities and sick dogs (around 5-10%) that develop a potent non-protective humoral response and the parasite evades the immune response and is distributed throughout the body organs producing parasitic granulomas and immunocomplex deposits that are responsible for the wide variety of compatible clinical signs and laboratory abnormalities described. In both cases, we can detect anti-*L. infantum* antibodies and evidence of the parasite in haematopoietic organs by cytology and molecular diagnosis make it difficult to differentiate these two types of patients.

The most frequent clinical signs in sick dogs include asthenia, weight loss, lymphadenomegaly, skin lesions and other more severe signs associated with immunocomplex deposition: vasculitis (haemorrhages), glomerulonephritis (polyuria, polydipsia), polyarthritis (erratic lameness) and ocular lesions (conjunctivitis, keratouveitis, retinopathies). And laboratory abnormalities include non-regenerative anaemia, thrombocytopathies, leukopenia/leukocytosis, hyperproteinemia (hyper beta-gammaglobulinaemia), hypoalbuminaemia, renal azotemia, elevated liver enzyme activity, proteinuria. Other much less frequent clinical signs are neuropathies and cardiorespiratory disturbances.

Serological methods available are qualitative (based on immunochromatographic tests, dot-ELISA) and quantitative (indirect immunofluorescence-IFAT, enzyme immunoassay-ELISA, western blotting-WB). Since a strong correlation between high antibody titres and disease has been demonstrated, it is necessary to use quantitative techniques to classify patients as sick dogs. Moreover, although immunochromatographic tests are easy to use and can give a quick qualitative result in clinic with good specificity, their sensitivity is variable and consistently lower than quantitative serology.

Regarding molecular diagnosis, PCR has improved the sensitivity in the parasitological diagnosis of *Leishmania* infection in dogs. Different methods have been developed using nuclear genome or kinetoplast DNA (kDNA). Methods using kDNA seem more sensitive for direct detection in infected tissues. Three PCR methods are currently available: conventional PCR, nested PCR and quantitative PCR. PCR can be performed by extracting DNA from different tissues, blood, biological fluids, and even histological material. Bone marrow, lymph node, spleen or skin are the most sensitive tissues for PCR diagnosis while blood, buffy coat and urine considerably reduce the sensitivity of molecular diagnosis.

We will discuss all of these aspects with clinical cases as examples.

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HIP AND ELBOW DYSPLASIA - ARE WE MOVING IN THE RIGHT DIRECTION?

João Alves[1,2,3]

[1]Guarda Nacional Republicana, Divisão De Medicina Veterinária, Queluz, Portugal, [2]Universidade de Évora, Med – Mediterranean Institute For Agriculture, Environment And Development, Évora, Portugal, [3]Lusófona University, Faculty Of Veterinary Medicine, Lisboa, Portugal

Qualifications:

João Carlos Agostinho Alves

DVM, Ph.D., DECVSMR

alves.jca@gnr.pt

Hip and Elbow dysplasia - are we moving in the right direction?

Canine hip dysplasia (HD) and elbow dysplasia (ED) are two major heritable orthopedic diseases. They result from the combined effect of genetic predisposition and environmental influencing factors. Ultimately, they lead to osteoarthritis, a disease with a prevalence of around 20% in dogs over 1 year of age, with a profound health, welfare, and economic impact, including euthanasia in approximately 5% of dogs(1).

HD is the most commonly diagnosed orthopedic disease in dogs and is characterized by joint laxity that ultimately leads to osteoarthritis. The prevalence varies according to the reports and breeds, reaching 73.4% in Bulldogs(2). Depending on the source, the trait's heritability also varies from 0.11 to 0.68. It has polygenic inheritance, with many alleles scattered throughout the genome. Joint laxity does not appear to be the only factor involved in HD, as there is significant breed and individual variation in the tolerance to the various degrees of laxity and subsequent development of osteoarthritis(2).

The elbow is a complex joint, and ED is a syndrome encompassing different entities: ununited anconeal process, medial coronoid disease, osteochondrosis, and joint incongruity. Recently, the term medial compartment disease has also been introduced, referring to a group of conditions affecting the medial compartment of the elbow(3). Incongruity can involve all three joints that compose the elbow, particularly in growing dogs of medium, large, and giant breeds, diagnosed between 4 and 7 months old. The individual predisposition is based on a polygenetic component involving multiple genes without direct transmission. The prevalence varies from 17% to 70%, and heritability from 0.19 to 0.46. The prognosis is always poor because osteoarthritis will almost inevitably develop with time, despite treatment(4).

Several screening methods have been developed and implemented to control and eradicate the two diseases. For HD, these include three main phenotypical schemes: the Orthopedic Foundation for Animals (OFA), the British Veterinary Association/Kennel Club (BVA/KC), and the Federation Cynologic International (FCI). The OFA scheme uses the standard ventrodorsal hip extended view (HEV) to evaluate for radiographic changes associated with HD. Dogs must be 2 years old to receive an official score, and breeders can choose their breeding dogs regardless of OFA scores(5). The BVA/KC scheme is voluntary, aimed at skeletally mature dogs, with a participation rate of 8-10% of annual eligible dogs. It assesses nine radiographic features for HD in a HEV. The official score is the total of the two hips(1). Since the scheme is not mandatory, an affected dog can be used in breeding(5). The FCI scheme also uses the HEV, following a scale of five categories, from A to E. In some countries, and for some breeds, the offspring of affected parents do not receive a pedigree(5). One of the main limitations pointed out to schemes using the HEV is that this positioning can underestimate the degree of joint laxity, with a possible high false negative rate (44%). It also has a reported inter and intraobserver variation, with an average reported concordance rate of 74% with OFA, with the reliability of the reads decreasing as the scores become closer to fair or mild.

In addition to the phenotypical schemes, there are two laxity schemes, the Pennsylvania Hip Improvement Program (PennHip) and the dorsolateral subluxation score. The PennHip follows a mandatory submission policy and has a high repeatability rate. The distraction index obtained has been correlated with the development of HD but with a possible high false positive rate. The dorsolateral subluxation score is claimed to have a more functional hip laxity assessment than the PennHip, as it is based on a weight-bearing position(5).

For ED, schemes are based on the International Elbow Working Group procedures, using extended and flexed lateral radiographic views, from which a score of 0-3 is determined based on the worse score of the two elbows. The schemes are ruled by regional organizations, such as the BVA/KC or the FCI. The minimal age for screening is 12 months(1).

The success of the described schemes in reducing HD and ED varies from mild to significant improvement, depending on the report and breed considered(6). Despite an initial improvement, with a reduction in HD and ED and a corresponding overall improvement of scores, a slowing in progress is currently observed. Dogs in these programs are also unlikely to be a random sample of the breeds considered, as voluntary participation schemes open the possibility of self-selection bias, and radiographs of clearly dysplastic dogs and clearly normal dogs may not be submitted for evaluation(7). Grading HD and ED based on the worse score of the two sides seems to give relevance to environmental factors, as left and right joints display almost identical heritabilities for HD and ED, with a near-perfect genetic relationship(1).

The principles governing breeding choices are paramount. Dogs have undergone selective breeding over the centuries, and in the 19th, a major bottleneck occurred, leading to a loss of genetic diversity. In many cases, breeding has focussed on appearance or behavior, in contrast to longevity and production goals as in other domestic species(9). Even with an increased awareness of the impact of HD and ED, breeding may be moved by other factors, and breeders also have to consider other factors when making a breeding assessment(7).

Interestingly, the two diseases seem to affect fewer dogs from working lines. The Siberian Husky, for example, traditionally had very good hip scores, raising the hypothesis that the breed had been selected against lameness due to their function as sled dogs. This selective pressure has weakened as the breed's popularity as a Companion animal grew(2). In some countries, mandatory HD and ED tests only apply to working lines(9). In contrast, some breeds commonly affected by HD and ED even include features that promote these conditions in their standards, like the Skye Terrier or the Glen of Imaal Terrier, with their short and curved thoracic limbs (10).

A different approach is the introduction of expected breeding values (EBV) to guide breeding. Using EBV as a reference offers substantial benefits compared to the phenotype-based selection methods, as it provides an assessment based on information collected from relatives and offspring, not just the individual animal. The use of EBV will aid in the education of breeders and owners on using a better tool to their advantage(1). In some countries, EBVs for evaluation of HD and ED are provided for registered pedigree dogs. It will also help further reduce HD and ED when almost all breeding is done in animals graded as unaffected, as it already happens in some countries(8).

This approach is probably the next step, as genetic testing and selection do not seem suitable. HD shows many associated chromosomes, which vary depending on the breed(6). A study evaluating a commercially available DNA test showed no prognostic value in a population of Labrador Retrievers. ED is the common endpoint of different diseases that affect normal elbow development through various mechanisms inherited independently. If a test is developed, it will probably need to be breed specific. With time, the goal is to move for a real breeding value, representing the actual genetic quality of the particular animal, rather than relying on phenotype information(5).

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DIAGNOSIS AND MANAGEMENT OF FOOD RESPONSIVE CONDITIONS

Alison Manchester

Colorado State University, Clinical Sciences, Fort Collins, United States of America

Qualifications:

First Section:

Full Name Alison C. Manchester

Qualifications DVM, MS, DACVIM (SAIM)

Email alison.manchester@colostate.edu

Introduction

Diet is a powerful means of altering disease course. The intestinal tract is the primary interface with food components and a critical immune organ. Recent advances have provided mechanistic links between nutrients, gut immune reactions, and systemic manifestations. Improved appreciation of the role of diet in health and disease may have positive impacts on patient health, and this lecture will arm attendees with information enabling optimal consideration of diet specifically in the management of gastrointestinal (GI) and dermatologic conditions.

Basic physiology of intestinal tract & epidermis + interaction with the immune system

The epidermal and intestinal barriers have shared features and key differences in their structure and function. Both barriers are made up of epithelial cells that form a physical barrier to prevent harmful agents from entering the body. They also contain specialized cells that secrete protective substances, such as antimicrobial peptides, enzymes, and immunoglobulins, which provide chemical defenses against pathogens. In the skin, keratinocytes serve as the first line of defense, while the intestinal barrier comprises a single cell layer of columnar epithelial cells connected by tight junctions. Epithelial cells secrete cytokines and serve as first responders in the face of potential danger.

The gut-associated lymphoid tissues (GALT) is home to more immune cells than those in any other anatomic region in the body[1]. The gut mucosal surface offers a vast area (estimated average of 32 m^2 in humans) for close interactions with the gut luminal inhabitants, especially bacteria and dietary antigens. The GI mucosa must at once recognize (and possibly, eliminate) these "foreigners" while avoiding overzealous inflammatory responses which may impair nutrient absorption and disrupt barrier function. The gut mucosal immune system "educates" the peripheral immune system; antigens encountered first via the oral route tend to incite a tolerant response[2].

Conversely, antigen encountered via the skin, airways, or other mucosal surfaces is typically considered a threat, and inflammation ensues.

Updates on CIE pathophysiology

Canine chronic inflammatory enteropathy (CIE; previously referred to as inflammatory bowel disease) is a syndrome encompassing patients presenting with chronic clinical signs referable to GI dysfunction. At this point, diagnosis of CIE is achieved after exclusion of once specific causes (e.g., infection, endocrine disease, neoplasia) for signs, and documentation of inflammatory infiltrates in GI mucosal biopsy samples [3]. Given the heterogeneity of clinical presentations and responses to therapy, it is likely that various distinct conditions are lumped together under the CIE umbrella. This common condition is not well understood but thought to involve aberrant host reactions to dietary antigens and commensal bacteria in the face of gut barrier dysfunction [4].

Recent attention has been paid to composition of the intestinal microbiome in CIE. Studies to date have shown reductions in the abundance of select bacterial groups (*Faecalibacterium* spp.) without significant differences in overall community structure in CIE versus health[5]. Current understanding is unable to ascribe prognostic information to fecal microbial signatures. Moreover, more severe dysbiosis may paradoxically coincide with clinical improvement. A recent study documented differences in humoral responses to luminal bacteria in the feces of CIE dogs compared to healthy ones [6], supporting the hypothesis that CIE involves heightened immune responses against non-pathogenic gut bacteria. Further exploration of the functional consequences of gut dysbiosis are needed.

Updates on atopic dermatitis pathophysiology

Atopic dermatitis (AD) in dogs is a clinical syndrome with various causes and triggers and is passed down genetically. Like CIE, AD in dogs is a clinical syndrome, not a single disease. Genetic factors and environmental conditions shape the immunological response culminating in clinical disease. Skin barrier impairment plays a role in promoting increased allergen penetration and cutaneous dysbiosis, with downstream alterations in dendritic cell and lymphocyte responses. It is still unclear whether skin barrier gene mutations exist in AD dogs or if the observed alterations are only secondary to inflammation. Dogs with AD have dysregulated immune responses with increased Th2, Th17, and CD4+ CD25+ regulatory T cells. Specific cytokines (such as interleukin-31, IL-34, and Macrophage migration inhibitory factor) are proposed as potential biomarkers and treatment targets for dogs with AD[7].

Current classification places dogs with cutaneous adverse food reactions (CAFR) under the umbrella of AD. Food-specific serum IgE has been found to be elevated in several studies. However, subsequent studies using client-owned dogs failed to demonstrate a reliable correlation between serum IgE concentrations and clinical exposure to the offending allergens [8]. Similarly, intradermal, gastric, or colonoscopic testing are unreliable[8]. There are many unknowns regarding the pathophysiology of CAFR in dogs[9].

Canine CIE management

Management of CIE in dogs involves sequential treatment trials until clinical signs improve. The exclusive feeding trial, lasting 10 to 14 days in dogs and cats, remains the gold standard diagnostic test to rule in diet-responsive CIE. Prospective treatment trials have found 53 to 88% of this patient population to improve clinically with diet[3]. Several studies have found CIE dogs responding to diet to be younger, with less severe clinical signs. However, more recent studies have challenged that assertion, with dogs of all ages and severities of clinical disease having favorable responses to diet. In this way, it is challenging to paint a portrait of the prototypical diet-responsive CIE dog. A role for diet, be it monotherapy or adjunctive, should be considered for all dogs presenting with chronic intestinal signs.

Cutaneous adverse food reactions diagnosis and management

A dedicated feeding trial remains the gold standard for diagnosing dogs presenting with year-round pruritus and other compatible manifestations of AD with CAFR[8]. The goal of the diet trial should be to identify a change in pruritus and other related clinical sign severity in the patient. Patients that require medical management of pruritus during the diet trial should receive oclacitinib or prednisone during the first phases of the diet trial while other issues, such as secondary infections, or otitis, are managed. Topical therapy may also be included during this phase to manage secondary infections and reduce pruritus.

Why and how does diet help?

Certain attributes of the diet may provide direct benefits. Enterocytes gain much of their energy directly from the gut lumen. Sulfur-containing amino acids and short-chain fatty acids have well established links with positive

impacts on mucosal inflammation. Food components can also provoke clinical signs. While much attention has been paid to IgE-mediated reactions against dietary antigens, this is not likely to be a major driver of disease in diet-responsive CIE dogs. Direct harmful effects from dietary components can stem from other immune (e.g., T-cell, mixed cell) or non-immune mediated processes. These may include negative reactions to certain ingredients (e.g., chicken) or nutrients (e.g., fat intolerance). Thus, adding or removing certain components from the diet could enable a dog to improve clinically.

Indirect effects from diet may be even more important. Diet is known to induce rapid changes in gut microbial populations, which may be associated with altered gut immunological responses. A feeding trial of an amino acid-based diet to CIE dogs found clinical response to the diet to coincide with significant shifts in fecal bacterial community compositions which were absent in non-responders (Manchester in press). Alternatively, ingestion of a diet rich in plant fibers by dogs with chronic large bowel diarrhea had no detectable changes in bacterial populations, but the fecal metabolome showed decreased proteolytic and putrefactive processes[10].

Conclusions

Diet is a powerful tool in the management of various GI and dermatological conditions. An individualized approach is critical to maximizing treatment success. Well-designed clinical trials of representative patient populations leveraging current immunological techniques are needed to continue to put the pieces together and explain the mechanisms underlying canine CIE and AD.

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OPTIMISING HYDRATION AND WATER TURNOVER IN CATS WITH LUTD - IMPORTANCE AND STRATEGIES

Andy Sparkes

Simply Feline Veterinary Consultancy, -, Shaftesbury, United Kingdom

Qualifications:

Dr Andrew Sparkes

BVetMed PhD DipECVIM MANZCVS MRCVS

andy@sparkes.uk.net

Most cats are very adept at managing water balance and hydration and this is a refined homeostatic mechanism that is vital to normal healthy living. The physiological control of thirst, water balance and hydration is complex and can be disrupted in a number of different disease processes.

However, it has been suggested that cats originated as desert-living animals and as a result are relatively insensitive to dehydration and may have a poor thirst response (or 'thirst drive'). Although this has not been explored in detail, there is evidence that cats, for example, will be slower than dogs to replace lost water (dehydration) through voluntary drinking.[1] Whether this reflects a poorer thirst drive though is an open question and it is important to challenge unproven assumptions about the thirst drive and predisposition to dehydration in healthy cats.

Although cats may not have an inherently poorer thirst drive, in other species such as humans and rats, it has been shown that the ageing process is associated with a lower total body water content and a poorer thirst response that may predispose to sub-optimal hydration (or hypohydration).[2] It is assumed that the same is also true in cats and there is some objective evidence to support this. The practical consequence of this is that in older cats, pathological processes that may interfere with normal water homeostasis that may result in a greater risk of under-hydration or dehydration. Further, cats are known to generally produce very concentrated urine (more so than dogs or humans) and thus there total water turnover may generally be relatively lower and urine produced generally more concentrated.[3]

Diet and water intake

As a result of their excellent urine concentrating ability, cats consuming a meat diet can, at least potentially, derive all the water they need from the diet alone and may not need to drink to maintain hydration.[4] Most cats fed commercial wet diets (tins or sachets) will still drink some water, but cats fed dry food will drink more as a result of the lower water content in the diet (wet foods typically have around 80% moisture and dry foods typically less than 10%). Total water intake in cats fed wet diets is almost always higher than in cats fed dry foods, and where water consumption is critical for medical needs this can be exploited to help increase overall water intake.

In a healthy cat, there are practical advantages to feeding both wet and dry foods and feeding either has been demonstrated to be both safe and to support the long-term health of the cat. As a species, cats are typically neophilic when it comes to their diet. This means that they will naturally be inclined to try new and different food items, a mechanism that is likely to add variety to their diet and help protect against nutritional imbalances and deficiencies. However, many factors influence the food preferences among individual cats, and some cats develop a very strong preference for certain food types (eg, dry vs wet) and/or flavours. In general, to try to avoid cats developing a very strong preference for one particular type of food, it may be better to feed them a variety (eg, a mix of both wet and dry food) from a young age. This means that if a cat ideally needs to be transitioned to a completely wet diet for medical reasons in the future it is more likely to be successful.

Water-sensitive medical conditions

There are many diseases that affect cats where water intake will be an important consideration and where, as part of the overall approach to management, increased water intake will be desirable. Although outside of the scope of this presentation, these diseases include chronic kidney disease, diabetes mellitus, constipation, hyperthyroidism and other conditions associated with increased water loss through the kidneys, gastrointestinal tract, skin etc.

Feline lower urinary tract disease (FLUTD) represents a very important collection of medical conditions where the management of many causes requires consideration of hydration status and water turnover. Diseases of the lower urinary tract account for around 4-5% of cats presented in primary care practice[5], and the three most common diagnoses made in most studies are feline idiopathic cystitis (FIC), urethral plugs, and urolithiasis.

Increasing water intake and creating an increased volume of more dilute urine (which is therefore voided more frequently) appear to be important strategies in the management of all three of the major causes of FLUTD. In addition to optimising urine dilution, with urolithiasis (and urethral plugs associated with crystalluria) additional dietary modifications to reduce urine concentrations of calculogenic minerals is also important.

Strategies to increase water intake

Feeding a wet rather than a dry diet is an important strategy in increasing water intake, and wet diets (eg, greater than 70-80% moisture) are preferred to help produce dilute urine. However, in some cats (due to strong food preferences) using wet diets may not be possible, and even where they are accepted, wet diets alone may not necessarily result in the target urine specific gravity. Several other approaches may also be used therefore to increase and enhance voluntary intake of water:

• In cats that have a strong preference for dry food as part or all of their diet, using a therapeutic diet with a moderately increased salt content can be successful in increasing water intake, promoting diuresis and producing a more dilute urine with reduced risk of spontaneous crystal formation.[6] As with the use of wet foods though, increased salt in dry food may not necessarily produce the desired target urine specific gravity.

• Consideration can be given to the number of water bowls offered, their position (it is suggested they are sited in a quiet location where the cat will not feel threatened), the type of water bowl (it has been suggested cats may prefer smaller bowls, may prefer metal or ceramic over plastic bowls, and may prefer bowls that are full) and positioning the bowls away from food bowls and litter boxes. While some of these recommendations are based on behavioural observations of wild cats, whether they actually increase voluntary water intake in domestic cats has not been documented, but they may be sensible options.

• There has been some work done on investigating the use of water fountains or flowing water on voluntary intake in cats – three studies all failed to show a significantly greater water intake in cats offered flowing water[7-9], although it may be that some individual cats prefer running water and so providing this option may be valuable.

• Anecdotally, in addition to running water, some cats appear to have a preference for drinking from outside sources (such as puddles and ponds), and some appear to develop a preference for drinking from a dripping/running tap or even a toilet bowl. These observations suggest individual variation exists in preferences and owners should be encouraged to explore different options.

• Offering flavoured water is another suggested strategy (eg, adding chicken broth or tuna, clam or prawn juice) that anecdotally may help with some cats, but again studies evaluating this are lacking.

• Provision of a palatable, increased viscosity nutrient-enriched water

source has been critically evaluated in cats, and this appears to be a successful way of increasing water intake and producing a more dilute urine[10], and based on published data this strategy can be recommended.

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CLIENT FRIENDLY CONVERSATIONS TO IMPROVE ADHERENCE WITH NUTRITIONAL RECOMMENDATION

Marge Chandler

Vets Now Referrals, Nutrition, Lasswade Midlothian, United Kingdom

Qualifications:

Marjorie Chandler

DVM, MS, MANZCVS, DACVIM (SA Internal Medicine and Nutrition), MRCVS

marge.chandler@vets-now.com

INTRODUCTION

Diet can cause, prevent or treat many diseases as well as improve pets' quality of life and longevity. Providing nutritional advice is a vital part of maintaining pet health.

SOURCES OF PET FOOD INFORMATION

Dietary information is available from multiple sources of varying quality, many providing conflicting and confusing advice and misinformation. Nearly half of 900 dog owners felt diet choice was the most difficult part of ownership, over half said their dog's nutrition was more confusing than their own, and 25% felt overwhelmed by the choices available1.

Diet recommendations may come from the veterinary healthcare team, friends, family, pet stores, breeders, internet "information websites" not aligned with a pet food manufacturer, or manufacturer websites. In one study 44% of dog owners fed based on "past experience"2.

Several surveys have been done on owners' pet food choices. Surveys can be affected by selection bias, i.e. self selection by those interested or engaged in the topic, and by social desirability bias, a tendency to respond in a way that will be viewed favourably by others. Responses are limited to the population selected, making it difficult to generalize to a wider population, but surveys are a starting point for understanding diet choices.

The percentage of owners using veterinary diet advice varies from 9%2 to 43.6%3. The latter US study included 26% animal professionals and about 75% owners with college degrees compared to 38% of the total US population4.

In studies before the Covid 19 pandemic, friends and family provided about 10% of recommendations, similar to pet food stores, and online sources provided about 5%5. Online pet food purchases increased during the Covid-19 pandemic6. Internet use for information about pet foods likely also increased with limited availability of veterinary visits.

COMPLIANCE WITH PET FOOD RECOMMENDATIONS

Compliance with veterinary diet recommendation was reported at 77% to 80%, lower than breeder recommendations at 86%5. Compliance with "information websites" e.g. comparison sites, and manufacturer's websites was 68% and 66%, respectively.

Owner receptiveness to diet recommendations is lower if a conventional or alternative diet, e.g. homemade or raw, is fed. Cat owners were more likely than dog owners to feed commercial rather than homemade food 7,8 and to consider veterinary nutritional recommendations 9.

Owners feeding non-commercial diets are less likely to discuss nutrition and less likely to trust veterinary nutritional advice10. Many feeding raw foods find information online or from friends or family10. Unfortunately owners feeding non-conventional diets, include home prepared raw diets, likely source diet formulations from the internet or non-veterinary books10, 11. These formulations frequently contain deficiencies and excesses12.

Reason given for feeding unconventional diets include the desire to feed similar to the pet's wolf ancestor, perception that these diets are healthier or more natural, wish to avoid certain ingredients (e.g. grains, by-products/meat derivatives, additives), distrust of large pet food manufacturers, or lack of appropriate and/or palatable diet for medical conditions or co- morbidities.

THE NUTRITION CONVERSATION

In studies, only 60% of veterinarians discussed nutrition in appointments, only 12% recommended long term health related diet changes13, and only 21% of Belgian and Dutch veterinarians had knowledge of WSAVA nutritional guidelines14. Veterinarians recommend therapeutic diets but discussion during wellness appointments is less common.

Factors perceived by practitioners preventing nutrition discussions during healthy pet appointments included: 1) client resistance to changing food brands, 2) time constraints, 3) misinformation online, and 4) difficulty keeping up with products15. Reported barriers during appointments for sick pets included: 1) client cost concerns, 2) pet not accepting new food, 3) time constraints15. Veterinarians reported limitations of their knowledge and wishing to avoid potentially emotionally charged discussions. Often nutrition has not been incorporated into consultations by practice management.

NUTRITIONAL ASSESSMENT

Nutritional assessment should occur at every consultation16. It's an effective way to initiate a diet discussion and provide fact based information. Using open ended questions such as "Tell me about what you feed your dog" garners more information than " What do you feed?", which may result in only the main diet17. Many pets are fed homemade or raw foods in addition to a conventional diet8. Other suggested diet history approaches include asking everything the pet eats from morning until bedtime17 or describe the diet as for a pet sitter.

Owners may be reluctant to discuss treats or food used for medications. Using similar statementS such as "Tell me what treats Sam gets" or "Describe foods you use to give Buffy her medications" can provide an approach which appears less judgemental than "Do you give treats?".

Taking a good diet history can be time consuming. This can be addressed by emailing/mailing a form to the owner before the consultation or having the owner it fill out in reception before the appointment. A nurse/technician may be able to scan the history for problems or red flags.

Body and muscle condition assessments are incorporated into the physical examination. Values can be put into computerised clinical records, defaulting to zero if omitted.

INTITIATING THE NUTRITION CONVERSATION AND DIET RECOMMENDATIONS

The diet history provides a platform to initiate the nutrition discussion. If there are concerns about a diet or you are unfamiliar with it, ask the owner if they are willing to discuss it. Sometimes they may not be willing to have this discussion. They may feel that the healthcare team will disapprove of their choice (alternative diet, inexpensive diet) or they may not have the time or energy that day. A stressed owner will not be able to have a constructive discussion.

If their diet choice is due to misperceptions about its benefits, ask if it is ok to discuss it further. Some owners may not be ready for the discussion or may not wish to have it at all. If possible provide handouts or web links to good information. If they are willing to discuss a diet which you are

concerned about, ask non-judgementally about the reasons for their diet choice.

If you are unfamiliar with the food, offer to find out more about it (if possible). In addition to diet and dietary management, a conversation about the pet's lifestyle and activities and any pet care challenges the owner may have is essential. This provides background and helps establish rapport with the client. The better the client relationship, the more likely they are to adhere to recommendations.

Nonverbal communication skills are vital. Body language should be "open". If possible sit next to the client rather than across an exam table. Don't stare at the computer during the discussion.

Information discussed should be reinforced in writing. The person in the consultation may not be the primary care giver and no one retains much information provided only orally.

Recommendations should be very exact and clear. Saying " Bob needs to lose a little weight" will usually not work. The consequences of a poor diet or dietary management on quality of life and longevity should be discussed to emphasize its importance.

PROVIDING PET FOOD FACTS

While many veterinarians feel their nutrition knowledge is inadequate, review and research articles, textbooks, webinars, and other online learning resources abound. The WSAVA GNC toolkit has information on using internet information and on selecting a petfood16.

It is difficult to deal with misinformation owners may believe. When belief is based on misperception the person has a set mental model using that idea. They may also have confirmation bias, the process of selectively seeking or agreeing with information which fits a world view or idea and ignoring or refuting opposing ideas. When presented with a balanced set of facts, people gravitate toward those which reinforce their pre-existing views, especially strongly held views.

When facts are presented which disagree with established ideas, the established idea may be clung to more fiercely. Doubt turns people into stronger advocates of their ideas18. This is cognitive dissonance and the effect is stronger if someone's identity is threatened (e.g. "I'm a vegetarian so my pet should be vegetarian") or the belief is important to them (e.g. "My dog should be fed like a wolf").

A set mind is unlikely to change in one consultation, but the seed can be planted about other potentially beneficial diets and discussed at another consultation. Statements based on pet health are more effective for persuading owners to consider diet change compared to a veterinarian's personal choice or manufacturer recommendations19. About 93% of owners indicated being somewhat willing to change their pet's diet based on veterinary recommendation. Of the 18% who had diet change recommended, 68% planned to follow the advice, especially if recommendations occurred within an established veterinarian-client-pet-relationship.

ESTABLISHING NUTRITIONAL ASSESSMENT AS PART OF THE PRACTICE

The entire veterinary healthcare team, including receptionists and kennel staff, should be included in incorporating nutrition into all consultations. This practice should be assessed after implementation for challenges as well as successes.

Computerized records can incorporate diet history, body condition score, muscle mass score as part of the amanuensis and physical examination. Discharge sheets should include a section for diet recommendation along with any medication or other management or therapeutic recommendations.

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EVIDENCE BASED USE OF PROBIOTICS IN PRACTICE

Michael Lappin

Colorado State University, The Kenneth W. Smith Professor In Small Animal Clinical Veterinary Medicine, College Of Veterinary Medicine And Biomedical Sciences, Fort Collins, United States of America

Qualifications: Michael R. Lappin DVM, PhD, DACVIM
Michael.Lappin@ColoState.edu

Abstract Body: Probiotics are live microorganisms that when administered in adequate amounts confer a beneficial health effect on the host. When probiotics are combined with prebiotics like psyllium, they are called synbiotics. There have been many studies and reviews of the effects of probiotics on the health of humans, but fewer in small animals. Evidence supporting the use of probiotics is generally strongest for managing gastrointestinal syndromes such as acute or chronic diarrhea due to infectious diseases or inflammatory bowel disease. There is also some evidence that probiotics might be beneficial for mitigating antibiotic-associated vomiting or diarrhea. It is known that some probiotics help balance the endogenous microbiota and that some can inhibit replication of pathogenic bacteria. Some of the proposed mechanisms of action include competition for essential nutrients or receptor sites, binding of pathogenic bacteria, and production of inhibitory substances. There is also evidence that some probiotics induce immune modulating effects with potential benefits for the management of inflammatory bowel disease, atopy, or infectious diseases with systemic involvement (e.g., feline herpesvirus-1; FHV-1). Recently, data has been published in both dogs and cats that some probiotics may alter the brain-gut interactions and lessen stress. Infectious diseases are common in small animals, so the potential beneficial effects of probiotics could impact veterinary practice significantly. It is also now known that some probiotics can beneficially influence innate and acquired immunity systemically. Not all of the methods by which probiotics modulate the immune system have been characterized and it is likely that these effects vary by probiotic. Thus, a clinical effect that is shown to be induced by one probiotic may not be induced by others, even in the same genus and species of bacteria. For example, there are many strains of *Enterococcus faecium*, but positive clinical effects in dogs or cats have only been shown with the *E. faecium* strain SF68. While probiotic use is generally considered safe, consumers should ask companies marketing probiotics for the product's safety information. One of the other major issues concerning probiotic use in small animal practice is quality control. In recent veterinary studies, the majority of products claiming to contain probiotics generally did not meet the label claim when evaluated.Other unresolved issues for probiotic use in small animals is the optimal number of bacteria to be used and whether there are clinical benefits to having multiple strains of bacteria in a product. Since each bacterium in a probiotic can have unique effects, products containing multiple bacteria actually may have competing mechanisms of action lessening potential beneficial effects. There are several veterinary probiotic products marketed in some countries, including the United States that have been shown to be safe, meet label claims, and have clinical studies supporting potential beneficial effects. In this lecture, we will focus on multiple studies that emphasize key points concerning prebiotics, probiotics, and synbiotics.**Suggested readings** Benyacoub J, Czarnecki-Maulden GL, Cavadini C, et al. Supplementation of food with *Enterococcus faecium* (SF68) stimulates immune functions in young dogs. *J Nutr* 2003;133:1158-62. Benyacoub J, Perez PF, Rochat F, et al. *Enterococcus faecium* SF68 enhances the immune response to *Giardia intestinalis* in mice. *J Nutr* 2005;135:1171-6. Bybee SN, Scorza AV, Lappin MR. Effect of the probiotic *Enterococcus faecium* SF68 on presence of diarrhea in cats and dogs housed in an animal shelter. *J Vet Intern Med*. 2011;25:856-860. Chandler M. Probiotics - not all created equally. *J Small Anim Pract*. 2014;55:439-441. 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CLOSE CONTACT WITH PETS: ZOONOTIC INFECTIONS TRANSMITTED THROUGH TICKS, FLEAS, AND HELMINTHS

Ana Margarida Alho

Public Health Unit, Northern Lisbon, Lisboa, Portugal

Qualifications:

Ana Margarida Pignateli Vasconcelos de Assunção Alho

Qualifications: Integrated Master's in Veterinary Medicine Degree (2012); European Doctoral Degree (PhD) in Veterinary Sciences (2017); Integrated Master's in Human Medicine (2019); Currently 3rd Public Health Medical Resident at USP Francisco George, Primary Medical Healthcare Cluster Lisbon North.

Email: alhinha@gmail.com

Proceeding Title: Close Contact with Pets: Zoonotic Infections Transmitted through Ticks, Fleas, and Helminths

Vector-borne diseases have become an increasingly intricate issue. These illnesses are caused by various infectious agents such as parasites, bacteria, and viruses, often requiring a coordinated and multidisciplinary approach. The complexity stems not only from the nature of the diseases themselves but also from the fact that many of these ailments can impact both animals and humans. In recent years, there has been an emergence of new diseases or a re-emergence of existing ones, accompanied by changes in their epidemiology, including geographical spread, rising prevalence, and heightened pathogenicity. Climate change, particularly global warming and extreme weather events, contributes to this increase. Globalization has further facilitated the circulation of pathogens. Additionally, demographic and social factors such as human population growth, urbanization, changes in land use and an increase in outdoor recreational activities like hiking, biking, and running have increased the risk of exposure to these disease-carrying vectors [1,2].

Lyme disease, is the most common tickborne disease in the USA and Europe, with an estimation of 476,000 and >200,000 cases diagnosed per year, respectively. This multisystemic zoonotic disease is transmitted by ticks of the *Ixodes* species that are infected with spirochetes of the genus *Borrelia*. In the USA, most infections are caused by *Borrelia burgdorferi sensu stricto* while in Europe are caused by *B. afzelii* and *B. garinii*. Lyme disease is particularly common in children, with one-fourth of all cases occurring in this age group [3]. Another significant zoonotic tick-borne disease is Mediterranean spotted fever, an acute infection caused by *Rickettsia conorii*. Transmitted by the brown dog tick, *Rhipicephalus sanguineus*, this disease is endemic along the Mediterranean coastline and is prevalent in much of the Middle East, Africa, and the Caspian and Black Seas [2]. Cat-scratch disease, caused by *Bartonella henselae*, is an important flea-borne zoonosis that can be transmitted from a cat to a person through a scratch contaminated with infective flea feces. In fact, for several zoonoses, dogs and cats appear to play a crucial role as amplifiers of the reservoir and vector, both in domestic and peridomestic cycles, in urban and peri-urban areas [2].

On the other hand, the increasing trend of anthropomorphism, where pets are treated with human-like affection, has led to closer physical contact between owners and their animals. This closeness creates a growing risk for the transmission of zoonotic pathogens including parasites, bacteria, viruses and fungi through this direct interaction. Practices such as sharing a bed with pets, allowing pets to lick faces or wounds, engaging in soil contact, and modifying feeding habits have become increasingly common. In countries such as Portugal, the Netherlands, the USA, UK, France, Canada, the Czech Republic, and Qatar, a substantial number of pet owners permit these behaviors [4,5,6]. Such intimacy may facilitate the spread of bacterial infections like *Yersinia pestis* (plague), *Bartonella henselae*, and Methicillin-Resistant *Staphylococcus aureus* (MRSA), highlighting the potential health hazards of such close contact with pets [4]. Although pets themselves do not directly transmit arthropod-borne diseases such as ehrlichiosis, Lyme borreliosis, or anaplasmosis to humans, they can introduce zoonotic vectors like ticks and fleas into close proximity with people, especially when sharing close quarters with their owners. A study focusing on healthy pets that shared sleeping spaces with their owners found that 32% of the cats and 68% of the dogs carried *Enterobacteriaceae* on their fur or footpads, while 14% were found to be infested with fleas and flea larvae [7].

An additional risk tied to close contact with animal fur arises when it is contaminated with the eggs of zoonotic parasites, notably *Echinococcus granulosus* and *E. multilocularis*. These eggs can infect immediately and may lead to serious health issues in humans. A similar risk exists with the presence of sporulated *Toxoplasma gondii* oocysts on dogs' fur. The natural hand-to-mouth behavior of children adds to this danger, with an estimated indoor frequency of 6.7 to 28 contacts per hour and an outdoor frequency of 2.9 to 14.5 contacts per hour [8]. However, merely 15% of dog owners and 8% of cat owners consistently state to wash their hands after interacting with their pets [5]. Additionally, a meta-analysis revealed a substantial 21% global prevalence of contamination with *Toxocara* spp. eggs in public spaces [9].

Many pet owners also have a limited understanding of zoonotic risks, including the sources of infection and necessary preventative measures [10]. Furthermore, practices for controlling parasites are often not ideal. While most pet owners administer antiparasitic drugs, they frequently fail to adhere to the manufacturer's guidelines, deworming at irregular and consequently ineffective intervals. As a result, compliance with proper parasite control is often poor [10].

Given the escalating threat of zoonotic diseases to both humans and animals, adopting a unified 'One Health' approach has become vital. This collaborative and multifaceted strategy acknowledges the interconnection of human health with the well-being of animals and the environment. Implementation of this framework is essential for monitoring and controlling public health threats, emphasizing the importance of viewing these diseases within a broader context of global health.

Call to Action: Encourage veterinarians to take an active role in education, collaboration, and public health.

Summary of Key Points: This lecture aims to offer a comprehensive understanding of the most common vector-borne and helminth zoonoses, demystifying myths and presenting facts from both veterinary and public health perspectives. The discussion will include an overview of these diseases, their prevalence, and transmission dynamics, emphasizing the vital role of veterinarians in diagnosis, treatment, prevention, and, especially, education about zoonotic risks to pet owners. The talk will also explore strategies for empowering pet owners with knowledge and encouraging responsible behavior that minimizes disease transmission. By connecting pet care with public health, the lecture aims to foster a community that is well-informed and proactive in managing these diseases, highlighting the pivotal role of veterinarians in this complex public health challenge.

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HOW RESPONSIBLE HEALTH-FOCUSED BREEDING CAN IMPROVE THE GENETIC HEALTH OF DOGS AND CATS

Åke Hedhammar

Swedish University Agriculture Science, Clinical Science, VAXHOLM, Sweden

Qualifications:

Åke Hedhammar ,dipl. ECVIM-passive

DVM prof em. Internal Medicine - Small Animals

ake.hedhammar@slu.se

Since domestication dogs have been selected and bred by humans to suit our desires. Somewhat later and to less extent also cats were "semi-domesticated". Recently, there has been intense focus on the genetic health of pedigree dogs and cats. Pedigree dogs account for less than 10% of the global canine population and cats even less. Nonetheless, many diseases defined as genetic conditions of pedigree dogs and cats also exist in non-pedigree populations. This paper therefore deals with how we, as small animal veterinarians are able to promote and enhance genetic health mainly focusing in dogs with or without a known pedigree.

While originally selected for their performance of various tasks such as hunting, watching and herding, dogs have for a long time also been bred for their appearance; with a supposed or hypothesized correlation to desired functional capabilities (e.g., as hunters, herders or protectors). Human perceptions and preferences (e.g. cuteness / anthropomorphic ideas, size, hair coat, etc.) have also played a role. Selection has also, especially in recent times, been focused on the appearance and success of the breeding stock, with less emphasis on the health or performance of the progeny.

Breeders and breeding

A **breeder** is a person who selectively breeds carefully selected mates, normally of the same breed to produce offspring with specific, consistently replicable qualities and characteristics.

Breeding versus mating

Mating is a natural process that occurs when animals come together and reproduce. On the other hand, breeding is a complex process that occurs purposely when the animal is specifically chosen by humans to create a special offspring. By domestication man took the responsibility for breeding of domesticated animals as dogs and cats

Responsibility is for the individual animal as well as the population. The responsibility is also against the individual owner as well as the society. **Responsible health focused breeding is performed by responsible breeders assisted by responsible breed clubs/ national kennel clubs and skilled veterinarians**

Health-focused with reference to breeding means physical health as well as mental health. Health focused breeding beyond the wise selection of breeding stock calls for proper nourishment as well as protection against infections and infestations

Responsibility by whom

Introduction of breed standards and closed stud books have encouraged so-called line breeding and even inbreeding to an extent very much like that seen in geographically isolated populations of various species, including humans. As a consequence of these breeding practices the phenotype of many breeds has become almost fixed, sometimes including breed-specific disease risk and very high within-breed prevalence of certain hereditary disorders. Breed standards and dog shows, without malicious intent, also have resulted in individuals with exaggerated anatomical features.

The cynological organizations and breeders of the past might bear substantial responsibility for the current situation in those breeds where a high proportion suffer from disorders related to their (extreme) anatomical features and / or other hereditary disorders. However, individual veterinarians and veterinary associations over the same period have - in various capacities - served breeders as well as individual dog owners and dogs. Therefore, we share the responsibility for the current situation. Most effectively changes should be made in collaboration with other stakeholders including the cynological organizations, geneticists, authorities and welfare organizations.

The role of our profession

In our professional duties as small animal veterinarians preventive measures to control spread of genetic disorders are gaining an increased attention and importance. We are able assist in the selection of breeding stock by diagnosing clinical entities and screening for early signs. An increasing interest in preventive measures and animal welfare calls for a closer tie with other stakeholders in these measures. To reveal the inheritance of them we are collaborating with geneticists and breeders. To arrange for screening programs and certification we ideally work together with the national cynological organizations.

OUR PRIME RESPONSIBILLITIES AS VETS *is to diagnose and treat*. As practicing veterinarians our prime responsibility is to cure whenever possible and at least to give symptomatic relief. For hereditary diseases, which most commonly are congenital and/ or developmental or metabolic and/or degenerative it is usually not possible to cure. It is however equally important to come up with an aetiology based diagnoses. Even if it is not to permanently cure these conditions, it is of outmost importance for any breeding advices to be given for the benefit of the next generations.

is to assist in control and prevention We are as small animal practitioners more and more involved in preventive measures. For hereditary diseases it is mainly to assist in the performance of various screening programs and registration of verified cases of genetically defined diseases. We as veterinarian should guarantee that proper inclusion/ diagnostic criteria are used for screening procedures as well as for inclusion in registries of identified cases.

General Practitioners are the ones most exposed to various health problems with a genetic background. They are seeing a wide variety of cases. Daily contact with owners of these Dogs should be utilized to not only revile suffering of the individual animal but also to inform about an animal's suitability for breeding. To have such a discussion is of course most appropriate with dog owners known as breeders. In many European countries it is however common that "regular dog owners" occasionally do produce litters of puppies. In fact in many countries and breeds that part makes up a fair share of litters produced yearly.

Practicing specialists discipline do see a greater number only within their field of specialization. Thereby commonly involved in various screening programs for hereditary disorders and are very important "launcher" of these programs.

Practicing veterinarians involved in reproduction and paediatrics have a special exposure to breeders – experienced as well as those with very little experience. At deliveries it is appropriate also to discuss whether or not a bitch is suitable for further breeding. Neonatal puppy inspections might also reveal inherited conditions to be considered with reference to further breeding.

In some countries including Sweden it is already common practice to have all puppies "inspected" before delivery. In UK a special puppy contract have recently been launched.

Veterinarians at academic institutions and other vets involved in research are playing an important role to apply their results into practical dog breeding and to take advantage of and promote the noted value of canine research also for comparative studies for the benefit of humans.

Veterinarians with dual roles

By involvement in breeding, breed clubs, dog "sports" including showing, many veterinarians are strongly involved in the cynological organization in various functions; commonly serving on health committees but not rarely as even as presidents of breed clubs and even national kennel Clubs. Veterinarians involved in breed clubs have a responsibility to function as a bridge between the profession and the "cynological" world.

Nowadays, some kennel clubs have veterinarians and / or geneticist full-time employed to assist in matters related to health and breeding. Others have veterinary and genetically consultants on a part time basis for special purposes i.e. on hip, elbow and eye panels

The professional organizations

At an international and regional level WSAVA and FECAVA and at national levels their member organizations should promote collaborative efforts, i.e. to work together with the cynological organizations in the setup of screening programs and registries.

As specialist organizations the European and American colleges should serve as authorities to validate diagnostic criteria and procedures in their special area of competence.

Proposed actions

***taken and to be taken* by cynological organisations include an adaptation and interpretation of "old fashioned" breed standards not to be misinterpreted and resulting in exaggerated anatomical features in individual rewarded at dog shows. It also include measures not to limit the population size by rules and regulations resulting in breeds and varieties not to be bred to each other.**

Proposed stronger involvement by the veterinary profession

As a conclusion of views presented above the following is proposed:

That the professions nationally and internationally take an active part in collaborative efforts with other stakeholders for enhancement of canine genetic health.

That the veterinary profession takes a more active part in pre-breeding inspections and advices regarding potential breeding stock.

That the veterinary profession is involved in the launching of puppy health certificates.

That the veterinary profession by introduction in the curriculum is better prepared to take a more active part in breeding advices related to screening procedures they are involved in.

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UPDATE ON THE "ZERO BY 30" RABIES PLAN AND THE WSAVA ROLE

*Felix Lankester[1], **Sarah Cleaveland**[2], Luke Gamble[3]*

[1]Washington State University, Paul G. Allen School For Global Health, pullman, United States of America, [2]University of Glasgow, School Of Biodiversity, One Health And Veterinary Medicine, Glasgow, United Kingdom, [3]Mission Rabies, Director, Cranborne, United Kingdom

Qualifications:

Felix Lankester

BVSc MSc PHd

felix.lankester@wsu.edu

Will we eliminate rabies by 2030? Wouldn't it be better to vaccinate people, rather than dogs? What effect has the pandemic had on our efforts to control rabies? These and other questions will be debated by three rabies experts, Prof. Sarah Cleaveland (University of Glasgow), Dr. Luke Gamble (Mission Rabies) and Prof. Felix Lankester (Washington State University and Rabies Free Africa) during this mini-symposium dedicated to rabies elimination on World Rabies Day (28th September). Following a presentation summarising the key aspects of rabies epidemiology and control, the panel will address frequently asked questions regarding rabies and the 'Zero By 30' global human rabies elimination strategy.

Rabies is a fatal encephalomyelitis caused by viruses in the Lyssavirus genus. The disease has been recognised for many centuries and has been the subject of more than 100 years of research but remains one of the most distressing human diseases. Safe and highly efficacious vaccines have been developed for prevention and control of rabies in human and animal populations. Although the disease rabies can be caused by several Lyssaviruses, maintained in several different mammalian host populations, dog-transmitted rabies causes >99% of human rabies deaths worldwide. Considerable advances have been made towards the elimination of canine rabies, but the disease continues to kill tens of thousands of people annually in Africa and Asia[1]. The disease also exerts a substantial economic burden, estimated at $8.6 billion per year[1]. While these costs primarily relate to the costs of human rabies vaccine and premature human deaths, several other components of the canine rabies burden are also of concern. These relate both to livestock losses, which remain poorly quantified but can have important impacts and to wildlife conservation, with canine rabies threatening several endangered wildlife populations.

Human rabies is a disease that can be prevented through (a) prompt administration of post-exposure prophylaxis (PEP) for people who have been bitten, and (b) by controlling infection at the animal source through mass dog vaccination (MDV). The occurrence of human rabies, with deaths occurring primarily in poor, rural areas of Asia and Africa, is a clear indicator of inequalities in provision of both human and animal health services. For PEP, the high costs, limited access and complex vaccination regimens represents a challenge and health emergency for more than 30 million people a year bitten by suspected rabid dogs and who require life-saving PEP[2]. The high costs of PEP often result in financial hardship, and delay in accessing PEP invariably results in intense anxiety as people await an uncertain outcome and, in some cases, the development of fatal disease.

Despite the on-going threat of rabies, a considerable body of research now exists to demonstrate the feasibility of canine rabies elimination. Across a range of settings worldwide, the basic reproduction number, R_0, for canine rabies consistently falls between 1 and 2, despite very wide variation in dog density and demography[3]. This suggests that rabies should be feasibly controlled through MDV, and a threshold of 70% coverage (achieved during annual campaigns) has been shown empirically and theoretically to be sufficient to result in elimination (3). Conversely, the lack of a strong relationship between R_0 and dog density suggests that approaches based on reducing dog density, such as culling, are likely to be ineffective and can often be counterproductive[4]. Consequently, there is now strong evidence to indicate that MDV provides the most effective approach of controlling domestic dog rabies and preventing transmission to people.

Much research has been carried out to demonstrate the operational feasibility of MDV. Contrary to widely held perceptions, most dogs in Africa and Asia have owners, and sufficient dogs are accessible to parenteral vaccination to allow target vaccination coverages to be reached. The presence of less accessible community dogs in areas of Asia makes the situation more challenging, but target levels of vaccination coverage have also been achieved in these communities[5]. Developments in oral vaccination of domestic dogs may also allow opportunities for vaccination of hard-to-reach populations to reach target vaccination thresholds or to avoid a patchiness in vaccination coverage that can delay elimination.

Wildlife populations can maintain different rabies virus variants. However, in areas where rabies variants are maintained in domestic dog reservoirs, there is little evidence that these variants are maintained independently in wild carnivore reservoirs. In these situations, although wildlife cases may occur, wildlife cycles do not appear to be sustained once dog rabies has been brought under control[6].

With evidence of the feasibility and cost-effectiveness of canine rabies elimination, policy efforts are being directed towards a global target of zero human deaths from dog-mediated rabies by 2030, with the 'Zero By 30' strategy coordinated through the United Against Rabies forum. The strategy is based on One Health principles, with improved provision of PEP in combination with scaling up of MDV shown to be the optimal strategy for reaching a target of zero human deaths by 2030[7]. Recent commitments by Gavi, The Vaccine Alliance, to include human PEP within their investment portfolio have provided a critical catalyst for progress but are contingent upon parallel efforts being made in scaling up of MDV. While rabies is a national priority in many countries of Africa and Asia, barriers remain in the effective implementation of MDV strategies – in particular, reaching remote rural communities is an expensive and logistically challenging problem. To address this, novel delivery strategies have been designed and trialled in northern Tanzania. These strategies exploit the thermotolerant properties of some rabies vaccines[8] so that consignments of vaccine can be stored in, and managed by, communities themselves. With vaccines locally available, it is suggested that teams might not be required to travel from village to village vaccinating dogs each year - instead vaccination of dogs can, through such decentralised strategies, continue all year round[9].

With effective delivery strategies, scaling up at a national level remains a challenge. To achieve this, regional coordination will be required, and surveillance measures will need to be enhanced. The limited resources available to government veterinary services in Africa and Asia are directed primarily on control of production animal diseases and further investment is needed to reach the goal of zero human deaths.

To overcome these funding challenges, many advocate charging owners for dog vaccines, but this is unlikely to be effective in the poorest communities where dog rabies remains endemic. Furthermore, in human disease elimination programmes, such as polio and measles, vaccines are administered to people free of charge. It remains unclear why this is not considered appropriate for rabies when the goals (elimination of a deadly human disease) and strategies (mass vaccination campaigns) are the same. Yet cost-recovery for public health vaccination campaigns seems only to be invoked when the intervention involves veterinary service delivery.

While Covid-19 has raised awareness as to the value of One Health, the pandemic has also highlighted some of the prioritisation and perception barriers associated with implementation and operationalisation of One Health, with MDV disproportionately affected[10]. Nonetheless, rabies provides an excellent exemplar of how action on an endemic disease

that is of local concern to communities can generate the cross-cutting benefits, capacities and inter-relationships needed by health systems to respond effectively to health emergencies. There is no doubt that animal health services have a critical role to play and that animal interventions have scope to deliver on a wide range of development and health outcomes, but there is a need for solutions that provide more equitable access to services, particularly in supporting the essential health and welfare needs of the most vulnerable communities.

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PROS AND CONS OF OCLACITINIB AND LOKIVETMAB IN THE TREATMENT OF ALLERGY IN DOGS

Diana Ferreira

Universidade do Porto, Icbas, Porto, Portugal

Qualifications:

Your full name: Diana Raquel Martins da Silva Ferreira

Qualifications: DMV MSc MRCVS Dip ECVD EBVS® European Specialist in Veterinary Dermatology

Email: dianaferreira.dermavet@gmail.com

The treatment of canine AD is dependent on various factors, where duration of disease (chronic vs acute disease), presence and degree of pruritus, degree of inflammation, and infections play a role when deciding for the different anti-pruritic drugs currently available. Also, many other circumstances may impact our choices regarding what molecule to choose, such as side effects, efficacy, costs, concurrent diseases, age of the patient, concurrent medications being used on the patient and so on.

Oclacitinib is a first-in-class Janus kinase (JAK) inhibitor and acts predominantly to inhibit JAK 1.[1] The cytokines most sensitive to JAK 1 enzyme inhibition are IL-31, IL-2, IL-13, IL-14 and IL-6. [1] Pharmacologically, oclacitinib is rapidly (plasmatic peak <1 hour) and almost completely (bioavailability of 89%) absorbed orally, with a half-life of 4 to 6 hours.[1] The dose of oclacitinib for all allergic disease cases is 0.4 to 0.6 mg/kg given 12hrs for 14 days then q 24hrs. It is available in 3.6, 5.4 and 16mg tablets.

Efficacy in the management of pruritus associated with allergic disease has been demonstrated in various studies. In a long-term compassionate care study where 247 client-owned dogs were included, the percentage of dogs showing >/=50% reduction from baseline on day 90 was 63.9% for pruritus and 66.4% for canine atopic dermatitis extent and severity index (CADESI).[2] Apoquel is indicated for use in dogs 12 months of age or older.

Cytokines like IL-2 and IL-4 are involved in immune protection against tumour growth, specifically through JAK-STAT stimulation of NK cells and γδ T cells, which are important mediators of tumour innate immunosurveillance.[3] This JAK-STAT action is known to be inhibited by oclacitinib.[3] Because of this there is concern regarding the use of oclacitinib in dogs with neoplasia.[3] In a long-term compassionate care study that evaluated 247 client-owned dogs with allergic skin disease, 16 dogs developed some type of confirmed or suspected malignant neoplasia, however, the association with Apoquel and tumour formation in these cases is not known.[2] A recent study looked at a comparison of malignancies and non-malignant skin masses in 660 allergic dogs receiving long-term (> 6 months) oclacitinib with age and breed matched control population.[3] The investigators found no meaningful differences in the incidences of malignancies and overall skin masses or the mean age at death or euthanasia for dogs in the exposed group versus the nonexposed group, concluding that long-term treatment with oclacitinib did not pose additional risk for malignancy in dogs. Despite the studies presented, the manufacturer recommends avoiding it in patients with cancer, or with a history of cancer, stating there is a small risk that oclacitinib may exacerbate some neoplastic conditions.

According to the manufacturer, oclacitinib could increase susceptibility to infection due to its modulation of the immune system. The study of lymphocyte subpopulations is crucial for evaluating immunocompetence and the progression of infectious diseases. One study used flow cytometry to evaluate cellular cytokine production.[4] The investigators detected that the prolonged use of oclacitinib for up to 12 months at recommended doses during treatment of CAD did not negatively influence lymphocyte subpopulations, not supporting the evidence for immunosuppression.[4]

An increase in pruritus and clinical lesions has been described in some atopic dogs when tapering oclacitinib therapy from twice to once daily. Cosgrove et al. reported a mean owner pruritus Visual Analog Scale (pVAS) score of 2.6 (“very mild itching”) in oclacitinib treated dogs by D14, which increased to 4.1 (“mild itching”) at D28.[3] These cases may benefit from prolonged twice daily dosing of oclacitinib. However, in a premarketing study, this regimen showed an insufficient margin of safety and is not currently recommended. A very recent objective retrospective study aimed at describing the efficacy, adverse events and variations in selected laboratory parameters in 53 client-owned atopic dogs treated with oclacitinib twice daily for a maximum period of 113 days.[5] Excellent-to-good disease control was obtained in 72% of the treated dogs, including 73% of cases that failed to respond to the once-daily regimen. Also, this dosing regimen was considered generally well-tolerated. Mild and self-limiting gastrointestinal adverse effects were described in 17% of dogs, and no cases required treatment interruption. The frequencies of vomiting (7.5%) and diarrhea (5.7%) were not higher than those reported previously for the licensed protocol. In this case series, pyoderma (26%) and OE (19%) occurred more frequently than reported previously in dogs treated with oclacitinib according to the standard protocol (≤12%). During treatment, there was no significant reduction in red blood cell count, and only three dogs developed mild neutropenia (8.6%). Consistent with previous studies, total serum cholesterol levels increased significantly during treatment and slightly exceeded the reference ranges in five dogs.

Safety data on the combination therapy of oclacitinib and systemic glucocorticoids are lacking. In an open-label long-term (≤630 days) compassionate study, systemic steroids were administered to 31 of 247 oclacitinib-treated atopic dogs to control flare-ups or to treat concomitant diseases.[2] Six of the 31 dogs in this compassionate study showed abnormal health events, including vomiting, diarrhoea, haematochezia, haematemesis and diabetic ketoacidosis. The latest guidelines from the International Committee on Allergic Diseases of Animals (ICADA) do not recommend the prolonged concomitant administration of oclacitinib and other immunomodulatory drugs, as a result of the potential for dose-dependent drug induced immunosuppression predisposing to potentially severe opportunistic infections of the skin or other organs.[5]

Lokivetmab is a caninized anti-canine interleukin-31 (IL-31) monoclonal antibody. This molecule was very recently approved as the first biologic for the treatment of atopic dermatitis in dogs. Lokivetmab recognizes and binds to naturally produced IL-31, making IL-31 unavailable to bind to its receptor and trigger the pruritic cascade.[6] Although IL-31 has a clear role in the development of pruritus, its function in the inflammatory process has been questioned. Its effectiveness has, however, been determined to reach 76% in dogs with atopic dermatitis.[7] A similar efficacy was obtained also for dogs with other allergic conditions, making this treatment adequate to treat pruritus of other origins.[8] Lokivetmab is also approved for dogs less than one year of age, making it a useful alternative when other drugs are less desirable in this age frame.

Lokivetmab is approved in Europe at a targeted dose of 1 mg/kg administered by subcutaneous injection and with expected continued efficacy of at least one month. In USA the approved dose is 2 mg/kg, resulting in a possibly longer period of efficacy. Its duration of action is somewhat variable, making it not as good option as oclacitinib while dietary trials are being performed. Lokivetmab shows a rapid onset of activity. One study reported an efficacy within 3 hours of the administration.[9] Lokivetmab also presents minimal side effects. The most common ones are vomiting, diarrhea and lethargy.[8] Furthermore, it can be safely used concomitantly with a wide variety of medications including corticosteroids, vaccines, immunotherapy, and other immunomodulatory medications such as oclacitinib and cyclosporine.

Lokivetmab presents, therefore a serious of advantages when compared to other therapies, such as rapid onset of activity, less regular dosing, lack of an age restriction on its use, safety and compatibility with other medications.

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PEMPHIGUS FOLIACEUS IN DOGS AND CATS

Diana Ferreira

Universidade do Porto, Icbas, Porto, Portugal

Qualifications:

Diana Raquel Martins da Silva Ferreira

DVM MSc MRCVS Dip. ECVD EBVS® European Specialist in Veterinary Dermatology

dianaferreira.dermavet@gmail.com

Pemphigus foliaceus (PF) is the most common autoimmune skin disease in dogs and cats. Of the pemphigus diseases it is also the most common variant and is characterized by autoantibodies that target keratinocyte desmosomal proteins, leading to loss of cell-to cell adhesion (acantholysis) with subcorneal pustule formation.[1,2] Desmocollin-1 (DSC-1) is the major autoantigen identified in dogs with PF[3], however, in cats, a different autoantigen target is considered as a recent study confirmed only the presence of antikeratinocyte IgG.[4] In dogs and cats, PF may occur spontaneously or, more rarely, be associated with drugs.[1,2]

There is no sex predisposition identified in dogs and cats for the development of PF.[2,5] PF can occur at any age, however, median age of onset rounds 6 years of age.[2,5] Canine PF can affect dogs of any breed; however, Akitas and Chow chows are overrepresented,[6] suggesting a genetic predisposition.[7] No strong cat breed predisposition to PF has been reported.[5]

The primary lesion in PF is the pustule. These are, however, transient lesions that rapidly evolve into erosions and crusts. Crusts are, therefore, the most common clinical lesions identified in PF in dogs and cats.[1,2] Pruritus is variable but commonly reported and can be severe in patients of both species.[1,2] A relatively high number of dogs and cats also exhibit systemic signs of lethargy, pyrexia, hyporexia or anorexia, weight loss, and pain.[1,2]

Lesions typically first appear on the face and commonly progress to other body sites such as the trunk and footpads. In dogs some PF variants lesions can be restricted to the face or footpads only or to the trunk only.[1,2,8] In cats, lesions can also occur in the ungual folds and the periareolar region, and these locations can be uncommonly, be the only area affected.[1,5] Periareolar lesions lead to high suspicion for feline PF, although lesions are less commonly found in this area than in other areas.[1,5]

Differential diagnoses for PF include conditions that can cause superficial pustular dermatitis with acantholysis. Diseases that can mimic PF clinically and histopathologically are superficial pyoderma, pustular dermatophytosis (*Trichophyton* species), and leishmaniasis.

Diagnosis of PF is based on compatible clinical presentation, confirmation of superficial pustular acantholysis, and exclusion of relevant differential diagnoses.[7] Cytology should be performed to detect acantholytic keratinocytes. However, presence of acantholytic keratinocytes is not pathognomonic for PF. Pyoderma, dermatophytosis caused by *Trichophyton* species, and canine leishmaniasis can also produce acantholytic keratinocytes.[9] The next diagnostic step is skin biopsy.[7] Classic histopathologic features of PF are superficial epidermal and follicular (subcorneal or intragranular) pustules with acantholytic keratinocytes in the absence of infectious pathogens.[7] These pustules are often large and span several hair follicles.[7]

The standard of care for patients with PF is immunosuppression.[7] Several immunosuppressive drugs can be used for dogs and cats either as monotherapy or combined. The overall treatment strategy of PF is to initially induce remission and control the disease as soon as possible. Glucocorticoids represent the most common initial treatment, either alone or combined with a second immunosuppressive drug (adjuvant) until remission is achieved. In the long-term management, glucocorticoids should be tapered to the minimum effective dosage. The percentage of dogs achieving complete remission with prednisolone monotherapy varies among studies. Adjuvant use of nonsteroidal immunosuppressive drugs is a valid option when little to no response to glucocorticoid monotherapy is seen during the first weeks of treatment, when an acceptable and safe long-term protocol with glucocorticoids is not possible due to relapsing and when adverse effects of steroids are severe. Most common nonsteroidal immunosuppressive drugs considered are azathioprine, mycophenolate mophetil, chlorambucil and cyclosporine.

The prognosis for patients with PF remains fair (dogs) to good (cats) depending on comorbidities, response to therapy, and adverse response to treatment. Clinical remission is likely for most patients (50% of dogs and 90% of cats), and the time to remission is generally 4 to 7 weeks.[1,2]

In conclusion, obtaining a definitive diagnosis before starting treatment for PF is essential, as immunosuppressive treatments carry numerous risks. In order to diagnose PF, patients must meet the following requirements: (1) compatible clinical presentation: pustular lesions that quickly evolve into erosions and crusts, with a tendency towards the face (symmetrical lesions) and plantar pads; (2) cytology and histopathology compatible with the diagnosis, where pustules rich in neutrophils and acantholytic keratinocytes are present; (3) other diseases that result in pustular lesions with acantholytic cells are correctly ruled out, especially adverse drug reactions, pyoderma, pustular dermatophytosis and leishmaniasis.

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MUCOCUTANEOUS AND DISCOID LUPUS IN DOGS

Diana Ferreira[1,2]

[1]*Onevet Group, Dermatology, Vila Nova de Gaia, Portugal,* [2]*Universidade do Porto, Icbas, Porto, Portugal*

Qualifications:

Diana Raquel Martins da Silva Ferreira

DVM MSc MRCVS Dip. ECVD EBVS® European Specialist in Veterinary Dermatology

dianaferreira.dermavet@gmail.com

Cutaneous lupus erythematosus (CLE) represents a group of clinically heterogeneous diseases that share the same pathogenesis and histopathological characteristics.[1] They share, histologically, a lymphocyte-rich interface dermatitis associated with basal keratinocyte apoptosis and oncotic necrosis.[1]

In the dog, CLE encompasses facial discoid LE (FDLE), mucocutaneous LE (MCLE), generalized DLE (GDLE) and exfoliative CLE (ECLE).[2] Together, these four canine CCLE variants exhibit unique signalment and clinical characteristics. This talk will focus on MCLE and DLE.

MCLE is considered a rare disease and is characterized by mucocutaneous erosive and ulcerative lesions and microscopic characteristics of CLE.[2,3] Of all published cases of canine MCLE 47% were German shepherd dogs and their crosses.[4] In this condition, females appear nearly twice over-represented.[2] The age of onset varied from 3 years to 13 years, with a median age of 6 years.[4]

The characteristic lesions of MCLE are well-demarcated multifocal to patchy erythematous erosions and ulcers that are mainly symmetric and affect the anal/perianal regions or genital/perigenital.[4] In rare cases, lesions also occur around the lips, eyes, and nasal planum.[4] Crusts can also occur in haired skin areas.[2] Hyperpigmentation often surrounds ulcerative lesions or develop at the site of previous lesions.[3] MCLE ulcerative lesions do not tend to heal with scarring.[2] This is a major difference with facial and generalized DLE lesions.[2] Systemic signs do not occur, however, most patients exhibit pain when defecating and urinating or at the site of lesions.[3] Pruritus is normally absent or mild.[2] Diseases that can mimic MCLE and represent differential diagnoses include mucocutaneous pyoderma (MCP), mucous membrane pemphigoid and erythema multiforme.[2] Diagnosis of canine MCLE is based on history and clinical presentation supported by characteristic histopathologic findings.[3] Multiple samples of the margin of the erosions and ulcers are recommended to be performed for histopathological analysis.[3] Perimucosal erosions and ulcers, however, are easily colonized by bacteria and bacterial infection can also occur in MCLE lesions which could complicate the histological evaluation and result in an MCP diagnosis.[3] For this reason, antimicrobial treatment is recommended as a first intervention and before obtaining biopsy samples.[3] MCLE appears to respond best to immunosuppressive dosages of oral glucocorticoids.[2] However, tapering of this medication usually results in a relapse. For that reason, additional immunomodulatory or immunosuppressive drugs (tetracycline antibiotic, with or without niacinamide, azathioprine, calcineurin inhibitors and mycophenolate mofetil) could be of benefit for a long-term management.[3,5] A recent study reported a complete remission of all lesions in two dogs with MCLE with oclacitinib treatment.[6] Although the exact role of sunlight in the pathogenesis of MCLE is currently unknown, sun avoidance and the use of sunscreen is recommended.[3]

DLE represents the most common form of CLE and it is divided into a localized variant (FDLE) where skin lesions are confined to the head and neck, and a generalized form (GDLE), in which skin lesions also occur below the neck.[2]

Of all published cases of canine FDLE 31% were German shepherd dogs and their crosses.[2] In this condition, the female-to-male ratio was 0.7.[2] The age of onset varied from 1 to 12 years of age, with a median age of 7 years.[2] The early skin lesions in canine FDLE consist of erythema, depigmentation and scaling that progress into erosions, ulcerations and crusting with loss of the architecture of the nasal planum.[2] Skin lesions have also been reported on the dorso-proximal muzzle, lips, periorbital skin and pinnae.[2] Diseases that can mimic FDLE and represent differential diagnoses include epitheliotropic T-cell lymphoma, uveodermatological syndrome, MCP and leishmaniosis.[2,7] In canine FDLE, interface dermatitis is often subtle or mild in biopsy samples.[2] Antibiotics of the tetracycline family, with or without concurrent niacinamide have been suggested to be helpful in FDLE.[2] Topical tacrolimus ointment has also been used successfully for the topical treatment of canine FDLE.[2] A recent study reported a complete remission of all lesions in three of four dogs with FDLE with oclacitinib treatment.[6] A good response was seen in the remaining dog with FDLE.[6] Sun avoidance is highly recommended.[2]

Recently, a case series of 10 dogs with GDLE was published.[8] The age of onset of GDLE ranged from 5 years to 12 years, with a median age of 9 years.[8] The female/male ratio was 1.0.[8] Different breeds were identified, however, amongst them there were two Chinese crested dogs.[8] Lesions consisted of generalized or multifocal annular to polycyclic plaques with dyspigmentation, an erythematous margin, adherent scaling, follicular plugging, and central alopecia.[8] In some cases mucocutaneous junctions were affected.[8] Diseases that can mimic GDLE and represent differential diagnoses include hyperkeratotic erythema multiforme and generalized ischemic dermatopathies.[3] In 1 dog with GDLE, progression to a clinical systemic LE (SLE) was observed, for that reason, further investigations, such as complete blood cell count, serum chemistry profile, urinalysis and ANA serology are recommended to rule out concurrent SLE.[3,9] Diagnosis of canine GDLE is based on history and clinical presentation and supported by characteristic histopathologic findings.[3] Multiple skin biopsies are recommended to be collected from affected dogs at the areas of active margin to normal skin.[3] In a recent retrospective study, the best long-term therapeutic outcome was obtained with oral cyclosporine along with a short course of glucocorticoids at treatment onset.[8] Oral hydroxychloroquine in conjunction with topical 0.1% tacrolimus ointment helped induce and maintain remission of skin lesions in 2 dogs.[8]

Knowing the clinical appearance of CLE variants in dogs will allow an early diagnosis. A characteristic cell-rich interface dermatitis obtained in skin biopsies will reinforce clinical suspicion and allow early treatment institution.

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SKIN BIOPSY- KEYS FOR SUCCESS

Diana Ferreira[1,2,3]

[1]*Universidade Lusófona, Dermatology, Lisboa, Portugal,* [2]*Universidade do Porto, Icbas, Porto, Portugal,* [3]*Onevet Group, Dermatology, Vila Nova de Gaia, Portugal*

Qualifications:

Diana Raquel Martins da Silva Ferreira

DVM MSc MRCVS Dip. ECVD EBVS® European Specialist in Veterinary Dermatology

dianaferreira.dermavet@gmail.com

Histopathological analysis of skin biopsies is one of the most valuable diagnostic techniques in dermatology. Despite their diagnostic value, biopsies can be unrewarding if there is poor sample selection or the technique for collection is inadequate.[1] In order to obtain the maximum benefits from the use of this tool, real teamwork is required between the clinician, who has the history data and the clinical pattern, and the pathologist who will interpret the histological findings.[1] Skin biopsy should not be considered only as a diagnostic aid for difficult cases or for cases that can only be diagnosed by biopsy. Biopsy can also be useful to establish the group of diseases in which the case is inserted, even when a definitive diagnosis is not obtained, and, therefore, help to guide the clinician in the appropriate diagnostic/therapeutic direction.[1] It is important to remember that, although the biopsy is very useful, it is only a source of information about the pathological process, and the final diagnosis must be made by the clinician, who correlates all the findings, and not by the pathologist. The biopsy only adds to these findings and is not a substitute for a thorough history, physical examination, or the results of other relevant tests.[1] The veterinary clinician must, therefore, know when biopsies are indicated, be able to appropriately select lesions to biopsy in order to ensure that the samples will provide diagnostic results, obtain correctly the biopsy samples, and provide the pathologist with an accurate history, clinical description, and clinical differential diagnosis.[2]

A biopsy should be performed when: (1) lesions of neoplastic origin are suspected; (2) persistent ulcerative lesions are present; (3) the suspected condition can only be diagnosed by skin biopsy (e.g. immune-mediated diseases); (4) the condition is not responding to an apparently correct treatment; (5) the lesion is apparently atypical or clinically severe; (6) a vesicular dermatitis is present; (7) the suspected condition requires an expensive therapy, with high risks for the patient or with a slow response that requires a definitive diagnosis before starting treatment; (8) if a specific infectious disease is suspected (mycobacteria and atypical bacteria or fungi).[2]

Dermatohistopathology is most diagnostic when samples are taken early in the disease process while pristine primary lesions are present.[2] Correct lesion selection is essential as it directly impacts the success of the diagnosis as a lot of frustrations result from poor lesion selection.[2] Multiple samples are almost always indicated.[2] Between 3 and 5 samples should be taken, from the different areas that represent the disease process.[2] Different lesions should be obtained from different levels of disease progression.[2]

Different types of lesions require a specific sampling approach. Large pustules and vesicles could benefit from excision biopsy. If pyoderma is suspected, antimicrobial treatment is recommended prior to sampling. Nodules should be excised entirely for histopathology analysis, however, if this is not possible, part of the nodule should be collected avoiding ulcerated or necrotic areas. Freezing some of the material could be useful if cultures or PCR end up being needed after the histopathological diagnosis (e.g. micobacteriosis). Also subcutaneous lesions should be excised entirely, however, when this is not possible, it is advisable to combine excision and punch biopsy. In the case of non-inflammatory alopecia it is recommended to sample the more advanced areas of alopecia. Ulcers should be sampled at the periphery including ulcerated and nonulcerated skin.

In most cases, the biopsy is performed with a sedated patient. In case of contraindication for sedation or in very quiet dogs, only local anesthesia can be used. If it is necessary to obtain samples from locations that are difficult to access or painful (such as the footpads, nasal plane, pinna, oral cavity, muzzle, eyelids), it is preferable to perform general anesthesia.[2]

For local anesthesia, 1-2% lidocaine is used.[1,2] The anesthetic should be injected into the subcutaneous tissue and the dermis should be avoided to avoid producing histological artifacts. For a more precise injection, the lesion to be sampled can be circled with a permanent marker. The needle is inserted from outside the circle, and the drug is injected as the needle is redirected to cover the entire area of the desired sample site. The volume to be injected ranges from 1 to 2 ml per lesion.[1] Care must be taken with the total amount of lidocaine injected into kittens and small dogs, as myocardial depression, muscle spasms, neurotoxicity and death may result.[1] A total dose of 5 mg/kg for dogs and 2.5 mg/kg for cats should not be exceeded.[1]

In general, it is recommended that the biopsy sample is obtained with a biopsy punch (4 mm to 8 mm). In normal skin, an 8 mm should be used, while in the footpads and nasal planum it may be necessary to use a 4 or 6 mm. In certain cases, however, it is necessary to extract the sample through a scalpel blade excision.[1] For example for the removal of nodules; in very deep lesions that affect the adipose tissue; in the case of large vesicles or pustules and in lesions of difficult access for a biopsy punch (eyelids, digits, etc).[1] In this case, the biopsy is performed in the form of an ellipse.

The biopsy area should not undergo surgical cleaning/disinfection.[1,2] The sample must include all material from the lesion (crusts, scaling, exudates), which provide valuable information for determining the diagnosis. However, if there is very long hair in the area, these can be cut with scissors to facilitate later suturing of the surgical incision. When using a biopsy punch, the instrument should be centered directly over the lesion.[2] To minimize artifacts arising from shearing forces, the biopsy punch should be rotated in only one direction. Once the punch has penetrated into the subcutis, the instrument is carefully withdrawn. Nontraumatic forceps should be used to grasp the sample gently at its attachment to the subcutis, thus avoiding crushing of the epidermis and dermis with surgical instruments. The attachment is then cut from the subcutis with small curved scissors.[2] The sample is then gently blotted to remove excessive blood and rapidly transferred to a container and submerged in 10% formalin for fixation during transport.[2] The sample can also be placed with the subcutaneous tissue side on a piece of card and submerged in formalin to prevent the sample from curling or shrinking with the formalin.[2] This is especially useful for elliptical samples. The lesion is then sutured.

The lesions sent for histopathological examination must be properly identified (type of lesion, location) and sent to the histopathological laboratory. It is essential to provide the pathologist with all information regarding the patient. Detailed data about the case, clinical picture and lesional pattern and the differential diagnosis considered are essential. The choice of the histopathological laboratory is equally important as not all pathologists have experience in diagnosing skin diseases.

The anatomopathological report usually includes a description of the microscopic lesions, a morphological diagnosis when possible, an etiological diagnosis and comments where the pathologist includes the diseases compatible with the observed lesions and refers to the convenience of performing special stains, immunohistochemistry or other diagnostic techniques. It is important to bear in mind that on many occasions, the lesions observed do not allow a definitive diagnosis. In these cases, a good communication between the veterinarian and the pathologist is usually determinant. Also, if the pathologist's report is not clear, or if the morphological diagnosis does not fit the patient's clinical picture, one should not hesitate to discuss the case with the pathologist.

Sometimes, by reviewing the case at the request of the clinician, is possible to detect alterations that could have gone unnoticed previously.

It is, again, important to consider the fact that it is the clinician and not the pathologist who makes the final diagnosis, but only after all relevant data concerning the case have been evaluated, of which the histology report comprises only a part.[3]

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FELINE ALLERGIC SKIN DISEASE: NEW NOMENCLATURE AND CLINICAL PRESENTATIONS

Susan Paterson

Virtual Vet Derms, Vet Derm, New Hutton Kendal, United Kingdom

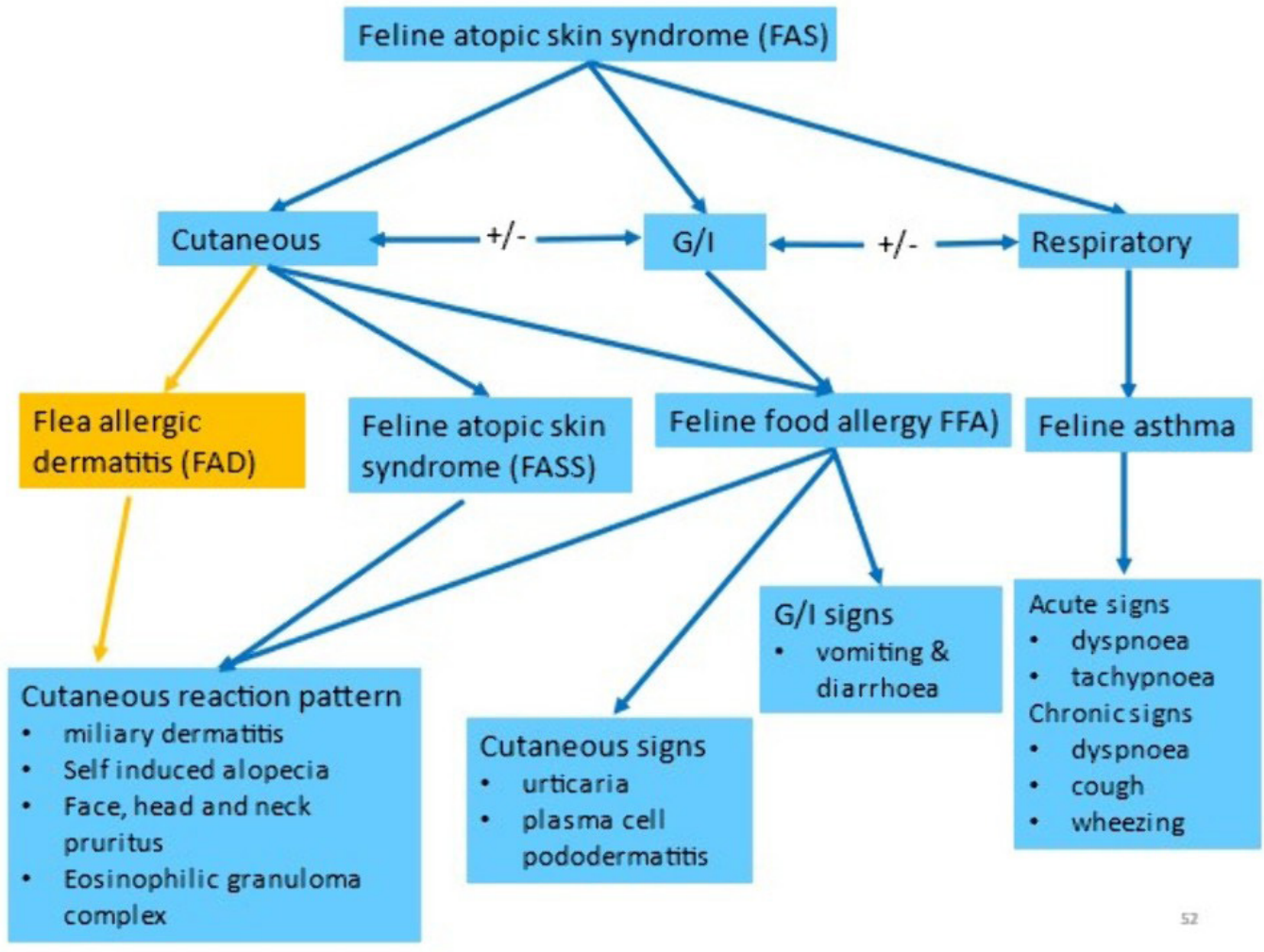
Qualifications:

Dr Sue Paterson MA VetMB DVD DipECVD FRCVS, RCVS and European Specialist in Veterinary Drrmatology

spatersonvetmb1959@btinternet.com

Abstract Body: A series of four new consensus papers were published in 2021 in Veterinary Dermatology compiled by leading world veterinary dermatologists (1-4). These sought to better define allergic disease in cats to encompass the different cutaneous allergies and also allergy affecting the gastro-intestinal and respiratory tract. They created a new nomenclature based on the available evidence base at the time and outlined the current knowledge of feline disease.

dermatitis. Cats suffer from an allergic triad of dermatitis, enteritis and asthma (FAS). There is some evidence that disease may be IgE mediated but minimal evidence suggesting genetic basis, although unlike the dog little work has been undertaken to investigate this. The umbrella term used to define allergic disease has been defined as feline atopic syndrome and that is now accepted as encompassing three diseases affecting the three different organ systems. **Feline atopic skin syndrome (FASS)** an inflammatory and pruritic skin syndrome of cats thought to be caused by an IgE mediated reaction to environmental allergens. Four principal reaction patterns can be seen in FASS, namely miliary dermatitis, face, head and neck pruritus, self-induced alopecia and eosinophilic granuloma complex. These reaction patterns are not unique to FASS but also be caused by FFA and also by flea allergic dermatitis (FAD) although this disease is not IgE mediated. **Feline food allergy (FFA)** refers to any clinical signs which may be cutaneous (including the cutaneous signs that overlap with those of FASS) or non-cutaneous signs that can be attributed to an immunological reaction to ingested food. Cutaneous signs other than those seen with FASS include urticaria, non-pruritic skin nodules and plasma cell pododermatitis. Non cutaneous signs include gastro-intestinal signs (18%) including vomiting, diarrhoea, flatulence and soft faeces; conjunctivitis (12%) and respiratory signs (11%). **Feline asthma (FA)** an eosinophilic inflammatory disease affecting bronchioles. Leading to spontaneous reversible bronchoconstriction and airway remodelling. Cats with acutely disease show signs of respiratory distress, those with chronic disease will cough and wheeze. Table 1 Clinical manifestations of FASS and important differential diagnosis



Adapted from Feline allergic diseases: introduction and prosed mechanism Halliwell REW et al Vet Derm Jan 2021 A brief summary of the important facts outline in the paper are that feline allergic disease some common features with human atopic disease & canine atopic

Cutaneous reaction pattern FASS, FFA, FAD	Description	Principal differential diagnoses
Miliary dermatitis	Numerous small papules -2mm) with associated crust. Usually present on the dorsum, can be generalised. Pruritic condition resulting in SIT, excoriation, erosions, alopecia	Bacterial infection (Staphylococcus spp.) Fungal infection (dermatophytosis) Autoimmune (Pemphigus foliaceus) Viral infection (Pox) Idiopathic (drug eruption) Ectoparasites (Cheyletiella, Otodectes)
Face, head and neck pruritus	Pruritus can be severe directed at face, head and neck. Cats claw or scratch affected areas causing varying degrees of excoriation, erosions and ulceration	Ectoparasites (Notoedres cati, Demodex gatoi, Otodectes cynotis) Mosquito bite hypersensitivity Fungal infection (dermatophyte, cryptococcus) Viral infection (herpes, pox, calici) Neoplasia (squamous cell carcinoma, paraneoplastic disease) Immune mediated (mural folliculitis) Autoimmune (pemphigus foliaceus) Idiopathic (facial oral pain syndrome, facial dermatitis Persians)
Self induced alopecia	Cat over grooms, licks, bites, pulls out hair to create extensive areas of alopecia. Hair loss is self-induced and is only from an accessible site	Self-induced hair loss due to non-allergic causes e.g. localised pain, itch due to ectoparasites or behavioural causes (psychogenic alopecia) True hair loss which can be inflammatory (infection, parasites, immune mediated, neoplastic) or non-inflammatory (hair cycle arrest or follicular abnormality)
Eosinophilic granuloma complex Consists of a group of clinical syndromes Indolent/rodent ulcer Eosinophilic/linear granuloma Eosinophilic plaque	**Indolent/rodent ulcer** Upper lip usually unilateral. Starts as focal ulceration of lip margin chronically lead to lip deformity. Not pruritic unless secondary bacterial infection	Immune mediated disease (pemphigus. Bullous pemphigoid) Bacterial infection (Nocardia spp, Mycobacteria spp) Fungal (Cryptococcus spp) Viral infection (Herpes, calici) Neoplasia (Squamous cell carcinoma, lymphoma)
	Eosinophilic granuloma Lesions seen at many sites, each with own phenotype Rear legs – linear areas of dermal thickening often with ulceration, caudal aspect thigh Mouth – proliferative lesions esp. tongue and soft palate	
	Eosinophilic plaque Lesions usually ventral abdomen, medial thighs Raised, eroded or ulcerated areas. Variable shape often circular, also oval, serpiginous Usually marked pruritus, secondary infection common	

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MANAGEMENT OF FELINE ALLERGIC SKIN DISEASE

Susan Paterson

Virtual Vet Derms, Vet Derm, New Hutton Kendal, United Kingdom

Qualifications: Dr Susan Paterson MA VetMB DVD Dip ECVD FRCVS RCVS and European Specialist in Veterinary Dermatology Spatersonvetmb1959@btinternet.com

Management of feline atopic skin syndrome

Feline atopic skin syndrome is a diagnosis of exclusion and a diagnosis that should only be made after all other causes of clinical lesions have been eliminated. Symptomatic therapy of cutaneous lesions should only every be undertaken for a short period of time on a welfare basis and should never be a substitute for an appropriate investigation.

A recent consensus paper published in 2021 in Veterinary Dermatology examines the evidence base to support the use of a range of different treatment modalities in the cat suffering from FASS (1).

Drugs that will be considered include glucocorticoids, ciclosporin, allergens specific immunotherapy, oclacitinib, maropitant, essential fatty acids, ultra micronized palmitoyl ethanolamide (PEAum) and antihistamines

Systemic glucocorticoids are broad spectrum in their mode of action, preventing recruitment of inflammatory cells.

Table 1 Glucocorticoids used for the treatment of FASS

Drug	Initial treatment dose	Maintenance therapy
Prednisolone	1-3mg/kg po sid up to 4 weeks. 1mg/kg 50% controlled	Reduce to lowest possible dose rate on an alternate day basis (2)
Methyl prednisolone	1.4 – 1.5mg/kg po sid 90% controlled < 14 days	Reduce to lowest possible dose rate on an alternate day basis (3)
Methyl prednisolone acetate	20mg/cat s.c. 2 weekly for 2 -3 administrations	Not suitable for long term therapy (4)
Triamcinolone	0.1 – 0.2 mg/kg po sid up to 3 weeks	Reduce to lowest possible dose rate and give every 3 days. Excellent control of signs
Dexamethasone	0.1 – 0.2 mg/kg po sid up to 3 weeks	Reduce to lowest possible dose rate and give every 3 days. Excellent control of signs (5)

Side effects are uncommon systemic glucocorticoids at recommended doses are well-tolerated in cats. Altered haematology, serum biochemistry and urinalysis parameters are frequent (particularly markers of glucose metabolism). Regular monitoring of cats on a long-term treatment with systemic glucocorticoids is warranted, especially with more diabetogenic drugs such as dexamethasone.**Topical glucocorticoids** - a single study in the literature (6) used hydrocortisone aceponate to control FASS. 4/10 cats needed daily therapy and 6/10 every other day after 28 days which may lead to cutaneous side effects. *Recommendations. Steroids are rapid acting, effective, low cost and useful in a high proportion of cases of FASS. Cats on long term medication especially dexamethasone should be monitored.***Ciclosporin** has potent anti-inflammatory effects. Numerous papers show good control can be achieved in 65% of cats at a dose of 7mg/kg daily. Once stable > 75% of cats can be tapered to every other day or twice weekly. Contra-indications include cats infected with FeLV or FIV, and those with a history of malignancy or suspected malignancy. It is not recommended for outdoor cats, known hunters or raw meat eaters (if seronegative) due to the risk of toxoplasmosis (due to T cell inhibition). It must be withdrawn for two weeks before and after live vaccine administration. Side effects include gastro-intestinal signs, lethargy, anorexia, hepatic lipidosis and gingival hyperplasia. *Recommendations Ciclosporin at 7mg/kg sid is efficacious in FASS. Although relatively high cost and slow onset many cats can be tapered once remission achieved. Contra-indications exist for some cats.***Allergen specific immunotherapy (ASIT)** can change the patho-mechanism of the disease by stimulating allergen tolerance and "cure". Results of ASIT for FASS showed response in 45 – 75% cats for subcutaneous immunotherapy [SCIT] (1) and sublingual immunotherapy [SLIT] (7). Cats can be successfully treated with Rush protocol [RIT] which builds allergen levels over a 24 hour period (8). This usually requires hospitalisation and monitoring. Vaccine type depends on the cat, owner resources and owner compliance. Few side effects are reported with ASIT in cats. *Recommendations ASIT (SCIT/RIT/SLIT) is an efficacious way to treat FASS with a good success rate. Adverse effects rare but larger high-quality studies are needed.***Oclacitinib** - cats need higher doses of the drug than dogs and metabolise it more quickly needing it to be given twice daily. The therapeutic levels are reported to be very close to level producing adverse effects. The manufacturers advise against using it except under exceptional circumstances with fully informed owner consent. *Recommendation Oclacitinib at 1mg/kg sid/bid is efficacious for FASS but should only be used in exceptional cases.* **Maropitant** normally used to prevent feline vomiting and motion sickness has been used in a single open study (9). 11/12 cats given maropitant 2 mg/kg po sid for 4 wks showed good signs of improvement. Drug appeared to be well tolerated. *Recommendation Maropitant may be a useful drug to control pruritus in FASS. More data needed.* **Essential fatty acids** given orally have been shown to improve coat condition and improve skin barrier function to reduce trans-epidermal water loss in dogs. Most studies in the literature are open, unblinded studies with numerous variables including the cats diet. *Recommendation There is limited evidence for moderate efficacy of EFA supplementation in cats with miliary dermatitis. EFAs are unlikely to be effective by themselves***Ultra-micronized palmitoyl-ethanolamide** - two studies in cats show that it may be useful in FASS. One study showed improvement in 10/15 of cats when given at a dose of 10mg/kg po bid for a month. Another study showed it reduced the length of time to relapse of clinical signs in cats with FASS controlled with methyl prednisolone (1). *Recommendation based on two trials is that there is moderate evidence of moderate efficacy for PEAum in FASS.* **Antihistamines** are selective antagonists of histamine receptors and only have weak anti-inflammatory action. Numerous antihistamines have been assessed in cats. Most studies are open, non-blinded and often without specific diagnostic criteria. Most drugs except cyproheptadine appear to be well tolerated, chlorpheniramine producing the best control.

Table 2 Antihistamines used to treat FASS

Antihistamine	Dose	Cats with good to excellent control
Loratidine	5mg/cat po sid 14 days	4%
Cetirazine	5mg/cat po sid 14 days	9%
Cyproheptadine	2mg/cat po bid 14 days	45%
Chlorpheniramine	2mg/cat po bid 14days	70%
Clemastine	0.34mg/cat po sid 14 days then 0.68mg/cat po bid 14 days	50%

Recommendation Oral antihistamines may give small and limited benefit in some cats with FASS. Chlorphenamine may be useful for early and/or mild disease. Its sedative effects may alleviate stress in FASS.

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FELINE ALLERGIC SKIN DISEASE INVESTIGATION

Susan Paterson

Virtual Vet Derms, Vet Derm, New Hutton Kendal, United Kingdom

Qualifications: Dr Susan Paterson MA VetMB DVD Dip ECVD FRCVS RCVS and European Specialist in Veterinary Dermatology Spatersonvetmb1959@btinternet.com

Abstract Body: A good general and dermatological history is helpful to try and give some initial direction. After this a general physical and dermatological inspection can help establish the range of clinical signs that are present and the most appropriate diagnostic tests that need to be instituted. Stage 1 Use basic diagnostic tests to eliminate the major differential diagnoses for the principal cutaneous reaction patterns for miliary dermatitis, self-induced alopecia, face, head and neck pruritus and eosinophilic granuloma complex. Stage 2 Further tests help to establish which allergy is involved. This may not be a single allergic trigger as cats may have multiple allergies concurrently. FASS is a diagnosis of exclusion (1)**Basic diagnostic testsWet paper test -** the cat's coat is brushed onto a piece of white wet paper. Live fleas can be easily visualised and flea faeces can be seen as streaks of blood. *Findings - superficial parasites: adult lice, Cheyletiella spp. and their eggs, fleas, flea faeces***Acetate strips of coat –** clear 5M scotch tape is pressed repeatedly onto haired areas of the coat to collect material especially inaccessible areas e.g. the back of the neck. The tape can be applied sticky side down directly onto the microscope slides for examination under increasing powered objectives up to high power (100 x oil immersion).*Findings: superficial living parasites: adult lice, Cheyletiella spp. and their eggs, Trombicula autumnalis, Otodectes cynotis, fleas and flea faeces***Acetate strips of skin –** clear 5M Scotch tape is pressed firmly onto the area of skin to be examined and gently rubbed with a thumb nail to ensure good contact with the skin. The tape is looped onto the microscope slide with the sticky side outermost and immersed in stain e.g. a modified Wright's stain such as Diff-Quik. Once stained the tape can be inverted with the adhesive slide downwards onto a microscope slide for examination.*Findings: bacteria and yeast e.g. Malassezia spp. as well as cellular infiltrates which may be inflammatory or neoplastic. Occasionally surface parasites such as Demodex spp.***Hair plucking (trichography)** is useful in cases of feline alopecia. The hair should be grasped firmly between the finger and thumb and epilated in the direction of hair growth. A small pair of artery forceps may be used to grasp the hairs but can cause crush artefact on the hair shaft. To avoid this drip tubing may be applied to the jaws of the forceps. Where hair plucks are used to identify dermatophytes, infected hairs (M. canis only) can be visualised with a Wood's lamp, then plucked. Hairs can be mounted in mineral oil, compounded chlorphenolac, blue-black ink or potassium hydroxide (KOH) 10-20%, to help highlight fungal elements, before microscopic examination.*Findings: growth phase of hair, appearance of hair tips to indicate self-induced trauma, parasites (demodex mites), dermatophyte infected hairs.***Impression smears** are suitable for any exudative lesions. The microscope slide is pressed directly onto the lesion. The sample may be air dried or heat fixed using a hair or hand dryer. The slide is stained using a modified Wright's stain (Diff Quik), rinsed and dried again. The sample should be examined on low power (x10 objective) initially to select areas for close inspection then high power (x40) or under oil immersion (x100).*Findings – bacteria and yeast e.g. Staphylococcus spp. Malassezia spp. cellular infiltrates which may be inflammatory or neoplastic. Parasites (Demodex spp.)***Superficial and deep skin scrapes** used to identify surface browsing and deep living parasites. Superficial skin scrapes remove superficial skin layers; deep scrapings remove the entire epidermis to create capillary ooze. The technique is identical for both only the depth of scrape differs. If the hair coat is thick, it may be clipped to improve access. A No 10 scalpel blade should be used and material mounted into liquid paraffin or 10% potassium hydroxide. A cover slip should then be applied for examination.*Findings: Superficial scrape: adult lice, Cheyletiella spp. and their eggs, Trombicula autumnalis, Otodectes cynotis, fleas/ flea faeces. Deep scrape: Notoedres spp., Demodex spp.* **Fungal culture** can be performed by hair coat brushings, hair plucking or sticky tape sampling. Hair coat brushings and sticky tape sampling appear are the most useful techniques. Coat brushing are performed with a new sterile toothbrush. The toothbrush can be inoculated directly into fungal culture medium e.g. Sabouraud's dextrose agar (SDA) or Dermatophyte test medium (DTM). SDA encourages the development of reverse pigmentation and macrocondia. DTM incorporates a pH colour indicator that changes from yellow to red in the medium, within 10 days. Culture result take 1 – 3 weeks. Many labs now offer PCR tests from hair roots and skin scrapings to identify Microsporum spp and Trichophyton spp. These offer rapid results within 2 – 4 days with a 95% sensitivity and 99% specificity.*Findings: typical reverse pigmentation and dermatophyte colony morphology on SDA, yellow to red colour change < 10 days on DTM* **Further diagnostic testsInvestigation of a flea allergic dermatitis** There is no age, sex or breed predilection for flea allergy in the cat. Historical information includes poor flea control, inconsistent use and/or inappropriate products use. Owners may report seeing fleas or flea faeces on the cat or other animals and humans within the house hold or other pets may be being bitten by fleas. The presence of tape work segments of Dipylidium caninum in faeces (intermediate host is the flea) suggests presence of fleas. Diagnostics tests to identify fleas or faeces are wet paper tests and tape strip. Allergy testing is not useful to rule out flea allergy. Reports of positive tests range from 2% to 77%. Intradermal allergy testing with flea salivary antigen is more reliable than serology (2) but will not pick up non IgE mediated disease. Intradermal and allergen specific IgE serology often positive in cats with FAD. 36% of cats without skin disease are positive to flea extract. Where there is a strong suspicion of a flea allergy but minimal confirmatory evidence then empirical therapy may be undertaken. Where a rapid acting isoxazoline adulticide is used for empirical therapy, improvement should be seen quickly. This should be used as part of integrated flea control e.g. a juvenoid to prevent the development of flea eggs, larvae and pupae in the home, mechanical control methods, such as vacuuming the carpets, furniture cushions and rugs regularly, increasing heat and humidity within the home and washing the pet's bedding (>60°C) as well as raising awareness with the pet owner of the understanding of the flea life cycle within the home environment.**Investigation of a food allergy** Although 27% of cats with food allergy present with signs < 12 months of age, the reported age range is three months to 13 years. The domestic short haired cat and Siamese are at increased risk of developing disease. Female appear to be at increased risk to male at 1.4:1 Typically, cats show a lack of seasonality and concurrent gastrointestinal signs are seen in 33% of cats. Other cutaneous signs that can be seen concurrently in addition to the classical four presentations shared with FASS include urticaria, non-pruritic nodules and plasma cell pododermatitis. Response to anti-inflammatory doses of oral glucocorticoids is usually good but the response to injectable steroids is poor. Other concurrent non-cutaneous signs include conjunctivitis (12%) and respiratory signs (11%). Serology tests as a diagnostic tool are non-specific and insensitive (3). The gold standard test is the institution of a low allergy diet. This may be a novel protein diet or a hydrolysed diet. The selection of a novel protein diet can be difficult as many proprietary diets contain multiple proteins, undeclared proteins and contaminants making selection of a truly novel protein difficult. Cross reactivity between closely related proteins can also hamper diagnosis. Although hydrolysed diets eliminate concerns that the proteins being fed are not novel or the diet contains undeclared proteins. A diet it should be fed as the sole form of nutrition for 8 weeks before dietary challenge is undertaken. The final stage in investigation can be undertaken if the cat is found to have FASS. In this case although not necessary to diagnose the disease allergy testing either in vitro or in vivo may be useful to identify specific inciting triggers for the skin problem to give the opportunity to consider allergen avoidance and allergens specific immunotherapy References 1. Santoro D, Pucheu-Haston CM, Prost C, Mueller RS, Jackson H. Clinical signs and diagnosis of feline atopic syndrome: detailed guidelines for a correct diagnosis. Vet Dermatol. 2021;32(1):26-e6. 2. Laffort-Dassot C, Carlotti DN, Pin D, Jasmin P. 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DIAGNOSTIC APPROACH TO INCREASED SERUM ALP

Andrea Johnston

LSU School of Veterinary Medicine, Veterinary Clinical Sciences, Baton Rouge, United States of America

Qualifications:

Andrea N. Johnston, DVM, PhD

Diplomate American College of Veterinary Internal Medicine (SAIM)

Assistant Professor of Small Animal Internal Medicine

Louisiana State University School of Veterinary Medicine

johnston1@lsu.edu

DIAGNOSTIC APPROACH TO INCREASED SERUM ALP

Abstract: Increased ALP is identified in 7.5 – 28.4% of mature dogs. ALP is not a specific biomarker for liver disease. ALP is synthesized in the cells of the renal cortices, placenta, intestine, bone, & liver. Two ALP isoenzymes have been identified: intestinal ALP & tissue non-specific ALP. Liver, bone, & kidney isoforms are transcribed from the tissue-non-specific gene locus. Differential glycosylation of the gene product generates tissue-specific isoforms. Glucocorticoid-induced ALP (G-ALP) is transcribed from the intestinal ALP gene that is expressed in hepatocytes and the biliary epithelium.

-G-ALP is ↑ ~10 days after beginning exogenous steroid administration and may continue to rise with ongoing treatment.

-The liver isoenzyme (L-ALP) is also inducible by glucocorticoids and is the first isoenzyme to be serologically detected but transcription plateaus at ~ 10 days

The ALP induction phenomenon is not limited to glucocorticoids*. G-ALP activity is also associated with inflammation and chronic disease (possibly secondary to increases in endogenous glucocorticoid secretion) and many drugs.*

-L-ALP and G-ALP have half-lives of 2-3 days. Canine placental, renal, and intestinal ALP half-lives are less than 6 minutes.

Signalment, clinical signs, a thorough history (including drug/nutraceutical administration) and physical exam are critical to synthesize a rational diagnostic plan

Etiology: Hepatobiliary disease: Enzyme synthesis may be induced (secondary to inflammatory mediators or endogenous/exogenous glucocorticoids) or released from the hepatic canaliculi via bile acid solubilization.Drugs / Nutraceuticals

Phenobarbital

D-penicillamine

CBD Oil

Capromorelin?

Herbal therapies

Congenital hepatopathies

Ductal plate malformations (Cairns, Boxers)

Primary hepatobiliary cancer

Hepatocellular carcinoma

Cholangiocarcinoma

Neuroendocrine tumors

Biliary disease

Gallbladder mucoceles

Cholangitis, cholangiohepatitis, cholecystitis

Extrahepatic bile duct obstruction

Infectious disease

Heterobilharzia americana (American schistosomiasis)

Vacuolar hepatopathy

Endocrinopathies: Hyperadrenocorticism: endogenous and exogenous (glucocorticoids), hypothyroidism, diabetes mellitus, hepatocutaneous syndrome

Scottish terrier progressive glycogen-type vacuolar hepatopathy

Nodular Hyperplasia: Well recognized but poorly documented lesion in the liver of elderly dogs.

No underlying disease recognized

Hepatocutaneous syndrome (Necrolytic Migratory Erythema (NME))

Rare syndrome associated with cutaneous lesions on face, paw pads (marked hyperkeratosis, fissures).

“Honeycomb” pattern on liver ultrasound

Chronic Stress (illnesses > 4 weeks)

Congestive heart failure

Necroinflammatory liver disease

Neoplasia (systemic, alimentary lymphosarcoma, metastatic)

Disorders influencing lipid metabolism (diabetes mellitus, idiopathic hyperlipidemia)

Chronic systemic inflammatory conditions (inflammatory bowel disease, cardiovascular disease, dermatitis, pancreatitis, pyelonephritis, severe dental disease)

Non-hepatic disease

B-ALP is ↑ in growing dogs up to 7 months of age

Renal secondary hyperparathyroidism

Cancer: Hemangiosarcoma, mammary carcinoma, osteosarcoma (negative prognostic indicator), metastatic disease

Osteomyelitis.

Any chronic or inflammatory disease can cause an ALP ↑

Clinicopathologic features that may hone diagnostic plan

i. Hematologic

1. Relative polycythemia and stress leukogram: Hyperadrenocorticism.

2. Low grade non-regenerative anemia: Hypothyroidism and other chronic inflammatory conditions (anemia of inflammatory disease).

ii. Biochemical Profile

1. Vacuolar hepatopathy is associated with marked ↑↑↑ in ALP and less severe ↑ AST, ↑ALT, ↑ GGT. If leakage enzymes or GGT are more markedly ↑↑↑ than ALP, consider primary hepatic parenchymal disease or biliary disease, respectively.

3. Hyperbilirubinemia: Pancreatitis, necrotizing cholecystitis, hyperlipidemia, & gallbladder mucocele

4. ↑↑ Cholesterol: Hyperadrenocorticism, pancreatitis, diabetes mellitus, idiopathic hyperlipidemia

Imaging

1. Radiography

a. Abdominal Radiography: Hepatomegaly is common with vacuolar hepatopathy

b. Thoracic radiographs: Cardiovascular or pulmonary disease

2. Abdominal Ultrasonography

a. Vacuolar hepatopathy on nodular hyperplasia: Hyperechoic parenchyma interfacing with hypoechoic nodules

b. Look for other evidence of underlying disease in liver & other organs

Liver Biopsy

1. May be required to definitively diagnose underlying hepatic disorders and to confirm nature of vacuolar change in terms of severity and lobular / zonal distribution and character

2. *Rather than immediately pursuing a liver biopsy, a search for an underlying disorder- if an underlying cause is not identified pursue biopsy*

Treatment

1. Treat underlying disease

2. Discontinue causative medications: glucocorticoids, herbal/holistic remedies

3. Add antioxidants: Phosphatidylcholine (PhocChol), SAMe (Denamarin), & vitamin E, +/- telmisartan

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HOW I TREAT- LARGE SKIN DEFECTS WITH A MESHED SKIN GRAFT

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

ameetsingh747@gmail.com

A free skin graft first requires removal of a segment of skin (epidermis and dermis) from one section of the body, typically where extra skin is available (donor site) and transferring it to another (recipient site). This piece of skin is devoid of vascular and nervous supply when placed in the recipient site, so essentially you are transferring a dead section of skin, and then hoping that through “take” of the graft, revascularization will occur and the skin will become vital again. Grafts can be classified as “full thickness” including all of the epidermal and dermal layers, or “partial thickness” where full epidermis is present but only part of the dermal layer is present. A different type of free graft is the Island or Seed graft where multiple small pieces of skin are placed within a larger granulation bed and the spaces between grafts fill in over time. Free graft failure is commonly associated with infection, separation and elevation from the underlying recipient bed and graft movement. Controlling these conditions is essential to graft survival. Meshing the graft or using continuous suction drains is recommended to prevent fluid accumulation from seroma, hematomas or discharge between the graft and the recipient bed. Movement concerns are best addressed by using bandages and limb splints for extremity grafts. Patients are typically sedated for any bandage changes during the first several days post-graft placement to allow easier bandage removal, optimal patient restraint and minimize the risk of graft disruption and movement. Steps to ensure recipient beds are free of infection prior to graft placement is recommended and a key component of graft survival. In the presence of infection, exudate production as well as the production of proteolytic enzymes and plasmin will lift the graft and disrupt the overall fibrinous attachments between the graft and underlying tissue, ending with progressive graft necrosis and procedure failure. Reinnervation of a free graft usually takes several weeks. Protection against patient self-trauma is often required for a few months following graft placement. The overall success of a full thickness graft is also dependent upon several other factors including surgical technique, graft preparation, state of recipient bed, tissue responses, and vascular ingrowth. Full thickness and expanded mesh grafts tend to offer the best potential cosmetic results and hair regrowth potential.

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HOW I TREAT- BRACHYCEPHALIC OBSTRUCTIVE AIRWAY SYNDROME WITH FOLDED PALATOPL

Ameet Singh

University of Guelph, Clinical Studies, Guelph, Canada

Qualifications:

Ameet Singh

DVM, DVSc, DACVS-SA

ameetsingh747@gmail.com

Brachycephalic obstructive airway syndrome (BOAS) is a complex and dynamic disease that affects all the brachycephalic breeds of dog and leads to a variety of clinical signs. The most common of these clinical signs, related to upper airway obstruction, include exercise intolerance, respiratory compromise, collapse and cyanosis. Gastro-esophageal reflux disease and sliding hiatal hernia can also occur as a result of BOAS further compromising quality-of-life in brachycephalic dogs.

The French Bulldog breed has soared in popularity and clinical signs as a result of BOAS in this breed are an increasingly frequent cause of visits to veterinarians. Most brachycephalic dogs with moderate to severe upper respiratory obstruction as a result of BOAS are offered surgical palliation.

One of the major components of upper respiratory tract obstruction as a result of BOAS is an elongated soft palate. A surgical procedure known as traditional staphylectomy (TS) is commonly performed to shorten an elongated soft palate that causes upper airway obstruction. This technique is performed by sharp incision or the use of an electrosurgical vessel-sealing device that shortens the soft palate. While this removes the redundant caudal portion of the soft palate causing upper airway obstruction, it does not alter the often thickened soft palate of brachycephalic dogs.Furthermore, it does not remove any nasopharyngeal obstruction caused by dorsal compression of the thickened rostral portion of the soft palate.

Recently, an alternative surgical technique for the treatment of elongated soft palate in BOAS affected dogs, termed the folded flap palatoplasty (FFP), has been described. The FFP technique is a variation on the TS that involves resection of the ventral mucosa and a portion of the underlying musculature to a create a flap of tissue that is then pulled rostrally and sutured onto itself to create the folded flap of soft palate. The underlying principle behind this technique is that the palate will not only be shortened but that it will also be thinned and result in decompression of the dorsal nasopharyngeal area that is responsible for a considerable amount of resistance in the upper respiratory tract.While this theory suggests that it may offer an advantage over TS, its effect on clinical signs of dogs with BOAS has not previously been evaluated using validated outcome measures.

Folded flap palatoplasty will be initiated by resection of the ventral mucosa of the soft palate extending from the caudal margin up to the pigment line close to the transition of the soft and hard palate using a combination of monopolar electrosurgery and sharp dissection. Hemorrhage will be managed using monopolar electrosurgery. The split thickness of palatal muscle deep to the mucosa will also be resected to thin the palate before the caudal margin of the palate is folded cranially and sutured into position in direct apposition to the cranial margin of the incised palatal mucosa.

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HOW I TREAT BRONCHOMALACIA

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle R. Johnson

DVM, MS, PhD, Diplomate ACVIM lrjohnson@ucdavis.edu

How I treat bronchomalacia

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Most dogs with tracheal collapse or bronchomalacia have a chronic history of waxing and waning respiratory difficulty or cough that has grown progressively worse over time. No sex predilection has been recognized. At our institution, over 2/3 of dogs diagnosed with tracheal collapse are overweight or obese, although a review of surgically managed patients from the U.K. reported only a 9% incidence of obesity. Tracheal collapse is most commonly recognized in small or toy breed dogs, such as the Yorkshire terrier, Pomeranian, Poodle, Maltese, and Chihuahua. However both small and large breed dogs can be affected by bronchomalacia. Affected dogs range from 1-15 years of age, and many are middle-aged when first presented.

Dogs with tracheal or bronchial collapse present with paroxysmal, dry, "honking" cough. Dogs with bronchomalacia often have expiratory effort and crackles on expiration. Tachypnea, exercise intolerance, and respiratory distress tend to occur in stressful situations, such as during physical exertion, with heat stress, or in humid conditions. Cyanosis or syncope occurs in severely affected animals due to complete airway obstruction or pulmonary hypertension.

In animals that require inpatient management, stress should be kept to a minimum. Oxygen supplementation is often beneficial. Mild cough suppression and sedation with butorphanol (0.05 - 0.1 mg/kg SC q4-6 hours) and/or acepromazine (0.01 - 0.1 mg/kg SC) may be useful. This combination of drugs seems to provide synergistic sedation, and caution should be employed when using the drugs together. Trazodone can also be effective in reducing anxiety although caution is warranted if hydrocodone will need to be employed because the 2 drugs can result in serotonin syndrome. To decrease laryngeal or airway tracheal irritation, a single dose of dexamethasone-SP (0.1 – 0.2 mg/kg IV) can be administered.

In some animals with suspected bronchomalacia or small airway disease, the 'bronchodilator' sustained release theophylline at 10 mg/kg PO BID can improve respiration and decrease the likelihood of intrathoracic airway collapse. This will indirectly limit cough. Caution is warranted when using sustained release theophylline because side effects of agitation and gastrointestinal upset can occur in some dogs. Starting with half the recommended dose can be helpful in achieving tolerance of the full dose. Because dogs do not actively bronchoconstrict, the true bronchodilating beta agonists (terbutaline, albuterol) are of limited value in management of bronchomalacia.

Outpatient management should be designed to correct risk factors identified in the diagnostic work-up. If chronic bronchitis or airway inflammation is diagnosed, corticosteroids should be employed. The best treatment modality is likely inhaled steroids, which avoid the deleterious side effects of panting, polyphagia, and weight gain commonly encountered with administration of oral steroids. Use of fluticasone propionate (110 µg/puff) and the Aerodawg ® spacing chamber can achieve 50% reduction in cough within 2 weeks of starting therapy.

In most cases, obesity plays a role in worsened cough and respiratory difficulty. Encouragement of weight loss can result in significant reductions in cough and improvement in overall health. Providing the owner with appropriate goals to obtain slow, steady weight loss can improve gas exchange and lessen cough. Owners should be instructed to exercise their pets only as the dog will tolerate and to avoid exercising in the heat of the day. Use of a harness instead of a collar should be encouraged.

Narcotic cough suppressants are often required to control cough and should be administered often enough to control cough without inducing severe sedation. Suggested drugs include hydrocodone (0.22 mg/kg PO QID-BID) and butorphanol (0.55 - 1.1 mg/kg PO PRN). Non-narcotic agents are less likely to be effective. If an anxiolytic is required, consideration can be given to use of acepromazine or gabapentin.

Although uncommonly encountered, airway infection should be treated with appropriate antibiotics. If an airway sample has not been obtained, a broad spectrum agent active against oropharyngeal or gastrointestinal bacteria should be employed. Doxycycline is a reasonable alternative when aspiration injury is suspected. Finally, acid suppression can be considered in dogs that suffer from coughing in the middle of the night, which can be suggestive of micro-aspiration or aspiration injury.

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HOW I TREAT LARYNGEAL PARALYSIS AS AN INTERNIST

Lynelle Johnson

University of California, Davis, Vm: Medicine & Epidemiology, Davis, United States of America

Qualifications:

Lynelle R. Johnson

DVM, MS, PhD, Diplomate ACVIM (Small Animal Internal Medicine)

lrjohnson@ucdavis.edu

How I treat laryngeal paralysis as an internist

Lynelle Johnson DVM, MS, PhD, Diplomate ACVIM Professor, University of California, Davis

Laryngeal paralysis can be a congenital condition (Dalmatian, Rottweiler, Leonberger, Husky, etc) but more commonly occurs as an acquired disease and it is occasionally documented in cats. The acquired syndrome occurs most often in older large breed dogs as a generalized neuromuscular disease with the most obvious dysfunction in the recurrent laryngeal nerve. Laryngeal paralysis can also be associated with trauma or a mass lesion impinging on the recurrent nerve anywhere along its pathway. History and presenting complaints include loud breathing, exercise intolerance, and continual panting in dogs. When asked, owners might recall that the pet has had a change in the character or frequency of the bark or meow. Neurologic assessment is important because additional nerve dysfunction can be detected in some congenital cases as well as in the acquired syndrome of large breed dogs. Proprioceptive placing deficits are quite common in these dogs and help establish the likelihood of disease. Careful questioning about dysphagia or regurgitation is also important because esophageal dysfunction accompanies laryngeal disease in many dogs. Laryngeal and pharyngeal sensation is also abnormal in these dogs.

Cervical radiographs can reveal caudal retraction of the larynx associated with increased inspiratory effort. Thoracic radiographs sometimes reveal hyperinflation or an air-filled esophagus, which must be differentiated from megaesophagus. Videofluoroscopy should be considered to evaluate esophageal motility, even in dogs lacking clinical evidence of regurgitation. Diagnosis of laryngeal paralysis is based on visualization of decreased or absent laryngeal abduction on inspiration while the animal is under a light plane of anesthesia. Ultrasound of the larynx has also been reported as a means for confirming the diagnosis. With either technique, it is important that an assistant identifies inspiratory motions to the examiner for correlation of laryngeal abduction with inspiration. Motion can be slightly asymmetric and still be within normal limits, and complete closure of the laryngeal cartilages may or may not be observed on expiration. In dogs, when a definitive diagnosis of laryngeal paralysis cannot be made based on visual examination due to the plane of anesthesia, respirations are stimulated using doxapram (1.0 mg/kg IV). Animals that display marked clinical signs associated with laryngeal paralysis require surgical treatment via unilateral arytenoid lateralization while less severely affected animals can be managed medically. Aspiration pneumonia does not appear to occur post-operatively in cats as often as it is reported in the dog.

Before a dog or cat undergoes surgery, ancillary medical treatment can help reduce clinical signs an improve quality of life. Accurate assessment of body condition score (BCS) is very important in devising a therapeutic plan. On a scale from 1-9, 5/9 is considered ideal however most respiratory patients will have improved clinical signs at a BCS of 4/9. For each point above the ideal, a dog can be considered 10% overweight. With a weight loss goal of 1-2% per week, it can easily take months for appropriate and sustainable weight loss to be achieved. Owners should be instructed precisely what and how to feed their animal and provided with realistic goals for weight loss. Frequent follow-up with owners and encouragement improves compliance.

It is critical to limit aspiration events in order to avoid repetitive pulmonary injury that can lead to bronchiectasis, and to avoid acute respiratory distress syndrome from aspiration of gastric acid. Altered feeding strategies that can be employed include elevating food and water, changing the consistency of food and water, and even employing a Bailey chair to keep dogs upright after feeding. Animal feeding can be slowed by using a commercially designed bowl to impede access to food or by placing a large can in the middle of the dog's bowl. In some cases, feeding a small meal before bedtime is helpful in limiting regurgitation in the middle of the night. Acid suppression remains controversial. While gastric acid is caustic to the surface of the lungs, it also inhibits bacterial growth that could result in overwhelming bacterial pneumonia. Omeprazole is most effective in reducing gastric acid but in my experience, can result in vomiting. Judicious use of an H-2 blocker such as famotidine can be considered on a trial basis. Elevating the animal's head at night-time with a pillow or inflatable ring can be helpful in some dogs.

Ancillary measures include avoidance of collars and decreased exposure to heat and humidity. If an animal with laryngeal paralysis lives in a hot environment, owners should exercise only in the cool of the morning and evening. If a dog overheats, owners should be instructed to institute active cooling measures by dousing with water and taking immediately for veterinary care. Dogs that are overly anxious can benefit from acepromazine or trazodone for calming effects.

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HOW I TREAT TO OPTIMISE ANIMAL WELFARE IN THE CLINIC

Heather Bacon

University of Central Lancashire, School Of Veterinary Medicine, Preston, United Kingdom

Qualifications:

Dr Heather Bacon

OBE BSc (Hons_ BVSc CertZooMed SFHEA MRCVS

hbacon@uclan.ac.uk

Veterinary professionals aim to optimize the welfare of their patients as part of their ethical duty of care, as well as to ensure improved clinical and surgical outcomes for the animal and help build a good veterinarian–client–patient relationship. However, the fear and anticipated discomfort that a patient often experiences at, and therefore associates with, the veterinary practice can make handling and treating them difficult and/or dangerous. Distressed patients may have increased circulating levels of stress hormones, which can affect the immune system and hinder recovery from disease or surgery; these patients may also require higher doses of anaesthetic agents or other medications, which could be associated with an increased risk of complications. Behavioural communications of patient distress include aggression and avoidance, which can make delivery of clinical care difficult and dangerous for veterinary staff. However, with thoughtful planning of each area of the clinic, an understanding of the animal's perspective, and staff awareness of low-stress handling and restraint methods, a patient's experience of the clinic can be much more positive. If procedures are well planned to minimize the compromise to patient welfare, then patients, owners and staff members will all benefit.

This presentation will outline a number of simple and practical steps that veterinary practitioners can use to improve clinical animal welfare. From building the 'trust bank account' to prioritised behavioural advice, reducing stress triggers, and optimising in-patient and end-of-life care.

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HOW I TREAT TO WORK WITH SHELTERS TO IMPROVE ANIMAL HEALTH

Natasha Lee

Animal Happiness Consultancy, -, Puchong, Malaysia

Qualifications:

Natasha YP Lee,

DVM, MSc, MANZCVS

dr.natasha@gmail.com

Shelter assessment

It is firstly important to understand the function of the shelter and the goals of the organisations running the shelter, as it has an impact on how animals are being kept in the shelter. Furthermore, it is also important to understand the values or perspectives and the level of awareness of shelter staff and managers, as it will determine style of communication and type of advice or training that can be given. Many times, it may be necessary to target behaviour changes of people managing the animals to have a larger animal welfare impact.

A thorough shelter assessment would include looking at the existing policies and operating procedures including how decisions are made, resource management and allocation, layout of the shelter and flow of animals through the shelter, facilities within the shelter, animal welfare and how their needs are fulfilled, animal handling, health management and disease history, and other aspects depending on where the problem lies.

Aspects for improvements within shelters

Population management within the shelter

The number of animals coming into a shelter should always equal the number of animals going out (whether they are adopted or euthanised, etc) as it will determine the overall balance of population within the shelter. A growing population with limited space and resources will soon encounter lots of animal welfare problems. A shelter should always operate within their 'capacity for care' which is determined by the amount of space, manpower, number of animals, and resources available.

Housing and facilities

The housing structure and facilities within the shelter should provide for the important animal needs such as hiding places to feel safe from people and other animals, or separate sleeping, toileting and eating areas. Shelters should have the ability to quarantine new incoming animals until they are safe enough to be introduced into the general population. The housing areas should be easy to clean and disinfect on a regular basis.

Health management and preventative healthcare

Shelters should focus on preventative healthcare which includes control of infectious diseases, rigorous vaccination protocols, control of internal and external parasites, nutrition and exercise, and reduction of stress. For example, vaccination should start as soon as the animal arrives in the shelter and is given a booster in two weeks to reduce the window of opportunity for diseases.

Sanitation

Sanitation of the housing and facilities goes hand in hand with preventative healthcare to prevent the spread of diseases. Proper sanitation protocols should pay attention to high-risk areas, thorough cleaning before disinfection procedure, correct dilution, and adequate contact time of disinfecting solutions. If disease spread is a problem within the shelter, then attention must be paid to sanitation procedures for staff and equipment as well.

Animal handling and behaviour

Staff must be trained to handle animals in the least stressful way. Animals should be given plenty of exercise opportunities and be given enough enrichment within their enclosures, especially for those that are staying long term. Socialisation of new animals should always be supervised to avoid fights or other stressful situations.

Approaches to implementation

Both staff and management respond better with thorough discussions and when given a chance to voice their opinions. Any discussions on designing new or reviewing current protocols should be inclusive for all those involved as this would increase both their understanding and ownership over the protocols, thus its implementation.

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HOW I TREAT CHRONIC PANCREATITIS IN CATS

Minna Rinkinen

IVC Evidensia, Tammisto Veterinary Hospital, Vantaa, Finland

Qualifications:

Minna Rinkinen

DVM, PhD, Adjunct professor

Finnish Veterinary Specialist in Small Animal Medicine

Evidensia Veterinary Hospital Tammisto, Vantaa, Finland

minna.rinkinen@evidensia.fi

Feline chronic pancreatitis is a persistent, long-term inflammation of pancreas that can lead to significant damage to the pancreas and surrounding tissues. Historically, pancreatitis was considered rare in cats, but current evidence suggests that it is more common than believed.

The exact cause of feline chronic pancreatitis is not entirely understood, but it is believed to involve a combination of genetic predisposition, environmental factors, and immune system responses.

Clinical signs of feline chronic pancreatitis can be subtle and variable, making diagnosis challenging. Common symptoms include decreased appetite, weight loss, vomiting, diarrhoea, and abdominal pain. Due to the nonspecific nature of these signs, other diseases must be ruled out through various diagnostic tests, including blood work, imaging (ultrasound, CT scan), and in some cases, pancreatic biopsy. Cats with chronic pancreatitis can have acute episodes, and it may be impossible clinically to distinguish an exacerbation of chronic pancreatitis ("bout") from an episode of acute pancreatitis[1].

Therapy

Treatment of feline chronic pancreatitis aims to manage the inflammation and alleviate symptoms. This may involve a combination of medications such as anti-inflammatories, pain management, and dietary changes.

Overt bouts of disease may cause abdominal pain. For a short-term analgesia at home, transmucosal buprenorphine can be administered. For long-term pain management, gabapentin or tramadol may be better choices. Maropitant, often selected for control of vomiting, also may provide visceral analgesia in cats.

Poor appetite is often associated with feline pancreatitis. Appetite stimulant mirtazapine or maropitant may be beneficial to support feed intake.

Prednisolone is a commonly used anti-inflammatory and immunosuppressive, and it can have a beneficial effect. The adverse effect of most concern in cats with chronic pancreatitis is the risk of diabetes mellitus. The suggested dose of prednisolone varies from 0.5 mg/kg PO q24h to 2 mg/kg PO q12h on a tapering schedule. If hyperglycaemia develops, or is pre-existing, cyclosporine (5 mg/kg q24h for 6 weeks) with close monitoring, is an alternative. Close monitoring (clinical re-evaluation and measurement of fPLI after 2-3 weeks) is recommended[1].

Nutritional therapy

Currently a little is known about the best dietary profile and energy and nutrient needs in cats with pancreatitis. A highly digestible, "low residue" (or "intestinal") complete and balanced feline diet usually works well.

As many cats with pancreatitis have poor appetite good palatability is important. Assisted feeding should be considered when needed. Unlike dogs, cats with pancreatitis do not need a low-fat diet.

In cats with comorbidities, the specific disease(s) may affect diet choice (e.g., hydrolysed protein diet for CIE; low CH diet for DM).

Cats with pancreatitis can have hypocobalaminemia, so serum cobalamin should always be measured in cats with suspected pancreatitis and supplemented if found below reference ranges[2].

It is essential to monitor affected cats closely, as chronic pancreatitis can lead to complications such as exocrine pancreatic insufficiency (EPI) and diabetes mellitus. Early diagnosis and appropriate management are crucial for improving the quality of life and long-term prognosis of cats with chronic pancreatitis.

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HOW I DIAGNOSE AND TREAT ECLAMPSIA

Sabine Schaefer-Somi

Platform AI and ET, Vetmeduni Vienna, Small Animals And Horses, Vienna, Austria

Qualifications:

Sabine Schäfer-Somi, Prof.

Platform Artificial Insemination and Embryo Transfer, Vetmeduni Vienna, Austria

sabine.schaefer@vetmeduni.ac.at

The periparturient bitch is exposed to manifold stresses. During the late stage of gestation, the strong growth of the fetuses requires among others energy, and sufficient and balanced mineral nutrients. After parturition, the demands of the neonates even increase and after 2-3 weeks, the bitch enters the high-lactation stage with maximum production of milk. The neonates are fully dependant on the nutrients in the milk and need more volume each day. Provided the feeding of the mother is well-balanced with a calcium:phosphor ratio of 2:1, calcium supplements prior to parturition are not needed. However, a lack of calcium in the food, undernutrition or a small body size: litter ratio may cause depletion of calcium from the extracellular compartment, severe hypocalcaemia and consecutively the signs of eclampsia (puerperal tetany). Another reason for eclampsia is supplementation of too much calcium before parturition since this can disturb the mobilisation of calcium. Eclampsia during late gestation is seldom (1).

Diagnosis can be done by case history, clinical examination and measurement of heparinized plasma-concentrations of ionized-calcium. Only the ionized form is biologically active and important for neuromuscular function (2). Typical is a history of a post parturient bitch, 2-3 weeks after parturition, with many puppies which sucked all milk off the teats. Bitches frequently present with panting, restlessness, hypersalivation, stiffness and twitches that mostly start in the face and on the head. In advanced cases, minutes to hours later, the dogs have high fever, tachycardia or bradycardia and show tetany or tonic-clonic convulsions; the condition can be life-threatening. During the acute phase, they are fully awake. Plasma-concentration of ionized calcium is < 0.8 mmol/L and serum-concentration of total calcium is < 6.5 mg/dL (3, 4). As differential diagnoses, epilepsy, neurological diseases, sepsis, hypoglycaemia and poisoning (caffeine, strychnine, lead, metaldehyde) should be considered (5). Eclampsia may occur combined with hypoglycaemia and/or a beginning puerperal infection.

Bitches showing acute eclampsia are an emergency case. They should be treated immediately, otherwise brain oedema, respiratory alkalose, high fever and the severe muscle contractions can cause the animal's death. For treatment the first decision must be whether administration of a benzodiazepine like diazepam is required. In low grade cases, this is not necessary. In case the bitch is afraid because of the highly increased muscle activity and to stop convulsions, diazepam is indicated. This will also normalise breathing and treat alkalosis which contributes to decrease of ionized calcium (4). The gamma-aminobutyric acid inhibitor diazepam and related substances decrease the excitability of nerves and lead to muscle relaxation and anxiolysis. This also allows to insert a venous catheter. Blood must be taken for measurement of the plasma-concentration of glucose and ionized calcium. While the measurement is ongoing, a mixture of glucose or dextrose 5% and calcium-gluconate 30% (1:1) should be slowly administered intravenously (i.v.) to effect. Calcium gluconate is preferred over calcium chloride since extravasation of the latter may cause skin necroses (4). Heart rate must be thoroughly monitored during the infusion and in case it increases, the infusion must stop immediately. The amount is dependent on the effect. A total amount of 0.5 mL of the mixture / kg body weight should be prepared (10 mL syringe for a 20 kg bitch). Another regimen is to administer 10% calcium gluconate i.v. (0.5-1.5 mL/kg to effect (4)). As soon as the bitch relaxes and the convulsions stop, the infusion should stop as well (5). The bitch must be observed during the following hour(s) to avoid a recidive while travelling home. The measured calcium concentration will help to calculate the amount of calcium supplementation dependent on the elemental calcium in the solution. It might be necessary to administer a slow i.v. infusion with more calcium (some of the remaining mixture) during the following hour(s) until the plasma-concentration is normal. After full recovery, sonographic examination of the abdomen is recommended since due to the lack of calcium, accumulation of lochia in the flaccid, non-contracted uterus may occur (lochiometra). All clinical findings and the plasma-concentration of ionized calcium should be normal before the dog is released.

For prevention of recidives during lactation, the dog should receive a sufficient amount of a balanced diet with a calcium:phosphor ratio of 2:1 (6) and in addition vitamin D (dihydrotachysterol, 0.5 mg/dog, 5 days). Oral calcium carbonate or gluconate may be given (25-50 mg/kg/day in 3-4 divided doses; (4)). The puppies should not be taken away completely but should be allowed to suckle once or twice daily; otherwise, the nervousness of the mother can provoke a recidive. During the rest of the day she should wear a body but should be allowed to see her puppies. Feeding with milk replacer and early change to solid food will be necessary. Despite all measures, a recidive may occur (3). Owners should be properly instructed to visit the vet when first signs occur. For prevention during pregnancy, a balanced diet with a calcium:phosphor ratio of 1.2:1 will be sufficient. The daily need of calcium for a dog is 50-90 mg calcium/kg body weight. Pregnant and lactating bitches may need up to 180 mg calcium/kg. Before substitution, the calcium amount within the diet must be considered.

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HOW I DO EARLY SPAY & NEUTER

Natasha Lee

Animal Happiness Consultancy, -, Puchong, Malaysia

Qualifications:

Natasha YP Lee

DVM, MSc, MANZCVS

dr.natasha@gmail.com

Early age neutering can be considered as sterilisation surgeries performed before the traditional neutering age, which is typically around 6 months of age and sometimes older in certain dog breeds. In my practice, early age neutering is performed for animals of at least 2 months of age and weighs at least 1kg.

These young puppies or kittens must be in good health, regardless of its vaccination status. A basic physical examination is conducted including assessing its general demeanour, heart rate, respiration rate, mucous membrane colour, hydration status, lung sounds, and observe for any abnormal discharges. The genitals are examined to confirm the sex as well as to ensure it is normal e.g., both testicles have descended. Temperature is taken if further investigation is warranted.

Animals younger than 6 months old are not fasted any more than 4 hours. Water is continuously given right up to premedication. The anaesthesia drugs and dosages are given according to the Table 1. An NSAID such as tolfedine or meloxicam is given before the start of surgery. Lidocaine is splashed on ovarian pedicles or injected intra-testicularly.

	Kittens	**Puppies**
Premedication	Acepromazine (0.04mg/kg) and tramadol (4mg/kg) given IM or SQ	Acepromazine (0.04mg/kg) and morphine (0.5mg/kg) given IM or SQ
Induction	Midazolam (0.2mg/kg) and ketamine (5mg/kg) given IM	Propofol (2-6 mg/kg) given IV to effect
Maintenance	Isoflurane	Isoflurane

Table 1: anaesthesia drug and doses for kittens and puppies

Ovariohysterectomy is performed on female animals and orchidectomy is performed on the males. Attention is given to gentle handling of tissues and accuracy in ligation of blood vessels, but otherwise surgical procedures are comparable to adult animals. However, it is much easier to perform in young animals due to better visualisation, less fat surrounding ovaries, ovarian ligament is less taut, less bleeding, and smaller organs. Surgeries in younger animals are faster too.

Precautions are needed to reduce risk for hypothermia such as providing heat during surgery and recovery and ensuring they do not get excessively wet during prep. Hypoglycaemia risks are also higher in young animals therefore glucose should be on standby, and food should be offered to the animals as soon as they recover from anaesthesia.

Overall, early age neutering is a very rewarding procedure to do as it is easier, faster and the animals bounce back very quickly after surgery.

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HOW I COMMUNICATE BAD NEWS TO CLIENTS.

Sheilah Robertson

Lap of Love Veterinary Hospice, Medical Director, GAINESVILLE, United States of America

Qualifications:

Sheilah A Robertson

BVMS (Hons), CertVA, PhD, DACVAA, DECVAA, DACAW, DECAWBM (AWSEL), FRCVS.

drrobertson@lapoflove.com

Introduction

Terms such as difficult, challenging, courageous or serious have been used to describe conversations that physicians and veterinarians have with patients or clients when discussing an end-of-life situation and how to move forward. In her book "Listen, How to Find the Words for Tender Conversations",A Kathryn Mannix, a palliative care clinician, suggests these are problem labels with negative overtones and may evoke a feeling of self-defense or anxiety. She suggests tender is a better description for discussions that are painful, where we acknowledge the pain is not something to overcome but to experience and be held with sensitivity and respect.

Empathy versus sympathy

Empathy and sympathy differ in how they make the person who is suffering feel. Empathy conveys that you can understand and share the feelings of another. Sympathy is a feeling of pity or sorrow for someone's misfortune and pity can generate feelings of alienation in others.

Let's talk about communication

Every member of a veterinary team will have a "difficult conversation" with an owner, and often each other, about a pet's care when a serious illness is diagnosed. How these conversations and interactions play out have an impact on all stakeholders. In human medicine, there has been a move to use structured conversation guides for discussions on dying and end-of-life care. In veterinary medicine, there is the option of euthanasia to prevent suffering. Some of us have difficulty bringing this topic up because it can be upsetting, we feel like we have failed, or we anticipate a negative reaction from the owner.

Tips for talking about euthanasia

Most of us have interacted with an owner who resists the suggestion of euthanasia and requests life-prolonging treatment. As veterinarians, we have the challenge of weighing the best interests of the patient with the client's wishes. When the pet's family isn't on the same page as us, it makes the situation even more complex and can result in significant ethical and moral stress.1,2

Guidelines for conversations about serious illness help deal with these complex issues and aid in developing a plan for moving forward. NOT using guidelines, "is akin to wandering a trail-less wilderness without a map."1 The need for more training in communication, including euthanasia discussions within the veterinary profession is highlighted by Nogueira Borden and colleagues who describe two conversation or interview styles.3

The veterinary-centered approach is led by the veterinarian, is rich in medical information and is focused on the patient.

The client-centered approach encourages the client to ask questions and share their perspectives and opinions. This approach is especially important for end-of-life discussions.

The authors enrolled companion animal veterinarians in a study. Two case scenarios were presented by undisclosed standardized clients (USCs) – these were actors who stood in for clients; one case involved a geriatric dog with progressively worsening osteoarthritis and the other was a cat with inappropriate urination. Both case scenarios were designed to initiate a euthanasia discussion with the veterinarians unaware they were talking with a USCs. After the appointment both parties completed a questionnaire. The questionnaires were designed to assess the client's and the veterinarian's perception of client-centeredness of the appointment. The data showed a marked disagreement about how "client centered" the appointment had been. Important details were often missed because veterinarians did not elicit the client's perspective. For example, the client with the geriatric dog with arthritis had promised to care for the dog when her father died and was wrought with guilt about euthanizing the dog. Both participants indicated that discussion of this subject was lacking, which suggests that the veterinarians knew they were not exploring potentially important avenues. The results of this study support the need for training veterinarians in end-of-life conversations and euthanasia decision-making.3

The serious illness conversation guide – humans

The Serious Illness Care Program was created by a team of palliative care experts at Ariadne Labs (www.ariadnelabs.org/serious-illness-care). At the center of the program is the Serious Illness Conversation Guide which provides clinicians with language to ask patients about their goals, values, and wishes. Existing evidence does not support the commonly held belief that communication about end-of-life issues increases patient distress.4 Many oncologists and palliative care clinicians believe that serious illness discussions are beneficial interventions that should be systematically integrated into clinical care.5 When these conversations occur, patients experience less anxiety and depression; but sadly, they occur infrequently. The keys to success include using a conversation guide or checklist, a little bit of preparation, and practice. We can easily substitute "patient" for "client" when following these guidelines.

The principles behind using the guide include:

Patients (clients) want the truth

You will not harm your patient (client) by talking about end-of-life issues

Giving patients (clients) an opportunity to express fears and worries is therapeutic

Adapting the tools for veterinary medicine

The Serious Veterinary Illness Conversation Guide developed by Dr. Katherine Goldberg is an excellent resource.1

The 7 key components to the conversation are:

Set up the conversation – "I'd like to talk about your pet's illness and what lies ahead, is that okay?"

Assess their understanding and preferences – "What do you currently understand about this illness? How much information would you like from me?"

Share prognosis – "I want to share my understanding of where we are with [pet's name]."

Explore key topics – "What are your most important goals? What are your fears and worries?"

Close the conversation – "I've heard you say that 'X' is really important to you," or "How does this plan seem to you?" or "I will do everything I can to help [pet's name] and you through this."

Document your conversation.

Communicate with other key clinicians and care team members.

The Serious Illness Care Program developed for physicians recommends the words "WISH, WORRY, WONDER" – use these words as much as you can:

I wish allows for aligning with the client's hopes.

I worry allows for being truthful while sensitive.

I wonder is a subtle way to make a recommendation.

Good advice includes:

Allow silence – do not fear it! 80% of communication is non-verbal.

Don't spend more than 50% of the time talking.

Important concepts to convey to owners:

Animals do not have a concept of the future. This means how they feel "in the moment" is what matters. Humans can rationalize going through a difficult treatment because they can see beyond it – animals cannot do that.

Veterinarians are the patient's advocate and are doing what they are trained to do, prevent suffering, the owner is the "proxy" for making decisions on behalf of their pet.

Let them know you are concerned about their pet's quality of life.

Phrases to use:

"What do you think Max would want?" (Focus on the pet)

"I wish we were not in this situation, but I am worried about Fluffy."

Instead of saying "what are your biggest worries?" say "what are your biggest worries about Flash?"

"I am bringing up these issues because I want us to be prepared for what is ahead."

What if they don't want to talk about it?

Just as physicians hear patients say, "I don't want to talk about it," we will have clients say the same thing. What do we do if this happens? One suggestion is to say, "help me understand the reasons you would prefer not to talk about this." In this scenario, you can explain that discussing the topic helps make decisions; if a pet is clearly dying, we need to move this conversation along as we don't have the luxury of giving the owner more time. Clients may start talking about other things (they are likely in denial) or take a long time to express their feelings. There is a limit to how much time we can allow, so gentle "redirects" or interruptions are sometimes necessary. For example, say "I wish we had more time to talk, but I would like to get back to making a plan for Bella."

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HOW I COMMUNICATE QUALITY OF LIFE CONCERNS

Heather Bacon

University of Central Lancashire, School Of Veterinary Medicine, Preston, United Kingdom

Qualifications:

Dr Heather Bacon

OBE BSc (Hons) BVSc CertZooMed SFHEA MRCVS

hbacon@uclan.ac.uk

How I communicate Quality of life concerns

Increasingly in animal welfare, we aim to provide a 'good life' for the animals we keep as companions, but even though we have an emotional bond with our companion animals, we may often struggle to provide good welfare for them. Companion animals often lead lives with significant behavioural and physical restrictions – we choose what and when they will eat, who they socialize with, when they exercise, where they sleep, and in many cases even when or where they can toilet. Such decisions are made almost automatically, often unthinkingly, and often on the basis of prior experience, convenience, or informal advice, than scientific evidence. Of course, companion animals also benefit from their relationship with us – by restricting their social and physical activities, and providing them with food, and veterinary care, they're less at risk of traumatic injury, infectious disease and other health-related problems. But this level of protection also generates an entirely different set of welfare and ethical challenges, particularly for companion animals bred for extreme conformation or those entering older age and experiencing multiple health problems which may negatively impact on their quality of life.

We value our companion animals often not just for themselves but also for what they bring to our lives, for example, as status symbols of a particular breed or as a reflection on the morality of their owner who has 'rescued' them. This mixed value can confound our ability to provide for their welfare needs, as often the welfare needs of our pets may be in conflict with our own perceptions of their welfare, generating cognitive dissonance in many pet owners. An example of this can be seen in the UK's PDSA Pet Animal Welfare (PAW) reports where companion animals are described as under-exercised, under-socialised and obese[1], but very much loved by their owners

In particular, the intrinsic value of companion animals to human society, and our individual emotional bond with them, may often confound objective decision-making around end-of-life animal care. Whilst the slaughter of animals for food production, or humane end-points for animals used in research, are often clearly prescribed and regulated, it is rare for such protections to be extended to our companion animals. There is perhaps, an assumption that the animals with whom we share our homes and lives will automatically experience good welfare throughout their lives and their deaths. But is this always the case? As veterinary medicine services develop, and new treatments are offered, the options for extending the lives of our companion animals increases. Similarly, as selection for extreme conformations becomes increasingly popular, the proportion of companion animals requiring lifelong management of multiple health problems is also increasing. Such investment in owner time, finances and emotion can be significant over the animal's lifetime, and this investment undoubtedly can confound objective decision-making around the animal's welfare state with many owners unable to recognize suffering in their own pets [2]. Delayed Euthanasia has been recognized as a significant problem in UK companion animals [3,4] and companion animal owners often experience feeling of guilt and remorse in addition to their grief after euthanasia of a pet [5,6].

This presentation will explore some of the ethical and practical considerations when considering quality of life issues and discussing euthanasia of our companion animals with their owners . What does euthanasia really mean? How can we manage it well? And what do we need to consider when we as pet owners need to make that decision, or we as veterinarians support pet owners in making decisions around euthanasia? We'll draw on research from around the world to better understand some of the challenges to really achieving euthanasia in our companion animals, and explore challenges and opportunities in providing a good death to the animals that share our lives.

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HOW I DIAGNOSE: URINARY BLADDER CANCER IN DOGS

Pachi Clemente-Vicario

La Merced Veterinary Specislists, Oncology, Calpe, Spain

Qualifications:

DVM, MS, Diplomate ACVIM (Oncology)

Urinary bladder cancer, with transitional cell carcinoma being the most common urinary tract cancer, has been considered a challenging disease to diagnose[1].

With unknown prevalence, it might represent 1-2% of all canine cancers and affects usually to old dogs, more frequently in females, with some breeds (Scottish terrier) overrepresented. Clinical signs are similar to urinary tract infections, bladder stones or benign polyps (hematuria, dysuria or stranguria or pollakiuria).

A definitive diagnosis typically required histopathological examination obtained by cystotomy, cystoscopy or catheter biopsy. Fine needle aspiration of the bladder ***is not indicated*** for diagnosis due to the risk of cancer implantation through the needle tract[2]. However, cancer transplantation has also been described with urinary bladder surgery[3],[4].

Also, cytological evaluation is often inconclusive (low cellularity, concurrent inflammation and or infection). The cytological diagnosis depends on the collection method, and it is more likely to have a diagnosis with catheterization. In any case, cytology sensitivity is variable (31 to 91% depending on institutions) and specificity also (50 to 97%)[5].

Ultrasonography needs experienced operators and protocols to assess progression[6]. Additionally, the tumor volume may be different based on method and modality of diagnostic imaging used[7], making difficult to assess response to therapy.

BRAF mutations have been described in canine cancers, including transitional cell carcinoma[8,9] and represent now a diagnostic tool for this common cancer. *BRAF* mutations may activate the MAPK pathway[10], and also induce CCL17 production and contribute to regulatory T cell recruitment[11].

The mutation test can be done in urine or in cytological samples from sediment of free catch sample. About 70 to 85 per cent of tumors have the mutation[12], that seems to be more frequent in Terriers than in other breeds[13]and the specificity of the positive result is 100%.

However, the presence of the mutation is not correlated with the histological grade[13] and is not prognostic as an independent factor[14] but it may be prognostic depending on the treatment used.

Circulating Tumor DNA (ctDNA) looks for the presence in plasma or specific mutations from cancer cells. *BRAF* mutations in ctDNA tests can be measured and quantified in plasma, what may be potentially useful for monitoring the progression or response to treatment[15,16] and in this setting, the values above the cut-off point have a worse prognosis.

In summary, *BRAF* mutation test is now the first diagnostic tool in cases with suspcion of uninary bladder cancer.

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HOW DO I COMMUNICATE WITH OWNERS THAT THEIR PET HAS CANCER?

Natalia Ignatenko

Praxis Feldkirchen, Oncologist, Feldkirchen, Germany

Qualifications:

Nataliia Ignatenko

Dr.med.vet,phD, Dipl.ECVIM-Ca-oncology

natali.ignatenko@gmail.com

Abstract Body:

During the conversation with the owner about the cancer diagnosis, it is important to me that it does not automatically mean that this is an "end of pet's life" conversation. We live in the 21st century and many cancers are controllable if not curable, yet for most owners the thought of cancer in their pets is devastating.

There are several stages when we raise the issue of cancer with the owners of our patients: when we suspect cancer; when we report the diagnosis; or when the diagnosis is known, the process of reflection with the owners has passed and treatment options can be discussed. Or when we have a conversation with the owner of a patient in the terminal stage of the disease.

For example, it is very important for the owner of the patient with a mammary tumour (which is small and non-invasive in appearance) to understand that the sooner the decision for surgical treatment is made, the more favorable the prognosis can be.

It is necessary, in my opinion, to perform a fine-needle aspiration of skin neoplasms if they are more than 5 mm in diameter.

Screening for cancer in our patients in the coming years, I hope, with the development of liquid biopsy, will allow us to detect cancer at an earlier stage, and therefore to deal with it more effectively. But even now we should not ignore even small visible neoplasms, and to talk to the owners of our patients about the importance of diagnosis and the timeliness of the prescribed treatment.

After diagnostic procedures (cytological or morphological examination), it is very important to be able to communicate with the owner of the pet about the diagnosis personally and to give them time to accept the diagnosis before talking about possible treatment options or palliative care.

During my veterinary studies more than 27 years ago, there was no place in the foundational knowledge of anatomy and clinical disciplines to discuss the need for proper communication skills of the doctors with their patient owners. We weren't told about the Spikes protocol system for delivering bad news, which has been taught to medical students for decades, and which no doubt is useful to us as veterinarians.

What do the letters of this abbreviation mean to me?

S- Setting up - I am preparing for a conversation, I know not only the results of the morphological conclusion, but also the information about the general well-being of my patient. I choose a place where we will not be disturbed by the discussion of bad news, and I set up a time slot for this. If the pet has several owners, then it is important to clarify whether everyone wants (can) be present during this conversation, or if I should additionally talk to the second family member that did not have the opportunity to come.

P- Perception - it is important for me to understand the expectations and the level of knowledge of the owner of the animal; to understand their view on the problem.

I-Invitation - firstly for me, it is feedback from the owner about their desire to talk about cancer and to know the amount of information about pet's illness. Many owners would like to receive all available information about the disease and about all possible outcomes, but there are owners who prefer to receive information in a dosed manner.

K-knowledge - honest and most complete information about the diagnosis, treatment options, expected effects of the treatment and possible side effects of the therapy. At this time, I try to concentrate on developing a constructive treatment strategy and to shift the focus away from things that cannot be changed. It is important to concentrate on the actions that the owner of the animal need to take. Information should be as easily accessible as possible; to be presented not in medical slang, full of professional terms, but in a format that will be clear to the owner. It is important to ask questions that will allow you to assess how much of the provided information owner absorbed. A good tip: give the owner an opportunity to read what was spoken about later, printed out in a condensed form as an extract either right after the appointment or a little later by e-mail.

E - emotions - I do not hide empathy, I try to give the owner the opportunity to feel through the emotions if the diagnosis was unexpected for them. It is difficult to find words of sympathy, but one must not forget about them. Kind words are often an important support to the owner of the animal when they find out about a difficult diagnosis.

S - strategy and summary - despite the emotional complexity of the dialogue, I try to sum up and structure the results with which the owner leaves: it can be a developed treatment strategy, or it can be just the results of the diagnosis, treatment options and the prognosis. The choice to be made is left to the owner.

When dealing with owners of terminally ill animals, the issue of humane euthanasia is a difficult but necessary conversation. In veterinary oncology, quality of life, not quantity of time, is the priority. And choosing the best therapy option, we strive to maintain a good quality of life. If your patient is suffering, it is important to explain why the decision for humane euthanasia needs to be made. The issues of euthanasia, however, deserve a separate report. It is important in some instances, however, that euthanasia is not the only option offered to the owner. If you, as a specialist, cannot offer a specialized treatment (surgery, chemotherapy, radiation) that can significantly prolong the patient's life, preserving or improving its quality, but another doctor can, consider a reference. None of us can be an expert in all fields, so referring a patient to a narrowly specialized vet not only doesn't demean your knowledge as a doctor but will also increase the level of trust among the owners of your patients.

In my opinion, the most important guideline to follow when reporting cancer is combining a professional with an empathetic human being. A doctor with the clear, but accessible and understandable statement of the diagnosis, treatment options and prognosis; and an empathetic person that allows owners who find themselves in such a difficult situation to count on your support.

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HOW DO I TREAT MY DOGS WITH MULTIPLE ACQUIRED PORTOSYSTEMIC SHUNTS?

Andrea Johnston

LSU School of Veterinary Medicine, Veterinary Clinical Sciences, Baton Rouge, United States of America

Qualifications:

Andrea N. Johnston, DVM, PhD

Diplomate American College of Veterinary Internal Medicine (SAIM)

Assistant Professor of Small Animal Internal Medicine

Louisiana State University School of Veterinary Medicine

johnston1@lsu.edu

HOW DO I TREAT DOGS WITH MULTIPLE ACQUIRED PORTOSYSTEMIC SHUNTS (MAPSS)

Abstract: Acquired portosystemic shunts develop secondary to portal hypertension. There are many pre-hepatic, hepatic, and post-hepatic causes of portal hypertension. Dogs with multiple acquired portosystemic shunts (MAPSS) have an array of clinical signs and may even be asymptomatic. In some instances, MAPSS are identified incidentally on abdominal ultrasound or CT angiography wherein nests of shunting vessels are detected near the spleen, kidney, or mid-abdominal vasculature. This discussion will focus on how to manage dogs with MAPSS.

Objective 1: Treat the underlying cause. Identifying the etiology of the portal hypertension that led to the development of MAPSS is not always possible. Yet, in cases where it can be identified, treatment of the primary problem may ameliorate clinical signs. In cases where portal hypertension can be resolved (e.g., splenic torsion), no further treatment may be indicated.

Objective 2: Treat the hepatic encephalopathy. Overt hepatic encephalopathy manifests as a range of signs from subtle behavioral deficits to stupor and coma. The presence of acquired shunts warrants treatment for hepatic encephalopathy to avoid chronic neurocognitive impairment, but the level of treatment is dictated by the severity of clinical signs. Covert encephalopathy may be managed with L-Ornithine or L-asparate powder (LOLA, 3g = ½ teaspoon every 12- 24 hours) or lactulose (0.25 - 0.5ml/kg PO q 8-12h, modify dose as appropriate to avoid diarrhea) alone. In cases with overt hepatic encephalopathy, gut flora modulation (Visbiome or alternative probiotic; psyllium; for more severe HE: metronidazole 7.5mg/kg PO q 12h) or dietary protein modification to a diet high in vegetable or casein-based protein and low in animal protein is indicated. In severely affected dogs, protein restriction may be required, but should be titrated to the highest tolerable protein content to avoid muscle catabolism.

Objective 3. Treat the peritoneal effusion. If peritoneal effusion is present, the severity will dictate the degree of intervention. Many dogs with effusion will have waxing and waning fluid volumes. Abdominal girth can be measured just caudal to the last rib with a tape measure or even a folded piece of tape marked daily to log response to therapy. Avoid large volume abdminocentesis! This causes fluid, protein, and electrolytes shifts that may be detrimental to the patient. Perform abdominocentesis only when the patient is experiencing taut abdominal distension or perceived discomfort from the fluid. Remove just enough volume (20 - 50%) to alleviate clinical signs. Prior to tapping, perform a sterile prep of the sight to avoid bacterial peritonitis and tap laterally, to avoid persistent fluid leakage and subcutaneous accumulation. Administration of isotonic intravenous fluids may be indicated if the patient is hemodynamically unstable. Diuretic therapy is the first line of treatment and is titrated to the lowest effective dose to avoid hypovolemia and electrolytes derangements. Furosemide (Initial dosage 0.5 – 1mg/kg/d) and spironolactone (Initial dosage is 1 - 2mg/kg/d) can be combined to enhance fluid mobilization initially. Furosemide is tapered first after a response to therapy is noted.

Objective 4. Treat the portal hypertension? In cases of hepatic portal hypertension that cannot be resolved by treatment of the primary disease, I consider initiating medications to address the portal hypertension. These recommendations are largely anecdotal and extrapolated from human medicine. To induce splanchnic vasoconstriction, the non-selective beta-adrenergic antagonist and alpha 1 agonist, carvedilol is the most effective of its class in humans. Systolic blood pressure must be monitored to avoid hypotension with use of carvedilol. To induce splanchnic vasodilation, I have used the angiotensin II receptor antagonists, losartan or telmisartan. Both drugs have been shown to attenuate hepatic fibrosis in experimental rodent models, which may be an added benefit in canine chronic liver disease but remains untested. Renal and electrolyte values must be regularly monitored with losartan and telmisartan use.

***Many dogs can survive for years despite the development of MAPSS. Survival times are likely dependent on the underlying disease.**

Note: Attenuation of MAPSS is not recommended unless the underlying cause of the portal hypertension has been completely resolved and the patient is experiencing severe hepatic encephalopathy. In most cases, surgical attenuation of acquired shunts is a poor choice.

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HOW I DIAGNOSE HEPATIC FIBROSIS

Andrea Johnston

LSU School of Veterinary Medicine, Veterinary Clinical Sciences, Baton Rouge, United States of America

Qualifications:

Andrea N. Johnston, DVM, PhD

Diplomate American College of Veterinary Internal Medicine (SAIM)

Assistant Professor of Small Animal Internal Medicine

Louisiana State University School of Veterinary Medicine

johnston1@lsu.edu

Abstract: "How do I diagnose hepatic fibrosis" will be a discussion of 2D shear wave elastography (a non-invasive fibrosis assessment), liver biopsy with histology (Masson's trichrome or Sirius red staining) and pathologist scoring versus automated digital quantification.

Two-Dimensional shear wave elastography. Ultrasound shear wave elastography (SWE) is a non-invasive ultrasonographic method to quantify tissue stiffness. The speed at which shear waves travel correlates to tissue elasticity. There are many types of SWE. Two Dimensional SWE uses acoustic radiation force imaging. The impulse propagates perpendicular to the incident sound wave at multiple focal zones. Radiofrequency images are collected to measure real time wave velocity. Because shear waves travel faster in dense tissue, increased hepatic collagen results in higher shear wave velocity. Ultrasound elastography has been routinely used to diagnose hepatic fibrosis in humans for the past 20 years. In both humans, cats, and dogs, this method works best for patients with moderate to severe fibrosis.

Liver biopsy and histologic assessment: Histology is the gold-standard diagnostic method for hepatic fibrosis. Liver tissue may be obtained by ultrasound guided needle biopsy, laparoscopy, or exploratory laparotomy (Liver biopsy guidelines). Either a Masson's trichrome or Sirius red stain must be applied to quantify and grade fibrosis severity. Fibrosis cannot be adequately evaluated on H&E alone. While many fibrosis grading schemes are published in human medicine and are often applied to veterinary patients, I think this is an area that still requires critical review. As digital imaging capabilities improve, quantitation of hepatic fibrosis should accompany the pathologists qualitative fibrosis assessment.

Liver biopsy guidelines

Histology

Accurate histologic evaluation requires a minimum of 15 portal tracts

5 laparoscopic or surgical samples, multiple 14 – 16 G needle biopsies

Biopsy multiple lobes (n >, = 2)

Handle tissue carefully to avoid crush artifact & immediately place in neutral buffered formalin

(10:1, fixative to tissue, No sample should be >0.5-1cm to ensure proper fixation)

Histology should include:

H&E stain,

Rhodanine or rubeanic acid stain – quantify & localize copper

Masson's trichrome or Sirius red – fibrosis

Reticulin stain – lobular architecture

Perls' Prussian blue stain – quantify and localize iron

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WSAVA ONE HEALTH AWARD

Paula Boyden

Dogs Trust, Veterinary, London, United Kingdom

Qualifications:

Dr Paula Boyden

BVetMed MRCVS

paula.boyden@dogstrust.org.uk

The Link between Abuse of Animals and Abuse of People: One Health and the role of the Veterinary Profession

When animals are abused, people are at risk

When people are abused, animals are at risk

This quote from Phil Arkow sums up the challenges we face regarding abuse of animals and abuse of people. There is robust evidence that animals can also be abused in households where people are being abused, a clear link between the victims in an abusive home. Whilst the abuse may be physical, known as 'non-accidental injury' (NAI), it could equally be using the threat of violence against an animal to coerce and control human victims, or even actions that result in neglect of an animal, such as not allowing or delaying veterinary treatment, food or basic care. Some domestic abuse legislation now acknowledges that animals may be involved as part of an abusive relationship and specifically references them.

It should be no surprise that there are similarities in the physical abuse of humans and the abuse of animals, with regards the circumstances of the violence, the actions involved, and the excuses offered. This is due to one common denominator: the human perpetrator. However, these similarities may be difficult for some professionals to understand.

As veterinary professionals it may be hard to comprehend why someone would deliberately hurt an animal and then seek veterinary attention. Even accepting that an animal's injuries may be deliberate and that clients may lie to us can be challenging.

Work which has contributed to our understanding of the link and NAI

Arkow[1] authored a paper 'child abuse, animal abuse and the veterinarian' where he concluded that there was growing evidence of a link between violence to people and violence to animals and vets were important because we see the results of the violence in our animal patients. It is now apparent that the whole veterinary team is important when a case of NAI is suspected, not least of all veterinary nurses.

Thanks to the work of Helen Munro and Mike Thrusfield[2] published in 2001 there are now good diagnostic indicators for NAI in companion animals. Unsurprisingly these are identical to the diagnostic indicators for NAI in children; history inconsistent with the injury, repetitive injuries, a discrepant history.

Our awareness of NAI and the link has led to the evolution of 2 disciplines of veterinary medicine: clinical veterinary forensics and forensic veterinary pathology. A name synonymously associated with forensic veterinary pathology is Professor Ranald Munro. Not only was Professor Munro at the forefront of the early successful prosecutions of non-accidental in the UK, giving clear evidence relating to deliberate injury of animals, he has been instrumental in the introduction of a Certificate in Forensic Veterinary Pathology by the European College of Veterinary Pathology[3].

Chellenges when dealing with suspected abuse

The diagnostic indicators for NAI are exactly that; they are not pathognomonic. No single factor is diagnostic, it is a combination that raises concern, and that combination is variable. It may therefore only be after a period of time that suspicions are aroused. All of which adds to the challenges of dealing with such cases.

There are further complexities for the veterinary profession; dealing with multiple species with differing attitudes towards them; the variation in training of veterinary professionals; and that despite the prevalence of domestic abuse and the involvement of animals in these cases, as a profession we are likely to see the tip of the iceberg. To support practices dealing with suspected NAI, the veterinary corporate IVC Evidensia has launched a helpline open to all veterinary professionals across the UK.

Reporting cases of suspected NAI may or may not be a mandatory requirement of veterinary surgeons or veterinary nurses depending on their geographical location / local laws. Irrespective, every practice should have a protocol for dealing with such cases, including the provision of support for all members of the practice team. With the opportunity for pet owners to interact with different members of the practice team, and to consult with different vets (vet shopping does not have to be between practices), it is imperative that if abuse is suspected, the case is discussed within the practice so that any discrepancies can be identified, and a decision made as to whether concerns are such that further steps need to be taken.

Whilst the primary responsibility of those in veterinary practice is to their animal patients, we may also be faced with suspected abuse of a human. Whilst animal abuse *may* be an indicator of other abuse in the family, it is not a given. Equally, whilst the person presenting the pet *may* be a victim themselves, they might also be the perpetrator. We must not cross our professional boundaries if other abuse, beyond that involving our animal patients is involved, however there are ethical and moral considerations of how such situations are approached. We should be prepared and able to show compassion if we suspect a client is also a victim of abuse, and to be able to signpost them to organisations where they might receive help and guidance.

The Links Group

The Links Group was established in 2001 to raise awareness of the 'link' and to encourage communication and collaboration between professions dealing with abuse of people and / or animals (with appropriate caveats). A key activity of the Links Group has been to raise awareness within the veterinary profession, notably amongst veterinary undergraduates. This training, generously sponsored by MSD Animal Health, is now delivered annually at most of the UK veterinary schools.

The Links Group has developed the Links Veterinary Training Initiative, generously supported by the British Small Animal Veterinary Association (BSAVA), to train veterinary practice teams in recognising and managing cases of abuse. As part of this, the group has developed a resource pack, including guidance for the veterinary team, domestic abuse awareness plus resources to support suspected human victims.

There is also a pet fostering group, consisting of specialist pet fostering services which foster the pets of survivors fleeing an abusive situation. It is estimated that animal abuse occurs in approximately half of all households affected by domestic abuse where animals are within families, although this figure could be much higher. Due to the nature of domestic abuse, the actual figure will never be known. However, what is clear is that survivors will delay fleeing an abusive situation if they cannot take their pets with them, and therefore the absolute need to ensure that pets are accommodated when survivors flee.

There is no doubt that dealing with suspected abuse is emotionally challenging. It is vital that we recognise this and ensure there is appropriate support for colleagues dealing with such cases. Approximately 1 in 3 women will experience abuse in her lifetime[4]. We must therefore be mindful and be aware of colleagues who may be impacted by domestic abuse themselves, it can happen to anyone.

This talk will be given from the speaker's perspective of their involvement of raising awareness of these issues in the UK.

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