



2022 OVMA CONFERENCE & TRADESHOW



WESTIN HARBOUR CASTLE
TORONTO, ONTARIO

JULY 14-16

PROCEEDINGS

OVMA
ONTARIO VETERINARY
MEDICAL ASSOCIATION

FOREWORD

Please be advised that the manuscripts contained herein remain the property of the respective authors and reproduction without their written consent is prohibited. The ability of the authors to condense their lecture material to the limited number of pages before you is a testimony to them and is very much appreciated. These pages have been reproduced directly from their submitted manuscripts and any questions concerning their content should be directed to the authors.

The OVMA and its Conference Committee for 2022 extend warm thanks to all of our speakers and also to all those sponsors, past and present, who have supported the veterinary profession.

Our sponsors' continued commitment has helped make our medical association a stronger body and has enabled us to offer you top calibre education at our annual conference.

Again, thank you to our speakers and our sponsors.



Katherine Mullin, DVM
2022 Conference Chair
Ontario Veterinary Medical Association



Ontario Veterinary Medical Association

205 – 420 Bronte Street, South
Milton, ON L9T 0H9

TEL (905) 875-0756

FAX (905) 875-0958

TOLL FREE TEL 1-800-670-1702

TOLL FREE FAX 1-877-482-5941

E-MAIL info@ovma.org

WEB SITE www.ovma.org

SMALL ANIMAL PROGRAM

BEHAVIOUR

LISA RADOSTA

Veterinary Behaviorist, Owner, Florida Veterinary Behavior Services

1001 – Feline Behaviour Update.....	7
1002 – Don’t Dread Feline Behaviour Appointments – Learn How to Successfully Triage and Treat the Problems.....	11
1003 – Separation Anxiety Solutions – 5 Tips for Treating Separation Anxiety.....	16
1004 – A New Look at an Old Concept – How the 5 Freedoms Can Help You Treat Behaviour Problems in Pets.....	19
1005 – Behavior medication Guide – 5 Medications That Get Pets to the Vet.....	22

CARDIOLOGY

Proceedings have not been provided for the Cardiology lectures

MARK RISHNIW, BVSC, MS, PHD, DACVIM

Adjunct Professor (Cornell), Director of Clinical Research (VIN)
Cornell University and Veterinary Information Network

DENTISTRY

JESSICA JOHNSON, BS, DVM

Lead Veterinarian, LLC & Main Street Veterinary Dental Clinic, Grapevine TX

2001 – The Ordinary Dental Patient.....	26
2002 – Sherlock Holme Case of the Chief Complaints.....	29
2003 – Tooth Resorption – Not Just for Cats.....	34

DERMATOLOGY

KINGA GORTEL, DVM, MS, DIPLOMATE ACVD

Veterinary Dermatologist, VCA Canada Tri Lake Animal Hospital & Referral Centre

3001 – 21st Century Pyoderma Antimicrobial Stewardship in Dermatology.....	40
3002 – Treating the difficult atopic dog Silver bullets.....	44
3003 – Tips for Chronic Otitis Externa.....	49

EMERGENCY & CRITICAL CARE

ADESOLA ODUNAYO, DVM, MS, DACVECC

Clinical Associate Professor, University of Tennessee

4001 – Approach to the Animal in Respiratory Distress – Part 1.....	52
4002 – Approach to the Animal in Respiratory Distress – Part 2.....	56
4003 – The First Five Minutes.....	60
4004 – Nutrition for the Hospitalized Patient.....	62
4005 – Fluid Therapy.....	65

Table of Contents

CLICKABLE
TABLE OF
CONTENTS

Just “click and jump”
to the proceeding
of your choosing.

INTEGRATED MEDICINE / CANNABINOIDS

CORNELIA MOSLEY, DMV, DACVAA, CVA

Veterinary Anesthesiologist, VCA Canada 404 Veterinary Emergency and Referral Hospital

5001 – Update on Integrative Modalities Used in Veterinary Medicine with Focus on PEMF Therapies.....	71
5002 – Neutraceutical Therapies Utilized in Veterinary Medicine.....	73
5003 – An Update on Current Knowledge and Clinical Aspect of Cannabinoids in Veterinary Medicine.....	76

PRACTICE PEARLS

ADESOLA ODUNAYO, DVM, MS, DACVECC

Clinical Associate Professor, University of Tennessee

6001 – Needles in Body Cavities	79
---------------------------------------	----

KINGA GORTEL, DVM, MS, DIPLOMATE ACVD

Veterinary Dermatologist, VCA Canada Tri Lake Animal Hospital & Referral Centre

6002 – Dermatology and Telemedicine.....	81
--	----

CAROLINA DUQUE, DVM, MSC, DVSC, DACVIM

Head of Neurology Department, Mississauga Oakville Veterinary Emergency Hospital

6003 – When Ear Infections Become Neurological Headaches.....	83
---	----

JESSICA JOHNSON, BS, DVM

Lead Veterinarian, LLC & Main Street Veterinary Dental Clinic, Grapevine TX

6004 – Closure of 109-209.....	87
--------------------------------	----

CHRIS DOHERTY, DVM

Manager of Economic Research

6005 – Using Data to Recruit and Retain Associate Veterinarians.....	89
--	----

JINELLE WEBB, DVM, DVSC, DIPLOMATE ACVIM (SAIM), ADJUNCT PROFESSOR OVC

Medical Director, Associate Internal Medicine

6006 – Is it Feline Inflammatory Bowel Disease or Small Cell Lymphoma	92
---	----

ANNATASHA BARTEL, BSCH, BVMS&S, MRCVS, DIP. ACVAA

Anesthesiologist, Head of Anesthesia and Surgery, VCA Toronto Veterinary Emergency Hospital

6007 – Successful Sedation of Difficult Patients	95
--	----

JEFFREY BISKUP, DVM, DACVS

Staff Surgeon, Animal Health Partners

6008 – What Are We Long for When We Watch Dogs Walk.....	97
--	----

ALICE DEFARGES, DVM, MSC, DIPLOMATE ACVIM

Associate Professor Small Animal Internal Medicine, Ontario Veterinary College, University of Guelph

6009 – Endoscopy on the Go.....	99
---------------------------------	----

MARK RISHNIW, BVSC, MS, PHD, DACVIM

Adjunct Professor (Cornell), Director of Clinical Research (VIN)

Cornell University and Veterinary Information Network

6010 – A Non-Consensual Look at the ACVIM Mitral Valve Consensus Statement	
--	--

Proceedings have not been provided for this lecture

Table of Contents

**CLICKABLE
TABLE OF
CONTENTS**

Just “*click and jump*”
to the proceeding
of your choosing.

RADIOLOGY / ONCOLOGY

LYNN GRIFFIN, DVM, MS, DACVR, DACVR(RO)

Associate Professor, Colorado State University

7001 – Review of Pulmonary Patterns.....	103
7002 – Have a Heart – Cardiac Radiology	108
7003 – Interpreting Challenging Thoracic Radiographs.....	111
7004 – To Cut or Not to Cut – Abdominal Radiographs in a Vomiting Animal.....	121
7005 – The Use of Ultrasound in the Vomiting Animal.....	133

ALICE DEFARGES, DVM, MSC, DIPLOMATE ACVIM

Associate Professor Small Animal Internal Medicine, Ontario Veterinary College, University of Guelph

7009 – Endoscopy on the Go	141
----------------------------------	-----

REHABILITATION

TIFFANY DURZI, DVM, DVA, CCRT, DVPP

CHARLOTTE DONOHOE, BA, RVT, VTS(ECC), CCRP

JACY FORD, BSC, RVT, CCRP

8001 – The Arthritis Games – May Rehab be Ever in Your Favour.....	145
8002 – Omegas – Glucosamine and Chondroitin Oh My – Navigating the Yellow Brick Road of Nutraceuticals in the Rehab Patient.....	150
8003 – The ABCs of ANNPE and FCEM in the Canine Rehab Patient	156
8004 – Idiopathic Vestibular Syndrome – Merrily We Roll Along With Rehabilitation.....	161
8005 – Rehabilitation of the ICU Patient.....	165

FOCUS ON INFECTION PROGRAM

MATTHEW KORNIA, DVM, ABVP (FELINE)

Residency Trained, Resident ACVIM (SAIM), Resident ACVIM, Ontario Veterinary College

9001 – Feline Infectious Peritonitis – An Update	172
--	-----

KATIE CLOW, DVM, PHD

Assistant Professor, Department of Population Medicine, OVC, University of Guelph

9002 – Update on Ticks and Tick-Borne Pathogens in Ontario.....	179
---	-----

KELLY ST. DENIS, MSC (IMMUNOLOGY), DVM, DABVP (FELINE PRACTICE)

Veterinarian/Educator, St. Denis Veterinary Professional Corporation

9003 – They Can Run but They Can't Hide! Parasite Prevention Strategies For All Cats	183
9004 – Infectious Disease and Feline Vaccinology – What You Need to Know.....	188
9005 – AAFP Retroviruses Management Guidelines.....	192

EQUINE PROGRAM

SPORTS MEDICINE / REHABILITATION

VALERIE MOORMAN, DVM, MS, PHD, DACVS-LA

Associate Clinical Professor, Large Animal Surgery and Lameness, University of Georgia, College of Veterinary Medicine

10001 – Developing Rehabilitation Plan in the Field.....	197
10002 – A Review of Rehabilitation Modalities	202
10003 – Regenerative Therapies.....	207
10004 – Co-morbidity Lameness Rehabilitation Cases	212
10005 – Equine Rehabilitation Cases	216

PREPURCHASE EXAMS

HARRY WERNER, VMD, BSC, PHD

Consulting Associate (retired), Grand Prix Equine

11001 – Delivering a Successful Prepurchase Examination Service	219
---	-----

WILLIAM MOYER, BS, DVM

Professor Emeritus, Large Animal Clinical Sciences, College of Veterinary Medicine, Texas A&M

11002 – Moyer – Examination of the Equine Foot.....	224
---	-----

PRACTICE MANAGEMENT PROGRAM

FINANCE

DARREN OSBORNE, MA

Director of Economic Research, Ontario Veterinary Medical Association, Milton, Ontario

12001 – Selling to Corporate	230
12002 – Blame the Pandemic – Why You Need to Raise Your Fees	234
12003 – Keeping Up With Wages.....	237
12004 – How COVID Has Changed Veterinary Medicine.....	241

MANAGEMENT

BASH HALOW, CVPM, LVT

Owner, Halow Consulting

13001 – State of the Industry Report.....	245
13002 – Going with the flow	251
13003 – Keys To The Asylum.....	255
13004 – Office Bickering Infighting and Cattiness.....	260
13005 – Talk To The Animals – Connecting with the Savage Client.....	264

LEADERSHIP

DAVE NICOL, BVMS CERT MGMT MRCVS
CEO, VetX International

14001 – Performance Management – What-Why-How	268
14002 – Step Up or Step Back – Leading Teams Through Change	273
14003 – The Biggest Obstacle to Good Leadership is...TIME.....	276
14004 – Breaking Up is Hard to do – Part I.....	279
14005 – Breaking Up is Hard to do – Part II.....	282

PLENARY SESSIONS

MAUREEN ANDERSON, DVM, DVSC, PHD, DACVIM
Lead Veterinarian, Animal Health & Welfare, OMAFRA

15001 – Infectious Disease Roundup 2022.....	288
--	-----

2022 OVMA CONFERENCE – SPEAKER BIOS.....	293
---	------------

Small Animal Program



FELINE BEHAVIOUR UPDATE: A PRACTICAL SYNOPSIS OF THE LATEST FELINE BEHAVIOURAL RESEARCH

Lisa Radosta DVM, DACVB

Veterinarians are trained as scientists, basing our diagnostic and treatment decisions on the published literature. Unfortunately, the day-to-day duties of veterinary practice can make keeping up with the current research challenging. Even when there is time to read, the takeaways and applications to primary care may not be obvious. Currently, research regarding the behavior of companion animals is widely accessible through open access websites. In this paper, 3 topics regarding feline behavior will be addressed: 1) Factors relating pain and behavioural clinical signs; 2) Best practices for feline handling; 3) Cognitive dysfunction in cats

Factors relating pain and behavioural clinical signs

Solano M, Townsend HGG. Pain and adverse behavior in declawed cats. *Journal of Feline Medicine and Surgery*. 2017; <https://doi.org/10.1177/1098612X17705044>

In this study, declawed and clawed cats were compared to assess for behavioral problems and pain. Cats were physically examined and the previous two years of medical history reviewed. In addition, declawed cats were radiographed for distal limb abnormalities. Cats who were declawed or more likely to have back pain, periuria, perichezia, barbering, and aggression when compared to non-declawed cats. Wildcats who did not have retained P3 fragments had fewer adverse outcomes, patients without P3 fragments who had been declawed still had an increased likelihood of fighting and undesirable elimination habits.

Takeaway:

Cats who are declawed are more likely to have back pain and perichezia even when best practices are used.

Ellis A, van Haaften K, Protopopova A, Gordon E. Effect of a provincial feline onychectomy ban on cat intake and euthanasia in a British Columbia animal shelter system. *Journal of Feline Medicine and Surgery*. 2021. doi:10.1177/1098612X211043820

In a study conducted at the British Columbia Society for the Prevention of Cruelty to Animals, records from cats admitted to the shelter before and after a ban on onychectomy were examined for the following factors: reason for relinquishment, euthanasia and length of stay. There were no statistically significant differences between the number of cats relinquished for destructive scratching behavior in the 3 years previous or after the ban. Interestingly, the number of cats presented for euthanasia specifically decreased after the ban. There were no differences in the number of cats surrendered, the average length of stay or adoption rate.

Takeaway:

Many veterinarians worry that if they decline to participate in declaw procedures that cats will be more likely to be relinquished or euthanized. At least in this area of the country, that was not the case. This should ease the concern that veterinarians have regarding these factors giving them more confidence when declining to do a declaw procedure.

Best practices for feline handling

Accurate assessment of body language is essential when handling patients. Without a proper understanding of what the animal is experiencing, restraint cannot be tailored to the patient. Studies of the ability of pet parents and veterinarians to read the body language of dogs demonstrate that veterinarians and pet parents are of equal skill when asked to characterize an image as either fearful or calm. While not yet directly studied, it is likely that cat pet parents and veterinarians are of similar skill when assessing feline body language. Recently, a feline ethogram with an emotion-based legend was created.

Nicholson SL, O'Carroll RÁ. Development of an ethogram/guide for identifying feline emotions: a new approach to feline interactions and welfare assessment in practice. *Ir Vet J*: 2021;74,8 <https://doi.org/10.1186/s13620-021-00189-z>

Starting with 372 images, two independent feline behavior experts narrowed the ethogram to 10 images, two for each feline emotional state. Five emotional states were identified (fear, anger, joy, contentment, interest). While the ethogram has yet to be validated in additional studies, it can be of immediate use to educate veterinary team members in order to facilitate low stress handling and restraint.

Takeaway:

Even veterinary healthcare team members are not well schooled in the recognition of feline body language. This helpful and easy to use tool can assist in low stress handling whether in the exam room, outpatient, emergency or ICU.

Couture M, Stellato A, Moody C, Niel L. Owner Perspectives of Cat Handling Techniques Used in the Veterinary Clinic, *Journal of Applied Animal Welfare Science*, 2022; DOI: [10.1080/10888705.2022.2039144](https://doi.org/10.1080/10888705.2022.2039144)

In a survey of 1754 cat pet parents, most pet parents disagreed with scruffing and full body restraint and felt more amenable to lower restraint methods such as the use of towels. The pet parents didn't change their perception of restraint based on their assessment of their cat's personality (difficult to manage vs easy to manage). Pet parents who were most likely to dislike scruffing were pet parents from the US between 51-70 years of age who had a close bond with their cat.

Takeaway:

The gateway or barrier (depending on the situation) to the delivery of medical care to cats is the pet parent. Therefore pet parent perceptions are an essential element of providing appropriate medical care to our feline patients. Pet parents overwhelmingly rejected the type of restraint regarded by many veterinary team members as benign (i.e., full body restraint, scruffing). It is in everyone's best interest to avoid these types of restraint techniques regardless of whether the pet is in the back or in front of the pet parent.

Humphrey T, Proops L, Forman J, Spooner R, McComb K. The role of cat eye narrowing movements in cat-human communication. *Nature* 2020.10:16503 <https://doi.org/10.1038/s41598-020-73426-0>

In this study, cats exhibiting a slow eye blink (opening and closing the eyes slowly) were examined in several situations. Cats were found to mimic pet parents by slow eye blinking when

they did the same. Cats were also more likely to approach an unfamiliar person when that person offered this body language signal.

Takeaway:

This oft seen cat body language signal appears to be exhibited when cats are stressed or attempting to discern the intent of the recipient. They may also be attempting to demonstrate that they are not a threat to the recipient. When veterinary healthcare team members see this signal, they should slow down and allow the pet to regroup emotionally. They might also offer this same signal to demonstrate that they do not intend to proceed in an aggressive fashion.

Moody C, Picketts V, Mason G, Dewey C, Niel L. Can you handle it? Validating negative responses to restraint in cats. *Applied Animal Behaviour Science*.2018; 94–100

This study examined the behavioral and physiological responses of cats to full body restraint and passive restraint. The parameters were measured under three conditions: placement into restraint; restraint; and post restraint. The likelihood of a cat struggling or 8.2 times greater when cats were placed into full body restraint compared to passively restrained cats. In addition, full body restrained cats were significantly more likely to have tachypnea, increased frequency of lip licking and hold their ears back. Finally, cats restrained with passive restraint were 6.1 times more likely to stay on the table after the physical exam was completed when compared to cats who were restrained with full body restraint.

Takeaway:

As would be expected, cats restrained with less stressful restraint showed less changes in physiologic parameters and were more amenable to physical examination.

Cognitive dysfunction in cats

Neuropathology, diagnosis, and potential treatment of feline cognitive dysfunction syndrome and its similarities to Alzheimer's disease

While cognitive dysfunction is commonly screened for and recognized in dogs, cats appear to develop cognitive changes as a result of brain aging. The signs of CDS in cats can be summarized by the acronym VISHDAAL (i.e., vocalization, changes in interactions, changes in sleep wake cycle, housesoiling, disorientation, activity level changes, changes in anxiety and changes in learning/memory). In this study, seven brain regions of cats with and without CDS were subjected to immunohistochemistry. Cats, much like humans accumulated intra and extracellular A β deposits and hyperphosphorylated tau deposits. In addition, the elderly cats developed atrophy of the whole brain, the hippocampus, and the occipital lobe. They also had enlarged ventricles. Temisartin was investigated in a double-blinded placebo-controlled trial in the cats with severe signs of CDS. There were no differences found between groups.

Takeaway:

Cats have changes in their brains associated with aging which appear to be similar to those in humans and dogs. While potential clinical signs have been identified and are easy to remember with the acronym VISHDAAL, further study is necessary in cats to elucidate the proper treatment.

DON'T DREAD FELINE BEHAVIOUR APPOINTMENTS: LEARN HOW TO SUCCESSFULLY TRIAGE AND TREAT THE PROBLEMS

Lisa Radosta DVM, DACVB

Cat emotional disorders such as fear induced aggression, excessive barbering and feline periuria can send veterinarians running for the text books. Cat behavior doesn't have to be mysterious! There are some simple guidelines that you can apply when approaching feline behavioral medicine cases which can help you to help your patients.

History

In order to help patients to the maximum extent possible while still staying within the time constraints of a typical primary care appointment, written instructions in the form of prepared handouts and a behavior questionnaire are a must. These tools allow the practitioner to gather information quickly and treat cases efficiently. Intake questions should reflect changes in behavior such as aggression, urination or defecation.

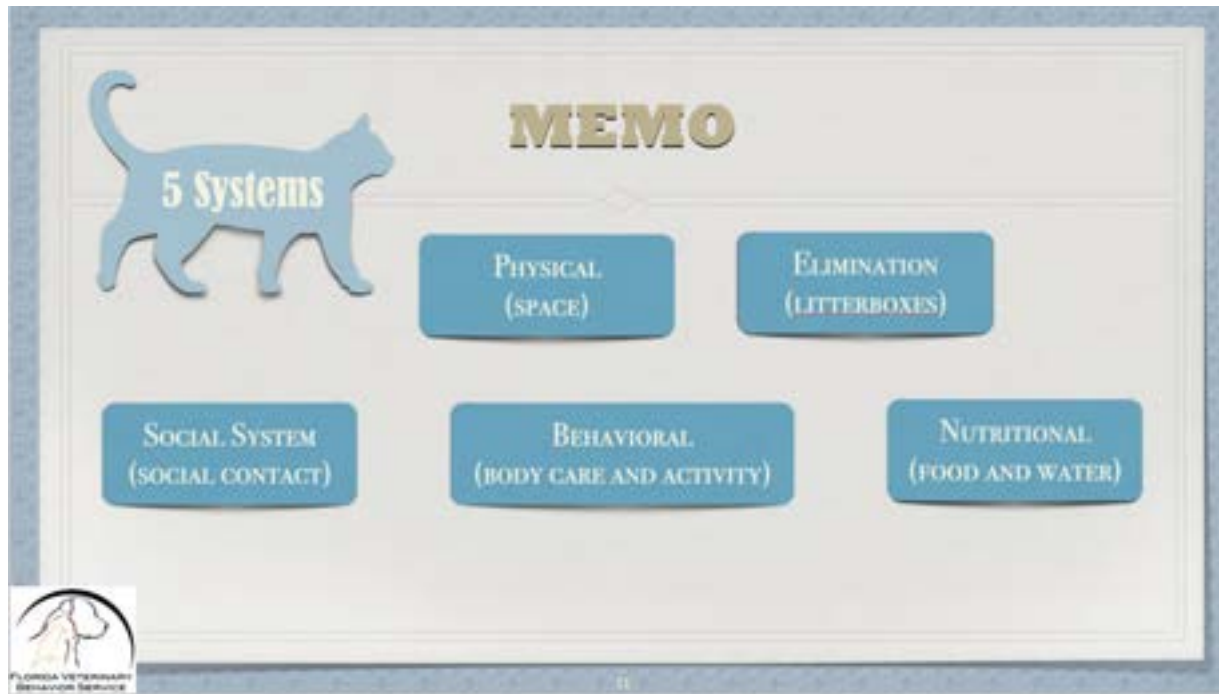
Do a thorough medical examination...always.

It is very easy to say that behavioral signs are all in the kitty's head, but that may not be and often isn't true. In some cases, such as excessive grooming/barbering, there is likely to be at minimum a dermatologic component if not a primary dermatologic cause. Aggression related to petting may be a result of lumbosacral pain or degenerative arthritis. Veterinarians may have difficulty assessing pain in their feline patients. Using toys in the exam room or letting the cat move around if possible can be helpful in diagnosing pain.

All patients presented for clinical signs consistent with an emotional disorder should receive a physical examination, CBC, serum chemistry, T4, fT4, fecal antigen and U/A. You never know what you will find unless you look. The research continues to accumulate supporting the link between disease and emotional signs.

Always recommend MEMO at the first appointment for all behavior problems.

Multimodal environmental modification encompasses five systems: social, physical, behavioral, illumination and nutrition. Virtually every cat behavior problem responds to some extent to the application of MEMO. Recommendations are easy to make and can be given in a hand out form which is explained by the veterinary technician.



When to prescribe?

As veterinarians, we are taught about medications and how to use them. When presented with a feline emotional disorder, we do what we have been taught to do, reach for a medication or supplement to change the animal's emotional state. However, for some behavior problems and emotional disorders, medications are not necessary for a positive outcome. Environmental changes alone can be effective in resolving some behavior problems such as toileting outside of the litterbox and should be tried as a first line in many cases.

Some medications are more appropriate for short term use and some for chronic use. When deciding to institute pharmacologic therapy, the veterinary should consider these questions: 1) Is the environment conducive to a positive outcome? 2) What is the animal's latency to arousal? 3) Is the animal's quality of life affected? 4) Is the animal at risk? 5) Is the behavior predictable? 6) What is the animal's recovery time when stressed?

If the behavior modification cannot be implemented, the animal's latency to arousal is very short, the quality of life is affected, the animal is at risk or the behavior is unpredictable, a medication should be considered. Veterinarians should make sure that they are aware of the potential side effects and interactions before they prescribe a medication for a patient.

There are many medications to choose from to alleviate stress and anxiety immediately. Drug classes which are commonly used are benzodiazepines, serotonin reuptake inhibitors/antagonists, antihistamines and phenothiazines.

When to prescribe?



- RISK TO THE PATIENT OR RISK TO OTHERS
- LONG RECOVERY
- SHORT LATENCY TO AROUSAL.
- ENVIRONMENT IS SUBSTANDARD FOR IMPROVEMENT
- MODERATELY-SEVERELY AFFECTED
- QOL DECREASED
- CORMORBITIES




14

When to refer?

Cases which are chronic, where there is threat of injury to a person or where the patient is at risk should generally be referred.

When to Refer?

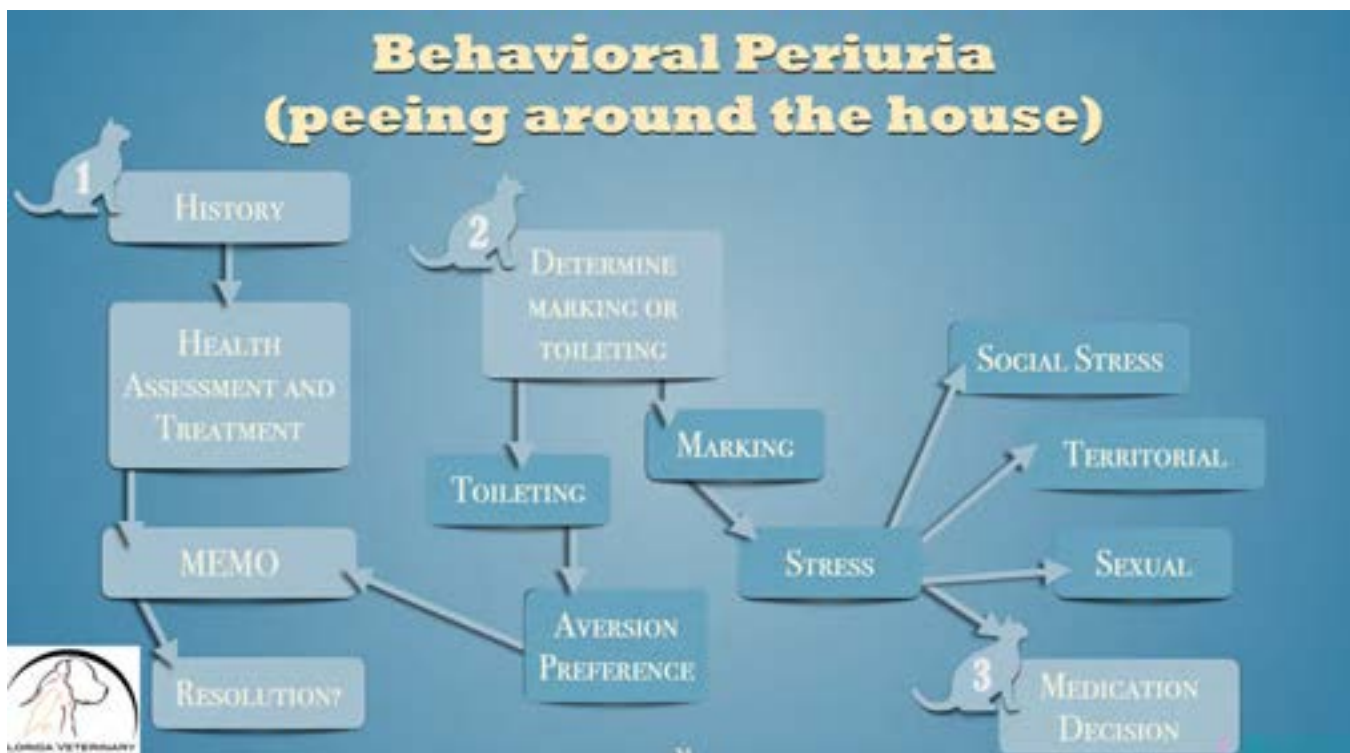
- 1 HIGH RISK
- 2 CHRONIC W/POOR RESPONSE
- 3 YOU ARE FLUMMOXED
- 4 MEDICATIONS OUTSIDE OF YOUR COMFORT ZONE



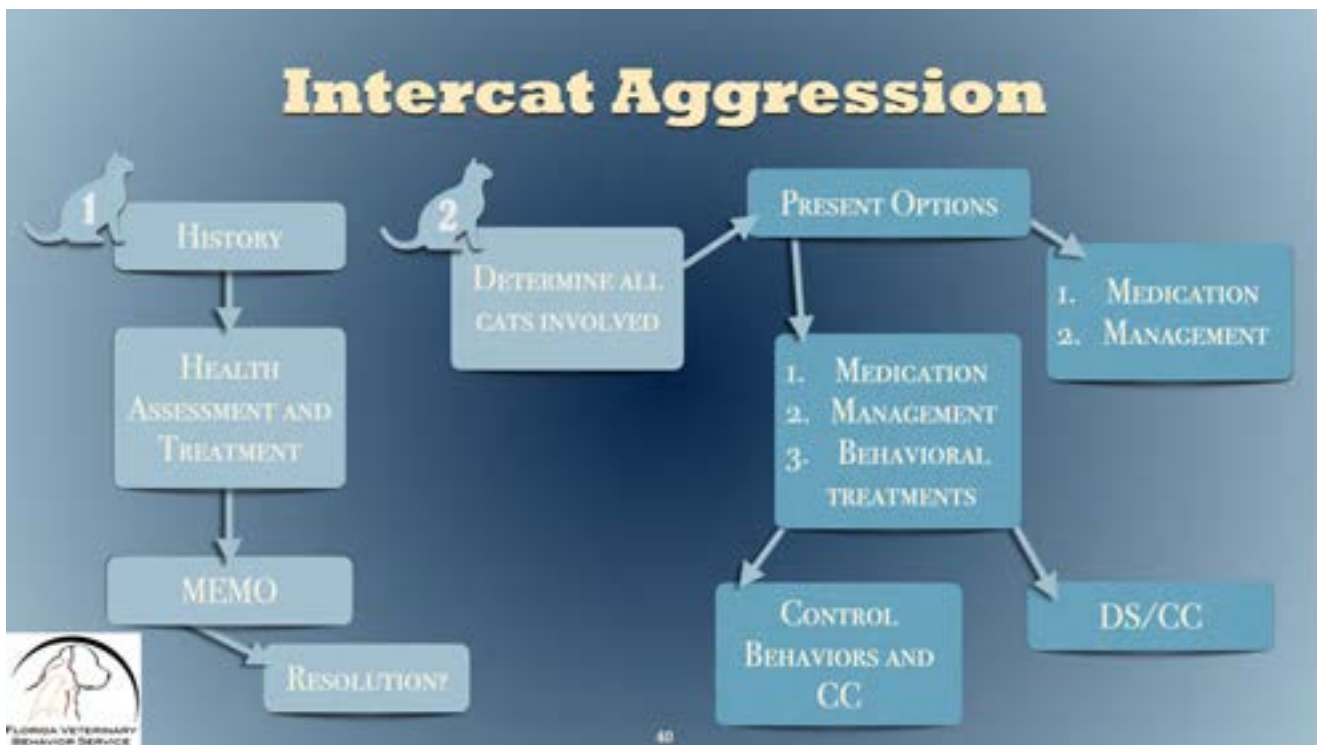
15



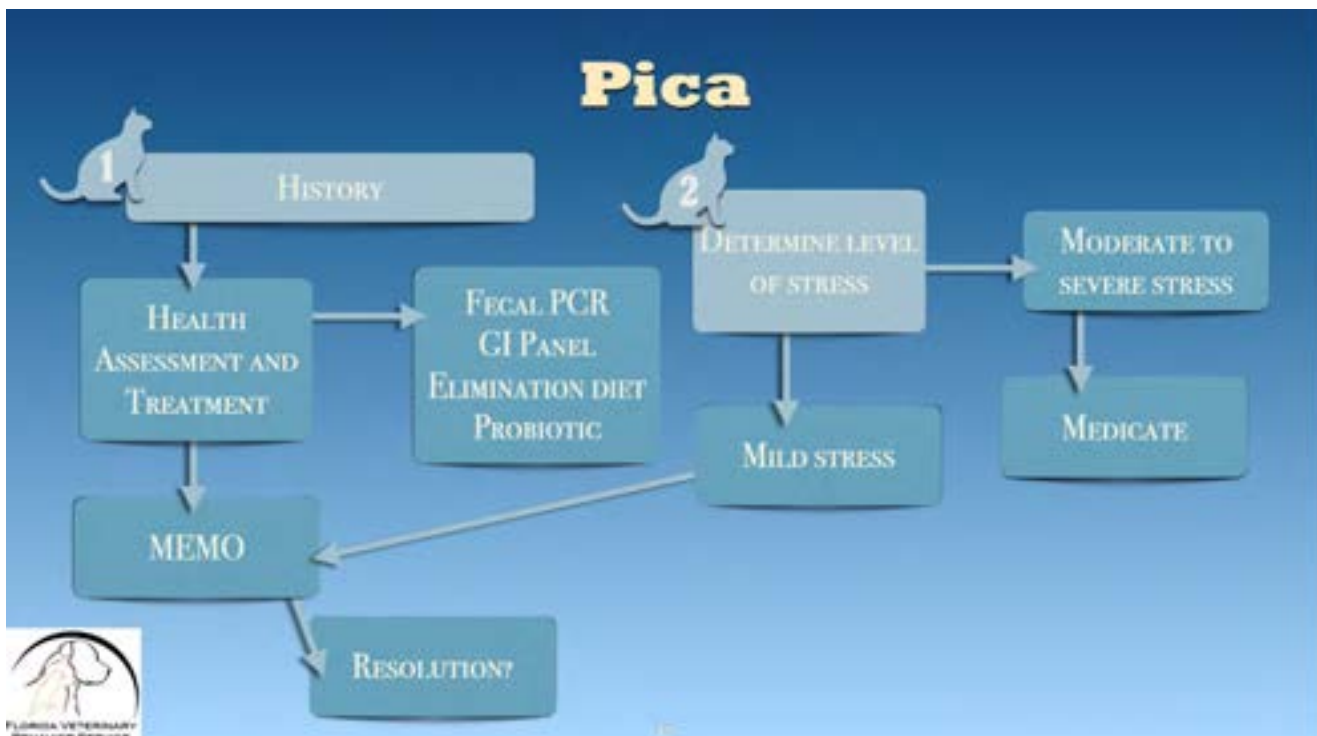
Behavioral Periuria



Intercat Aggression



Pica



Feline cases will need phone and email follow up which is usually done by the veterinary healthcare team with the veterinarian’s oversight. Checking in on clients every 2 weeks for the first two months can increase success rates and reduce client frustration. The first appointment with the veterinarian should include diagnosis and rule out of other medical diseases which may be contributing. Team members can then explain basic, general recommendations. Within a week, the client should return for a technician appointment lasting about 30 minutes to explain the treatment further and add on necessary detail. Then,

the patient should recheck with the veterinarian in another 6 weeks. Aggression cases will need more in person follow up with the technician whereas in appropriate elimination cases will need less in person follow up generally.

SEPARATION ANXIETY SOLUTIONS: 5 TIPS FOR TREATING SEPARATION ANXIETY

Lisa Radosta DVM, DACVB

Separation related disorders are common in dogs in the United States. Diagnoses and treatment in primary care is most effective when broken up into multiple, shorter appointments. Just as with medical appointments in which the technician takes the animal to another location to draw blood or administer treatments, the technician is an integral part of the efficient and effective management of behavior cases.

Separation related disorders involve a physiologic response to the stress of isolation or separation from one or both of the owners. Some patients may only respond to the owners departure with a stress response when left completely alone, remaining calm if any person is home, even an unfamiliar one. Other patients will react to the movement of one particular owner throughout the house with no clear signs that the owner is actually departing.

The signs include: hypersalivation, urination, defecation, vomiting, panting, self mutilation, destruction, attempts to escape, aggression, pacing, vocalization, immobilization, injury, and vocalization. While dogs can exhibit signs of separation related disorders when there is a virtual absence (i.e., owner in another room), most commonly the signs will be exhibited when the owner has departed. The signs of separation related disorders can look very similar to other behavioral disorders such as storm phobia, noise phobia, canine cognitive dysfunction, lack of housetraining, attention seeking behavior, normal territorial behavior, frustration related destruction and confinement fear/phobia. In addition, diseases of other body systems which cause diarrhea, polyuria and/or polydipsia can cause elimination when the owner is not home leading to an incorrect diagnosis of separation anxiety/fear/phobia. Because there is a physiologic component to this disorder, physical diagnoses can contribute and other behavior disorders can present similarly, it is imperative that the veterinarian interview the client and examine the patient to make the diagnosis. The best way to make an accurate diagnosis is through a detailed history obtained through a history form and interview and a video of the pet's behavior when the owner departs. Once the diagnosis is made, the treatment plan can be laid out and a veterinary technician can be utilized to teach the owner how to implement the plan.

#1 Ask the right questions

While ideally, the veterinarian would be able to collect all history in one appointment, time limitations don't allow for that luxury in all cases. Ask the following questions to get an initial history:

1. Does the behavior happen only when you are not home or separated from your pet?
2. What does your pet do?
3. Does it occur every time?

From these questions, you can glean enough information to understand urgency, frequency and the next steps.

#2 Work up the patient

The focus of the first appointment is medical work up, diagnosis, and emergency treatment. Collecting history is more efficient with a one-page history form filled out while the client waits in the lobby. This way, the history taken in the examination room can be more targeted. A one-page questionnaire intended for use by primary care veterinarians is available on the Veterinarians page at the following website: www.flvetbehavior.com. A complete physical examination is warranted with any ancillary tests indicated as necessary from the physical examination results. Most separation related disorders will need some sort of medical treatment in the form of either supplements or medications so screening labwork (CBC, serum chemistry, T4, fT4, U/A) is often indicated at the first appointment. When the history has been taken and the diagnosis made, emergency treatment intended to stabilize the patient should be instituted.

#3 Treat separation related disorders as emergencies because they are!

Emergency treatments take the form of environmental changes, avoidance and pharmaceutical therapy. When deciding to institute pharmacologic therapy, the veterinary should consider 7 basic questions: 1) Is the environment conducive for a positive outcome? 2) What is the animal's latency to arousal? 3) Is the animal's quality of life affected? 4) Is the animal at risk? 5) Is the behavior predictable? 6) Is the behavior mild, moderate or severe? 7) Are there concurrent diagnoses which would cause medication choices to be limited?

While it is impossible to predict how diligently a particular client will implement the behavior modification and management changes, certain factors can be considered when assessing the adequacy of a particular environment. Veterinarians should consider the presence of young children, the number of caretakers in the house, the number of hours that the dog has to be left alone during the day and the owner's willingness to participate. If the household is clearly deficit in the qualities needed for a positive outcome, medication should be strongly considered as a part of the treatment plan.

The latency to arousal is the amount of time that it takes for the animal to mount a stress response once the owner has started her morning routine. For example, if the dog begins to show signs of stress when the owner picks up her keys, the dog has a long latency to arousal. If the dog shows signs of stress when the owner's alarm goes off or when she takes a shower (early in the departure sequence) she has a short latency to arousal. Dogs with a short latency to arousal should be considered candidates for treatment with at least one pharmaceutical.

Behavior problems can significantly affect an animal's quality of life. Daily panic attacks contribute to chronic stress which can cause various sequelae including suppression of the immune system and muscle wasting. If the animal's stress reaction is intense on a daily basis, a pharmaceutical should be considered as a part of the treatment plan.

The assessment of risk to the patient is dependent on owner attitude toward the patient and the problem as well as the strength of the human animal bond. Because the signs of separation anxiety frequently include damage to the owner's property and the injury to the pet, it is not uncommon for owners to approach their veterinarian about euthanasia. If the owner is considering euthanasia or if the pet is causing injury to herself, a pharmaceutical should be considered for the patient.

#4 Don't wait to prescribe!

Predictable behaviors can often be treated with PRN pharmaceutical whereas unpredictable behaviors or behaviors where the stimulus cannot be controlled are more likely to need a daily administered maintenance medication and/or an as needed medication.

Patient's whose owners can't premedicate for departures or who have concurrent behavioral diagnoses will most likely need long term and PRN pharmaceutical treatment. Patients who are mildly affected or who have concurrent medical diseases may be better served through the use of supplements instead of medications. The choice of an individual supplement or medication should be made based on the clinical signs of the patient. For example, if the patient is withdrawn and will not eat while the owner is gone, a benzodiazepine which will increase appetite, decrease anxiety and elevate mood while offering mild sedation or Zylkene® may be the best choice. On the other hand if the patient is frantic, panting and pacing, raiding the garbage, trazodone or Solliquin® may be the most successful pharmaceutical treatment.

#5 Always add in management

Once the decision of whether or not to institute medical treatment has been made, the veterinarian should prescribe behavior modification and management changes. The standard of care for veterinary behavioral medicine is to prescribe behavior modification for behavioral diseases.

First appointment management changes include: leaving the dog with food toys, hiding departure cues from the dog, discontinuing all punishment and making the owner's departure and return non events. Many dogs with separation related disorders are best treated without confinement due to the likelihood of confinement anxiety. Finally, offer day boarding or daycare until the dog is stable.

An appointment should be made within 7 days for behavioral treatments. These treatments are generally conducted by the technician and include: adding structure to the owner/dog relationship, rewarding the dog when he is relaxed and stopping all physical punishment. Make sure to address any safety issues and ask the owner if the dog is showing any aggression toward the family

The second appointment should be scheduled about one month after the initial appointment. At this appointment, additional history should be gathered, progress and the affect of medications can be assessed and second level behavior modification should be recommended. At this time, medication changes can be made as well. During this appointment, the technician will become indispensable, as she will be teaching the client how to complete the behavior modification. Second line behavior modification includes techniques that are best completed when the dog's anxiety has started to subside. These include uncoupling departure cues and relaxation techniques.

A third appointment should be scheduled 8-12 weeks from the first appointment. At this appointment, gradual departures can be added if needed and the effect of the daily-administered medication (if prescribed) can be assessed completely. At this time, any changes to medication doses can be made and a more accurate prognosis can be given to the owner.

NEW LOOK AT AN OLD CONCEPT: HOW THE 5 FREEDOMS CAN HELP YOU TREAT BEHAVIOUR PROBLEMS IN PETS

Lisa Radosta DVM, DACVB

In 1964, Ruth Harrison authored *Animal Machines* a text describing mass farming of animals for food. The book touched so many people in England, the home of the author that the government was compelled to form a committee to investigate animal welfare in farm animals and recommend best practices. From the resultant report called the Brambell report, the Five Freedoms were born.

While the original intent was for farm animals and despite the extraordinary growth of interest and study in animal welfare, the Five Freedoms still hold today as foundational pillars of animal welfare for all animals. They don't only have philosophical uses. They can be used each day to guide our decision making in veterinary medicine.

The Five Freedoms:



Freedom From Pain, Injury and Disease

Veterinarians are trained to find pain and treat it. There are many pharmaceuticals on the market for pain relief in companion animals. However, some types of pain are overlooked. For example, pain is difficult to assess and cats however it is common, especially in older cats and declawed cats. Application of this freedom may include treating cats for suspicion of pain when pain cannot be confirmed. In addition, veterinarians have the obligation to look for disease processes when patients present for behavior problems. The pet parent may feel that the pet is healthy, however up to $\frac{3}{4}$ of patients referred to veterinary behaviorists have systemic disease or orthopedic disease which was undiagnosed by the primary care veterinarian.

Freedom From Fear and Distress

This is the most overlooked freedom in veterinary medicine. Very often practitioners rule out “medical” disorders before they treat “behavioral” disorders. Unfortunately, undue suffering occurs when we do not treat both behavioral and medical disorders at the same time. In addition, animals who have behavioral clinical signs are suffering. Emotional suffering is of the same level of importance as physical suffering.


Medical or Behavioral?

A

Both!!

Behavioral clinical signs are caused, perpetuated and modified by endocrine, neurochemical and hormonal systems






Should all medical disorders be ruled out and treated before treating any behavioral clinical signs?

From a welfare perspective, unless treatment will interfere with diagnosis and treatment of another disorder, all clinical signs should be abated.

Medications which alter behavior can be reduced or discontinued later.

Patients may need treatment of the behavior disorder and the physical disorder for resolution.

No



Freedom to Engage in Species Typical Behavior

Both cats and dogs need enrichment and time to engage in activities which are natural and decrease stress. Most of our patients live in loving homes with seemingly everything they need. Unfortunately, even loving pet parents don't always know what their individual pet needs. For example, most indoor cats are underenriched and cannot engage in behaviors such as hunting which lower stress. By emphasizing the importance of enrichment, we can decrease behavior problems in dogs and cats.

Freedom From Hunger, Thirst and Malnutrition

Some pet parents may put their dog on unbalanced home cooked foods, raw foods or feed table scraps leading to obesity and resulting endocrine disease, pain and difficulty breathing. Assessment of diet critically remains important for all of our patients. In addition, pet parents may overlook signs of an underlying process leading to malnutrition such as intermittent diarrhea. Screening for these signs at each visit by asking not if they are present currently (at the time of the visit), but instead the frequency of the signs on a weekly or monthly basis can help to find patients who have clinical disease which has gone unnoticed.

Freedom From Environmental Discomfort

Environmental discomfort can include obvious deficits such as being left out in the heat or the cold. It also can include overlooked aspects such as the environment of an older dog. Dogs who are elderly or arthritic may not be able to navigate slick floors. Putting down rugs or using booties can help to alleviate pain, fear and stress. Likewise, cats who are arthritic may need litterboxes with low sides or boxes placed in easy to access places.

FEAR FREE MEDICATION SOLUTIONS. FIVE MEDICATIONS THAT GET PETS TO THE VET.

Lisa Radosta DVM, DACVB

Why do patients act aggressively at the veterinary hospital? Most frequently, it is about self defense and self preservation. Even the large Rottweiler lunging at you is most likely doing so because she perceives that you will hurt her. Animals who are fearful have a limited number of options: fight, flight, freeze or fidget. While veterinarians and their staff certainly recognize fight or flight, they may not recognize freeze or fidget. Often, dogs and cats who are perceived as “fine” are anxious or fearful. By identifying these patients and changing their management in the veterinary hospital, future aggressive incidents can be avoided. Veterinary staff can further increase their knowledge of dog body language by attending continuing education, looking to veterinary behavior textbooks, joining professional organizations focused on behavior, or viewing educational DVDs on the subject. It is imperative that each staff member be able to recognize the signs of stress and react appropriately.

General guidelines for Pre Visit Pharmaceuticals (PVP)

The doctor should be familiar with the medications which can safely be given in each species that you treat including the side effects, duration of effect, metabolism and dosing. If a patient has a known travel or veterinary hospital FAS consider a PVP. Unless otherwise noted, all medications mentioned here should be given 3 hours prior to the veterinary visit. If the owner gives the medication one hour prior to the veterinary visit, the patient will most likely be arriving at the veterinary hospital at the time that the medication is starting to take effect. This will cause an inadequate medical response because the patient most likely has mounted a stress response in the car either when they see the carrier (cats) or when they pull into the parking lot. This may contribute to the phenomenon often seen in veterinary medicine where patients “fight” the sedation in the hospital only to be sedated at home for the rest of the day. Manage owner’s expectations by following up regularly after recommended test doses and trials. Educate them on the number of trials and test doses it may take to find the right medication or mix of medications for their pet. The less stressed the patient is, the more likely the medications are to be effective. In other words, administration of medications alone is not enough to reduce FAS.

After test doses or potentially practice visits have been completed, you may find that additional medications need to be added to achieve the level of sedation required. In general, start with one medication at an effective dose and test dose it at home and on a hospital visit. If the effect is good, but not adequate instead of abandoning that medication, consider adding in another as you might do if you were attempting to alleviate pain in a patient.

There is a possibility when using a medication which alters mood that the patient will become disinhibited. If FAS are causing aggressive responses, diminishing that FAS may cause the aggressive responses to decline. If FAS is suppressing aggression, when you diminish the fear it is possible for the aggressive responses to increase. It is impossible to know the outcome before you administer the medication. Make sure to inform clients of this possible outcome.

As in many veterinary disciplines, the medication dosages used in behavioral medicine are based on empirical use, extrapolation from human dosages and a research studies. Few pharmacokinetics studies are available in dogs and cats for the medications discussed here.

There is no advantage to discontinuing SSRIs and TCAs prior to veterinary visits which involve sedation. Abrupt discontinuation has the potential to cause rebound side effects. It is acceptable

to discontinue the morning of the sedation because the patient is likely to be NPO, but the medications should be restarted as soon as the patient is awake and eating.

When formulating a PVP cocktail for a particular patient, consider pain, nausea, anxiety, stress and fear. Always eliminate nausea and pain first. Then, add medications for fear, anxiety and stress. Choose medications which alleviate the clinical signs instead of simply choosing a sedative.

General Guidelines for PVPs (supplements and medications)
Consider: patient temperament, clinical signs of FAS, health status, owner ability to medicate, and if further sedation is likely to be necessary.
Assess clinical signs in the patient, correlate (if possible) those signs with the neurotransmitter that may be causing that effect, then make a medication choice.
Dose 2 hours prior to appointment
Responses to psychotropic medications vary widely depending on the individual.
Test doses must be completed at home when the pet is not coming to the hospital for an appointment to assess side effects, duration of effect, onset of action and clinical effect.
"Practice appointments" may be necessary to find the right medications for each individual patient.
In-hospital management will affect the patient's stress level and response to medications.
Always assess and manage pain and nausea.
Any medication which alters mood can cause a worsening of clinical signs or a disinhibition of learned behavior.
Dose supplements within the dosing range for each ingredient, not necessarily what is on the label of the brand name supplement.
Dose medications and supplements at the low end of the range and slowly move up within the dosing range to get desired effect.
Avoid combining SSRIs, TCAs and MAOs with other medications which increase serotonin such as tramadol. In general, avoid combining medications or supplements which increase the same transmitter or cause similar side effects.

Medications

The five medications that you will reach for most commonly are: gabapentin, trazodone, Sileo, acepromazine and benzodiazepines.

Phenothiazines	
Medications	acepromazine
Target effect	Sedation, calming
Latency to Effect	1-2 hours
Duration of Effect	8-12 hours
Side effects	Sedation, ataxia, sensitivity to sounds, disinhibition, increased startle response, GI
Latency to side effects	1-2 hours

SNRI	
Medications	trazodone
Target effect	Sedation, calming
Latency to Effect	1-3 hours
Duration of Effect	6-8 hours
Side effects	Sedation, changes in appetite, agitation, GI
Latency to side effects	1-3 hours

Benzodiazepines	
Medications	alprazolam, diazepam, lorazepam, clonazepam, clonazepam
Target effect	Decreased FAS, increased sociability and boldness, sedation, increased appetite
Latency to Effect	30 min-alprazolam, lorazepam 60 min-diazepam, clonazepam, clonazepam
Duration of Effect	4-8 hours
Side effects	Sedation, boldness, amnesia, ataxia, paradoxical excitement, hyperphagia, disinhibition, GI
Latency to side effects	30 min-6 hours

Gabapentin	
Medications	gabapentin
Target effect	Sedation, calming, decreased anxiety, anticonvulsant, pain relief
Latency to Effect	1-2 hours
Duration of Effect	6-8 hours
Side effects	Sedation, ataxia, increased appetite, GI
Latency to side effects	1-2 hours

alpha2 agonists	
Medications	clonidine, Sileo*
Target effect	Sedation, decreased SNS response, hypervigilance
Latency to Effect	Sileo* 20-40 min clonidine 1-2 hours clonidine
Duration of Effect	6-8 hours
Side effects	Sedation, incontinence, decreased appetite, GI
Latency to side effects	1-2 hours

The Ordinary Dental Patient: The Who, What, When, Why and How (Much). Jessica Johnson, BS, DVM

As a general practitioner for the first ten years in practice, and the last five years in dental specialty practice, I have learned that rarely is a “dental prophylaxis” truly that. Rather the majority of our patients have a variety of oral problems that may not fully present themselves or become evident until the patient is under anesthesia, probing has been performed, and the patient is evaluated with full mouth radiographs. In which case, we often times find ourselves in a more complicated procedure, that is more costly to the client and more time consuming than anticipated. The choice of the title “the Ordinary Dental Patient” was therefore, a bit tongue in cheek. Likely, you are recommending procedures, or your client is pursuing them once periodontal disease is visually evident on awake oral exam. In which case, the potential findings are likely quite variable, and therefore, so is time in surgery time and cost to the client.

During this presentation, we will follow patient “Sammie” and her owners on their dental experience. The details of Sammie’s appointments, procedure, cost, and follow up are reserved for the presentation.

The Who: “An aggregate review of the literature suggests the prevalence of the disease is 80–85% in the canine and feline patient over two to three years of age.”¹ Periodontal disease is present in the large majority of our small animal patients, and it is becoming more common at a surprisingly young age in our patients. A recent study highlighted the prevalence of periodontal disease in Yorkshire terriers, demonstrating that 98% of the dogs had at least one tooth or aspect with early periodontitis at 37 weeks (7 months) of age.² Our patient may still be on a puppy diet, and have evidence of irreversible periodontal “gum” disease!

The What: Sammie presented for “one bad tooth”. A lower premolar had evidence of tooth resorption and her regular veterinarian referred her for extraction of this tooth, as she suspected resorption and did not have intraoral dental radiography in her practice. During the course of the procedure, we determined that Sammie had periodontal disease, endodontic disease, and tooth resorption.

One research study found that 28% of grossly normal teeth in dogs had clinically important findings radiographically.³ A similar study in cats reported that number at 42%.⁴ During Sammie’s consultation, this information was discussed with the client. We never want the patient’s owners to feel they have experienced a bait and switch. During our consultation, our goal is to educate and prepare the client. It cannot be overstated how important it is to be as honest and transparent in the exam findings – oral or otherwise. If a patient clearly has advanced periodontal disease and the veterinarian knows many extractions are needed, it is unkind to present the client with an estimate that greatly underestimates the work that is needed, with the intention of informing them once the patient is anesthetized. One potential exception to this is if

your clinic offers staged procedures. Even so, clients appreciate when their veterinarian is direct and upfront on the work that is anticipated.

The When: According to the 2019 AAHA Dental Care Guidelines for Dogs and Cats, “A true dental prophylaxis (complete dental cleaning, polishing, and intraoral dental radiographs in the absence of obvious lesions) is recommended by 1 yr. of age for cats and small- to medium-breed dogs, and by 2 yrs. of age for larger-breed dogs.”⁵ It is this author’s experience that dental cleanings/procedures are usually recommended, clinically, once the teeth are “bad enough”. At which point, the procedure is no longer “prophylaxis”, but rather periodontal therapy, and sometimes extensive extractions, are needed. As a general practitioner, this author encountered many client roadblocks when proposing true prophylactic procedures to clients. It is fair to say that the precedent in veterinary medicine has been to be reactive to periodontal disease rather than prevent it. Therefore, most clients seem surprised that routine veterinary dental care would be suggested in juvenile and young adult patients. In fact, this author has encountered many clients who believe that loss of adult teeth due to periodontal and endodontic disease is a *normal* part of the aging process. A culture shift is needed and preventative medicine for our patients should include prevention of periodontal disease. Periodontal disease is preventable. This may be particularly challenging in small and toy breeds with high predisposition to it. The conversation on prevention of periodontal disease needs to begin during our kitten and puppy visits. Additionally, the advent of pet insurance can help with compliance. Owners are more inclined to follow veterinary recommendations and make use of their insurance policy for their pet.

The Why: A 2019 study found a connection between life span and veterinary dental procedures. Dogs receiving dental care lived, on average, 2 years longer.⁶ Other motivations for pursuing veterinary dental care are: a foul odor from the mouth, the owner perceiving oral pain in their pet, swelling around the muzzle, decreased appetite, facial rubbing or pawing, and weight loss to name a few. It is important to rule out systemic disease for many of these symptoms. Once that is accomplished, a reasonable next step is an oral ATP (assessment, treatment, and prevention).

How (Much): It is not this author’s intention or place to suggest the cost for your surgical procedures. During this presentation, we will examine what is needed to perform high quality, competent dentistry and compare this to similar procedures you may offer in your practice.

My sincere hope for the veterinarians who attend the dental lectures at this conference is that they will take the information provided to make change. Change is hard. This is one of the mantras we have at our dental specialty practice. We say this phrase often, with empathy, when we make changes (which we routinely do). We make changes that better serve our clients (operational), our patients (pain control options, pre-anesthetic protocols, any and all improvements in medicine that are evidence based), and our team (more efficient, improve communication). This has not been an easy process, to bring the entire team around to the idea that change is good, and necessary, to provide better care. I will say that it has been rewarding to penetrate barriers to change and to

unite the team under the agreement that we will be fluid and make changes when necessary. Those changes will be communicated directly with the team, the reasons why, and the team members will have a chance to discuss and ask questions.

“Progress is impossible without change, and those who cannot change their minds cannot change anything.” – George Bernard Shaw

References

1. Lobprise HB, Dodd JR. *Wiggs's veterinary dentistry : principles and practice*. Second edition. ed. Wiley-Blackwell; 2019.
2. Wallis C, Pesci I, Colyer A, et al. A longitudinal assessment of periodontal disease in Yorkshire terriers. *BMC Vet Res*. Jun 21 2019;15(1):207. doi:10.1186/s12917-019-1923-8
3. Verstraete FJ, Kass PH, Terpak CH. Diagnostic value of full-mouth radiography in dogs. *Am J Vet Res*. Jun 1998;59(6):686-91.
4. Verstraete FJ, Kass PH, Terpak CH. Diagnostic value of full-mouth radiography in cats. *Am J Vet Res*. Jun 1998;59(6):692-5.
5. Bellows J, Berg ML, Dennis S, et al. 2019 AAHA Dental Care Guidelines for Dogs and Cats. *J Am Anim Hosp Assoc*. 2019 Mar/Apr 2019;55(2):49-69. doi:10.5326/JAAHA-MS-6933
6. Urfer SR, Wang M, Yang M, Lund EM, Lefebvre SL. Risk Factors Associated with Lifespan in Pet Dogs Evaluated in Primary Care Veterinary Hospitals. *J Am Anim Hosp Assoc*. 2019 May/June 2019;55(3):130-137. doi:10.5326/JAAHA-MS-6763

Sherlock Holmes and the Case of the Chief Complaints

Jessica Johnson, DVM

Rarely do our patients present with a chief complaint that is clearly, and directly related to the underlying pathology. The anatomy of our feline and canine patients creates an intimate relationship between the mouth, eyes, ears, and our patients can present with a variety of symptoms that are not always unique to those body systems. In this lecture we will evaluate cases that presented to our dental specialty practice in Flower Mound, Tx.

An aggregate review of the literature suggests the prevalence of periodontal disease is 80–85% in the canine and feline patient over two to three years of age.¹ This means that the majority of our patients have periodontal (“gum”) disease; in fact, it is likely that periodontal disease is the most common health problem we face on a daily basis in small animal practice.

When a patient does not want to eat, the owners are often inclined to think their pet’s mouth must be the cause. Knowing that the majority of our patients have periodontal disease (sometimes extensive periodontal disease) and yet, the majority of our patients are eating and maintaining their normal weight, means that we cannot take our clients’ assumptions at face value. It is wise to fully evaluate each patient’s history, medical records, and blood work prior to determining the underlying cause of vague complaints such as: decreased appetite, weight loss, and lethargy. It is the opinion of this author that every patient should be fully evaluated prior to any anesthetic event, including a dental procedure. Here we channel our inner detective and examine cases that presented to our dental specialty practice. Along the way, we will look at the various oral problems we encountered and some information regarding those pathologies.

If you plan to attend the lecture, I recommend reviewing the following information after the presentation. This will give you an opportunity to think through the cases and problem solve as we go.

A variety of systemic disease can manifest in the oral cavity. A few conditions can masquerade as periodontal disease or another primary oral disease. The astute practitioner will evaluate the entire patient prior to anesthesia. One parameter that is incredibly valuable is the patient’s weight. Unintentional weight loss should trigger the veterinarian to perform, *at minimum*, a complete blood cell count, a full chemistry panel, +/- T4 +/- urinalysis prior to consideration that the weight loss is due to oral pain or disease. It is common for our dental specialty to receive referrals for patients who are not eating well, or losing weight, without performing basic blood work. As mentioned above, the majority of our patients have periodontal disease. If a patient develops new symptoms, we must first consider if there is another/new condition, that has resulted in the new symptoms. It very well may be the development of a tooth root abscess, or severely inflamed gingiva due to stomatitis, but it is a great disservice to the client and the patient to refer without investigating the pet’s systemic health. It can take weeks to months for a referral patient to be seen at a dental specialty practice and in that time,

their dental or sometimes more importantly, systemic diseases, can worsen and become more challenging and more expensive to treat. Recently, our practice had a patient referred to us for not eating well and an oral mass. Our region, like many others, is deficient in dental specialists. Unfortunately (even with chronic overbooking), it can take weeks to get an appointment. This patient had not received a basic work up for appetite loss and weight loss. The “oral mass” turned out to be swollen sublingual tissue due to a massive hematoma that continued to bleed due to trauma. Additionally, the patient had multiple ecchymoses. A complete blood cell count performed during the oral consultation revealed the patient’s platelet count was 3,000/uL. An emergency referred to internal medicine was made, and the patient was diagnosed with IMT. Three weeks later, a similar situation presented itself in a different patient who had less than 1,000 platelets/uL and a hematocrit of 14%.

One of the most challenging diseases encountered in veterinary dentistry is feline chronic gingivostomatitis (FCGS, often referred to simply as “stomatitis”). This disease is often exquisitely painful and can decrease a cat’s appetite or even result in anorexia. FCGS is a severe, immune-mediated, oral mucosal inflammatory disease of cats. Classic physical exam findings on the oral exam are ulcerative and/or proliferative inflammatory lesions in the caudal mouth, lateral to the palatoglossal fold², mucositis and significant oral malodor. The prevalence of this disease has been reported between 0.7% to 12.0%. In our dental practice in Dallas/Fort Worth, every day, we perform a consultation, a surgery, or a follow up on a cat with stomatitis. The cause of FCGS is undetermined despite a multitude of research studies. A number of conditions and infectious agents have been implicated. Implicated infectious agents include feline calicivirus, feline herpes virus, and feline immunodeficiency virus. Noninfectious causes that have been investigated include periodontal disease, environmental stress, and a hypersensitivity. Interestingly, cats with FCGS are more likely to live in shared households. The risk of FCGS correlates with the number of cohabiting cats.³ A 2015 study in *Journal of the American Veterinary Medical Association* found that extraction of teeth in areas of oral inflammation provided substantial improvement or complete resolution of stomatitis in more than two-thirds of affected cats. Full-mouth extraction did not appear to provide additional benefit over partial mouth extraction.⁴ This author has concerns about severity of this disease regionally, particularly in the southern United States; additionally, in light of recent studies including those on stomatitis and esophagitis⁵, this author elects full mouth extractions for all cats suffering from stomatitis.

It is well known that brachycephalic breeds have numerous health conditions affecting several body systems including the skin, eyes, mouth and perhaps most well-known, the respiratory system. A 2021 study in the *Journal of Small Animal Practice* determined that brachycephalic breeds had 1.25 times the odds of periodontal disease compared with mesocephalic breeds.⁶ This breed is prone to develop multiple dental problems such as malocclusion, crowded teeth, rotated premolars, gingival hyperplasia, incisor hyperdontia, fused premolars, unerupted mandibular first premolars, and dentigerous cysts to name a few. Another oral abnormality that is overrepresented in some breeds like boxers and bulldogs is their prominent palatal rugae and acquired palatitis due to

abnormally deep palatal rugae. Dogs with multifocal areas of palatitis may display clinical signs similar to the ones associated with oral ulcers induced by other oral diseases including decreased appetite, halitosis, ptyalism, oral pain, and mild oral bleeding.⁷

A commonly encountered tooth abnormality/trauma in our canine patients is attrition or abrasion. Attrition is the constant wear between two or more teeth and abrasion is the destruction of tooth structures from objects. The tooth (a living structure) is capable of protection of the pulp chamber when the tooth is being worn down by abrasion and attrition, to a certain extent. Increased wear of a tooth (attrition), is due to mastication or grinding between teeth. People who grind their teeth (bruxism) is a classic example, while animals with malocclusions causing tooth-to-tooth contact is another. (Ex: A “level” bite where the tips of the upper and lower incisors are in contact vs a normal bite where the lower incisors contact just behind the tips of the upper incisors.) If the process of attrition or tooth wear is gradual enough, once the enamel is gone, reparative dentin (which is the brown in color) will be deposited to help protect the pulp from being exposed. With slow, chronic wear, the crown can be worn down considerably, yet the canal may still be closed, the “retreating” pulp being protected by the dentinal deposition.⁸ In this case, the intact dentin will have a glassy appearance. The shepherds hook with glide all over the surface of the tooth. If this is the case, the tooth may be vital. If there is a pit in the middle of the tooth surface (where you would expect the pulp to be) where the shepherds hook falls into it, this is indicative of pulp chamber exposure and would need extraction (or root canal therapy depending on the extend of wear and the amount of crown remaining).

Renal secondary hyperparathyroidism is a common endocrinopathy that occurs as a consequence of chronic azotemic kidney disease. Renal osteodystrophy, the most dramatic clinical consequence of renal secondary hyperparathyroidism is uncommon, but can result in demineralization of maxillofacial bones, loosening of teeth, and pathological jaw fractures.⁹ Dental radiographs are valuable in diagnosing changes to bone density. Oral radiographic changes due to renal osteodystrophy include diminished radiopacity of the lamina dura, ground glass appearance of trabecular bone, reduced thickness of cortical bone, and there is a risk pathologic bone fractures associated with dental procedures. It has been this author’s experience that the tremendous amount of “bone loss” associated with this disease can be incorrectly labeled as periodontal disease. According to the “AAHA 2020 AAHA Anesthesia and Monitoring Guidelines for Dogs and Cats”, “Individual patient diagnostics may include a minimum database of laboratory analysis including complete blood count, chemistry panel, urinalysis”. It is important to monitor the weight of these patients and obtain a thorough history prior to anesthesia. It is risky to anesthetize these patients with severe chronic renal disease and if extractions are performed, fracturing the jaw is a significant risk.

Luxation of the TMJ can be seen in both canine and feline patients, however it is more common in cats, usually secondary to trauma. Patients suffering from TMJ luxation typically present with a “dropped jaw” or “stuck open jaw” appearance, and generally

lack the ability to properly close the mouth. TMJ luxation is usually unilateral, but cases should be evaluated for the possibility of both sides being involved.¹⁰ Physical examination in a cat with a unilateral rostradorsal luxation reveals an asymmetrical malocclusion with the mandibles deviated away from the side of the TMJ luxation. Alternatively, impingement of the coronoid process of the mandible on the zygomatic arch (vertical ramus of mandible caught lateral to the cheekbone) is a relatively uncommon cause for a cat to be unable to close its mouth, but it is occasionally seen in dogs and cats at our specialty practice. The most common cause for a cat with its “mouth stuck open” or unable to close its mouth, is mechanical obstruction that is not related to the TMJ. We commonly see trauma resulting in displacement of a tooth; this is often seen in cats with severe periodontal disease associated with a maxillary canine tooth. In patients with advanced periodontal disease, a canine tooth can easily luxate



mesially which interferes with occlusion. In a normal bite, the upper canine tooth is distal to the mandibular canine which sits in the diastema between the upper lateral incisor (103 or 203) and canine tooth (104, 204). If the upper canine gets knocked into a position inside the lower canine (instead of behind it), the cat cannot shut its mouth. It is critical for the general practitioner to be familiar with normal occlusion in dogs and cats.

In normocclusion, the lower canine should rest between the upper lateral incisor (shown here #103 and the canine tooth (#104)

References

1. DuPont GA, DeBowes LJ. Comparison of periodontitis and root replacement in cat teeth with resorptive lesions. *J Vet Dent*. Jun 2002;19(2):71-5. doi:10.1177/089875640201900202
2. Lee DB, Verstraete FJM, Arzi B. An Update on Feline Chronic Gingivostomatitis. *Vet Clin North Am Small Anim Pract*. Sep 2020;50(5):973-982. doi:10.1016/j.cvsm.2020.04.002
3. Peralta S, Carney PC. Feline chronic gingivostomatitis is more prevalent in shared households and its risk correlates with the number of cohabiting cats. *J Feline Med Surg*. 12 2019;21(12):1165-1171. doi:10.1177/1098612X18823584
4. Jennings MW, Lewis JR, Soltero-Rivera MM, Brown DC, Reiter AM. Effect of tooth extraction on stomatitis in cats: 95 cases (2000-2013). *J Am Vet Med Assoc*. Mar 15 2015;246(6):654-60. doi:10.2460/javma.246.6.654
5. Kouki MI, Papadimitriou SA, Psalla D, Kolokotronis A, Rallis TS. Chronic Gingivostomatitis with Esophagitis in Cats. *J Vet Intern Med*. Nov 2017;31(6):1673-1679. doi:10.1111/jvim.14850
6. O'Neill DG, Mitchell CE, Humphrey J, Church DB, Brodbelt DC, Pegram C. Epidemiology of periodontal disease in dogs in the UK primary-care veterinary setting. *J Small Anim Pract*. Dec 2021;62(12):1051-1061. doi:10.1111/jsap.13405

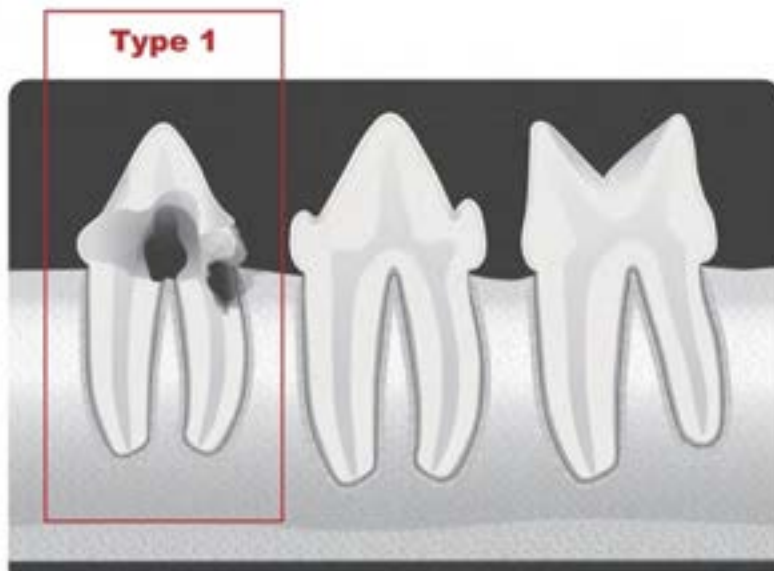
7. Regalado Ibarra AM, Legendre L. Anatomy of the Brachycephalic Canine Hard Palate and Treatment of Acquired Palatitis Using CO. *J Vet Dent*. Sep 2019;36(3):186-197. doi:10.1177/0898756419893127
8. Lobprise HB, Dodd JR. *Wiggs's veterinary dentistry : principles and practice*. Second edition. ed. Wiley-Blackwell; 2019. page 167
9. Davis EM. Oral Manifestations of Chronic Kidney Disease and Renal Secondary Hyperparathyroidism: A Comparative Review. *J Vet Dent*. 2015;32(2):87-98. doi:10.1177/089875641503200202
10. Klima LJ. Temporomandibular joint luxation in the cat. *J Vet Dent*. Sep 2007;24(3):198-201. doi:10.1177/089875640702400312

Tooth Resorption – Not Just for Cats: I’m Not Kitten You!

Jessica Johnson, DVM

Tooth resorption (TR) is defined as the resorption of dental hard tissue. TR occurs in domestic, feral, and wild cats, as well as other animals including dogs, chinchillas, and horses. The reported rates of prevalence of TR in cats range from 28-67% and the incidence appears to increase with age.¹

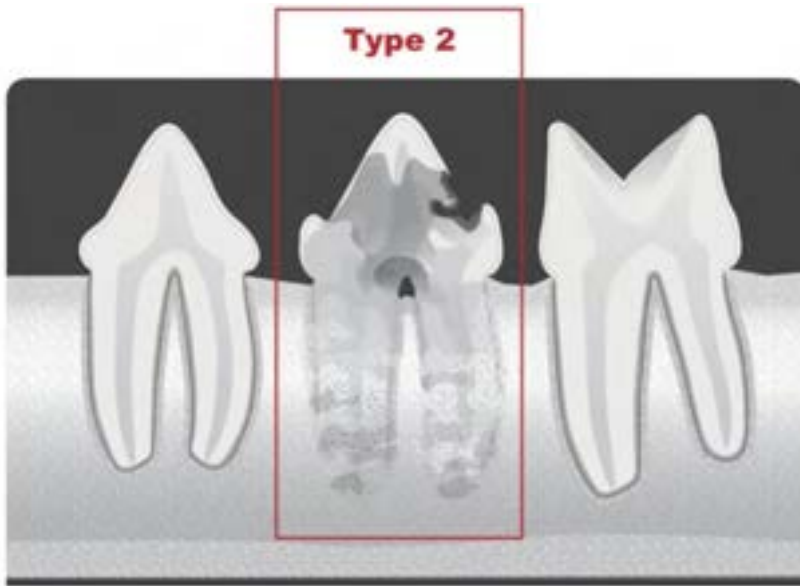
There is more than one way to classify TR. The classification of TR is important clinically because it will guide the veterinarian on how to extract the tooth. From the Nomenclature section of the American Veterinary Dental College website, the types of resorption based on radiographic appearance are Type 1, Type 2, and Type 3. For Type 1 TR, the tooth will have a focal or multifocal radiolucency with an otherwise normal radiopacity and *normal periodontal ligament space*.² Often times Type 1 TR is referred to as inflammatory resorption. *Because the periodontal ligament space is intact, when this tooth is extracted, the entire root should be extracted.* Dental radiographs are needed to evaluate the roots and therefore determine how the extraction should be performed. The periodontal ligament space cannot be evaluated without imaging. Some clinicians have elected to move away from dental radiography and are now using a form of 3-dimensional imaging known as cone beam CT (CBCT). Research has shown there are many benefits to CBCT and several pathologies can be detected with less bone loss/changes in comparison to dental radiography. Most veterinarians use dental radiography for imaging; therefore, this lecture will be limited to a discussion involving this modality.



*This image is used with permission of the American Veterinary Dental College.³

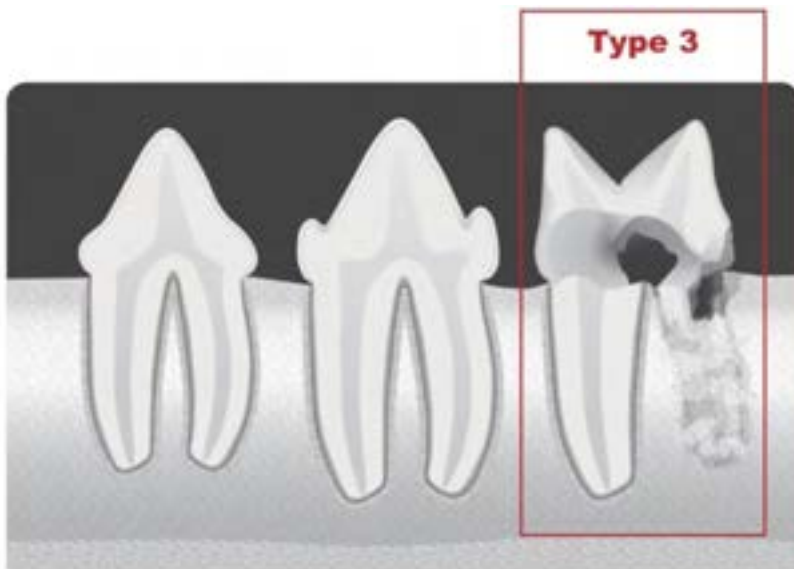
Type 2 TR is often referred to as replacement resorption. On a radiograph with a tooth affected by *Type 2 TR*, there is *narrowing or disappearance of the periodontal ligament space in at least some areas and decreased radiopacity in part of the tooth*. These

radiographs demonstrate replacement resorption of the roots in which the lost tooth structure is replaced by bone. Resorption is a progressive disease and may continue until no recognizable structure remains; these are referred to as ghost roots.⁴ In these cases, the root is often extracted by crown amputation. This author prefers the term *modified tooth extraction*. At times, when a portion of the PDL is still visible, partial elevation of the root(s) may be possible. In all cases, it is important to remove at least the crown on level with the alveolar margin (or the jawbone). Therefore, extraction involves removal of some tooth root and so, this phrase is favored over crown amputation.



*This image is used with permission of the American Veterinary Dental College.³

Type 3 TR is used to describe a tooth that has features of both Type 1 TR and Type 2 TR in the same tooth. This means, the tooth has areas of normal periodontal ligament space *and* areas of lost periodontal ligament space. This is typically seen in a multirooted tooth in which one root demonstrates features of Type 1 TR which another root has features of Type 2. Therefore, one root would need to be extracted completely, which the other root may require modified extraction technique.



*This image is used with permission of the American Veterinary Dental College.³

A 2002 study “Comparison of periodontitis and root replacement in cat teeth with resorptive lesions” in the *Journal of Veterinary Dentistry* examined 543 feline teeth with tooth resorption. 49% of teeth in that study had Type 1 TR. 51% of teeth had Type 2 TR. 72% of teeth with Type 1 TR had periodontitis present. Only 16% of teeth with Type 2 TR had periodontitis present.⁵

The information described thus far is important for the clinician to determine how to extract the tooth and to explain the need for imaging (intraoral dental radiographs). Clients often ask if dental radiographs are necessary, and the veterinarian should be confident informing the client that extraction can only be performed properly with dental radiographs. It is this author’s experience that clients often do not understand the value and necessity of dental radiographs. If dental radiographs are optional or listed as a “line item” in their estimate/treatment plan, the client may see this as a way to cut cost by simply asking to forgo imaging. It is a liability to the patient and the veterinarian to perform extractions without dental radiographs and the necessity of this imaging modality is particularly highlighted in tooth resorption.

The American Veterinary Medical College (AVMA) PLIT is a malpractice carrier commonly used by veterinarians in the United States. In their 2015 and 2021, they released professional liability newsletters on closed claims and updates in regard to “Best Dental Practices”. When dental radiographs were not offered, and the patient sustained an adverse outcome, the AVMA PLIT opined that the cases would be difficult to defend because the veterinarians did not discuss intraoral radiographs and the potential risks of performing oral surgery (tooth extractions) without radiographs. Thus the “standard of care” was not met and ultimately, the claims were paid out. The following excerpt is from the 2021 newsletter on “Dentistry Best Practices: ‘Radiograph the entire mouth of every anesthetized patient using intraoral radiography. Without intraoral radiography, oral pathology may be underestimated or may go undiagnosed, leading to inappropriate treatment recommendations.’”⁶

Every practice that has intraoral dental radiographs should offer them with every procedure, particularly when extractions are performed. The veterinarian can choose to decline extractions if they are uncomfortable performing them without imaging. If the client declines radiographs, it would be wise to dedicate time to educate the client on the necessity of imaging and to document this conversation fully in the patient's chart. This author's practice is often a third party in cases where the patient has an adverse outcome, and the patient is referred as a result. Recently, a cat presented with stomatitis that had undergone "full mouth extractions" at their veterinarian's general practice. During the procedure, dental radiographs were not performed. The cat continued to have significant symptoms of pain associated with stomatitis. The client sought a second opinion at another general practice (GP) where dental radiographs revealed 16 roots were intact for the 30 teeth that had been extracted. This patient was then referred to our dental specialty office. There was no documentation in the patient's chart from the first GP practice regarding a discussion on the offering, or need, of intraoral radiographs. Our clinic labored over the patient's chart to find any documentation to show the client they had declined imaging, but we were unable to find it because it simply did not exist. The client hired a lawyer and intended to sue their veterinarian. This situation is stressful for all parties involved and it is preventable. General practitioners are the champions of veterinary medicine, and this author always seeks to support them; with that said, all veterinarians, including those in specialty, must be honest and transparent with a client in terms of their pet's health.

It is common for our clients to ask why their dog or cat has TR, and how can they prevent it. Research has not determined absolute explanation for why a patient has TR. Many causes have been investigated including diet – hard kibble vs a soft diet, vitamin D, genetics possibly playing a role. Some of the TR seen in cats (Type 1) are associated with inflammation of adjacent tissue, usually periodontitis, but a large number of lesions are idiopathic.¹ There are several proposed etiologies for idiopathic tooth resorption, but it is not within the scope of this presentation to discuss those. It is fair to tell your client that while we often do not know the cause of TR, we do know that regular, good dental procedures and home care can potentially help and certainly would not hurt in preventing some forms of tooth resorption. Diet recommendations cannot be made solely in hopes of preventing TR. A patient with TR should receive an oral exam along with their physical exam biannually. At this time, it is recommended that a patient with TR have at minimum, an annual dental cleaning with full mouth intraoral dental radiographs.

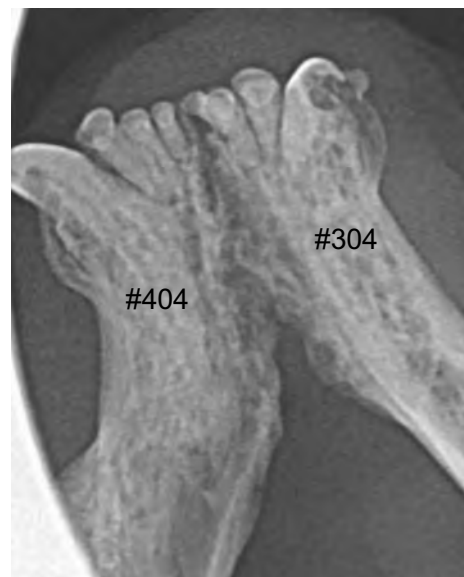
There are several oral pathologies that can accompany tooth resorption. Several cysts and tumors of the jaw can lead to tooth resorption either due to inflammation, damage of the apex, or other damage/displacement of the tooth that can lead to resorption.⁴ If there is a mass, or cyst close to the teeth which exhibit resorption radiographically, it is expected that surgically addressing the growth (cyst, tumor) should include the extraction of neighboring teeth, demonstrating resorption.

At this author's practice, our clients' main concern is usually for their cat or dog's quality of life and comfort. Therefore, a common question encountered: does TR cause

discomfort or pain? The answer to that question lies in the location and stage of the TR. If the lesions are limited to the root surface and do not involve pulpal inflammation, then perhaps not initially. TR is generally considered to be a progressive disease; any teeth exhibiting TR that does not warrant extraction should be monitored and a follow up oral ATP (assessment treatment and prevention) should be performed.

It is unpredictable if our feline or canine patients will show pain with TR. One observation at our specialty practice is that if a cat is going to show symptoms of pain, it is usually due to multiple teeth affected by TR +/- fractured teeth (due to the TR) and/or the canine teeth have significant resorption of the crown. If only one or two teeth have TR, the patient will likely show signs of discomfort if that tooth is palpated during a physical exam; however, they may not exhibit overt symptoms of pain on a day-to-day basis. Visual inspection and tactile examination with a dental explorer will identify only “end-stage” lesions (i.e., when the process is involving the crown and has resulted in an obvious defect).¹

(A) Example of “end stage” TR on tooth #304. (B) Note both teeth #304 and #404 have extensive Type 2 TR warranting extraction of both teeth. (This patient was exhibiting signs of discomfort.)



When it comes to our canine patients, a similar model (Type 1, 2, and 3) can be used to evaluate tooth resorption. A 2010 study evaluated resorption in dog teeth using the AVDC classification and human resorption classification.⁷ Although the human classification scheme was slightly more applicable, it is also much more involved and in this author’s opinion, more confusing and not particularly relevant for the general practitioner. The AVDC classification scheme for TR in cats can also be applied to dogs for staging, diagnosis, and decision-making.

When evaluating a tooth with TR, in a canine patient, we examine the following criteria to determine if extraction is needed (similar criteria used to evaluate any tooth, with or without TR, to determine if extraction is needed):

- Grade 3-4 periodontal disease (PD) often warrants extraction. (PD3: Moderate periodontitis – 25–50% of attachment loss as measured either by probing of the clinical attachment level, radiographic determination of the distance of the

alveolar margin from the cemento-enamel junction relative to the length of the root, or there is a stage 2 furcation involvement in multirooted teeth. PD4: Advanced periodontitis – more than 50% of attachment loss as measured either by probing of the clinical attachment level or radiographic determination of the distance of the alveolar margin from the cemento-enamel junction relative to the length of the root, or there is a stage 3 furcation involvement in multirooted teeth.

- Impacted or unerupted teeth, particularly in younger pets. Stable (not showing signs of cyst formation) impacted or unerupted teeth may be monitored regularly with an oral ATP (Assessment Treatment Prevention) and imaging.
- Teeth affected by pulp necrosis or irreversible pulpitis.
- Teeth that are potentially non-vital include: complicated or uncomplicated crown or crown root fractures.
- Mobility
- Tooth vitality
- Probe into the lesion (where is lesion compared to alveolar margin, into oral cavity)

Tooth resorption can be a frustrating for veterinarians and clients alike. Ultimately, our goal for the patient is a comfortable bite, with an oral cavity free of pain and infection. By performing regular thorough oral exams and dental procedures with radiographs, we have the ability to do just that.

References

1. Gorrel C. Tooth resorption in cats: pathophysiology and treatment options. *J Feline Med Surg.* Jan 2015;17(1):37-43. doi:10.1177/1098612X14560098
2. AVDC Nomenclature. <https://avdc.org/avdc-nomenclature/>
3. AVDC. Copyright of the images is owned by AVDC. Download of the images and use in printed materials or presentations is permitted without charge provided that the source is cited as Copyright AVDC, used with permission. The Board gratefully acknowledges Veterinary Information Network (VIN) for developing and donating the tooth fracture and tooth resorption diagrams. The clinical images are provided by diplomates of AVDC. www.avdc.org
4. Lobprise HB, Dodd JR. *Wiggs's veterinary dentistry : principles and practice.* Second edition. ed. Wiley-Blackwell; 2019.page 11
5. DuPont GA, DeBowes LJ. Comparison of periodontitis and root replacement in cat teeth with resorptive lesions. *J Vet Dent.* Jun 2002;19(2):71-5. doi:10.1177/089875640201900202
6. *Best Practices in Veterinary Dental Care and Dental Anesthesia.* AVMA PLIT; 2021.
7. Peralta S, Verstraete FJ, Kass PH. Radiographic evaluation of the classification of the extent of tooth resorption in dogs. *Am J Vet Res.* Jul 2010;71(7):794-8. doi:10.2460/ajvr.71.7.794

21ST CENTURY PYODERMA & ANTIMICROBIAL STEWARDSHIP IN DERMATOLOGY

Kinga Gortel DVM, MS, Diplomate ACVD

The following proceedings are condensed from the open access article:

Gortel K. Twenty years of pyodermas: How antimicrobial resistance has changed the way I practice. *Can Vet J.* 2020 Jul;61(7):781-784. Open access:

<https://pubmed.ncbi.nlm.nih.gov/32655164/>

Pyoderma caused by resistant staphylococci has become common enough in 21st century that the term “methicillin-resistant” is well known to veterinarians. This term identifies a broad resistance to beta-lactam drugs including the potentiated penicilins and cephalosporins typically prescribed for skin infections. Methicillin-resistant staphylococci (MRS) can express co-resistance to any combination of other drug classes and this makes antibiotic therapy very difficult to nearly impossible for some strains. The prevalence of methicillin resistance in *S. pseudintermedius*, the organism typically involved in canine pyoderma, had increased to >30% of isolates from American dogs within a decade of being reported in 1999. In the last decade, the reported prevalence of methicillin-resistant isolates from Canadian dogs with pyoderma has ranged from 12.1 % of all staphylococcal species in primary practice to 45% of coagulase-positive staphylococci in one referral practice.

How did they become so common? Staphylococci comprise part of the normal skin and mucosal microbiota, with several species serving dual roles as commensals and opportunistic pathogens. *Staphylococcus pseudintermedius* is part of the commensal skin microbiota of most dogs and the most common species causing infections, followed much less frequently by *S. aureus* and the coagulase-variable *S. schleiferi*. Commensal bacteria are subjected to selection pressure any time their host is treated with systemic antibiotics, regardless of whether they are the target of treatment. Resistant strains of staphylococci are not created *de novo* when an animal is treated with an antibiotic. Rather, treatment can obliterate the existing susceptible commensal populations and allow re-colonization by a strain resistant to these drugs. Over the last two decades, this lateral transmission has allowed MRS to spread through canine populations. Unfortunately, even after successful treatment of pyoderma caused by MRS, these organisms can continue to colonize dogs and cause future resistant infections.

The emergence of MRS in dogs is not surprising, as decades earlier *S. aureus* followed the same trajectory in humans and the role of antimicrobial use as a risk factor was well known. In dogs, skin infections are the primary reason for antibiotic treatment in this species and may account for up to 30% of prescriptions. The lengthy courses of therapy used for skin infections compound the large number of doses used worldwide.

The toll of antimicrobial resistance (AMR) to humans and health care systems is already staggering. In veterinary medicine, the principles of antimicrobial stewardship and the One Health Initiative have gained prominence as we recognize that efforts to combat AMR must encompass all species. Three key approaches recommended for limiting AMR include preventing disease occurrence, reducing overall antimicrobial drug use, and improving antimicrobial drug use. In small animal practice, one of the most practical and frequent opportunities to practice antimicrobial stewardship is in the management of canine pyoderma.

Our approach to pyoderma must take into consideration AMR and the principles of antimicrobial stewardship. Some of the key points are listed here, and published guidelines with more detailed recommendations are included below.

Topical therapy

Topical therapies should be the first line therapy for pyoderma. The World Association for Veterinary Dermatology recommends that “topical therapy should be used as the sole on-animal antibacterial treatment for surface and superficial infections whenever a pet and owner can be expected to be compliant”. The Canadian Veterinary Medical Association’s Guidelines for Veterinary Antimicrobial Use (see resources below, available online and through the Frontline App) support this approach. Topical therapy works because most cases of canine pyoderma are indeed superficial; limited to the epidermis and superficial portion of the hair follicles. Topical monotherapy was previously recommended chiefly for localized infections. But when using shampoos, does it really matter if the patient has one lesion, or a few dozen? Various topical therapies have been studied and found to be effective for pyoderma. The best evidence exists for the use of chlorhexidine shampoos. Chlorhexidine has a broad spectrum of antibacterial activity and a relative lack of resistance despite more than 60 years of use in health care settings. It is nonirritating, rarely sensitizing, and can remain bactericidal for many days after application. Chlorhexidine-based products can be as effective as systemic antibiotics in dogs with superficial pyoderma: the efficacy of twice-weekly shampoo (with 3-5 minutes of contact time) and daily spray was equal to 4 weeks of oral antibiotics in one study, whether infection was caused by susceptible or methicillin-resistant staphylococci. This is a common protocol for active infections, with reduced frequency for prevention. In the last few years, the selection of chlorhexidine-based products available in Canada has grown substantially and includes 2-4% chlorhexidine shampoos, sprays, mousses, and wipes. These can be accessed as a member resource on the Canadian Academy of Veterinary Dermatology website www.cavd.ca. In addition to an antiseptic effect, shampooing removes organisms and debris from the skin surface and improves the dog’s odour and appearance. It also spares bystander organisms in other organ systems unnecessary exposure to antimicrobial drugs, reducing the risk of selecting for resistant strains. Help clients implement topical therapies effectively. This means providing a topical therapy handout, and instructions on the frequency, volume, and duration of application of prescribed products.

Antibiotic therapy

Prescribe systemic antibiotics for pyoderma - when necessary. This includes dogs with deep or severe pyoderma, dogs responding poorly to topical therapy within 3-4 weeks, or when patient or client factors make topical therapy impractical. Follow-up is key for assessing the efficacy of treatments for infection. Aim to re-examine patients (including cytologic examination) within 2 weeks if using systemic antibiotics, and within 2-4 weeks if using only topical therapy. The decision to use systemic antibiotics should be based on clinical and patient/client factors, rather than on whether the isolate is resistant or susceptible on culture. MRSP are thus far no more invasive or destructive than susceptible strains and the disease they cause is clinically indistinguishable. It is only when systemic antibiotics are used that a difference becomes apparent. Thus the mere isolation of MRSP on culture should *not* prompt an escalation to systemic therapy. The duration of therapy for systemic antibiotics is still the subject of uncertainty.

When selecting systemic therapy, rely on culture and susceptibility testing whenever MRS is suspected. Empirical antibiotic selection is contraindicated in these cases due to the high

prevalence of multidrug resistance among these strains. In addition to severe infections, collect cultures with recurrent infections and when empirical therapy fails to resolve an infection as expected. Practically, a culture can be submitted from a patient with superficial pyoderma while commencing topical therapy and treating the primary condition with the aim of adding a systemic antibiotic, if needed, once results are reported. A follow-up call to the client to relay the culture results often indicates sufficient improvement that antibiotics are not prescribed. When interpreting cultures, it is critical to evaluate not just the antimicrobial resistance pattern but also the species isolated. The significance of the uncommonly pathogenic coagulase-negative staphylococci (aside from *S. schleiferi*) should be interpreted with caution, even if methicillin-resistant. Key indications and techniques for bacterial culture and susceptibility testing are available in open-access resources along with guidelines for culture interpretation, please see resources below.

Primary Causes

An attempt to identify and address the cause of pyoderma should always be made, knowing that repeated antibiotic therapy is likely to become ineffective. Preventing disease is arguably the most important component of antimicrobial stewardship and one that is often overlooked. Staphylococcal pyoderma in dogs is secondary to an underlying condition and addressing this is critical to preventing recurrences. Allergic skin disease tops the list of underlying conditions and may be responsible for 74 to 90% of cases. Despite their complex and chronic nature, most allergic dog can be successfully managed. Interventions including systemic and topical therapies to reduce inflammation and pruritus, allergen-specific immunotherapy, dietary and topical treatments to improve the skin barrier, and elimination diet trials can all be useful in preventing infections. It may take some time to find a regimen that is most effective for each dog, particularly now that we have many choices for antipruritic/anti-inflammatory therapies. The use of bacterins and other preventative therapies warrants further investigation (at the time of writing the most commonly used bacterin, Staphage Lysate®, is unavailable).

Other Considerations

It is prudent to be a bit patient with skin infections. Unlike with sepsis or pneumonia, a delay in starting systemic antibiotics is not likely to adversely affect the patient's overall health, so a more gradual improvement can be tolerated. Since pyoderma represents a dysbiosis, rather than a pathogenic infection, complete eradication of the causative organism is unlikely even using aggressive systemic therapy. Treatment should thus aim to restore a more balanced microbiota. This takes time. Treating the dog's pruritus allows for acceptable symptom control while the skin microbiota returns to this state.

It is important to recognize the potential for inter-animal transmission of resistant staphylococci. Although pyoderma is not considered "contagious", the lateral movement of resistant strains, especially within a clinic setting, is possible and impacts how patients are handled. Recommendations for hand hygiene, personal protective equipment, and cleaning/disinfection are discussed in the resources listed below.

Care should be taken when presenting information about resistant infections to clients. It is important to avoid the term "superbug" and the erroneous label "MRSA" when speaking about MRSP, and to reiterate that topical therapy is usually very effective for treating these infections. A balanced client handout such as that found on the CAVD or Worms and Germs website addresses many questions including the low potential for zoonotic transmission with MRSP.

Some of the questions that remain to be answered pertain to the appropriate duration of systemic antibiotic therapy. They are particularly relevant when treating resistant infections with drugs that carry a considerable risk of serious adverse effects (e.g. rifampin or amikacin). A 21- to 28-day course of systemic therapy, extending at least one week past the resolution of lesions, is a standard recommendation for treating superficial bacterial folliculitis in order to prevent relapses. It is based on experience but not yet on a scientific foundation, and the effect of concurrent topical therapy on treatment duration has not been explored. Since administering antibiotics for longer than is necessary can increase the risk of resistance, evidence-based recommendations in human and veterinary medicine have often moved to shorter courses of therapy than were previously prescribed. In light of the quantities of antibiotics prescribed to dogs with pyoderma, it is critically important to re-examine treatment durations for pyoderma using clinical trials.

The treatment of pyoderma has changed greatly in recent years. This is partly thanks to an improved selection of treatments to control the most common primary cause, allergic skin disease, but largely as a response to antimicrobial resistance. A silver lining of the dissemination of MRS has been learning that we can and should treat skin infections differently, providing a key opportunity for antimicrobial stewardship in small animal practice.

Resources:

Recommendations for approaches to methicillin-resistant staphylococcal infections of small animals: diagnosis, therapeutic considerations and preventative measures: Clinical Consensus Guidelines of the World Association for Veterinary Dermatology. This comprehensive document addresses many questions including less frequently isolated species, such as MRSA. Open Access: <https://doi.org/10.1111/vde.12444>

Guidelines for the diagnosis and antimicrobial therapy of canine superficial bacterial folliculitis (Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Diseases). Open Access: <https://doi.org/10.1111/vde.12118>

CVMA Guidelines for Veterinary Antimicrobial Use: <https://www.canadianveterinarians.net/AMU-UAM>

CVMA Guidelines on Veterinary Antimicrobial Use on the Firstline App: <https://firstline.org/cvma/>

The Canadian Academy of Veterinary Dermatology website contains open access and member resources including clinical guidelines, client handouts (including on MRSP) and lists of topical therapies available in Canada: www.cavd.ca

Client handouts for MRSP and MRSA: www.wormsandgermsblog.com

References available from the author upon request

TREATING THE DIFFICULT ATOPIC DOG: WHEN YOUR SILVER BULLETS DON'T WORK

Kinga Gortel DVM, MS, Diplomate ACVD

Successful treatment of atopic dermatitis in dogs is multimodal and responsive to change. It consists of treating acute flares of the disease as well as managing the chronic condition. Client communication and education are crucial, as affected dogs can be successfully managed, yet rarely cured.

We have seen major advances in the treatment of canine atopic dermatitis. The options for treating the inflammation and pruritus that characterize the disease have increased, but some cases fail to improve with the most conventional therapies or “silver bullets”.

Five common reasons for failure presented are:

1. An incorrect diagnosis
2. “It’s complicated” – secondary infections
3. Silver bullet miss despite appropriate use
4. Not the best bullet for this case
5. This case needs much more than a silver bullet

1. An incorrect diagnosis

Canine atopic dermatitis is very common in (the most common cause of pruritus in non-flea-endemic areas), and there is no definitive test to diagnose the disease. Thus the diagnosis is presumptive and rarely 100% certain. Other conditions can resemble it so closely that we will inevitably be wrong from time to time. Intradermal or serologic allergy testing, although it is helpful for selecting allergens for immunotherapy and sometimes avoidance, cannot be used to diagnose or rule out the disease. In particular, cutaneous adverse food reactions/food allergies are clinically indistinguishable from atopic dermatitis. Other conditions that can sometimes closely resemble atopic dermatitis include flea allergy dermatitis, pediculosis, Sarcoptic mange, *Cheyletiella*, *Demodex canis*, *Demodex injai*, *Malassezia* dermatitis, pyoderma, dermatophytosis, sebaceous adenitis, and epitheliotropic lymphoma. We do have tests to help us rule out some of these other conditions. All pruritic dogs should have the “dermatology minimum database” of 1) cytology and 2) skin scrapings/ectoparasite examination and/or treatment trial. When things look “weird”, if patients start showing signs at an atypical age, when they fail to respond to appropriate therapies, or if something just seems unusual, consider additional tests (e.g. skin biopsies and fungal cultures) to look for some of the “zebras” that can mimic atopic dermatitis.

2. “It’s complicated” – by secondary infections

Some atopic dogs are “just itchy”, but many suffer from secondary skin and/or ear infections that can significantly increase their pruritus. Diagnosing and managing these secondary infections is key to successfully managing their skin disease. Cutaneous cytology is a powerful but low-cost

tool that yields results quickly. Cytology collection techniques are subject to personal preference.

Armed with cytology results, one can make a more appropriate treatment decision. The treatment of secondary infections is a huge topic in its own right and beyond the scope of this lecture. A few key points:

- Otitis externa that becomes recurrent despite otherwise adequate control of the atopic dermatitis and ear cleaning can benefit from the use of topical corticosteroids.
- *Malassezia* dermatitis is a top reason for treatment “failures” of antipruritic drugs, likely due to *Malassezia* hypersensitivity occurring in a subset of atopic dogs. *Malassezia* hypersensitivity leading to severe pruritus can occur with even low numbers of *Malassezia* found on cytology, while in other dogs, modest pruritus accompanies a high yeast burden. The response to systemic treatment is an effective way to confirm the contribution of *Malassezia* found on skin cytology to the overall pruritus in a particular patient.
- Recommendations for the treatment of pyoderma have changed dramatically in recent years in response to the now common finding of resistant staphylococcal pyoderma in dogs. In the past, systemic antibiotic therapy was a cornerstone of treatment of superficial pyoderma, with topical therapy considered adjunctive. Today, published evidence and practice experience strongly support the use of topical treatments as monotherapy whenever this is practical.
- If recurrent skin or ear infections continue despite good control of pruritus (e.g. with Cytopoint), consider changing systemic therapy targeting inflammation (e.g. cyclosporine). Patients requiring multiple courses of antibiotic for skin disease risk acquiring resistant staphylococci and referral to a board certified veterinary dermatologist is recommended.

3. Silver bullet miss despite appropriate use

In some cases, an effective product such as oclacitinib or Cytopoint™ fails to work for a patient seems to be an excellent candidate for the drug.

When I encounter a treatment failure, consider the following:

- Reconsider the diagnosis (point 1) – for example, some dogs with ectoparasites can look normal
- Is there secondary infection? (point 2) – for example, *Malassezia* does not always present with many skin lesions
- Consider multimodal therapy (point 5)
- If oclacitinib is insufficiently effective, Cytopoint™ can still be helpful.
 - Although treatments owe their chief anti-pruritic therapy due to inhibition of IL-31, they can work for different patients.
 - Cytopoint™ can work in dogs that don't have 24 hours of relief from oclacitinib dosing.
- Could compliance with oral medications be to blame for the treatment failure? If so, Cytopoint™ can be a practical solution.
- For long term use, make sure your client hasn't unilaterally lowered the oclacitinib dose, e.g. tapered this drug every other day. It is unlikely to be effective.

- Is the patient showing an incomplete response low end of the oclacitinib dose of 0.4 mg/kg/day? If so, increasing the dose to 0.6 mg/kg/day might be more effective, though this is not an evidence-based approach.
- Avoid increasing the dose beyond the label dose, for example using it twice daily long term. Sufficient evidence for the safety of alternate dosing regimens is lacking.
- This patient may require the use of more than one antipruritic/anti-inflammatory therapy in combination.

Use a pruritus scale for all your allergic patients to track the responses to what are often complicated therapies. You can download one from the Resources -> In Clinic Tools page of the CAVD website (www.cavd.ca) along with calendar pages for owners to keep track.

4. Not the best bullet for this case

A silver bullet treatment is not the best treatment in every case. For example, in dogs exhibiting severe skin inflammation, consider the broad-spectrum anti-inflammatory drug cyclosporine. It tends to work more slowly, so pruritus and inflammation often need to be managed during the build-up phase.

Oral corticosteroids might also be necessary in some dogs with severe inflammation. Whenever possible, their long-term use is avoided. However, for their combination of rapidly reducing pruritus and controlling severe inflammation, they still maintain an important place in our treatment arsenal, especially for acute flares.

Systemic corticosteroids and/or cyclosporine can be very helpful in the following situations:

- When severe inflammation and secondary changes such as lichenification are present anywhere in the skin, but particularly the feet and ears
- When moderate to severe otitis externa is present, particularly if ear canals show ulceration or hyperplasia
- When secondary infections are a major feature despite good control of pruritus (note: corticosteroids can sometimes increase susceptibility to pyoderma, so use with caution)
- Corticosteroids if financial circumstances allow the use of only very inexpensive therapies.

Treatment responses in atopic dermatitis can be surprising and unpredictable and it is really worth trying a variety of therapies to optimize therapy.

5. This case needs much more than a silver bullet

Arguably, this is the case for every atopic dog. The components of the multimodal approach are to:

- Reduce pruritus and inflammation – see above
- Treat and prevent secondary infections – see above
- Improve barrier function
- Reduce allergen exposure
- Alter the immune response using allergen-specific immunotherapy based on allergy testing

Improve the barrier function:

This is the subject of intense interest in human and veterinary dermatology. The entry of environmental allergens into the body is through the skin rather than by inhalation (the term “inhalant allergy” is not correct). Ample evidence in human medicine - and some evidence in veterinary medicine - supports that the normally robust barrier function of the stratum corneum is impaired in atopic individuals. The inclusion of essential fatty acids in the diets of atopic dogs may improve the barrier as well as reducing inflammation, although the ideal combinations and quantities are not established. Other ingredients have also been investigated and added to therapeutic diets. Several products containing essential fatty acids, other lipids, ceramides, and other ingredients are marketed in Canada.

Reduce allergen exposure

Improving the barrier function helps with reducing allergen exposure. And for patients with *Malassezia* or staphylococcal hypersensitivity, controlling these infections also reduces these important allergens. Bathing to maintain good skin hygiene (using cool or lukewarm water) at least once weekly can also help to reduce the build-up of allergens on the skin.

More specific recommendations can be made if allergy testing is done. Even if not, house dust mites (e.g., *Dermatophagoides farinae*) are the most common environmental allergens for dogs worldwide. Although it is virtually impossible to eliminate house dust mites from our environment, we can take steps to reduce their populations:

- Ask clients to use pet beds that are completely washable. Do not use stuffed beds if the stuffing cannot be washed as it will accumulate dust mites. Use folded synthetic blankets or towels instead. Alternatively, if a stuffed pet bed is used, encase the stuffing in a sturdy trash bag and wash the cover weekly.
- Pet beds should be washed frequently at least weekly in HOT (55°C/130°F) water.
- The dog’s access to area rugs, carpets, stuffed toys, and upholstered furniture should be limited if possible.
- Suggest that clients keep their dogs out of their (human) beds and bedrooms but recognize this advice is rarely followed.

Alter the immune response

While we have many tools to help the pruritus, inflammation, and infections associated with atopic dermatitis, there is only tool that is considered a disease-modifying intervention: allergen-specific immunotherapy. Immunotherapy, the administration of gradually increasing amounts of allergens selected based on intradermal and/or serologic allergy testing by subcutaneous injection or oral mucosal administration, is the only therapy thought to have the potential to reduce overall disease severity, prevent disease progression, or in some cases even cure the disease. Atopic dermatitis tends to progress over time, with increasing severity of signs. The duration of signs also tends to increase, with most chronically affected patients progressing to year-round disease. Anything we can do to reduce the likelihood of this occurring is worth offering to clients and implementing early during the dog’s life. Immunotherapy is, however, a slow acting therapy that is expected to help about 2/3 of atopic dogs. It requires follow-up, “troubleshooting”, patience, and commitment on the part of the client and veterinarians. Referral to veterinary dermatologists, who have extensive experience with allergy testing, allergen selection, and prescribing immunotherapy, should be considered.

Principal symptom-relieving therapies in canine atopic dermatitis.

Source: Gortel K. An embarrassment of riches: An update on the symptomatic treatment of canine atopic dermatitis. Canadian Veterinary Journal 58: September 2018.

<p>Oclacitinib (Apoquel™)</p> <p>Uses</p> <ul style="list-style-type: none"> • anti-pruritic and anti-inflammatory, for short- or long-term use <p>Advantages</p> <ul style="list-style-type: none"> • effective anti-pruritic activity • very rapid onset • usually well tolerated • pharmacologic drug interactions unlikely <p>Disadvantages</p> <ul style="list-style-type: none"> • minimum age 12 months • may be less effective when severe inflammation, lichenification, otitis, pododermatitis are present • increased pruritus can be seen when reducing (from twice daily) to once-daily therapy <p>Contraindications</p> <ul style="list-style-type: none"> • include neoplasia, serious infections <p>Monitoring</p> <ul style="list-style-type: none"> • clinical examinations, periodic CBC, serum biochemistry, urinalysis <p>Common errors</p> <ul style="list-style-type: none"> • attempting to reduce the dose to alternate-day therapy (unlikely to be effective due to short half-life) • relying on oclacitinib exclusively, at the exclusion of other therapies or adjunctive treatments (e.g. for concurrent infections) 	<p>Canine atopic dermatitis dermatitis immunotherapeutic/Lokivetmab (Cytopoint™):</p> <p>Uses</p> <ul style="list-style-type: none"> • predominantly anti-pruritic, for short- or long-term use <p>Advantages</p> <ul style="list-style-type: none"> • effective anti-pruritic activity • very rapid onset • well tolerated • can be combined with other treatments including oclacitinib • no minimum age • no contraindications for concurrent illness including neoplasia, infections, and demodicosis • convenient • laboratory monitoring not routinely needed <p>Disadvantages</p> <ul style="list-style-type: none"> • high cost for large dogs • may be less effective when used alone if severe inflammation, lichenification, otitis, pododermatitis are present <p>Contraindications</p> <ul style="list-style-type: none"> • none, unless adverse effects have been noted <p>Monitoring</p> <ul style="list-style-type: none"> • clinical examinations <p>Common errors</p> <ul style="list-style-type: none"> • prescribing it only for “desperate” cases
<p>Cyclosporine (Atopica™):</p> <p>Uses</p> <ul style="list-style-type: none"> • maintenance anti-inflammatory therapy; use when glucocorticoids would otherwise be chosen • chronic otitis externa, particularly with hyperplasia • severe inflammation, e.g., pododermatitis • severe secondary changes, e.g., lichenification <p>Advantages</p> <ul style="list-style-type: none"> • broad-spectrum anti-inflammatory • usually well tolerated long-term • normalizes skin to help reduce secondary infections • labeled from 6 months of age • dose reductions often possible <p>Disadvantages</p> <ul style="list-style-type: none"> • slow onset, not useful for flares • gastrointestinal side effects more common than with other treatments, but usually self-limiting • high cost for large dogs at daily dosing • many drug interactions <p>Contraindications</p> <ul style="list-style-type: none"> • include neoplasia, serious infections <p>Monitoring</p> <ul style="list-style-type: none"> • clinical examinations including oral examinations (gingival hyperplasia), periodic urinalysis, CBC, serum biochemistry <p>Common errors</p> <ul style="list-style-type: none"> • routinely reducing the dose in all patients after 1 month, even if only partial improvement has been noted (daily dosing can be continued as needed) 	<p>Oral glucocorticoids (e.g. prednisone):</p> <p>Uses</p> <ul style="list-style-type: none"> • short term use for allergic flares • otitis externa, particularly with hyperplasia or ulceration • severe inflammation, e.g., pododermatitis • severe secondary changes, e.g., lichenification <p>Advantages</p> <ul style="list-style-type: none"> • potent anti-inflammatory and antipruritic effects • consistently effective • rapid onset • low cost <p>Disadvantages</p> <ul style="list-style-type: none"> • many well-recognized adverse effects <p>Contraindications</p> <ul style="list-style-type: none"> • many, including diabetes mellitus, severe infections, demodicosis <p>Monitoring</p> <ul style="list-style-type: none"> • clinical examinations, periodic urinalysis (possibly urine cultures), CBC, serum biochemistry

TIPS FOR CHRONIC OTITIS EXTERNA

Kinga Gortel DVM, MS, Diplomate ACVD

Otitis externa is an inflammatory disease of the ear canals and/or pinnae that can become chronic.

Signalment

There are important species and breed-related differences, e.g.:

- Feline vs. canine otitis can be very different
- American Cocker spaniels
- Standard poodles and various “-doodles”
- Cavalier King Charles spaniels
- Brachycephalic dogs

History

Is essential for identifying the primary causes of otitis, e.g. other history of skin disease? Is there more head shaking than pruritus (may indicate otitis media)? Any hearing loss?

Ear examination

- Look for any neurologic abnormalities such as vestibular signs, unilateral dry eye or nose, facial nerve paralysis, Horner’s syndrome, deafness, etc.
- Examine the concave and convex pinnae
- Palpate the ear canals – are they supple, firm, thickened, hard?
- Otoscope examination
 - Effective otoscopic examination is not possible in every case, e.g. if the ear canal is very painful or ulcerated, severely stenotic, or contains excess debris
 - May require sedation, a few days of oral corticosteroids and/or topical therapy before examination is possible
 - Utilize staff (not owner) for restraint
 - Pull pinna gently laterally and dorsally to straighten the canal and flatten the “auricular projection”, the corner you need to get around to see the horizontal canal
 - Look through the otoscope as you advance it, keeping it centered in the lumen to avoid traumatizing the sides
 - When using a handheld otoscope a 4 mm diameter cone is sufficient for most pets
 - Video otoscopy is by far superior to traditional otoscopy for ear cleaning/flushing, performing myringotomy and middle ear flushing, and other procedures
- Examine the rest of the skin, any signs of inflammation elsewhere?

Cytology

- Collect it every time, including follow-up examinations if otitis is still present
- Diff-Quik™ sufficient, Gram stain not usually necessary

- Note not only the presence and #s of organisms (and shape, rods or cocci) but also the presence of inflammatory cells

Culture

- Usefulness is controversial in veterinary dermatology as results reflect on attainable serum concentrations and are less useful for selecting topical therapy
- Useful if selecting systemic therapy e.g. for otitis media or deeper infections, or if suspecting resistant infections, e.g. pure rods on cytology, poor response to empirical therapy
- Always collect cytology at the same time

Diagnostic imaging

- Computed tomography (CT) is superior to radiography and is increasingly used to evaluate for the presence of otitis media as well as bony changes in the bulla
- Ideal to collect it before deep ear flushing to know if myringotomy is needed
- Otitis media can be an incidental finding on CT performed for other reasons, particularly in brachycephalic dogs

Why is this otitis occurring/recurring?

Consider the role of:

- predisposing factors: e.g., anatomy
- primary causes:
 - Identifying and controlling the primary cause (in dogs, most often allergic disease) is critical for preventing recurrences.
 - For allergic ear disease, consider the ongoing use of topical corticosteroids for prevention. Short term oral corticosteroids can also be very effective.
 - For allergic ear disease, oral cyclosporine can be quite helpful especially when more severe progressive changes are present in the ear canal. Oclacitinib can also be helpful with less severe secondary changes.
 - Diet trial any patient with year-round problem
- secondary causes: i.e., bacteria, yeast
- perpetuating factors: changes in ear canal anatomy and physiology in relation to inflammation that may be a major cause of treatment failures and progression. They include ear canal hyperplasia, stenosis, mineralization.

Treatment

Start with a clean ear to remove excess cerumen (nidus for bacteria/yeast), irritants such as accumulated hairs, purulent debris/biofilm.

- In a painful/ulcerated ear, consider a few days of oral corticosteroids and topical therapy before starting cleaning, to reduce pain
- At-home ear cleaning possible for most cases
 - Match cleaning solution to type of debris and degree of ulceration, e.g.:
 - Routine ear cleaners for ears that are not severely ulcerated or ceruminous – can also be used for prevention. Avoid if tympanic membrane is ruptured.

- TrisEDTA cleaners for purulent debris with bacteria, especially *Pseudomonas*
 - Squalene (oil) based cleaners for severely waxy debris that is hard to remove – can also be used for prevention, though they are messier
- Deep ear cleaning is necessary in more severe cases or if otitis media is present
 - Video otoscope is superior for this procedure, consider referral if needed
 - General anaesthesia with intubation and inflated cuff on endotracheal tube, nose tilted slightly down
 - Warmed saline for flushing
 - Myringotomy may be necessary if TM intact but otitis media suspected/present
 - Systemic corticosteroids (e.g. prednisone 0.5 -1.0 mg/kg/day) for at least one week before and after the flush are very helpful – recommend waiting until inflammation is less severe for a more effective flush
 - Deep ear cleaning is especially important for *Pseudomonas* infections, because otitis media is a common complication

Topical preparations

- Most ear preparations contain topical antimicrobials, antifungal drugs, and corticosteroids and are effective for common infections
- However, the volume administered may not be sufficient if dosed as per the label especially in larger dogs. It is essential that the medication coat the entire ear canal.
- Consider extra-label use of a larger volume using a syringe to apply medication when a larger volume is needed. For example, 0.25-0.5 ml for small dogs, 1.0 ml for large dogs and even 1.5 ml for giant breed dogs. This is especially important with *Pseudomonas* infections
- Compounded ear preparations may be needed with difficult infections, particularly for *Pseudomonas*
- Approved leave-in ear medications are an excellent alternative for some cases, generally the use of compounded leave-in medications should be avoided now that approved formulations are available

Preventative therapy

- Sometimes the most difficult of treatment is long term prevention
- Ear cleaning essential for many patients if the ear's self-cleaning mechanism is not sufficient. However, over-cleaning is also possible.
- Topical corticosteroids are almost always helpful if primary disease is allergic
- Treatment for primary disease including systemic therapy
- Role of hair plucking – difficult to make a clear-cut recommendation, but can be helpful in dogs with very hirsute ear canals that are also prone to infections (hirsute ear canals with no infections generally should not be plucked)

References available from the author upon request

APPROACH TO THE ANIMAL IN RESPIRATORY DISTRESS

Adesola Odunayo, DVM, MS, DACVECC
 Clinical Associate Professor, University of Florida
Odunayoa@ufl.edu

Introduction

Respiratory distress is defined as the (sudden) onset of rapid or labored breathing. This term may be preferred by some to the commonly used term dyspnea, which means “air hunger”. Respiratory distress is a common emergency presentation and is life threatening. A favorable outcome depends on rapid recognition, assessment of the underlying cause and quick intervention. The main focus of this hour will be on recognition and stabilization.

Recognition

Respiratory distress is typically easy to recognize. Dogs and cats will usually have an increased respiratory rate with an associated increase in work of breathing. One may also notice a change in body position or posture (orthopnea), open mouth breathing and cyanosis. If left unaddressed, all of the following may lead to death. Localization One of the most important steps in properly stabilizing and treating dogs and cats with respiratory distress is localizing the source of the distress. The main areas of interest are usually- upper airway, lower airway and pleural space disease. Abnormalities in each of these three main areas are usually treated differently. Emergency stabilization techniques are also generally different. There are usually cues on the physical exam that help localization of the source of the distress.

Upper Airway Disease: Anatomical locations commonly associated with upper airway obstruction includes the larynx (laryngeal paralysis, collapse, neoplasia), nasopharynx (polyps in cats), trachea (collapsing trachea, neoplasia), oropharynx (neoplasia, foreign material, hematoma, everted laryngeal sacculles, elongated soft palate) and nasal passages (stenotic nares, neoplasia, foreign material) Animals with upper airway obstruction almost always present with stridor (or stertor). Both sounds are accentuated during inspiration and are usually heard without the aid of a stethoscope. Stridor (stertor) radiates down the airway and can be heard over the thorax but should not be mistaken for wheezes. A tip is to listen over the larynx during auscultation to assess for any referred upper airway noises.

Lower Airway Disease: Anatomical locations commonly associated with the lower airway includes main stem bronchi (collapse, foreign body), bronchi (spasm, asthma, bronchitis), alveoli (edema, infection, neoplasia, hemorrhage). Animals with lower airway disease usually present with rapid and shallow breathing, with the chest and abdomen moving in the same direction.

Pleural space Disease: Common abnormalities associated with the pleural space includes pleural effusion from heart failure, pyothorax, chylothorax or hemothorax. Pneumothorax and chest wall injuries also fall into this category. Animals with pleural space disease usually present with rapid and shallow breathing, with the chest and abdomen moving in opposite direction (dyssynchronous breathing).

Triage

A triage exam is a quick (usually 30-45 seconds) exam to identify life-threatening abnormalities in clinical patients. Triage typically consists of evaluating the ABC's (airway, breathing and circulation). This section will focus on airway and breathing.

Airway: This typically does not involve any physical contact with the animal other than assessing them for an upper airway obstruction. This is classically identified due to the presence of stridor (other than rare instances where an animal with a complete obstruction may not make any respiratory sounds). An animal that isn't demonstrating stridor generally does not have an airway obstruction

Breathing: This is quickly recognized by tachypnea, orthopnea, cyanosis and open mouth breathing. Note that there are some non-respiratory causes of breathing abnormalities (pain, anemia, metabolic acidosis or anxiety).

Stabilization of the Respiratory Patient

Respiratory distress is always a true emergency. Both the client and patient should be treated urgently, as much as reasonably possible.

Oxygen therapy: Providing oxygen is a common intervention that can be performed with or without sedation. There are many ways of providing oxygen to the distressed patient. The fraction of inspired oxygen varies depending on the oxygen flow rate on the flow meter, the size of the oxygen cage and how much oxygen is lost to the surrounding environment. Care must be taken to ensure that there is appropriate venting of carbon dioxide emitted by animals confined in a cage. It is also important to ensure that patients don't overheat in cages. The recommended oxygen flow rate per nasal oxygen tube is 100-200 ml/kg/min, meaning that a 20kg dog should be started at 1L/min and could be increased to up to 3L/min as needed.

Oxygen Administration Technique	Mean FiO ₂ achieved (%)
Flow by oxygen	22-30
Face mask, loose fitting	35-60
Nasal Oxygen (unilateral to bilateral)	30-80
Intratracheal Oxygen	40-60
Oxygen cage	21-80
Oxygen tents	30-50
Intubation	21-100

FiO₂= Fractioned of inspired oxygen

Sedation: Sedation is extremely useful in animals that are anxious as a result of hypoxemia. This is especially true in animals (mostly dogs) with upper airway obstruction. In some cases, providing sedation is ALL that is needed to stabilize animals with upper airway obstruction (dogs with collapsing trachea, laryngeal paralysis or brachycephalic airway syndrome). The use of sedatives must be carefully considered in animals with lower airway disease or pleural space disease. If a sedative is administered, those animals should be monitored closely for worsening respiratory signs with appropriate plans made to immediately intubate the animal and administer positive pressure ventilation. Common sedatives utilized for upper airway obstruction includes butorphanol (0.1-0.4 mg/kg IV or IM) and acepromazine (0.005-0.05mg/kg IV or IM). Both of

these drugs may also be used together. Placing an intravenous catheter as soon as reasonably possible is always a great idea.

Active Cooling: Active cooling is especially important in animals with upper airway obstruction. It is important to differentiate hyperthermia from animals with a fever (Most helpful differentiator is the presence of compensatory signs for hyperthermia). Hyperthermia in animals with upper airway obstruction is usually due to increased work of breathing, anxiety and inability to effectively pant. From my clinical experience, the most helpful way to rapidly cool a hyperthermic animal is saturating the animal's fur with tepid water.

Thoracocentesis: This is an invaluable stabilization technique and is one that every veterinarian can feel comfortable doing. It is important for therapeutic and diagnostic purposes. Pleural space disease is diagnosed based on physical exam findings (rapid and shallow dyssynchronous breathing, muffled lung sounds ventrally or dorsally) and the use of the thoracic FAST evaluation (tFAST). Ideally, thoracic radiographs should NOT be used as the first tool in diagnosing pleural effusion in animals in respiratory distress. It is thought that approximately 30-60 mL/kg of fluid or air in the pleural space is required to cause respiratory distress. Thoracostomy tubes are rarely needed on emergency except one is unable to get negative pressure with dogs with pneumothorax. MILA, a veterinary company, makes small bore thoracostomy tubes that are easy to place with little or no sedation and well tolerated.

Minimizing stress: This is an important aspect of managing animals in respiratory distress, especially in cats. One may need to complete the entire physical exam in stages. There should be no major diagnostics performed until the animal is doing better. All noises and distractions should also be avoided, as much as possible.

Intubation: In some cases, it is important that the veterinarian takes control of the airway by intubating the animal (or placing a tracheostomy tube emergently). Intubating an animal can be lifesaving, especially when they haven't responded to other stabilization techniques. The indication to intubate a patient is when it crosses your mind that the animal is going to die if you don't do something quickly. Rapidly acting induction drugs (ketamine/diazepam, propofol, alfaxalone) are often needed to gain control of the airway. The veterinary staff must be prepared to mechanically ventilate (ambu bag or anesthesia ventilator) while other steps to stabilize the animal is carried out (thoracocentesis, foreign material removal, administration of plasma, placement of chest tubes, etc). Like thoracostomy tubes, tracheostomy tubes are rarely an emergent tool in most animals. There are very few circumstances where the airway cannot be captured with an orotracheal tube. In those circumstances, a "slash" tracheostomy may be required.

Other considerations for stabilizing an animal in respiratory distress include: Administering a dose (IV or IM preferred) is a reasonable consideration when heart failure is a differential (dog with heart murmur or any cat in respiratory distress). Furosemide may also be nebulized for possible positive effects on bronchoconstriction. Albuterol or terbutaline may be considered especially in cats. Steroids: May be useful in animals with allergic airway disease or upper airway disease (laryngeal edema). They are otherwise not recommended due to potential adverse effects.

References and Suggested Readings

1. Sumner, Catherine, and Elizabeth Rozanski. "Management of respiratory emergencies in small Animals"
2. Rozanski, Elizabeth, and Daniel L. Chan. "Approach to the patient with respiratory distress." *Veterinary Clinics: Small Animal Practice* 35.2 (2005): 307-317.
3. Tseng, Laura W., and Lori S. Waddell. "Approach to the patient in respiratory distress." *Clinical techniques in small animal practice* 15.2 (2000): 53-62.

APPROACH TO THE ANIMAL IN RESPIRATORY DISTRESS- DIAGNOSTICS AND TREATMENT

Adesola Odunayo, DVM, MS, DACVECC
 Clinical Associate Professor, University of Florida
odunayoa@ufl.edu

Introduction

Diagnostic tests are indicated after stabilization of the animal in respiratory distress. As much as possible, it is best to obtain these tests after stabilization

Sedated Oral Exam

Sedated oral and laryngeal exams allow for direct visualization of the pharynx and larynx to identify areas of dysfunction, facilitate differential diagnosis and formulate a diagnostic and therapeutic plan. The practitioner should be prepared to intubate the animal, as well as potentially plan on an emergency tracheostomy if orotracheal intubation is not possible. Additional diagnostics that may be required include fine-needle aspiration and tissue biopsy of masses. Butorphanol (0.2-0.4 mg/kg IV or IM) may be administered first, followed by a rapidly acting medication like propofol (1-3 mg/kg IV), ketamine (2-5 mg/kg IV) combined with midazolam (0.2-0.4 mg/kg IV)

Thoracic Ultrasound

Thoracic ultrasound can be performed quickly with minimal stress on the patient and very minimal manipulation needed. Thoracic ultrasound is useful to identify pleural effusion as well as pneumothorax in dogs and cats. When pleural effusion or pneumothorax is identified, thoracocentesis should be performed as soon as reasonably possible to stabilize the patient. PCV/TS, total nucleated cell count and fluid cytology should be considered on pleural effusion retrieved from the pleural space. Pleural fluid triglyceride levels should be measured and compared to peripheral blood triglyceride levels when pleural fluid is opaque to diagnose chylothorax. Chylothorax is confirmed when the thoracic fluid triglyceride concentrations is greater than serum triglyceride concentrations.

Thoracic Radiographs

Thoracic radiographs are key for diagnosis of dogs and cats with respiratory distress. Common conditions that can be diagnosed include fungal and bacterial pneumonia, pulmonary contusions, primary or metastatic neoplasia, feline asthma, congestive heart failure, cardiogenic or non-cardiogenic pulmonary edema, pleural effusion (ideally diagnosed via ultrasound), acute respiratory distress syndrome, etc.

Bronchoalveolar lavage, transtracheal wash, endotracheal tube wash

Bronchoscopy, transtracheal wash and endotracheal tube wash should be considered in dogs and cats with lower airway disease. These diagnostic tests help identify bacteria, viral or fungal causes of disease after cytology or virus isolation tests (PCR). Bronchoscopy generally requires referral to a board certified specialist but transtracheal wash and endotracheal tube wash can be performed in practice by the general practitioner. Those procedures should only be performed in patients with mild to moderate disease as it is possible to worsen the clinical state of the patient if performed in patients with severe respiratory distress. The transtracheal wash is easier performed in medium to large size dogs, while the endotracheal tube wash is performed

in small dogs and cats.

Lung aspirate may also be performed when there is a distinct mass or multifocal disease. The risk of developing a pneumothorax is high with lung aspirates so it is generally advisable to perform it with ultrasound guidance while going for a specific target. Cytology and culture may then be performed on the samples collected.

Other Tests

Other considerations for diagnostic tests include thoracic CT- which is helpful to give a 3-dimensional perspective of intrathoracic disease. Thoracic CT is usually performed under general anesthesia (although heavy sedation may be utilized) so the benefits and risks of the test should be weighed. In animals with multi focal nodular disease, urine antigen may be evaluated for histoplasmosis (cats) and blastomycosis (dogs primarily). Fluoroscopy may be used to evaluate for tracheal and main stem bronchus collapse (although bronchoscopy may also be utilized for this purposes). Bearmann flotation may be utilized for lung worms

Therapeutic Options

Once the patient is stabilized, specific therapy for the primary disease depends on the underlying cause. Common pharmacologic therapy utilized in dogs in respiratory distress include

a. Antibiotic therapy: Broad-spectrum antibiotics should be used in any pet suspected of having pyothorax or bacterial pneumonia. Antibiotics should ideally be based on the results of culture and sensitivity, although pre-emptive choices should be made before those results are finalized. Common antibiotics utilized include ampicillin (22-30 mg/kg IV q 8 hours), ampicillin and sulbactam (30-50 mg/kg IV q 6-q8 hours), fluoroquinolones (5-20 mg/kg IV q 24 hours), amikacin (15 mg/kg SQ q 24 hours) and doxycycline (5-10 mg/kg IV or PO q 12-24 hours). Certain antibiotics (fluoroquinolones, tetracyclines) may not be appropriate for rapidly growing animals and their potential adverse effects should be discussed with the owner.

b. Cardiac medications: Diuretics (furosemide 1-4 mg/kg IV q 1-8 hours, torsemide (0.2-0.4 mg/kg PO q8-q24 hours) are administered to pets with cardiogenic pulmonary edema. Diuretics reduce preload and relieve signs of left sided cardiogenic pulmonary edema. It is important to note that diuretics also help reduce the speed at which ascites develops in dogs with right sided pulmonary edema but they do not remove any fluid that may have accumulated in the abdomen or the thorax. A constant rate infusion of furosemide (0.66 mg/kg/hr.) has been described to be more effective, while reducing electrolyte derangements common with furosemide administration. A dose of furosemide may also be administered to pets with non-cardiogenic pulmonary edema although its efficacy for that indication is not completely known.² Care must be taken to ensure that these patients do not become volume depleted.

Other medications to consider may include pimobendan (0.5 mg/kg PO divided q 12 hours), dobutamine (5- 20 micrograms/kg/min), nitroglycerin (1/4 inch applied to mucous membranes every six hours), sodium nitroprusside (0.5- 10 micrograms/kg/minute) and lidocaine (50-80 micrograms/kg/min).

c. Glucocorticoids may be used in the treatment of lower airway disease, laryngeal inflammation (laryngeal paralysis, brachycephalic airway disease) and tracheal collapse. Glucocorticoids are also indicated for dogs with eosinophilic bronchopneumopathy. Glucocorticoids should be tapered to the lowest possible dose to prevent adverse effects (lethargy, polyuria/polydipsia, hepatomegaly). Inhaled glucocorticoids (fluticasone, beclomethasone) may be considered in dogs with chronic bronchitis.

Other pharmacologic considerations include the use of anti-fungal agents (itraconazole 5-10mg/kg PO q 24 hours or divided every 12 hours, fluconazole 5-10 mg/kg PO q 24 hours or divided q 12 hours), bronchodilators (terbutaline 1.25- 5mg per dog PO q 8-12 hours) and antitussives (hydrocodone 0.2-0.5 mg/kg PO q 6-12 hours, butorphanol 0.2-0.4 mg/kg PO, IV q 6-12 hours). Anti-thrombotic medications (clopidogrel 1-4 mg/kg PO q 24, fractionated and unfractionated heparin) may also be administered in animals with suspected pulmonary thromboembolic disease. Sildenafil (1-3 mg/kg PO q 8 h) may also be considered in dogs with pulmonary hypertension.

Animals with pyothorax should have bilateral thoracostomy tubes placed, although a unilateral tube is acceptable if the disease is unilateral. Abdominocentesis should be considered in any dog with significant ascites and concurrent respiratory distress

d. Other interventions include nebulization of saline (or inhaled medications) and coughage. The role of coughage in treating pulmonary disease is currently controversial at this time. Vitamin K and fresh frozen plasma should be administered to patients with hemothorax secondary to ingestion of rodenticides or anti-coagulants. Packed red blood cells/whole blood transfusion, analgesia or anxiolytic drugs may be used in dogs with respiratory look-alike syndromes

Surgical

Surgical intervention may be required in animals with respiratory distress. This includes but is not limited to; arytenoid lateralization for treating dogs with laryngeal paralysis, intrathoracic or extrathoracic stent placement for dogs with tracheal collapse and surgical exploration with lavage for dogs and cats with pyothorax. Surgery may also be indicated for dogs and cats with upper and lower airway neoplasms.

Nutritional

Nutritional intervention should be considered early in patients with respiratory disease. A nutritional plan should be implemented after the patient has been anorexic for about 72 hours, including the period of time the patient had not eaten before it was hospitalized. Placement of a nasogastric tube is the easiest and most effective way to provide nutrition to dogs with respiratory disease. However, the feeding tube should be placed only after the pet's respiratory status has been stabilized and the patient is alert enough to protect their airway. Appetite stimulants (capromorelin 3mg/kg PO q 24 hours, mirtazapine 3.75-30 mg q 24-72 hours) may also be utilized before placing a nasal feeding tube.

Nursing Care

Nursing care is critical in the management of patients in respiratory distress. There should be diligent care and attention made to the patient to ensure adequate oxygenation and patient comfort. This is achieved by monitoring oxygenation status of the patient via pulse oximetry, or less commonly, blood gas analysis. The patient's clinical status also goes a long way to tell how

comfortable they are. Patients who are still hypoxemic remain restless and are unable to fall asleep.

Vital signs should also be monitored (as frequently as deemed necessary) to monitor the patient's response to therapy. Intravenous catheter sites should be monitored on a regular basis to detect non-patency or phlebitis.

References and Suggested Readings

1. Sumner, Catherine, and Elizabeth Rozanski. "Management of respiratory emergencies in small Animals"
2. Rozanski, Elizabeth, and Daniel L. Chan. "Approach to the patient with respiratory distress." *Veterinary Clinics: Small Animal Practice* 35.2 (2005): 307-317.
3. Tseng, Laura W., and Lori S. Waddell. "Approach to the patient in respiratory distress." *Clinical techniques in small animal practice* 15.2 (2000): 53-62.
4. Loewen, Jennifer M., and Jonathan F. Bach. "Respiratory distress in small animals: Pathophysiology and clinical approach." *Journal of Veterinary Emergency and Critical Care* 32.S1 (2022): 3-15.

FIRST FIVE MINUTES

Adesola Odunayo, DVM, MS, DACVECC
 Clinical Associate Professor, University of Florida
odunayoa@ufl.edu

Life-threatening emergencies are presented to veterinary practitioners (both in general, urgent and emergency practices) commonly. In some cases, the prognosis is poor- regardless of the interventions performed by the veterinary staff. In other cases, specific interventions may directly affect the patient's outcome. This session will provide an overview of the most impactful interventions during the 1st few minutes of common emergencies.

The ABC's should be followed when evaluating any patient, regardless of how "stable" they look on presentation. The initial triage consists of the primary survey of the animal. The main goal of that patient's initial assessment (primary survey) is to identify any life-threatening abnormalities in the airway, breathing and circulatory system (ABCs). Common conditions that will result in airway obstruction include brachycephalic syndrome, collapsing trachea, foreign body obstruction, hypersensitivity reaction, laryngeal edema, laryngeal paralysis, severe upper airway or facial trauma. Animals with airway obstruction classically present with audible respiratory noise, typically characterized by inspiratory stridor. Those animals may have an increased respiratory rate and effort and may also be orthopneic. Cyanosis may be present if oxygen intake is significantly affected.

If respiratory failure is imminent, rapid anesthetic induction should be performed and the animal should be intubated (This one process MIGHT be lifesaving. Generally if the thought crosses your mind, it means you should do it!) Assisted ventilation should be performed in animals with inadequate ventilation (based on chest excursion or end tidal CO₂). An emergency tracheostomy may be required in patients where orotracheal intubation is impossible. The patient may then be transported, ideally with a veterinary professional to a referral center. The patient may be extubated but some patients may need to be intubated for transport. A propofol CRI generally works well but there should be plans made for assisted ventilation during transport.

Diseases that can impair normal oxygenation and ventilation include pneumothorax, hemothorax, chylothorax, pyothorax, pulmonary edema, pulmonary thromboembolic disease or allergic airway disease. Animals with breathing difficulties are usually tachypneic, have increased respiratory rate and effort and may be cyanotic. Radiographs can be used to identify pleural space disease but should not be performed in unstable patients. If available, thoracic ultrasound (TFAST) should be used to identify pleural effusion. TFAST has also been described for identification of pneumothorax. Animals with breathing difficulty should be administered flow by oxygen immediately. A thoracocentesis should be performed when pleural space disease is identified or suspected. Animals with large amounts of pleural effusion or air should not be transported before the pleural space is evacuated. Butorphanol is usually well tolerated with respiratory disease, and provides good sedation to help with anxiety and allow for thoracocentesis.

Circulatory disturbances (shock) may sometimes not be as obvious as airway and breathing difficulties but are equally as important. Poor circulation leads to poor oxygen delivery, which

ultimately causes cell death, organ dysfunction and patient death. Shock is usually easy to identify once the veterinarian has a clear idea of what they are looking for.

Causes of shock and poor circulation includes hypovolemia (GI, blood loss, severe dehydration), cardiogenic shock, obstructive shock (GDV, cardiac tamponade) or distributive shock (sepsis). Physical exam findings that indicate shock in dogs and cats include tachycardia, bradycardia, pale mucous membranes, prolonged capillary refill time, weak pulses and hypothermia. Additional diagnostics that supports shock is hypotension and elevated blood lactate levels.

Significant hemorrhage should be addressed immediately with direct pressure or ligation. Abdominal hemorrhage may be slowed with pelvic limb or abdominal compression bandage. Intravenous fluids are indicated in most cases of circulatory disturbances (except cardiogenic shock) .Blood products may be administered before transporting the patient.

Other Considerations

Hyperkalemia should be treated with insulin and dextrose infusions. Sodium bicarbonate and beta agonists should also be considered if insulin is unavailable. Severe hypokalemia may affect diaphragm function and ventilation and should be rapidly corrected. Potassium may be infused at a maximum rate 0.5 mEq/kg/hr. Hypocalcemia should also be corrected with a calcium gluconate CRI (0.5-1.5 mL/kg bolus) and may be repeated until clinical signs of hypocalcemia resolve. Hypoglycemia should be rapidly corrected with intravenous dextrose. Hyperglycemia rarely requires emergent therapy with insulin.

Steroids are rarely indicated in all emergency patients except there is a high index of suspicion for hypoadrenocortical crisis or an allergic reaction. Steroids are not indicated in animals with shock or head trauma. Animals with seizures should be treated with injectable benzodiazepines. Long acting anti-epileptic drugs should be considered in animals with status epilepticus or animals with a cluster of seizures (more than 2 seizures in 24 hours). Patients with back or neck injuries should be transported in lateral recumbency on a solid surface. Fractures of the distal limbs should be stabilized with a bandage with the joint above and below the fracture incorporated. Penetrating objects should NOT be removed unless the clinician is prepared for immediate invasive surgery.

Pain should be treated with systemic opioids. NSAIDS and alpha-2 agonists should be avoided in animals with cardiovascular compromise.

References

1. Donnelly, Emma, and Daniel Lewis. "Triage of the veterinary patient." *In Practice* 38 (2016): 6-11.
2. Jordan, Lynn A., and Benjamin M. Brainard. "Triage in the veterinary emergency room: part 2." *The veterinary nurse* 2.10 (2011): 560-566.
3. Mazzaferro, Elisa M. "Triage and approach to the acute abdomen." *Clinical techniques in small animal practice* 18.1 (2003): 1-6.

NUTRITION FOR THE HOSPITALIZED PATIENT

Adesola Odunayo, DVM, MS, DACVECC
 Clinical Associate Professor, University of Florida
odunayoa@ufl.edu

There are a variety of things the veterinary professional has to consider, in order to optimize the medical care of the critically ill patient. This includes heart rate, glucose, blood pressure, fluid balance, electrolytes, acid base status and nutrition. Nutrition plays a very important role in the management of critically ill patients. Numerous human and veterinary studies have shown a direct correlation between implementation of early nutrition and patient outcome.¹⁻⁵ In other words, increased intake of energy and protein appear to be associated with improved clinical outcomes in hospitalized patients.

Why Nutrition Should be Implemented Early

Hospitalized patients generally have many risk factors that contribute to malnutrition, including reduced dietary intake, reduced gastrointestinal absorption, increased gastrointestinal loss and increased energy expenditure. These may occur because of the primary disease process or as a consequence of their medical intervention. Consequences of malnutrition include but are not limited to

- Depleted fat and protein stores may lead to impaired immune function and neuromuscular impairment^{6,7}.
- Increases in the basal metabolic rate, which increases protein metabolism- leading to more significant complications, including an increased mortality rate.^{6,7}
- Increased intestinal permeability leading to bacterial translocation and sepsis^{1,7}.
- Delayed wound healing as a result of depleted protein stores and decreased immune function⁸

However, the significant adverse effects of malnutrition can be avoided/reversed by providing early nutrition to hospitalized dogs and cats.^{6,8,9} The goals of nutritional support are to provide the patient's ongoing nutritional needs, prevent or correct nutritional deficiencies, minimize metabolic derangements and prevent further catabolism of body tissue.¹⁰

Why Enteral Nutrition is Superior to Parenteral Nutrition

The enteral route (providing nutrition through the gastrointestinal tract) is the best way to provide nutrition to hospitalized patients. It is easy to administer, inexpensive and is the most physiologic way of providing assisted nutrition. Enteral nutrition helps maintain intestinal structure and function, it decreases the risks of bacterial permeability and helps improve gastrointestinal immune function.¹⁰

Parenteral nutrition (intravenous) nutrition can be considered for a select group of patients (patients with irretractable vomiting/regurgitation, patients with altered mentation which puts them at a high risk of aspiration pneumonia or patients with significant malabsorptive disease). Parenteral nutrition is infrequently utilized in hospitalized patients due to its significant

disadvantages. Disadvantages of parenteral nutrition includes increased cost, increased risk of infection and the loss of the physiologic benefits provided by enteral nutrition.

How to Provide Enteral Nutrition

Assisted nutrition can be easily implemented in hospitalized patients using feeding tubes. Short-term feeding tubes (nasogastric or nasoophageal tubes) are easy to place, relatively inexpensive and are well tolerated by dogs and cats. They can be placed with minimal sedation (if required) and can be utilized for prolonged hospitalization (5-7 days). Due to the size of nasoesophageal and nasogastric tubes (3.5Fr to 10Fr), their use is limited to liquid diets (such as the Royal Canin liquid diets)

Long-term feeding tubes can also be utilized in hospitalized patients (i.e. esophageal tube, gastrostomy tube) but the patient has to be stable enough for general anesthesia, which is required to place these tubes. Long-term feeding tubes are also usually placed in patients that are going to be discharged with a feeding tube in place. Thus, nasogastric/nasoesophageal tubes are utilized early in hospitalization and the patient is then transitioned to a long term feeding tube if they remain anorexic.

When to Provide Enteral Nutrition

Assisted feeding, via enteral nutrition, should immediately become part of a patient's plan when one or more of the following requirements have been met

- Anorexia for ≥ 3 days. This includes the number of days the patient had not eaten before presenting to the veterinary practice.
- Hepatic lipidosis or diabetic ketoacidosis
- Impaired ability to eat (jaw fractures, neurologic cases with normal gag reflex)

Enteral nutrition should be initiated once the patient is hemodynamically stable, rehydrated and all electrolyte abnormalities have been corrected.^{10,11}

References

1. Mohr, A.J., Leisewitz, A.L., Jacobson, L.S., Steiner, J.M., Ruaux, C.G. and Williams, D.A., 2003. Effect of early enteral nutrition on intestinal permeability, intestinal protein loss, and outcome in dogs with severe parvoviral enteritis. *Journal of Veterinary Internal Medicine*, 17(6), pp.791-798.
2. Brunetto, M.A., Gomes, M.O., Andre, M.R., Teshima, E., Gonçalves, K.N., Pereira, G.T., Ferraudo, A.S. and Carciofi, A.C., 2010. Effects of nutritional support on hospital outcome in dogs and cats. *Journal of Veterinary Emergency and Critical Care*, 20(2), pp.224-231.
3. Remillard, R.L., Darden, D.E., Michel, K.E., Marks, S.L., Buffington, C.A. and Bunnell, P.R., 2001. An investigation of the relationship between caloric intake and outcome in hospitalized dogs. *Vet Ther*, 2(4), pp.301-310.
4. Alberda, C., Gramlich, L., Jones, N., Jeejeebhoy, K., Day, A.G., Dhaliwal, R. and Heyland, D.K., 2009. The relationship between nutritional intake and clinical outcomes in critically ill

patients: results of an international multicenter observational study. *Intensive care medicine*, 35(10), pp.1728-1737.

5. Tappenden, K.A., Quatrara, B., Parkhurst, M.L., Malone, A.M., Fanjiang, G. and Ziegler, T.R., 2013. Critical role of nutrition in improving quality of care: an interdisciplinary call to action to address adult hospital malnutrition. *Journal of Parenteral and Enteral Nutrition*, 37(4), pp.482-497.

6. Dobson, K. and Scott, A., 2007. Review of ICU nutrition support practices: implementing the nurse-led enteral feeding algorithm. *Nursing in critical care*, 12(3), pp.114-123.

7. Gramlich, L., Kichian, K., Pinilla, J., Rodych, N.J., Dhaliwal, R. and Heyland, D.K., 2004. Does enteral nutrition compared to parenteral nutrition result in better outcomes in critically ill adult patients? A systematic review of the literature. *Nutrition*, 20(10), pp.843-848.

8. Saunders, J. and Smith, T., 2010. Malnutrition: causes and consequences. *Clinical medicine*, 10(6), pp.624-627.

9. Will, K., Nolte, I. and Zentek, J., 2005. Early enteral nutrition in young dogs suffering from haemorrhagic gastroenteritis. *Journal of Veterinary Medicine Series A*, 52(7), pp.371-376.

10. Chan, D.L., 2004. Nutritional requirements of the critically ill patient. *Clinical techniques in small animal practice*, 19(1), pp.1-5.

11. Marks, S.L., 1998. The principles and practical application of enteral nutrition. *Veterinary Clinics: Small Animal Practice*, 28(3), pp.677-708.

Fluid Therapy

Adesola Odunayo, DVM, MS, DACVECC
 Clinical Associate Professor, University of Florida
odunayoa@ufl.edu

Fluid therapy is an important part of the management of small animal patients. It is commonly used for the treatment of shock, dehydration, acid base disturbances and electrolyte imbalances. The body is composed primarily of water. Total body water is roughly about 60% of body weight. This water is distributed between the intracellular fluid (ICF) and the extracellular fluid compartment (ECF). The ICF is the larger of the two compartments and has about 2/3 (66%) of the total body water. The ECF is divided into the interstitial and the intravascular space. The interstitial space is about 75% of the ECF, while the intravascular space is about 25%. While water moves freely within most of the compartments in the body, electrolytes cannot move through the intracellular compartment without a transport system. Larger molecules (>20,000) daltons do not easily cross the vascular endothelial membrane and help create the colloid osmotic pressure (COP).

Fluid Prescription

Coming up with a fluid prescription or plan is an important part of clinical veterinary medicine, one that the veterinarian participates in every single day. While fluid therapy plays an important role in patient outcome, inappropriate use may be excessive, pro-inflammatory and potentially injurious. Fluids should be considered as drugs with specific indications, therapeutic windows and adverse effects. An understanding of the different types of fluids available to the small animal practitioner will allow better patient care.

Intracellular fluid loss is difficult to recognize clinically. Patients with intracellular loss are usually hypernatremic. The most common clinically recognizable fluid loss is from the interstitial space and is recognized as dehydration. This is manifested as dry mucous membranes, presence of a skin tent, sunken eyes and/or the presence of a doughy abdomen. Dehydration is not considered life threatening unless it is really severe and leads to intravascular fluid loss. Significant losses in the intravascular space is recognized as hypovolemia. This is life threatening and treatment of fluid loss from this space may determine if the patient lives or dies. All animals with evidence of hypovolemia must be treated emergently. Clinical signs suggestive of hypovolemia includes tachycardia (bradycardia in cats), weak pulses, hypotension, altered mentation and cold extremities. Cats tend to be hypothermic, bradycardic and hypotensive.

My approach to fluid therapy consists of determining where the fluid loss is, which can typically be answered based on the physical exam. The practitioner may follow three phases to coming up with a fluid plan

1. Resuscitation: This phase is important if the animal has clinical signs consistent with hypovolemia. Providing fluid therapy in multiples of maintenance doses is usually not enough to treat this potentially life-threatening condition. Large short bore intravenous catheters should be utilized (the intraosseous route is very appropriate when cardiovascular collapse is present). Large volumes of isotonic crystalloids should be given rapidly over 10-15 minutes. The shock dose commonly prescribed is 90ml/kg/hr in dogs and 45-60 ml/kg/hr in cats. These volumes represent the entire blood volume and is rarely needed in an emergency. Recommendations are

to provide **20-25 ml/kg over 15 minutes in dogs** and **10-15 ml/kg over 15 minutes in cats**. The rate can be accelerated using pressure bags, syringes and fluid pumps. After each bolus is delivered, the animal should be re-evaluated to see if end goals have been met. These goals include a normal heart rate, pulse quality, blood pressure and/or lactate concentration. Fluid boluses may be repeated if end goals have not been reached. Note that cats should be actively warmed up before providing large amounts of fluids to them.

Note that not all animals need to be resuscitated. This phase is only required for animals that present with signs of hypovolemic shock.

2. Rehydration: This phase is required to treat animals with signs of interstitial space deficit. The fluids administered in this phase is independent of any fluids administered in the resuscitation stage. The animal's fluid deficit is estimated based on physical exam findings as a percentage of their fluid loss. The fluid deficit is then calculated as % dehydration X weight in kgs. This fluid deficit is then given back to the animal over 6-24 hours. Generally maintenance fluids and any on-going losses are then added to the rehydration plan.

3. Maintenance: This phase is indicated when there is no evidence of volume depletion, interstitial fluid loss or ongoing losses. There are different calculations available for maintenance but I usually use about 60ml/kg/day in dogs and 45-60ml/kg/day in cats. Note that puppies and kittens have a higher maintenance rate (90-120 ml/kg/day) while larger breed dogs tend to have a lower maintenance rate (40-45 ml/kg/day)

Fluid Plan- Examples

1. 10-year-old 10 kg female spayed mixed breed dog with anorexia for 2 days, intermittent vomiting. Estimated to be about 5% dehydrated on physical exam. Vitals and rest of physical exam is normal

2. 5-year-old, 5kg cat presented for being unresponsive. Heart rate 120 beats/minute, temperature 94 degrees with weak femoral pulses. Estimated to be about 6% dehydrated. Rest of physical exam is unremarkable.

3. 12-year-old, 20 kg mix breed dog, presented for evaluation of azotemia diagnosed by another veterinarian. PE revealed normal vitals. Estimated to be 7% dehydrated, oral ulcerations but physical exam otherwise normal. BUN= 180, creatinine 7.9

Crystalloids

Crystalloids are generally described as electrolyte containing fluids. They can be categorized as replacement or maintenance fluids. Replacement fluids are usually given in large volume at a rapid rate and are designed to achieve physiologic endpoints. Maintenance fluids are provided in small volumes and usually do not cause acid-base or electrolyte alterations. Maintenance fluids are generally hypotonic. All crystalloid fluids are prepared in a water base but have different electrolyte composition.

1. Isotonic replacement fluids

Isotonic replacement fluids are the most helpful type of fluids used to replace deficits in hypovolemic or dehydrated animals. They are commonly used to expand the intravascular and interstitial spaces and do not distribute to the intracellular space. They provide very little to no free water and no colloid support. They have electrolyte compositions similar to plasma and have the same or similar osmolarity and tonicity to plasma. About 30 minutes after administration, about 75% of their infused volume redistributes to the interstitial space and about 25% remains in the vascular space.

a. Physiologic saline (0.9% NaCl)

Physiologic saline is a commonly used isotonic crystalloid. It contains 154 mEq/L of sodium and chloride respectively. Its chloride concentration is much higher than canine and feline ECF chloride concentration. Its sodium concentration is also relatively higher than normal serum sodium concentration.

Physiologic saline is devoid of potassium and is traditionally advocated to be the fluid of choice during hyperkalemic crises (Addison's disease, obstructive feline lower urinary tract disease), although other isotonic fluid types are reasonable choices in that respect. Its high sodium concentration makes it a good volume expander during periods of hypovolemia. It may also be used for gradual correction of hyponatremia. Recheck of serum sodium concentration is recommended every 2-4 hours to ensure that rapid correction does not occur. It is an ideal fluid of choice in patients with hypochloremic metabolic acidosis (e.g. patients that are vomiting stomach contents). It is also the preferred fluid of choice for animals with hypercalcemia as it selectively causes calciuresis. Physiologic saline is compatible with many drugs, blood products and sodium bicarbonate.

Based on its higher chloride levels, it tends to produce a higher serum, chloride concentration after infusion. Chloride is acidifying, thus infusions of physiologic saline may cause a hyperchloremic metabolic acidosis. This may lead to a delay in resolution of acid-base

abnormalities in animals with pre-existing metabolic acidosis. Unlike other isotonic crystalloids, physiologic saline has no buffers. Large volumes of physiologic saline may also cause hypokalemia, due to its lack of potassium. Due to its low pH, physiologic saline should not be administered subcutaneously.

b. Lactated Ringers Solution (LRS)

LRS is a balanced isotonic replacement fluid. It has a 130 mEq/L of sodium and 109mEq/L of chloride. The sodium concentration is slightly lower than serum sodium concentration, while the chloride concentration is close to plasma reference ranges.

LRS contains the sodium salt form of lactate. The lactate is metabolized in the liver and produces a mild alkalinizing effect. Animals with severe liver disease may have a reduced ability to metabolize lactate in the liver. This may cause a slight increase in plasma lactate levels but does not directly contribute to an acidosis. In essence, lactic acidosis is not a contraindication to using LRS. In most animals with lactic acidosis, the primary cause is poor perfusion. These animals will respond to fluid therapy and their lactic acidosis will resolve, regardless of the type of fluid used. LRS is the fluid of choice for botulism and other neuromuscular blockade diseases because of its lacks magnesium and has calcium. It may be the preferred fluid choice for use in neonates because lactate is their preferred metabolic fuel during periods of hypoglycemia. Due to the presence of calcium, LRS should not be administered in the same IV line as blood products. The calcium in LRS will bind to the citrate anticoagulant and cause precipitation. It should also not be used in the same line as sodium bicarbonate for similar reasons. LRS should be used judiciously in dogs with lymphoma as it may cause higher plasma lactate levels in those dogs.

C. Plasmalyte A and Normosol R

Both fluid types are very similar except that Plasmalyte A has a pH of 7.4 and normosol has a pH of 6.6. Both of these isotonic crystalloids have acetate and gluconate as buffers. Unlike lactate, both of these buffers do not rely solely on the liver for metabolism. Both fluids are alkalizing fluids with sodium concentrations in the normal physiologic range (140 mEq/L). Both fluids can be generally used in any situation, especially in cases with metabolic acidosis. Caution should be taken in cases where exogenous magnesium is contraindicated (botulism or neuromuscular weakness as magnesium potentiates neuromuscular blockade). They should also not be administered in the same line as injectable enrofloxacin as this may cause potentially dangerous precipitations.

2. Hypertonic replacement fluids

a. Hypertonic saline is the main hypertonic replacement fluid used in veterinary practice. It comes in various concentrations (3%-23.4%). It is used to rapidly (but transiently) expand plasma circulating volumes. In addition to raising blood volume, hypertonic saline can increase myocardial contractility, as well as produce anti-inflammatory effects. It is commonly used in animals with elevated intracranial pressure secondary to head trauma or neoplasia. IT has been shown to be about as effective (or more effective in a few studies) as mannitol. It is usually used at 4-6 ml/kg pushed over 10-15 minutes. Contraindications of hypertonic saline administration include pre-existing hypernatremia, hyperosmolarity or hypokalemia. In animals that are significantly dehydrated, isotonic crystalloids should be administered prior to, currently with or right after hypertonic saline is given.

3. Maintenance fluids

Maintenance fluids are used to provide the amount of fluid and electrolyte needed to maintain daily homeostasis. Replacement fluids are commonly used for maintenance fluid requirements in veterinary medicine but prolonged use of replacement fluids may lead to hypernatremia, hyperosmolarity and contraction of the ICF. However, unmonitored use of maintenance fluids may lead to hyponatremia and hypoosmolarity.

Maintenance fluids are generally hypotonic and contain a higher concentration of potassium and lower concentration of sodium than isotonic replacement fluids. They may also contain dextrose, which helps increase their tonicity and makes them isotonic but become effectively hypotonic once the dextrose is metabolized. Because of their low tonicity, they distribute into all fluid compartments, including the intracellular space. They should not be administered as a bolus to prevent the development of tissue edema.

- a. 0.45% sodium chloride/2.5% dextrose is the most commercially available maintenance fluid. It is also called half strength saline with dextrose. It has 77 mEq/L of sodium and chloride, about half the amount of physiologic saline. Half strength saline is useful in providing free water to patients with hypernatremia. It may also be used in patients with cardiac disease, to reduce sodium loading.

4. Colloids

Colloids are large molecular weight fluid types (>20,000 daltons) that are generally restricted to the intravascular space as long as the endothelium is intact. They are primary intravascular expanders and their use generally lead to more rapid volume expansion, as compared to crystalloids. They are isoosmotic and do not generally affect the ICF. The use of colloids in animals with intact vascular endothelium usually results in an increase in colloid osmotic pressure (COP).

They are divided into natural (plasma, whole blood) and synthetic colloids (hetastarch, vetstarch, pentastarch). This presentation will primarily focus on synthetic colloids. The most common synthetic colloids used in veterinary patients include hetastarch and vetstarch (voluven). Hetastarch and vetstarch are usually administered as a constant rate infusion at 20ml/kg/day. Due to its lower average molecular weight, vetstarch may be administered up to 50ml/kg/day.

Synthetic colloids may have adverse effects on coagulation with vetstarch having less of an effect than hetastarch. Synthetic colloids are also implicated in the development of hospital acquired acute kidney injury in human hospital although this has yet to be proven in veterinary patients. Lastly, allergic reactions to synthetic colloids, though rare, may occur during use.

References

Lee, Justine A., and Leah A. Cohn. "Fluid Therapy for pediatric patients." *The Veterinary Clinics of North America. Small Animal Practice* 47.2 (2017): 373.

Davis, Harold, et al. "2013 AAHA/AAFP fluid therapy guidelines for dogs and cats." *Journal of the American Animal Hospital Association* 49.3 (2013): 149-159.

Byers, Christopher G. "Fluid Therapy: Options and Rational Selection." *The Veterinary Clinics of North America. Small Animal Practice* 47.2 (2016): 359-371.

Odunayo A. Guide to Fluid Therapy. Clinician's Brief. October 2018

Update on Integrative Modalities Used in Veterinary Medicine with Focus on PEMF

Conny Mosley, Dr.med.vet., DACVAA, CVA

Osteoarthritis (OA) requires a multimodal treatment plan, which can be effectively supported by various modalities. These modalities can be incorporated into a rehabilitation program or as a stand-alone treatment. The new **Canadian Consensus Guidelines on Osteoarthritis Treatment based on OA-COAST Stages 1-4** recommend and explain the benefits and limitations of some of the more common modality options. Research is still in its infancy when it comes to objectively assessing and evaluating the effects of certain modalities on pain, mobility and quality of life and we rely on subjective clinical experience for usefulness. This obviously comes with owner and veterinary bias that can be reduced by trending video documentation. Individual differences to the treatment response and differences in the clinician's methodology add another layer of complexity to the efficacy evaluation. It remains important to continue to read the available studies, understand the bias, risks, side effects, techniques, required level of training or certification process, to better evaluate the benefits of different therapeutic modalities. The list of modalities more commonly used to support OA and chronic pain treatments include photobiomodulation, acupuncture, and Pulsed ElectroMagnetic Field therapy (PEMF), but others are often considered by experienced and trained practitioners (including osteopathy, chiropractic, canine massages, cryotherapy, therapeutic ultrasound among others).

Pulsed ElectroMagnetic Field therapy (PEMF) is an emerging area of interest in both human and veterinary medicine for a variety of diseases, but particular within pain and inflammation, and OA treatment. It is an FDA approved non-invasive, non-thermal treatment device which has shown increasing awareness and popularity for in-home or in-clinic use. PEMF utilizes pulsed low level electromagnetic frequencies (6-500zH), which stimulate various biological effects at the level of the cells. A full understanding of the mechanism of action has not been achieved, but for OA the stimulation of chondrocyte proliferation and differentiation, as well as extracellular matrix synthesis has been suggested. PEMF reduces the inflammatory cell infiltration and leads to a reduction in immuno-positive cells to IL-1 β , a decrease in TNF- α , and an increase in TGF- β 1 (promoting cartilage repair). An increased release of intracellular calcium, leads to an increase in binding of calcium to calmodulin, which in turn effects downstream signaling pathways including nitric oxide induction. PEMF shows promising results in both *in-vitro* and *in-vivo* studies to provide pain relief, improved function and slowing down the progression of OA. Although literature is readily available, the quality of veterinary studies on PEMF are still limited and more species and disease specific research needs to be conducted. As an adjunct, non-invasive therapy, this modality will likely play an increasing role in clinics and, especially as an in-home device in form of commercially available loops, discs, and mats. The confusing part for both owners and veterinarians are the growing variety of commercially available devices, that differ in shape, strength of its' electromagnetic wavelength, which in parts determines the frequency and duration of treatment. The majority of commercially available devices are untargeted wellness devices in form of mats that have technical specs below the therapeutic levels. FDA approved targeted PEMF therapy devices are required to provide efficacious and safe treatments. Clinical studies in humans have been conducted in various conditions including inflammation, pain and edema, soft tissue injury, wound healing, OA, sleep, neurological disorder, (including psychiatric disorders) and bone healing. Due to the increasing understanding of conservative treatments and better use of rehabilitation in veterinary medicine, there has been an increasing interest in PEMF therapy. In particular, for cats that do not appreciate the frequent clinic visits benefit from in-home treatment options.

Mosley CI. Proposed Canadian Consensus Guidelines on Osteoarthritis Treatment Based on OA-COAST Stages 1–4. *Front. Vet. Sci.*, 26 April 2022 | <https://doi.org/10.3389/fvets.2022.830098>

Wang T, Xie W, Ye W, He C. Effects of electromagnetic fields on osteoarthritis. *Biomed Pharmacother.* (2019) 118: 109282. doi: 10.1016/j.biopha.2019.109282.

Nelson FR, Zvirbulis R, Pilla AA. Non-invasive electromagnetic field therapy produces rapid and substantial pain reduction in early knee osteoarthritis: a randomized double-blind pilot study. *Rheumatol Int.* (2013) 33(8): 2169-2173. doi: 10.1007/s00296-012-2366-8.

Wu Z, Ding X, Lei G, Zeng C, Wei J, Li J, *et al.* Efficacy and safety of the pulsed electromagnetic field in osteoarthritis: a meta-analysis. *BMJ Open.* (2018) 8(12): e022879. doi: 10.1136/bmjopen-2018-022879.

Gaynor JS, Hagberg S, Gurfein BT. Veterinary applications of pulsed electromagnetic field therapy. *Res Vet Sci.* (2018) 119: 1-8. doi: 10.1016/j.rvsc.2018.05.005.

Neutraceutical Therapies Utilized in Veterinary Medicine in the Context of Scientific Knowledge

Conny Mosley, Dr.med.vet., DACVAA, CVA

Osteoarthritis (OA) requires a multimodal treatment plan, and the use of a joint supplement(s) is common and often requested by owners. The new **Canadian Consensus Guidelines on Osteoarthritis Treatment based on OA-COAST Stages 1-4** recommend a chondroprotective joint health plan. Some patients are not able to take NSAIDs due to potential co-existing diseases, therefore other options with anti-inflammatory properties are needed, which are available in form of medicinal herbal supplements. The challenges are the many available options, which can make the selection for the most appropriate supplement for a specific patient and its individual condition difficult.

Nutraceutical products or supplements are considered Animal Health Products, which have a different regulation process than pharmaceutical products. They do not require research or safety studies, but also cannot claim therapeutic benefits. When deciding on a specific product, it is important to evaluate the ingredient list and their concentrations. A certificate of analysis can be obtained, for quality assurance, showing that the concentrations of the ingredients are true, and that the product is free of contaminants like residual solvents, heavy metals, microbials, pesticides, or fungus. A reputable company is transparent and will provide information about quality of product, source of ingredients and manufacturing standards. A natural product number (NPN) is provided for a licensed natural health product assessed by Health Canada when deemed safe, effective and of high quality, which adds to quality assurance. To date we have little information about the stability of products, ingredient interaction, bioavailability, or PK profile, including dosing for most natural health products. Research evaluating the effects of using certain nutraceutical products together with other nutraceutical or pharmaceutical products, especially when the mechanism of actions is similar, or the metabolism is impacted, would be helpful. In general, we presume a synergistic or additive effect, but this is scientifically not established for most products. Close monitoring for efficacy and adverse events is recommended as has been previously suggested for any multimodal treatment regimen.

Choosing a product may include considerations like product formulation, palatability, and ingredient list. Understanding the mechanism of action (MOA) and pharmacology behind each ingredient and evaluate the documented evidence is imperative. Assessing studies require a critical mind considering the limitations we still face within pain research (animal's objective assessments, picking up on small improvements, assessing reduction in joint disease progression over 'improvements', etc.). At times we only have in-vitro studies available to us, which provide good information on MOA, but may lack on pharmacokinetic results. We should not undervalue the clinical experience with products, as long as we try to evaluate the effects and lack of effects or adverse events closely and as objective as possible. Individual variety in responses to certain products and high placebo effects in both owners and veterinarians are not uncommon. To assess any effectiveness, owners are encouraged to keep a journal, document with regular video recording for comparisons from before starting a new product, and if possible blind their partner to the treatment. A minimum of 1 month trial to establish if a specific product is working before switching to another one, is recommended. Palatability also plays an important role in the choice of supplements.

When evaluating a product to add to a multimodal treatment plan, reflect on the ingredient list with the goal and purpose the product is meant to achieve (ie chondroprotective focus, pain relief, muscle strengthening, muscle relaxation, GI protection?). Most commonly we look for a product that supports joint health and contains ingredients that have shown to have effects on the inflammatory cascade as well as the proven ability for chondroblast differentiation, presuming a chondroprotective property.

A more detailed understanding of the ingredient's effects can be helpful as explained in some examples:

Boswellia Serrata (also known as 'true' frankincense) comes from the active ingredient oleo-gum resin of its tree and has been included in many anti-arthritis joint supplements. The MOA for its anti-inflammatory property is the inhibition of leukotriene (5HETE and leukotriene B4) synthesis by blocking the 5-lipoxygenase as well as reduction of glycosaminoglycan degradation, inhibition of TNF α and IL-1 β *in-vitro*. The clinical studies are promising in dogs and humans. Boswellia has a wide safety range, based on acute and chronic toxicity and safety studies. The dose in one canine study was 40mg/kg, but others have suggested 50-100mg/kg once daily.

Perna canaliculus (green-lipped mussel) extract.

New Zealand green-lipped mussel extract products suggest having anti-inflammatory and chondroprotective properties through its high content in Omega 3 FAs (EPA, DHA), glycosaminoglycans (chondroitin sulfate) and provide a good source of zinc, iron, selenium, VitB12, A and E. Its beneficial effects on GI microbiome adds to anti-inflammatory as well as gastroprotective properties. The mechanism of actions for its anti-inflammatory properties are a reduction in leukotrienes (5HETE, LTB4) via inhibition of LOX and COX. A reduction in certain protein expression in arthritis models has also been suggested. Clinical trials in veterinary medicine show promising results in its use as a supplement for OA treatment. More details on exact dosing and formulations will allow for more insights into ideal efficacy.

Egg-shell membrane (ESM) is the mesh-like bilayered substance which lays between the calcified shell and the albumin in chicken eggs. It is composed of fibrous proteins including collagen type I, keratin and elastin, and glycosaminoglycans. Egg-shell membrane extract has been studied *in-vitro* and indicated an inhibition of IL1 β and TNF α . A clinical study with a commercial product presented positive effects on symptom relief that were detectable after 1 week and lasted throughout the study period of 6 weeks, but a statistical significance was not able to be achieved. The study further revealed a change in serum levels for a cartilage degradation biomarker and concluded a potential chondroprotective aspect. Symptom relief was also concluded in a clinical trial with dogs with HD. Dosing has been suggested to be 15mg/kg/day. Egg shell membrane supplements are an option for symptom relief, however its role in chondroprotective measures and its pharmacokinetic profile require future studies to be completed.

Avocado soybean unsaponifiable (ASUs) is a mixture of the unsaponifiable fractions of one-third avocado oil and two-third soybean oil. The mechanism of action is suggested to be the inhibition of IL-1, stimulation of collagen synthesis, and a potent inhibition of IL-8 and PGE₂. Cartilage repair may be promoted by its action on subchondral bone osteoblasts (preventing the osteoarthritic osteoblast-induced inhibition of matrix molecule production). A structural assessment study in a canine cruciate model with a dose of 10mg/kg/day demonstrated that ASUs reduce the development of early osteoarthritic cartilage and subchondral bone lesions (mediated by the inhibition of inducible nitric oxide synthase and matrix metalloproteinase 13). Another study with 12mg/kg/day evaluated joint

fluids and revealed an increase in TGF- β 1 and 2 levels, both considered to be associated with the chondrocyte production of collagen and proteoglycans. Other clinical trials assessing the efficacy of ASU in conjunction with glucosamine and chondroitin failed to show a significant difference in results, which may possibly be due to relatively low dosing (2.5-4.5mg/kg/day). Overall, the evidence for ASU providing beneficial effects in canine OA is still limited but positive for both symptom relief and potential chondroprotective effects, although product differences need to be considered.

References:

Adebowale A, Du J, Liang Z, Leslie JL, Eddington ND. The bioavailability and pharmacokinetics of glucosamine hydrochloride and low molecular weight chondroitin sulfate after single and multiple doses to beagle dogs. *Biopharm. Drug Dispos.* 2002;23(6):217–225.

Altinel L, Saritas ZK, Kose KC, Pamuk K, Aksoy Y, Serteser M. Treatment with unsaponifiable extracts of avocado and soybean increases TGF beta1 and TGF beta2 levels in canine joint fluid. *Tohoku J Exp Med.* (2007) 211(2): 181-6. doi: 10.1620/tjem.211.181.

Bhathal A, Spryszak M, Louizos C, Frankel G. Glucosamine and chondroitin use in canines for osteoarthritis: A review. *Open Vet J.* 2017;7(1):36-49. doi:10.4314/ovj.v7i1.6

Helal NA, Eassa HA, Amer AM, Eltokhy MA, Edafiogho I, Nounou MI. Nutraceuticals' Novel Formulations: The Good, the Bad, the Unknown and Patents Involved. *Recent Pat Drug Deliv Formul.* (2019) 13(2): 105-156. doi: 10.2174/1872211313666190503112040.

Hielm-Björkman A, Tulamo RM, Salonen H, Raekallio M. Evaluating Complementary Therapies for Canine Osteoarthritis Part I: Green-lipped Mussel (*Perna canaliculus*). *Evid Based Complement Alternat Med.* 2007;6(3):365-373. doi:10.1093/ecam/nem136

Maxwell LK, Regier P, Achanta S. Comparison of Glucosamine Absorption After Administration of Oral Liquid, Chewable, and Tablet Formulations to Dogs. *J Am Anim Hosp Assoc.* 2016; 52(2): 90–94

Reichling J, Schmökel H, Fitz J, Bucher S, Saller R. Dietary support with *Boswellia* resin in canine inflammatory joint and spinal disease. *Schweiz Arch Tierheilk.* 2004; 146(2): 71-9.

Rialland, P., Bichot, S., Lussier, B., Moreau, M., Beaudry, F., del Castillo, J. R., Gauvin, D., & Troncy, E. (2013). Effect of a diet enriched with green-lipped mussel on pain behavior and functioning in dogs with clinical osteoarthritis. *Can J Vet Res.* 2013;77(1):66-74.

Ruff KJ, Kopp KJ, Von Behrens P, Lux M, Mahn M, Back M. Effectiveness of NEM® brand eggshell membrane in the treatment of suboptimal joint function in dogs: a multicenter, randomized, double-blind, placebo-controlled study. *Vet Med (Auckl).* (2016) 7: 113-121. doi: 10.2147/VMRR.S101842.

Siddiqui MZ. *Boswellia serrata*, a potential anti-inflammatory agent: an overview. *Indian J Pharm Sci.* 2011; 73(3): 255-61. doi: 10.4103/0250-474X.93507.

An update on the Current Knowledge and the Clinical Aspect of Cannabinoids in Veterinary Pain Management

Cornelia I Mosley, Dr.med.vet., DACVAA, CVA

Pain management is probably one of the most common reasons for owners to ask a veterinarian about cannabis as a therapeutic option for their pet followed by neurological conditions, skin disease and behaviour management.

The emerging data for the use of medical cannabis in veterinary patients has been growing and research continues to be published for various species and specific diseases. In a Canadian survey, dog owners perceived cannabis products to be equal or more effective than conventional medications for pain and inflammation. In a similar 2016 survey from the US, dog owners reported subjectively 95% efficacy and cat owners 100% efficacy for pain. Realizing, that survey data is not as strong as a double-blinded placebo-controlled data, it can provide some clinical insight into efficacy for certain conditions. The recent well-designed clinical studies confirmed this insight. Limitations from most studies – like we see with a variety of pain related studies independent of the product tested- were the pain assessment tools. Because of the commonly inadequate or confusing methods of interpretations of assessment, it can be challenging when interpreting the evidence in chronic animal pain models in dogs and cats. Unfortunately, we still lack a valid objective assessment tool in our companion animals that is without a subjective or flawed component. A higher number of interpreters with an inter-interpreter evaluation could reduce some of the subjectivity. Despite these limitations, most of the cannabinoid related OA studies compared well to other pain studies using conventional medications.

Another consideration with cannabinoid studies is the testing of products with a very specific cannabinoid and terpene profile, which requires careful evaluation of the data and considerations when extrapolating it into clinical use, as the multitude of different products available and the inconsistency between the products can make it difficult to use or generalize the data. Unless an isolate was used, it is likely that a different product with a different profile will not have the same results than shown in the study, including its pharmacokinetic profile. This needs to be considered in the clinical case.

Nevertheless, the clinical studies that have been published give us some better understanding into the complexity of cannabinoid medicine and the importance of product profile and species-specific studies. One of the first randomized, placebo-controlled, double-blinded, cross-over study of CBD for osteoarthritis (OA) demonstrated a decrease in pain and an increase in activity in 16 dogs, which was reported by dog owners, but also included a pain assessment by a veterinarian. The CBD rich oil used is a 1:1 CBD to CBDA ratio with a rich terpene profile and was dosed at 2 mg/kg based on the CBD concentrations, administered orally twice daily. The mild elevations in the liver enzyme ALP were noted in nine of the dogs and this has been reported in other studies as well. Even with concurrent NSAID use in some of the patients, the combination was well tolerated throughout the study period and overall no other adverse events were described.

Another clinical pilot study found that the addition of a full spectrum CBD rich oil in a dose-escalating manner for dogs with chronic maladaptive OA pain, appeared to be successful in 30/32 dogs. The evaluation was done with one primary observer over a 90 day trial with dosing started at 0.25 mg/kg, twice a day, with an increment increase until reaching a final dose of 2 mg/kg twice a day. This dosing increase reflects what is practiced in a clinical setting. The concurrent treatment with gabapentin in 23/32 dogs was able to be discontinued in 10 dogs (43.5%) of those 23 dogs and reduced to 20–60% of the original dose in 11 of the 13 remaining dogs on gabapentin. Keep in mind tho, that this was a clinical pilot study, not a placebo-controlled or blinded study.

This study reflects what is clinically seen with cases on multimodal pain management and added cannabinoids. The understanding of possible drug interaction and synergistic effects within the multimodal approach is important. Phytocannabinoids, especially CBD, can inhibit and temporarily

deactivate the cytochrome P450 system in a dose dependent manner. It is not known if this is clinically relevant or patient specific in veterinary medicine, but theoretically this may contribute to delayed metabolism and prolonged activity of other analgesic agents when CBD is added to a multimodal analgesia protocol. Side effects might be seen due to potentially higher plasma levels of certain analgesic agents, but also may be occurring because of similar mechanism of actions and therefore potential synergistic effects and side effects between the different agents. Therefore, it is important to watch closely for these effects and consider a dose reduction of analgesic agents when using multimodal protocols that include phytocannabinoids. Synergism between the different analgesic agents has been scientifically demonstrated and is not uncommonly explained by the overlapping mechanism of actions. As an example, the synergistic effects between both gabapentin and CBD have been reported and sedation associated with the administration of high doses of gabapentin in combination with cannabinoids is not uncommonly seen clinically. This side effect could be related to increased gabapentin plasma levels due to the CYP450 system inhibition or because of the overlapping mechanisms of action. Careful consideration of drug dosage and patient monitoring is important when both gabapentin and CBD are used simultaneously. This is especially true in geriatric dogs to prevent the “drunken sailor” static ataxia that can be seen with higher gabapentin doses. Pregabalin is associated with fewer side effects and a favourable PK profile in comparison to gabapentin in dogs and has been more popular as an analgesic in chronic pain patients, particularly in senior pet. The combination of pregabalin with cannabinoids has clinically shown less sedation and therefore seems to be advantageous over gabapentin.

Not uncommonly, pet owners are reaching for cannabinoids, when their pet is not able to take NSAIDs, in light of the well documented anti-inflammatory effects of various cannabinoids. When NSAIDs are combined with cannabinoids it produces additive or synergistic analgesic effects due to the additional blockage of prostaglandins that are produced via delayed enzymatic endocannabinoid metabolism. The COX2 selective inhibition of both NSAIDs and cannabinoids (THCA, CBDA, CBG, and CBGA) increases endocannabinoid levels, adding to the synergism of analgesia. A big advantage is the gastroprotective property of some phytocannabinoids that may counteract some of the NSAID-related GI concerns (β -caryophyllene).

It is important to evaluate each case individually and make adjustments based on clinical evaluation. Something to remember is that the response to pain as well as the response to analgesic agents is highly individual and variable. This is in particular true for cannabinoid medicine, where the response variability may be attributed to the individual’s tonic activity of their ECS (known as the “Endocannabinoid Tone”). The individual tonic ECS activity will influence the endocannabinoid production, the hydrolyzing enzymes efficiency and the morphology, number and distribution of cannabinoid receptors. All of those components will influence the response to a painful stimulus. Another interesting development in individualized chronic pain management is the understanding of ‘genetic profiling’, which explains why some individuals respond favourably to certain analgesics in comparison to other patient populations. These so-called responders and non-responders to certain drugs are well recognized in opioid therapy but are also noted in cannabinoid therapy. This can be related to the metabolic ability of the patient, including the endocannabinoid degrading enzymes and various cytochrome producing enzymes, but also the genetic variants of the ECS receptors. All of those can be variable in individuals and will result in very different responses to pain therapy between individuals including to cannabinoid medicine. This is also applicable in other conditions and diseases.

References:

1. Gamble, L., Boesch, J. M., Frye, C. W., Schwark, W. S., et al. (2018). Pharmacokinetics, safety, and clinical efficacy of cannabidiol treatment in osteoarthritic dogs. *Frontiers in Veterinary Science*, 5. <https://doi.org/10.3389/fvets.2018.00165>.

2. Gyires, K., & Zádori, Z. S. (2016). Role of cannabinoids in gastrointestinal mucosal defense and inflammation. *Current Neuropharmacology*, 14(8), 935–951. <https://doi.org/10.2174/1570159x14666160303110150>
3. Kogan, L., Hellyer, P., & Downing, R. (2020). The use of cannabidiol-rich hemp oil extract to treat canine osteoarthritis-related pain: A pilot study. *Journal of the American Holistic Veterinary Medical Association*, 58(Spring Issue), 1–10. Retrieved from <https://www.ahvma.org/wpcontent/uploads/Use-of-Cannabidiol-Rich-Hemp-Oil-Sample-Article.pdf>
4. Lester, K. J., Coleman, J. R., Roberts, S., Keers, R., et al. (2017). Genetic variation in the endocannabinoid system and response to Cognitive Behavior Therapy for child anxiety disorders. *American Journal of Medical Genetics. Part B, Neuropsychiatric Genetics: The Official Publication of the International Society of Psychiatric Genetics*, 174(2), 144–155. <https://doi.org/10.1002/ajmg.b.32467>
5. Mosley C, Gaynor J, Cital S, Brassard J. Cannabinoids for Pain Management. *In: Cital S, Kramer K, Hughston L, Gaynor JS. (eds.) Cannabis Therapy in Veterinary Medicine. Springer, Cham. (2021) doi: 10.1007/978-3-030-68317-7_5.*
6. Ruhaak, L. R., Felth, J., Karlsson, P. C., Rafter, J. J., et al.. (2011). Evaluation of the cyclooxygenase inhibiting effects of six major cannabinoids isolated from *Cannabis sativa*. *Biological & Pharmaceutical Bulletin*, 34(5), 774–778. <https://doi.org/10.1248/bpb.34.774>.

NEEDLES (TUBES) IN BODY CAVITIES

Adesola Odunayo, DVM, MS, DACVECC
 Clinical Associate Professor, University of Florida
Odunayoa@ufl.edu

Introduction

Thoracocentesis, pericardiocentesis are life-saving techniques veterinary professionals can utilize frequently in practice. Abdominocentesis is also a skill that can help provide timely and valuable diagnostic and therapeutic information. The goal of this session is to get the practitioner more comfortable with all three procedures.

Recognition

A small amount of fluid is present in the body cavity of dogs and cats. This fluid provides lubrication that allows adjacent organ surfaces and body cavity walls to move without friction. Effusion is the abnormal or increased accumulation of fluid in any body cavity lined by mesothelial cells. This session will focus on thoracic effusion that includes pleural and pericardial effusions. Effusion is not a disease in itself, it results from alterations in fluid production, lymphatic drainage or a combination of both. Some factors that affect production and absorption of fluid include changes in capillary hydrostatic pressure (heart failure), plasma osmotic pressure (hypoalbuminemia) and capillary permeability (vasculitis, infectious/inflammatory diseases)

Procedures

Thoracocentesis and pericardiocentesis are relatively safe procedures, even for the practitioner that has never attempted one before. They are also truly life-saving procedures. Details of the procedures are described in the lecture but the main highlights is to utilize the ultrasound to identify where you would go. The author has also done both procedures blind when ultrasound was not commonly available in veterinary medicine. It is estimated that it takes 20-60 mL/kg of fluid in the pleural space to cause respiratory distress in cats and dogs. This can be used as a guide to determine if enough effusion has been removed from the pleural space, in conjunction with rechecking remaining fluid volumes with the ultrasound. Pericardial effusion is almost always hemorrhagic. A sample should be saved in a preservative-free tube and observed for about two minutes to ensure that there is no clotting. This provides the confidence that the needle is not in a cardiac chamber. In some cases, the pericardiocentesis may not produce a large volume of fluid because the fluid leaked into the pleural space. This pleural effusion generally does not need to be removed.

Abdominocentesis can be performed with ultrasound guidance or blind- if there is a large amount of effusion present. The 4-quadrant tap may also be utilized with small volumes of fluid or if ultrasound is not available

Pearls

1. Sedation can be helpful in agitated or anxious animals. Butorphanol (0.2-0.4 mg/kg preferably IV but can be administered IM) is the authors drug of choice. Dexmedetomidine (1-3 mcg/kg IV preferably but can be administered IM) may also be administered in very agitated patients.

2. The most common reason fluid is not obtained back from a thoracocentesis is because the needle/catheter is too short. Utilize a longer length needle if there is fluid but you are unable to retrieve it.
3. An ECG should be placed on dogs before pericardial effusion is retrieved in order to evaluate for ventricular arrhythmias. Presence of arrhythmias may indicate the needle has touched the myocardium
4. A sample of the pericardial effusion should be saved to ensure it is non-clotting blood. Clotted blood may indicate aspiration of blood directly from a cardiac chamber.
5. 18G catheters can be used to retrieve pericardial effusion although bigger gauge catheters work really well for large breed dogs.
6. In general, abdominocentesis should be performed with a 22G needle (rarely smaller) but never larger.

References and Suggested Readings

1. Alleman AR. Abdominal, thoracic, and pericardial effusions. *Veterinary Clinics: Small Animal Practice* 2003;33:89-118.
2. Valenciano AC, Rizzi TE. Abdominal, thoracic, and pericardial effusions. *Cowell and Tyler's Diagnostic Cytology and Hematology of the Dog and Cat* 2020:229

DERMATOLOGY AND TELEMEDICINE

Kinga Gortel DVM, MS, Diplomate ACVD

One of the silver linings of living through a global pandemic has been an increased acceptance of the use of telemedicine for veterinary patients, as well as changes in the regulatory framework that has made this possible. In my practice, telemedicine is mostly used for follow-up examinations.

Dermatology is in some ways exceptionally well suited for telemedicine, although there are obvious limitations. Below are some tips for using telemedicine to care for your dermatology patients.

- If you are not yet engaged in offering formal telemedicine services and the idea is daunting, consider how much of what you may do already – such as changing a pet’s medication based on a phone call or email – is considered telemedicine.
- Dermatology patients are often repeat visitors, as their problems are chronic. Most of your dermatology appointments have been seen for skin disease before. Telemedicine provides an easy and convenient way to provide follow-up examinations to assess the efficacy of your treatments, adjust your treatment plan, and provide ongoing care for a patient that you already know. The convenience of telemedicine may increase the likelihood that you will see the pet for a follow-up appointment, rather than just receiving refill requests with little information on how the pet is doing.
- Because skin diseases often involve lesions, images are very helpful. I have learned that a photo is worth a thousand videos. Well-lit photos of the skin submitted in advance of the visit are much more useful than clients trying to obtain video during your visit. The latter is technically difficult in a wiggly pet, may waste time during your visit, and be unnecessarily burdensome to the owner.
- Consider the use of a form or questionnaire in advance of the visit to obtain some key historical facts. I also use this to list some of the limitations of telemedicine, and to obtain consent in advance of the visit.
- Although both video and voice communications can be used, I have personally found that video allows for a more fulfilling and natural conversation more like an in-person visit.
- Telemedicine does not allow for one of our most useful tests in dermatology – skin and ear cytology. However, it is likely that these tests have already been performed in the past and you may be able to use empirical therapy based on what you see on the pet’s photos.
 - If pyoderma lesions are present, it would be appropriate to prescribe a chlorhexidine-based shampoo and mousse or spray. As we are moving away from using systemic antibiotics for pyoderma, the treatment would likely be the same during an in-person visit.
 - If the patient suffers from recurrent *Malassezia* infections (e.g., pododermatitis), a flare of typical symptoms such as severe pedal pruritus can warrant treatment for *Malassezia* even if cytology can’t be collected.
 - Most ear preparations contain a combination of ingredients that make them useful for both bacterial and yeast infections, so they can be used in the absence of cytology in uncomplicated cases. However, the inability to assess the ear canal and tympanic membrane is more problematic and if

I have any reason to suspect that the tympanic membrane could be ruptured, I ask for an in-person examination and may start oral corticosteroids until the patient can be seen.

- In some cases, it may be appropriate for the pet to be brought in for a necessary test done by a veterinary technician (cytology, bloodwork) separate from the telemedicine visit.
- If you determine during your telemedicine appointment that you need to see the patient in person, the time this follow up visit requires is generally much shorter.
- Remember parasites – patients that are newly pruritic should be treated for parasites in case of exposure to fleas, lice, or mites. In a flea-endemic area, monthly parasite prevention should be used.
- Telemedicine can be used to manage allergy flares. For example, a patient that is usually maintained on one type of therapy may require a short course of corticosteroids or oclacitinib, or an injection of canine atopic dermatitis immunotherapeutic to manage a flare.
- Diet trial periods lend themselves well to telemedicine. A recheck at 4 weeks allows you to make sure the pet is comfortable and tighten up any slips that are occurring during the trial. At 8 weeks, you can discuss ongoing symptom management, work-up for atopic dermatitis, and discuss a challenge with the pet's previous diet.
- Telemedicine is especially well suited to fearful, anxious, and stressed pets with dermatologic disease. The frequent follow-ups required in our specialty can be difficult for these pets and their owners.
- In my experience clients have really appreciated the convenience of telemedicine visits and how minimally disruptive they are to their schedule. They appreciate the value of this modality in dermatology, where frequent follow up is often needed for successful control of skin disease.

Telemedicine summary and background (excerpts) from the Canadian Veterinary Medical Association:

- Telemedicine is the provision of specific veterinary medical advice and treatment of an animal or animals based on the remote diagnosis of disease and injury by means of telecommunications technology where no physical examination of animals by the veterinarian takes place.
- There are multiple ways that veterinarians can offer telemedicine including, but not limited to, telephone, email (text, videos, pictures), live video streaming, online communication platforms (e.g. Microsoft Teams, Zoom), and specialized telemedicine applications.
- A valid veterinary-client-patient relationship (VCPR) is required before a veterinarian practising in Canada can engage in telemedicine. Each provincial or territorial regulatory (licensing) body in Canada defines the parameters around the establishment of the VCPR within their jurisdiction. Some jurisdictions permit the initial VCPR to be established virtually while other jurisdictions require the initial VCPR to be established through an in-person visit.

Full Position Statement available at: <https://www.canadianveterinarians.net/policy-and-outreach/position-statements/statements/telemedicine/>

WHEN EAR INFECTIONS BECOME NEUROLOGICAL HEADACHES

Carolina Duque, DVM, MSc, DVSc, DACVIM (Neurology). Mississauga-Oakville Veterinary Emergency Hospital, Oakville, Ontario

Otitis is a multifactorial condition where the primary cause can include food hypersensitivity, parasite infection, tumors and idiopathic causes. The primary cause may be subtle and unrecognized until a secondary complicating factor arises. These secondary factors often include infection and may be easier to treat when the primary or perpetuating factor has been properly identified.

Acute and uncomplicated otitis externa can often be treated successfully, but chronic or recurrent otitis externa is more challenging. Typically, underlying primary factors as well as predisposing and perpetuating factors are at play, including secondary ear infection. Repeated bouts of inflammation and infection can cause secondary changes in the ear canal that can ultimately lead to further lack of success in treating otitis, and possible end-stage ear disease. Severe glandular changes, fibrosis, stenosis, and calcification along the external ear canal lead to patient discomfort as well as progression of otitis from acute to chronic, and from straightforward to complicated otic disease. These changes are indicative of end-stage ear disease that can usually be avoided with appropriate initial therapy and consistent follow up.

Dogs with chronic, recurrent, and severe otitis usually require diagnostic imaging to help identify contributing problems, such as middle ear disease (eg, otitis media, neoplasia) and otitis interna, that cannot be identified with regular otoscopic examination. These patients can present with neurologic signs (eg, vestibular signs or facial nerve paralysis). Damage to the sympathetic nerves that course through the middle ear can result in ipsilateral Horner's Syndrome (i.e. miosis, enophthalmos, and ptosis). Damage to the facial nerve may result in ipsilateral facial paresis/paralysis, namely facial asymmetry and inability to blink.

Otitis interna can lead to damage of the vestibulocochlear nerve and secondary hearing deficits and/or vestibular signs, including a head tilt, nystagmus, and ataxia. A positional ventral strabismus may also be noted, such that when the patient's head is raised, an eye drop will be noted ipsilateral to the lesion. Rarely keratoconjunctivitis Sicca (KCS) develops from damage to the parasympathetic branch of the facial nerve that innervates the lacrimal gland. In severe cases of otitis interna that have progressed to an intracranial infection, mentation change, neck pain, ataxia, paresis, proprioceptive deficits, and seizure activity may be present.

Different bacterial organisms can be isolated from the same ear in 20% of the cases; therefore, it is important to remember that ear cytology or a single swab submitted for C/S may not reveal the total population of organisms truly present in the ear canal. This might explain why, in some cases, sensitivity results (in vitro) and response to topical therapy (in vivo) do not always correlate.

The bacteria most commonly isolated from ear canals of dogs affected by otitis are *Staphylococcus* spp. Other bacteria commonly associated with otitis include *Pseudomonas*, *Proteus*, *Enterococcus*, *Streptococcus*, and *Corynebacterium*. Some bacteria such as *Staphylococcus* and *Pseudomonas* may produce biofilm, which can lead to persistence of infection despite adequate therapy, as the biofilm needs to be disrupted for any antimicrobial therapy to be effective in clearing the infection. *Malassezia* yeast is another common component of otitis externa in dogs. Some dogs appear to develop an allergic response to *Malassezia* spp., leading to significant discomfort and pruritus.

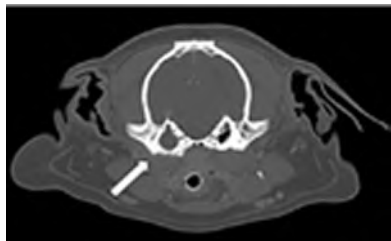


Figure 1. Post-contrast axial view of the skull at the level of the bullae from the head CT of an 11 year old female spayed pug with right otitis media. The right tympanic bulla is filled with iso attenuating material.

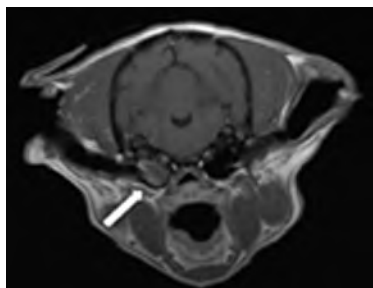
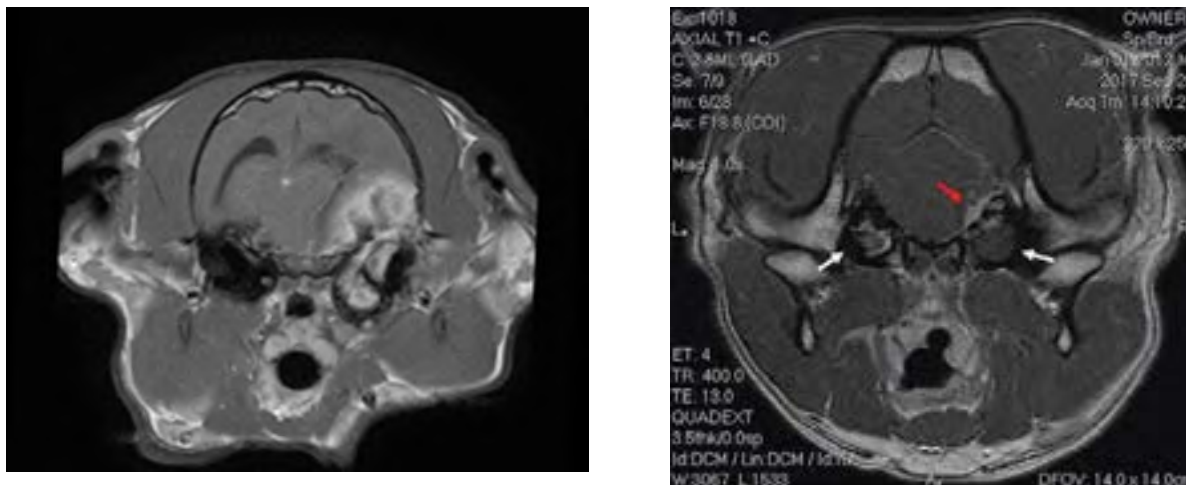


Figure 2. T1-weighted post-contrast axial view at the level of the caudal colliculus from the brain MRI of a 13 year old female spayed Shih Tzu with right otitis media. The right tympanic bulla is filled with T1 weighted isointense material with heterogeneous mild contrast enhancement (arrow).

The middle ear should be sampled separately if otitis media is confirmed when the tympanic membrane is intact. The types and sensitivity pattern of bacteria isolated from the middle ear may differ from those of bacteria isolated from the external canal. In one study, different organisms were cultured from the middle and external ear, and even when *Pseudomonas* species were cultured twice from the same ear, different strains were suspected on the basis of the sensitivity pattern exhibited. Culture results should be interpreted with caution because mixed bacterial flora and light commensal and contaminant bacteria might be present and may not be relevant as pathogens. Indications for systemic therapy include:

Otitis externa that is severe and unresponsive to topical therapy:

1. Concurrent otitis media. 2. Owner unable to medicate with topical therapy. 3. Topical therapy precluded by adverse reactions and 4. Marked proliferative chronic changes.



Even though the incidence of CNS ear related infections in dogs and cats is unknown, the rate of serious complications and death are high if the condition is not properly diagnosed and managed. In cases of bacterial meningitis in humans, prompt antibiotic therapy, preferably *via* intravenous injections, is mandatory to reduce the mortality rate to about 10%

The findings in cerebrospinal fluid (CSF) from animals with bacterial meningitis may include abnormally high protein concentrations and pleocytosis. Intra- or extracellular bacteria may be detected by a thorough microscopic examination of CSF, which can be supported by Gram-stain analysis of the CSF. However not always CSF cytology is definitive and the combination of imaging findings and history should be considered when excluding the possibility of bacterial infectious CNS disease.

A recent study including a total of 123 MRI was conducted. In this study a short, focused MRI scan allowed detection of inflammation of the mucosal bulla lining as well as excellent discrimination between avascular material and vascularized soft tissue in the tympanic cavity. Otitis media was found in 41 of 197 (21%) ears with chronic otitis externa. On otoscopy, the tympanic membrane was intact in six of 41 ears (15%), ruptured in 16 of 41 (39%) and not visible in 14 of 41 (34%) [no data in five of 41 (12%)]. Analysis of cytological findings showed that the presence of rods was only associated with an increased likelihood of otitis media when found together with inflammatory cells.

The treatment of infections of the CNS is challenging because the penetration of antibiotics of the blood brain barrier and the blood cerebrospinal fluid barrier, is not only dependent on these properties of the antibiotic, but is also highly dependent on their affinity to transport systems and on the degree of meningeal inflammation

The state of the pharmacological evidence for the treatment of bacterial infections of the CNS in dogs and cats is incomplete and insufficient for definitive therapeutic recommendations. While still fragmentary on an absolute basis, the best evidence for their effectiveness against bacterial meningitis relative to all other antimicrobials approved for dogs exists for enrofloxacin, benzylpenicillin and ampicillin. A reduced level of supporting evidence exists for the effectiveness of ceftriaxone and to a somewhat lesser extend for the effectiveness of cefoxitin two substances not approved in veterinary medicine. No data could be found for metronidazole

and trimethoprim-sulphonamides, which does not preclude their potential effectiveness in bacterial meningitis.

References available upon request.

Closure of 109/209 in Dogs (The Maxillary Molar) Jessica Johnson, DVM

According to *Wiggs's Veterinary Dentistry: Principles and Practice* published in 2019: “The alveolus of all extraction sites, regardless of whether the extraction was simple or surgical, should be debrided to remove debris, the surgical site should be lavaged, and the gingival tissue should be sutured. Closure of oral surgery sites allows for primary intention healing, which occurs more rapidly with a lower risk of infection than if the wound is left to heal by secondary intention.”¹

There are several techniques for closure of an extraction site in the dog; many techniques involve creating a gingival flap, with or without a vertical releasing incision, and require release the periosteum so that a tension-free closure can be achieved.

Extraction of a maxillary first molar (tooth #109, #209) in dogs is a common procedure in small animal veterinary medicine. Indications for extraction of this tooth are usually: stage 3 or 4 periodontal disease, endodontic disease, or tooth fracture +/- root fracture. (Stage 3 periodontal disease indicates there is 25-50% of attachment loss as measured either by probing of the clinical attachment level and radiographic determination of the distance of the alveolar margin from the cemento-enamel junction relative to the length of the root. Stage 4 periodontal disease indicates more than 50% of attachment loss or when probing, through and through furcation exposure.)¹

One of the most challenging extraction sites to close is 109 and 209, particularly when 108 and 110, or 208 and 210, remain intact. There are a number of potential complications when extracting this tooth:²

- Breaking the roots, particularly the two buccal roots, as they are long and skinny.
- Displacement of the roots or root tips into the maxillary recess that lies just dorsal to the teeth.
- Transection or damage to the salivary ducts, particularly those attached to the zygomatic gland, but potentially the parotid duct too.
- Orbital penetration from excessive pressure with an instrument during the extraction process or flap creation.³
- Damage to the maxillary artery.
- Damage to the superior alveolar nerve and/or minor palatine nerve.
- Extended anesthesia time associated with flap creation.

Extraction and closure of 109/209 is described in *Oral and Maxillofacial Surgery in Dogs and Cats*, published in 2020. “If a vertical-releasing incision was made, it should be sutured. Otherwise, tension-free closure of the gingiva may not be possible without extensive flap development, and it is acceptable to leave the first molar sockets to heal by second intention.”⁴

To author's knowledge, there are no prospective veterinary studies or assessments reviewing primary versus secondary wound healing for extraction of teeth in dogs or cats. Recently, a retrospective article was released in the *Journal of Veterinary Dentistry*: "A Retrospective Evaluation of Secondary Wound Healing for Extraction of the Maxillary First Molar in Dogs". From the article, "This retrospective assessment evaluated patients that had the maxillary first molar extracted with placement of a cruciate suture across the alveolus to achieve partial closure and secure the blood clot. Patients that had teeth extracted adjacent to M1 (maxillary fourth premolar [PM4] or second molar [M2]) were excluded from the study. Three groups of patients were assessed: Group A – at the time of extraction of M1, both the maxillary PM4 and M2 were still present in the oral cavity. Group B – at the time of M1 extraction only PM4 or M2 was present, but not both. The tissue was completely intact at the location of the missing tooth. Group C – at the time of M1 extraction neither PM4 or M2 were present, but tissue in these locations was intact. In a three-and-a half-year time period (2015-2018), 179 dogs with 213 solitary M1 extractions were performed. Of these 213 extraction sites, 127 sites (60%) had follow up examination within a two-week postoperative period. Of these 127 sites, 126 (99.2%) appeared appropriately healed without complication."

Extraction of multirooted teeth in dogs can be challenging. In veterinary medicine, sometimes more exposure is needed in surgery, be that during an exploratory, and spay or even a tooth extraction. If that is the case, the veterinarian should be prepared to perform an "open" extraction with a releasing incision in the gingiva/mucosa. It is important to be aware of the anatomy of the caudal maxilla during this process to prevent trauma to important structures as mentioned previously.

References

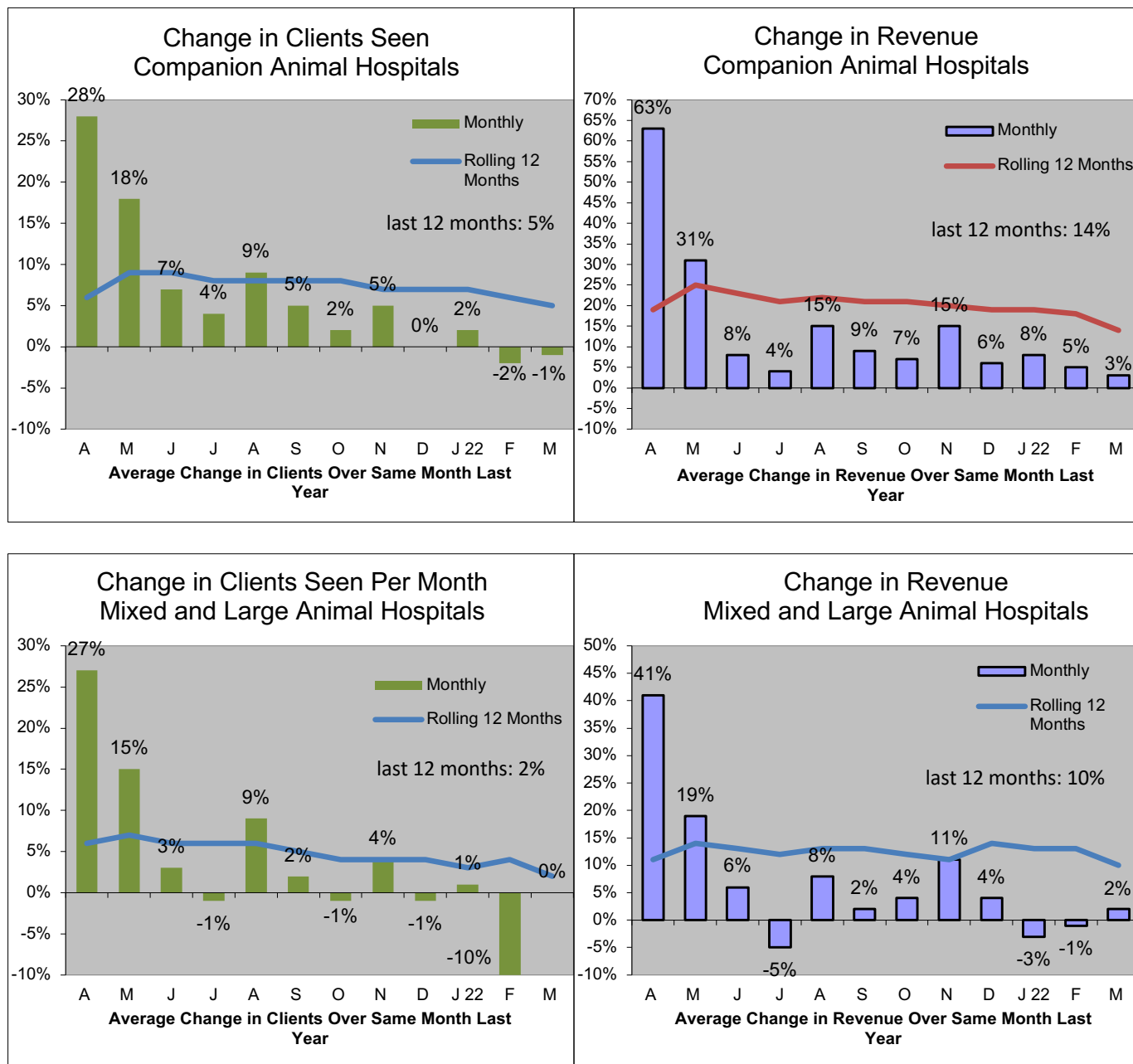
1. Lobprise HB, Dodd JR. *Wiggs's veterinary dentistry : principles and practice*. Second edition. ed. Wiley-Blackwell; 2019. pgs. 232, 37-38.
2. Bissett L, Niemiec BA. A Retrospective Evaluation of Secondary Wound Healing for Extraction of the Maxillary First Molar in Dogs. *J Vet Dent*. Dec 2021;38(4):208-215. doi:10.1177/08987564221076564
3. Smith MM, Smith EM, La Croix N, Mould J. Orbital penetration associated with tooth extraction. *J Vet Dent*. Mar 2003;20(1):8-17. doi:10.1177/089875640302000101
4. Verstraete FJM, Lommer MJ, Arzi B. *Oral and maxillofacial surgery in dogs and cats*. Second edition. ed. Elsevier; 2020:xv, pgs. 132-138.

Using Data to Recruit and Retain Associate Veterinarians

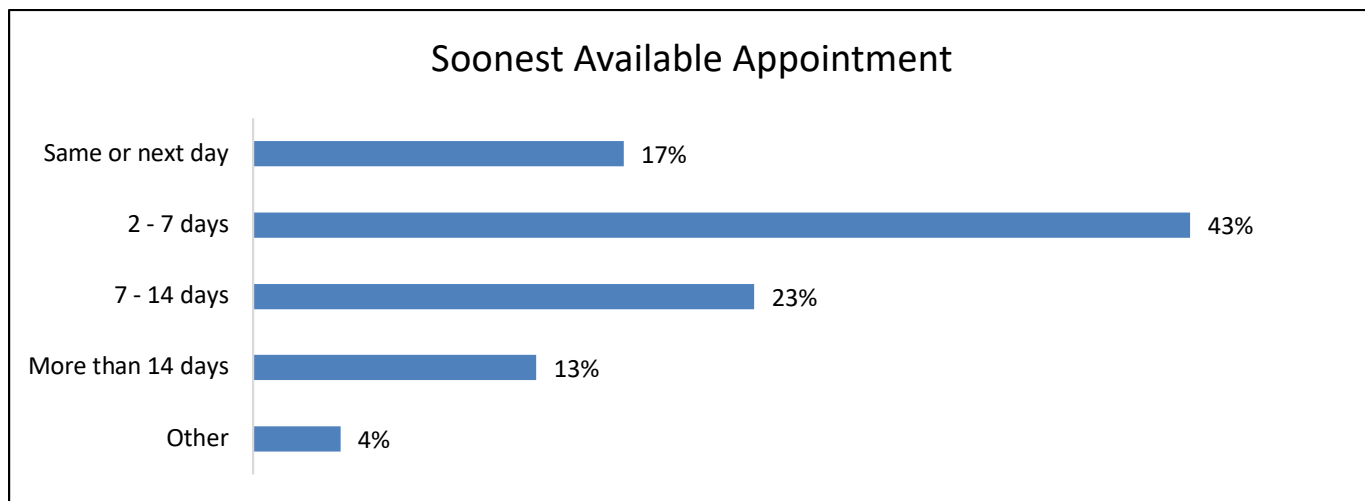
Chris Doherty, DVM - OVMA Manager of Economic Research

Demand for Associate Veterinarians

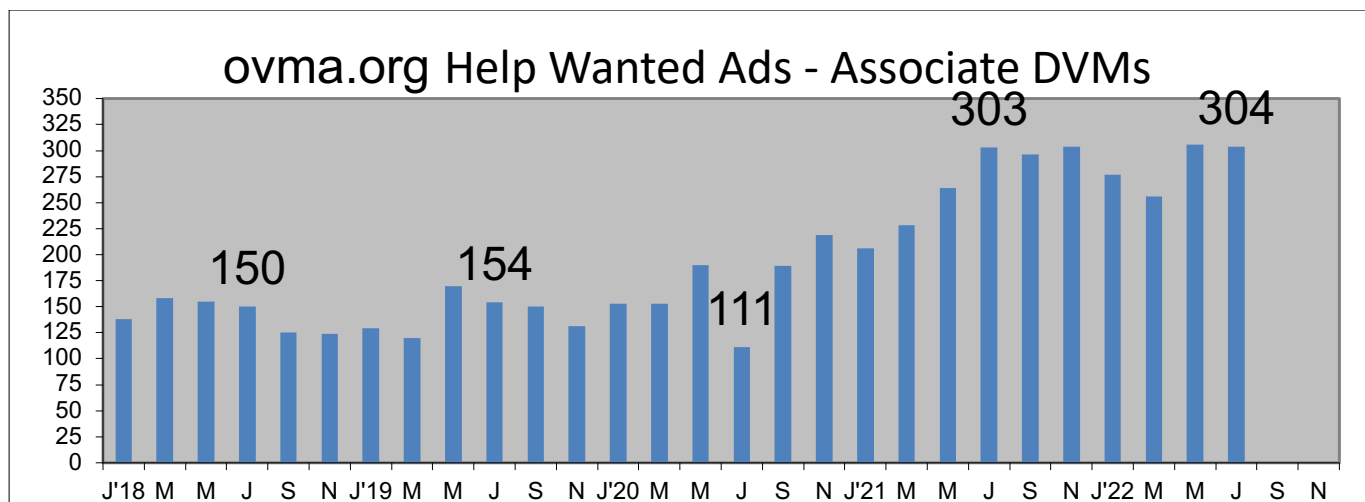
Over recent years, demand for veterinary services has accelerated, in both companion and mixed/large animal hospitals. Hospitals are seeing increased numbers of clients, and these clients are utilizing more veterinary services, leading to steep revenue growth.



As a result, hospitals are busier than ever, and hitting their ceiling with regards to capacity. This is leading to turning away of new clients, and longer wait times for booking routine appointments.



In an effort to deal with this growth in clients and business, many hospitals attempted to hire veterinarians to help cope with the increased workload. This has pushed the number of help wanted advertisements for associate veterinarians to record high levels.

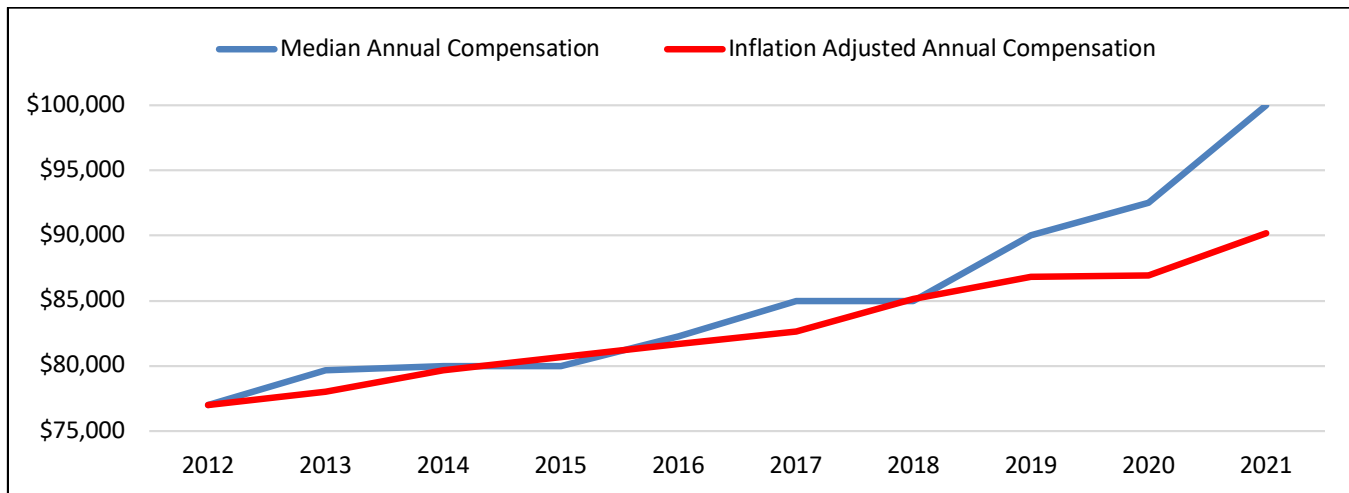


On the other side of the equation, supply of veterinarians has remained relatively consistent, with no significant additions from new veterinary colleges, larger class sizes, etc.

With a substantial increase in demand, and no commensurate increase in supply, basic economics predicts higher prices.

Associate Veterinarian Compensation

The mismatch between supply and demand, as expected, is resulting in rising levels of compensation and benefits for associate veterinarians. Over recent years, median annual compensation for associate veterinarians has increased well ahead of the rate of inflation.

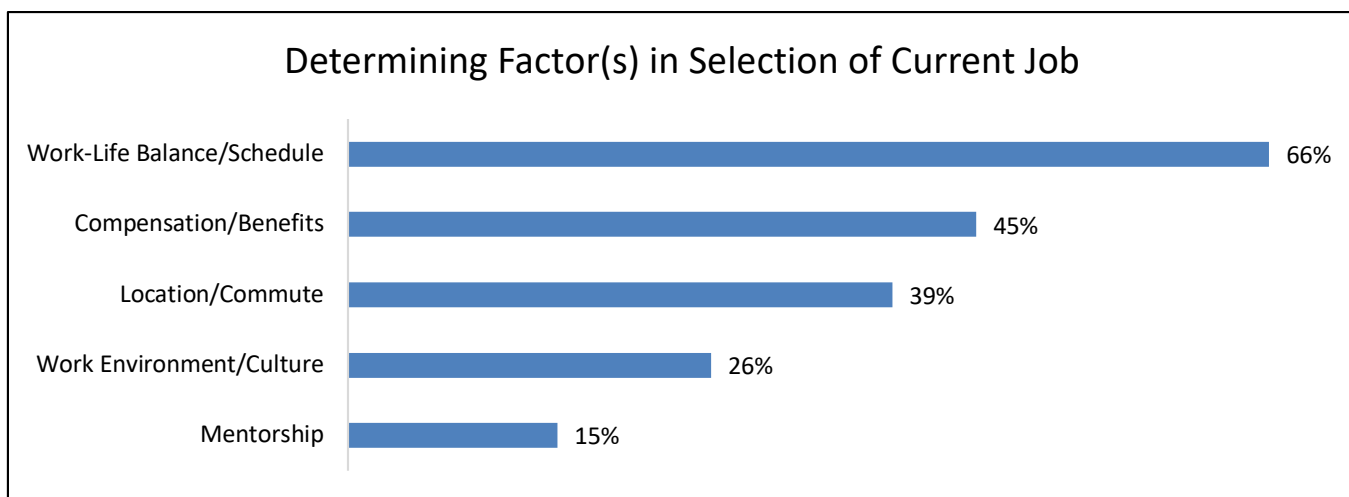


Focusing specifically on advertised levels of compensation, rather than all associate veterinarian, shows even higher wages on offer. This suggests that median reported compensation will continue to climb steeply in coming years, as turnover and retention pressures lead to higher pay.

July 2022 Advertised Annual Compensation	
25th Percentile	\$102,500
Median	\$120,000
75th Percentile	\$150,000
# w/ Compensation	29

Creating a Compelling Offer

The 2021 Associate Survey of Compensation and Benefits asked those associate veterinarians who had accepted a new job within the last two years what the determining factors were in their selection of their current role. By a wide margin, work-life balance was the most cited factor.



Whether seeking to recruit a new veterinarian, or ensure retention of a current associate, it's crucial that employers offer a package that provides competitive levels of remuneration, not only compared to reported medians, but to that on offer in the job market. In addition, work-life is imperative to consider, particularly with regards to scheduled hours, weekends, and on-call.

IS IT FELINE INFLAMMATORY BOWEL DISEASE OR SMALL CELL LYMPHOMA? DOES IT MATTER?

Jinelle A. Webb, DVM, MSc, DVSc, Diplomate ACVIM (Small Animal Internal Medicine)
VetLink Mobile Imaging, Oakville, Ontario

Introduction

In a mature cat that presents with chronic vomiting, diarrhea, weight loss, and/or inappetence, after ruling out some of the common non-enteric diseases, two of the main differential diagnoses include inflammatory bowel disease and intestinal small cell lymphoma. Many tools can be implemented in obtaining diagnostic information, however even with intestinal histopathology, immunohistochemistry (IHC) and investigation into clonality (PARR), it may be a challenge to definitively determine the diagnosis. Should we just initiate prednisolone and chlorambucil in these cats with suspected enteropathy, and skip the advanced testing?

Presentation and initial diagnostics

It is relatively common to have a senior cat present with chronic vomiting, diarrhea, weight loss, and/or inappetence. Given the common diseases seen in the senior cat population that may include some or all of these symptoms, such as hyperthyroidism, diabetes mellitus, and renal disease, it is imperative to first perform baseline diagnostic testing. However, once the common alternative causes are ruled out, a chronic enteropathy is quite possible. The two most common chronic enteropathies in senior cats include inflammatory bowel disease (IBD) and intestinal small cell lymphoma (SCL), however other causes exist, such as intestinal dysbiosis and large cell lymphoma. Unlike the previously mentioned extra-intestinal diseases, the cause of a chronic enteropathy cannot be determined on routine baseline diagnostic testing.

Once baseline diagnostics including the complete blood cell count, biochemical profile, urinalysis and total T₄ are performed, parasitism should be ruled out, particularly in cats that roam outdoors; deworming should also be considered as false negative testing can occur. Results of baseline diagnostics does not help differentiate between different types of feline chronic enteropathies, since changes such as hypoproteinemia and non regenerative anemia can be seen with all types of chronic enteropathies. Assessment of folate and cobalamin levels are useful but non-specific since all chronic enteropathies can cause an increase in folate and hypocobalaminemia. Measuring the fPL/PSL is beneficial information, but many cats with chronic enteropathies have concurrent chronic pancreatitis, therefore an elevated fPL/PSL does not help to rule out enteropathy as a cause. Having said that, a cat with a normal fPL/PSL is less likely to have chronic pancreatitis as a significant active disease process.

Abdominal ultrasound is recommended in all cases of suspected feline chronic enteropathy. There are changes that are commonly seen with feline chronic enteropathy, which include a thickened muscularis propria, loss of intestinal wall layering, and mesenteric lymphadenopathy. However, it is important to note that although some of these changes are more commonly seen in cats with SCL than IBD, they can be seen in any cat with IBD, and also in cats that do not have intestinal disease. In addition, a cat with IBD or SCL can have a normal abdominal ultrasound. Findings of the abdominal ultrasound should be considered in light of symptoms and labwork, and cannot provide a definitive diagnosis. An important purpose of the abdominal ultrasound is to rule out other concerns, such as a focal small intestinal mass, prior to obtaining samples for histopathology.

Biopsy techniques and options for analysis of obtained samples

Fine needle aspiration of the small intestinal wall and/or enlarged mesenteric lymph nodes does not provide a diagnosis for either IBD or SCL; it can be diagnostic for large cell lymphoma. Biopsy of the gastrointestinal tract is the only method to definitively diagnose IBD or SCL, however even with histopathology, the diagnosis may be elusive. Options to obtain biopsies for histopathology include endoscopic biopsy and surgical biopsy via a laparotomy or laparoscopy. There are pros and cons to each approach.

Surgical biopsy allows for full thickness sampling from all three levels of the small intestine, however typically only one biopsy is taken from each level. Both IBD and SCL may have a patchy distribution, therefore the affected site could be missed. If other organs require biopsy, such as the liver and/or pancreas, this can be performed at the time of surgery. Surgical biopsy has the disadvantages of invasiveness, longer anesthetic time, increased cost, and increased recovery time, including the need to delay immunosuppressive therapy until healing has occurred. These are important factors in senior cats who may have co-morbidities, higher complication rates and slower recovery times.

Endoscopic biopsy has the benefit of being minimally invasive with a very short recovery time, substantially shorter anesthetic time, and reduced cost, along with obtaining several samples from each site. The two challenges with endoscopic biopsy are the limitation of only obtaining mucosal samples, and the ability to reach limited areas of the small intestine. One study indicated a poor agreement between duodenal and ileal biopsies, indicating a possible benefit of obtaining ileal biopsy via colonoscopy. However, it has been argued that since some of cases from that study did not have IHC and/or PARR, the initial diagnosis may have been incorrect. With increased use of advanced analysis of biopsy samples, it may be that duodenal samples alone provide a definitive diagnosis in most cases. The ability to perform only an upper gastrointestinal endoscopy reduces patient preparation required, and anesthetic time needed.

Samples obtained via any of these methods should first be assessed via routine histopathology. In some cats, a definitive diagnosis is obtained with this initial assessment. However, in cases of IBD and SCL, it is more challenging to differentiate between these two diseases. The difficulty in interpreting gastrointestinal histopathology was highlighted in a study indicating that there is large interobserver variability in the interpretation of gastrointestinal samples. This interobserver variation lead to the development of WSAVA guidelines to standardize interpretation. Even with these guidelines, it has been shown that without the use of PARR +/- IHC, many cases are likely to be misclassified. In most cases of suspected chronic enteropathy in the mature cat, additional analysis beyond routine histopathology should be performed to attempt to arrive at the correct diagnosis. Clients should be counselled prior to biopsy about the high likelihood that these tests will be recommended, as their cost is quite high. Some labs will provide a combination testing option for feline gastrointestinal biopsies that includes several forms of analysis, which may prove to be more cost effective. There are a small proportion of cases where even additional analysis results in an inconclusive result.

Treatment options

Standard therapy after a diagnosis of IBD includes strict use of a single source, novel, hypoallergenic diet, as many cases of IBD have a component of food sensitivity. As cobalamin levels can be low, these should be measured, and supplementation provided to elevate levels to high normal, or even slightly above the normal range. Supplementation can be given either

injectably or orally, with adequate levels achieved using either route. Probiotics and fecal biotherapy can be considered in cases with diarrhea. In cases that do not respond adequately to this approach, glucocorticoid supplementation may be required. Prednisolone is the most commonly used glucocorticoid in cats, although budesonide can be tried in cases with significant side effects to prednisolone, or contraindications to its use. In refractory cases, chlorambucil is the most common second line immunosuppressive medication to be used in cats. Cyclosporine is an additional medication that has been used as second line medication.

Standard therapy for SCL includes prednisolone and chlorambucil. A hypoallergenic diet is not required, although many cats benefit from a gastrointestinal diet. As cobalamin levels can be low, these should be measured, and supplementation provided to elevate levels to high normal, to slightly increased above the normal range. Supplementation, as with IBD, can be given either injectably or orally, with adequate levels achieved using either route.

As prednisolone, chlorambucil, and cobalamin supplementation are indicated for SCL and also some cases of IBD, it seems logical that in a cat where there is a high degree of suspicion for *either* IBD or SCL, it is unimportant to narrow down the diagnosis further. It is understandable that for some clients, the cost of performing biopsies of the intestinal tract is prohibitive to their situation. Some clients do not wish to pursue diagnostic testing requiring an anesthetic in their mature cat, or the pet may have concurrent disease complicating the use of anesthesia.

Client communication and the benefits of pursuing a definitive diagnosis

There are some good reasons to the pursuit of obtaining a definitive diagnosis. In cats with IBD, diet plays a much larger role in disease control, and therefore it is prudent to pursue diet trials, even though it may take several diets to determine the best one for that patient. In a cat with SCL, diet does not need to be the main focus. Many cats with IBD do not require chlorambucil to control their disease, a drug that has potential side effects. For a cat with SCL, if their disease is not controlled with prednisolone and chlorambucil, there are rescue protocols available. However, it is not recommended to pursue these rescue protocols without a definitive diagnosis. That diagnosis is much harder to obtain once immunosuppressive medication has been started, and cats should be weaned off all immunosuppressive medication for several weeks prior to obtaining biopsies.

Client communication is vital through this process. Conversations should discuss the benefits of obtaining a definitive diagnosis, along with the reason for each recommended diagnostic step, and the pros and cons of different methods of biopsy. In addition, it is imperative to ensure that the client is aware of the potential for recommending IHC and/or PARR once histopathology results are received, and the reason why performing these additional tests is important to their pet. However, every client's situation is different, and some pets or clients may be unable to move forward with all indicated diagnostic testing. In such cases, thorough and well documented communication is essential if electing to treat cats with suspected chronic enteropathy with prednisolone, chlorambucil and cobalamin without a definitive diagnosis. Close monitoring of that patient will help to note any complications that occur. In addition, the on going use of these medications should be based on a documented improvement in clinical signs.

References provided upon request.

SUCCESSFUL SEDATION OF DIFFICULT PATIENTS

Dr. Annatasha Bartel, BScH, BVM&S, MRCVS, DACVAA

It is impossible in veterinary medicine to avoid sedating our patients to achieve both diagnostics and therapeutic procedures. The reasons for requiring sedation in veterinary patients are varied and include but are not limited to patient temperament and size, the type and duration of procedure being performed, and staffing availability. The overall goal of sedation is ensuring optimal safety as well as mitigating stress, anxiety, and fear for both the patient and the staff involved. Depending on the type of sedation used, administering pain control may also be a goal of the sedation protocol.

Ideally, each sedation plan should be individualized to the patient and procedural needs. One major limitation we have in veterinary medicine, however, is the ability to perform a full physical examination prior to finalizing a sedation protocol. This is often due to patient temperament and distressed or fractious behaviour may be the result of stress, fear, and/or pain. Some of the animal patients we encounter may have never been handled by humans before and they can meet this experience in full fight-or-flight mode, which makes our jobs quite challenging, if not dangerous, for the patient and staff members.

Because many of the drugs we use to achieve appropriate sedation involve physiological changes to the cardiovascular and pulmonary systems, performing a physical exam prior to sedating any patient is best practice. However, this can sometimes be an impossible feat, so how do we mitigate the risks associated with sedating a patient that cannot be appropriately assessed prior to the administration of drugs?

We may also encounter patients that are too fractious to handle and have either a known pathophysiology or a high index of suspicion for an ongoing disease process or trauma. For example, we may know a patient is tachypneic and in distress, but we do not yet know why and we need to facilitate sedation for this patient to further care. Another patient may have a cardiac murmur, but we are not able to assess what grade the murmur is or what the cardiac rhythm is, or what peripheral pulses, mucous membrane colour, jugular distension are, etc. What is the best sedation protocol for these patients for whom only partial information is available?

As most sedatives, particularly when used in combination with each other, involve a degree of cardiopulmonary depression, it is imperative that we attempt to minimize these effects, particularly if we do not know the full extent of the patient's underlying disease state. We must have a good understanding of the beneficial and adverse consequences associated with the classes of drugs that are frequently utilized clinically as well the common cardiopulmonary diseases that may further compromise our sedated patients.

We will review cardiac disease and how to sedate a patient you cannot auscultate to achieve effective and safe sedation when there is potential cardiac compromise. Lastly, we will touch briefly on the importance of monitoring a sedated patient and review supportive mechanisms and standard of care monitoring equipment that will ensure you are able to provide rapid intervention if the patient decompensates. The ability to intervene and support the sedated patient is crucial to successful outcomes, particularly in high risk patients.

References

Flood, P and Rathmell, J. (2021) Stoelting's Pharmacology and Physiology in Anesthetic Practice. Amsterdam: Wolters Kluwer Health.

Grimm, K et al. (2015) Lumb and Jones Veterinary Anesthesia and Analgesia. 5th ed. Oxford: Wiley & Sons.

Ko, J. (2019) Small Animal Anesthesia and Pain Management. 2nd ed. New York: CRC Press.

Muir, W. and Hubbell, JA. (2010) Equine Anesthesia. 2nd ed. New York: Saunders.

Silverstein, D and Hopper, K. (2009) Small Animal Critical Care Medicine. St. Louis: Saunders Elsevier.

Snyder, L and Johnson, R. (2015). Canine and Feline Anesthesia and Co-Existing Disease. Oxford: Wiley & Sons.

WHAT ARE WE LOOKING AT WHEN WE WATCH A DOG WALK?: IMPROVING THE LAMENESS EXAM

Jeffery Biskup, DVM, DACVS

Lameness evaluation in dogs is difficult, even for someone who is well trained. Both our inability to visualize mild to moderate lameness and innate bias towards wanting improvement makes lameness assessment very subjective. It is important to be cognizant of these limitations so that we can continue to work at eliminating them in our practice. The lameness exam can be intimidating for a veterinarian and requires practice. If a practitioner gets in the habit of informally watching all patients walk, picking up abnormalities becomes easier. Furthermore, it is important that the findings of the orthopedic exam are correlated to the lameness exam to assess accuracy.

Multiple studies have shown and quantified some of our short-comings with visual assessment of lameness. Examples include a study assessing outcome after repair of a cranial cruciate rupture. In 75% of dogs with no observable lameness as assessed by a surgeon, a lameness was detected on force platform analysis (Evans et al. 2005). Standardized scoring systems have been employed to help improve accuracy of visual assessment of lameness including the visual analogue score and numeric rating system. Although multiple scoring systems are validated (Hudson et al. 2004), they likely do not fully assess lameness. For example, a study by Quinn et al. 2007, showed that these subjective evaluations were not correlated with force platform data. Furthermore, the evaluations were most effective when the same evaluator assessed the dog at all time points, which often isn't feasible in practice.

Further complicating lameness evaluation is the documented phenomenon of caregiver placebo effect. A veterinary caregiver, either the veterinarian or the owner, is more likely to assess their patient/dog as improved even when objective outcomes has shown no or worsening improvement. In a study of induced lameness in research dogs, both orthopedic veterinary surgeons and 1st year veterinary students were poor at identifying lameness. More humbling was the fact that surgeons were not much different than students at identifying lameness (Waxman et al., 2008). A clinical study with naturally occurring osteoarthritis evaluated the caregiver placebo effect and found owners evaluating their dog's lameness said there was improvement 39.7% of the time and veterinarians said there was improvement 44.8% of the time (Conzemius et al., 2012), even though no improvement was documented on force platform analysis.

Although limitations of visual gait analysis have been identified, it does not mean that lameness evaluation is not a valuable tool. Like any skill, lameness evaluation improves with experience and practice. It is important that dogs are evaluated where they can comfortably walk and there is space for the evaluator to observe them. The walkway should be free of distracting objects, noises or other animals. Ideally, the walkway is long enough to allow the dog to a walk unimpeded for 20+ steps and have the observer watch the dog walking towards and away from them. Also, the walkway should be wide enough to allow observation from the side of the dog. The footing should provide adequate traction and be easy to clean. Having an indoor and outdoor area can also be beneficial.

Gait evaluation is generally performed with the dog at a walk and a trot. A subtle lameness is easier to detect at a trot but deciding what limb is affected is often easier when the limbs are moving slower at a walk.

The first step in lameness evaluation is deciding if an abnormal gait is orthopedic or neurologic in origin. In general, an orthopedic lameness will be consistently abnormal (the dog will take the same abnormal step every time). A neurologic lameness will be variable (the limbs are often placed differently on every step). Neurologic lameness also often involves scuffing of the nails, ataxia, and difficulty navigating circles or turning corners.

Orthopedic lameness is split into forelimb and hindlimb lameness. As the patient walks away from the observer, they are looking for one hip being held higher (hip hike), the pelvis being swayed side to side, circumduction of a limb and a short stride. A “hip hike” often indicates a stifle or tarsus issue as raising the hip allows forward movement of the limb with less flexion at these joints. A hip sway often indicates hip pain as the dog is moving the entire pelvis forward rather than fully flexing at the hip. As the patient walks toward the observer, a head bob can be seen with the head raising up when the affected leg hits the ground. Once again, a short stride is assessed.

Gait analysis becomes more difficult when multiple limbs are affected, it is a shifting lameness or it is subtle. Techniques to help in these situations include exercising the dog before evaluation, completing an orthopedic exam before evaluation or video-tapping the gait and replaying it in slow motion.

Given the difficulty of accurate gait analysis, findings should correlate with the rest of the signalment, history, exam and other diagnostics.

Evans R, Horstman C, Conzemius M. Accuracy and optimization of force platform gait analysis in Labradors with cranial cruciate disease evaluated at a walking gait. *Vet Surg.* 2005 Sep-Oct;34(5):445-9.

Hudson JT, Slater MR, Taylor L, Scott HM, Kerwin SC. Assessing repeatability and validity of a visual analogue scale questionnaire for use in assessing pain and lameness in dogs. *Am J Vet Res.* 2004 Dec;65(12):1634-43.

Quinn MM, Keuler NS, Lu Y, Faria ML, Muir P, Markel MD. Evaluation of agreement between numerical rating scales, visual analogue scoring scales, and force plate gait analysis in dogs. *Vet Surg.* 2007 Jun;36(4):360-7.

Waxman AS, Robinson DA, Evans RB, Hulse DA, Innes JF, Conzemius MG. Relationship between objective and subjective assessment of limb function in normal dogs with an experimentally induced lameness. *Vet Surg.* 2008 Apr;37(3):241-6. doi: 10.1111/j.1532-950X.2008.00372.x.

Conzemius MG, Evans RB. Caregiver placebo effect for dogs with lameness from osteoarthritis. *J Am Vet Med Assoc.* 2012 Nov 15;241(10):1314-9. doi: 10.2460/javma.241.10.1314

“Endoscopy on the Go”

How Videocapsule Endoscopy put the complete gut at anybody’s reach

Alice Defarges, DVM, MSc, DACVIM (Small Animal)

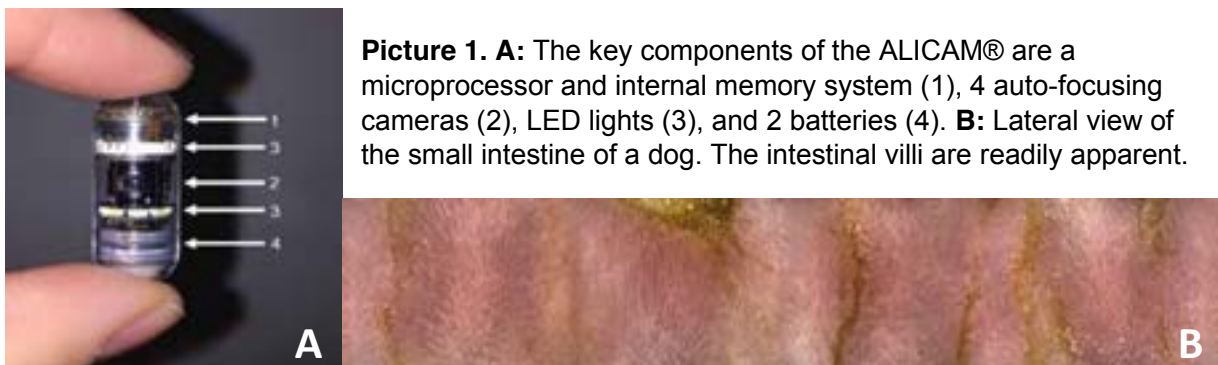
Video capsule endoscopy (VCE) provides a non-invasive endoscopic imaging technique that has been increasingly used for almost 2 decades in people. It involves the recording of the entire luminal gastrointestinal (GI) tract via an ingestible camera capsule. VCE offers several advantages over traditional GI endoscopy including the visualization of the entire small intestine and is performed as an ambulatory diagnostic test (no sedation or general anesthesia required). The main disadvantages of VCE are that GI biopsies cannot be collected and capsule movement cannot be controlled. First, the technology will be presented (focusing on the capsule used in dogs), then the procedure and bowel preparation will be described. Finally, indications, performance, and complications in people and dogs will be reviewed.

TECHNOLOGY

There are two different types of VCE available that differ based on the localization of the cameras within each capsule. Capsules with axial-view have 1 or 2 cameras at the extremity(ies), whereas capsules with lateral-viewing (“panoramic”) have several cameras at the center of the capsule. All commercialized capsules have similar components: a biocompatible plastic capsule, a digital camera, a compact lens, white-light-emitting diode (LED) illumination sources, and an internal battery source. The cameras take 2 to 3 images per second and their battery life ranges from 8 to 21 hours depending on the capsule. Newer generation capsules are smaller, have better image quality, and have longer battery life compared to earlier-generation models. To optimize the visualization of the small intestine, some have an adaptive frame rate system that is able to increase to 6 images per second if the capsule is accelerated by peristalsis. The capsules are single-use devices. Currently available capsules are the size of a large vitamin pill (11 x 31 mm). Several capsule platforms are approved for human use and available worldwide.

VIDEO CAPSULE ENDOSCOPY FOR VETERINARY PATIENTS: THE ALICAM®

ALICAM® (Infiniti Medical, USA) is currently the only device developed for use in veterinary patients. It has been used in people, dogs and horses. The ALICAM® is a “panoramic view” capsule (Picture 1.A). After downloading the pictures, a special software creates a 360° panoramic view from the pictures of each camera (Picture 1.B). No recorder or sensors are required- all pictures are stored in the capsule (versus other types of capsules).



Picture 1. A: The key components of the ALICAM® are a microprocessor and internal memory system (1), 4 auto-focusing cameras (2), LED lights (3), and 2 batteries (4). **B:** Lateral view of the small intestine of a dog. The intestinal villi are readily apparent.

BOWEL PREPARATION

Preparation of the GI tract prior to administration of a capsule is recommended to improve visualization quality, diagnostic yield, and completion rate. Preparation includes fasting with the potential administration of laxatives, antifoaming agents, and/or prokinetics. Like people, there is no standardized preparation protocol in dogs. In human medicine, the duration of fasting of solid food depends on the organ of interest: 2 to 4 hours for an esophageal study; 12 to 24 hours of fasting for visualization of the small intestine; and 24 hours of fasting for a

colonic study (+enemas). In dogs, fasting times from 12 to 48 hours have been described. No difference in the cleanliness of the colon was noted when the dogs were fasted for 24 versus 48 hours.

PROCEDURE

ALICAM® (Infiniti Medical, USA) capsules are available for any veterinarian at a lower cost than conventional endoscopy. No additional equipment nor training is required. They can be ordered through Infiniti Medical. All capsules are activated once disconnected from a magnet in its box. The main route of delivery is oral administration. In patients with dysphagia, abnormal upper GI anatomy or in sedated patients, swallowing of the capsule is contraindicated. For such instances, an endoscopic delivery device (AdvanCE® capsule endoscope delivery device, US Endoscopy) or a net retriever has been developed and used safely in people and in dogs. Patients administered the VCE orally can resume normal activity right after the capsule administration. When the capsule is delivered endoscopically, patients can resume normal activity after recovery from general anesthesia. For small bowel studies in people, a diet of clear liquids can be consumed 2 hours and a light meal 4 hours after swallowing the capsule. In canine studies, an 8-hour fasting time after administration of the capsule is recommended. It takes an average of 3 days for the capsule to be excreted. Because all pictures are stored in the capsule, the ALICAM® needs to be retrieved from feces. Once the capsule is collected and cleaned, the entire capsule is sent to Infiniti and is inserted into a reader that downloads the images. The capsule can be ordered easily from Infiniti Medical, administered at the clinic, and sent back to the Infiniti for interpretation. A report from a board-certified internist is produced within 24 hours. It includes description of findings, pictures and recommendations.

INDICATIONS AND DIAGNOSTIC PERFORMANCE OF VCE IN HUMAN MEDICINE

According to the European and North American guidelines for small bowel VCE, the main indications for use of VCE include small intestinal bleeding, iron deficiency anemia, diagnosis and management of Crohn's disease, celiac disease, as well as detection of small intestinal tumors and polyposis. In general, it is considered a complementary test in patients with GI disease who have had negative or inconclusive endoscopic or imaging studies. In these patients, diagnostic yield has been significantly higher with VCE compared with small-bowel radiograph, angiography, and push-enteroscopy. Because VCE studies soon after GI bleeding have higher diagnostic yields than later studies, it is recommended to perform VCE within 14 days of a bleeding event. In case of ongoing obscure overt GI bleeding events and negative findings of VCE, repeat GI endoscopy and/or VCE are recommended. The diagnostic yield of a single VCE is reported as 38% for the first procedure, 44% for the second procedure, and 63% for the combined findings of back-to-back VCE performed within a 24-hour interval.

INDICATIONS AND DIAGNOSTIC PERFORMANCE OF VCE IN VETERINARY MEDICINE

In contrast to human medicine, VCE is not yet widely used in veterinary patients. More recently, several clinical studies, case reports and abstracts were published describing the use of VCE in dogs, and horses; their use in feline patients has not been reported at the time of writing this proceeding (due to the small diameter of the intestines). The reported weights of dogs range from 6.0 to 62.5 kg.

Overall, the main indication for VCE is GI hemorrhage (either overt or occult/suspected). Investigating the entire gut without general anesthesia is very beneficial in patients with severe anemia that are poor candidates for general anesthesia.

VCE can be a great tool to investigate obscure GI bleeding after negative conventional endoscopy or surgical explore. The recent use of ALICAMs in veterinary medicine has revealed vascular anomalies in dogs that were missed in surgical explores and by conventional endoscopy (Manuscript in review).

Additionally, VCE has shown to be helpful to diagnose various GI diseases (such as ulcers, neoplasia, protein losing enteropathy) when general anesthesia is contraindicated, when mid intestinal disease is suspected, or when clients have financial constraints that preclude referral.

Finally, VCE may be helpful in diagnosing protein-losing enteropathy and GI vascular anomalies in dogs. The use of VCE to diagnose protein-losing enteropathy has the following advantages: no general anesthesia, no fluid therapy, non-invasive test in hypoproteinemic patients predisposed to delayed healing after biopsies and fluid imbalances. The possible role of VCE in diagnosis and monitoring dogs with protein losing enteropathy or inflammatory bowel disease is being investigated.



Picture 2: Still-frame recorded by an ALICAM showing an intestinal ulcer in 10-year-old female spayed Border collie cross (19kg). *Description of the case:* This dog presented for anorexia, melena and lethargy. On complete blood count, there was a mild to moderate anemia with mild polychromasia. The abdominal ultrasound and conventional gastroduodenoscopy did not reveal any abnormal findings. The VCE study revealed the presence of a severe ulcer in the jejunum.



Picture 3: Still-frame recorded by an ALICAM showing dilated lacteals in the small intestine of a 11-year-old female spayed Labrador (38kg). *Description of the case:* The dog presented for lethargy, hyporexia, and weight loss. On physical examination the dog had muscle wasting and distended abdomen. The biochemistry revealed severe panhypoproteinemia. Abdominal ultrasound revealed diffuse enteropathy and abdominal effusion. The abdominal ultrasound did not show any abnormalities except for speckles in the duodenal mucosa. While stabilizing the case, an ALICAM was administered and revealed dilated lacteals in the small intestine. Later on, endoscopic biopsies confirmed the suspicion of lymphangiectasia.

COMPLICATIONS AND CONTRAINDICATIONS

VCE is considered an overall safe procedure. Clinical complications include difficulty or inability to swallow the capsule (<1%), incomplete small bowel study (0 to 30%), and capsule retention (~2%).

Contraindications for VCE in people are known or suspected GI obstruction, strictures or fistula, dysphagia, cardiac pacemakers or other implanted electromedical devices, and pregnancy. In dogs, the use of VCE is limited to patients weighing ≥ 7 kg.

Difficulties in swallowing with oral administration, or aspiration of the capsule have not been reported in dogs. Incomplete small bowel studies are the most commonly reported complications in people and in dogs. Reported rates for incomplete studies in people range from 20% to 30%. Risk factors associated with incomplete studies in people include previous small bowel surgery, previous bowel obstruction, hospitalization, overt GI bleeding, suspected or known Crohn's disease, moderate or poor bowel cleansing, delayed gastric transit time, diabetes mellitus, older age, and male sex. The role of prokinetics and purgatives to improve completion rates of VCE studies is still uncertain. In dogs, rates of incomplete studies has been reported to be 6% to 38%. These differences in completion rates may be due to differences in: health status (e.g., healthy versus sick, hospitalized versus ambulant, acute versus chronic disease), size of dogs, the capsule used (e.g., size, battery life), and preparation protocol (e.g., fasting time, PEG administration).

Capsule retention, defined as the presence of the capsule in the GI tract for a minimum of 2 weeks, is a rare complication in people (never reported in dogs). The rate of capsule retention depends on the clinical condition of the patient; capsule size and patients' age have not been reported as risk factors. Higher incidents of capsule retention (10% to 25% of patients) have been noted in patients with known Crohn's disease, IBD, strictures or obstruction, pelvic or abdominal radiation, previous small bowel resection, chronic use of NSAIDs, or suspected tumor. Removal may be achieved via medical management (e.g., in patients for IBD) or surgical or endoscopic retrieval.

References

1. Gerber, J., A. Bergwerk & D. Fleischer (2007) A capsule endoscopy guide for the practicing clinician: technology and troubleshooting. *Gastrointest Endosc*, 66, 1188-95.
2. Hardy, B. T., J. Gentile-Solomon & J. A. Solomon (2016) Multiple gastric erosions diagnosed by means of capsule endoscopy in a dog. *J Am Vet Med Assoc*, 249, 926-930.
3. Harris, A. N., R. A. Armentano, A. R. Torres & A. E. Gallagher (2016) Use of endoscopic-assisted argon plasma coagulation for the treatment of colonic vascular ectasia (angiodysplasia) in an adult dog. *J Am Vet Med Assoc*, 248, 526-31.
4. Holden, J. P., P. Dureja, P. R. Pfau, D. C. Schwartz, M. Reichelderfer, R. H. Judd, I. Danko, L. V. Iyer & D. V. Gopal (2007) Endoscopic placement of the small-bowel video capsule by using a capsule endoscope delivery device. *Gastrointest Endosc*, 65, 842-7.
5. Höög, C. M., L. Bark, J. Arkani, J. Gorsetman, O. Broström & U. Sjöqvist (2012) Capsule retentions and incomplete capsule endoscopy examinations: an analysis of 2300 examinations. *Gastroenterol Res Pract*, 2012, 518718.
6. Kim, B. S., B. T. Li, A. Engel, J. S. Samra, S. Clarke, I. D. Norton & A. E. Li (2014) Diagnosis of gastrointestinal bleeding: A practical guide for clinicians. *World J Gastrointest Pathophysiol*, 5, 467-78.
7. Lee, A. C., C. Epe, K. W. Simpson & D. D. Bowman (2011) Utility of capsule endoscopy for evaluating anthelmintic efficacy in fully conscious dogs. *Int J Parasitol*, 41, 1377-83.
8. Lee, A. C., J. A. Hostetler & D. D. Bowman (2014) Assessing the speed of kill of hookworms, *Ancylostoma caninum*, by Advantage Multi[®] for Dogs using endoscopic methods. *Vet Parasitol*, 204, 402-6.
9. Lee, M. M., A. Jacques, E. Lam, R. Kwok, P. Lakzadeh, A. Sandhar, B. Segal, S. Svarta, J. Law & R. Enns (2010) Factors associated with incomplete small bowel capsule endoscopy studies. *World J Gastroenterol*, 16, 5329-33.
10. Leguillette, R., M. Steinmann, R. Bezugley & e. al (2017) Capsule Endoscopy (ALICAM) in horses: assessing gastrointestinal tract transit time, image quality and lesions.
11. Leung, W. K., F. K. Chan, S. S. Fung, M. Y. Wong & J. J. Sung (2005) Effect of oral erythromycin on gastric and small bowel transit time of capsule endoscopy. *World J Gastroenterol*, 11, 4865-8.
12. Liao, Z., R. Gao, C. Xu & Z. S. Li (2010) Indications and detection, completion, and retention rates of small-bowel capsule endoscopy: a systematic review. *Gastrointest Endosc*, 71, 280-6.
13. Mabry, K., T. Hill, S. L. Marks & B. T. Hardy (2019) Use of video capsule endoscopy to identify gastrointestinal lesions in dogs with microcytosis or gastrointestinal hemorrhage. *J Vet Intern Med*, 33, 1964-1969.
14. Palerme, J., A. Silverstone, Riedesel E & e. al (2018) Gastrointestinal transit time and mucosa appearance as assessed by capsule endoscopy. *Journal of Veterinary Internal Medicine*.
15. Pennazio, M., C. Spada, R. Eliakim, M. Keuchel, A. May, C. J. Mulder, E. Rondonotti, S. N. Adler, J. Albert, P. Baltés, F. Barbaro, C. Cellier, J. P. Charton, M. Delvaux, E. J. Despott, D. Domagk, A. Klein, M. McAlindon, B. Rosa, G. Rowse, D. S. Sanders, J. C. Saurin, R. Sidhu, J. M. Dumonceau, C. Hassan & I. M. Gralnek (2015) Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy*, 47, 352-76.
16. Pomrantz, J., B. Hardy, A. Sharma & J. Solomon (2016) Feasibility of a Novel Gastrointestinal Imaging Device for use in Dogs [Abstract]. *ACVIM Forum*, Denver, CO.
17. Rondonotti, E., J. M. Herrerias, M. Pennazio, A. Caunedo, M. Mascarenhas-Saraiva & R. de Franchis (2005) Complications, limitations, and failures of capsule endoscopy: a review of 733 cases. *Gastrointest Endosc*, 62, 712-6; quiz 752, 754.
18. Stiller, J., A. Defarges, B. Brisson, A. Bersenas & D. Pearl (2021) Feasibility, results and complications of video capsule endoscopy in dogs with gastrointestinal bleeding. *Journal of Veterinary Internal Medicine*.35(4);1743-1753
19. Stiller, J., A. Defarges, B. Brisson, A. Bersenas, J. Pomrantz, B. Lang & D. Pearl (2021) Diagnostic evaluation of urea nitrogen/creatinine ratio in dogs with gastrointestinal bleeding. *Journal of Veterinary Internal Medicine*.35(3);1427-1438
20. Westerhof, J., R. K. Weersma & J. J. Kornstraa (2009) Risk factors for incomplete small-bowel capsule endoscopy. *Gastrointestinal Endoscopy*, 69, 74-80.

REVIEW OF PULMONARY PATTERNS

THORACIC RADIOGRAPHS – LUNG EDITION

Lynn Griffin, DVM, MS, DACVR, DACVR(RO)

Radiographic interpretation of pulmonary disease is a critical part of veterinary diagnostics, but can be one a challenging area of radiographic evaluation. Utilizing a good understanding of normal radiographic anatomy as well as an organized, step-by-step approach, accurate interpretation of pulmonary disease is very likely.

Pulmonary disease usually results in either an increase or a decrease in radiographic opacity of the lungs. Most diseases result in an increase in opacity, usually characteristic for the pulmonary parenchymal component (alveolar, bronchial, interstitial, vascular) involved. These characteristic opacity changes are called lung patterns.

Identification of the lung pattern is helpful, as a list of differential diagnoses can be determined for that particular lung pattern. However, lung patterns can be non-specific, representing disease in transition (a disease process can progress or resolve through more than one lung pattern). It is not uncommon to get a mixed pattern (think “interstitial coalescing into alveolar” or “bronchointerstitial pattern”).

BRONCHIAL PATTERN

The bronchia pattern is caused by thickening of the bronchial walls, usually secondary to chronic inflammation. The underlying etiology of this thickening can include a combination of mucosal edema, smooth muscle hypertrophy, mucous production, mineralization, cellular infiltrates and, in some cases, neoplastic infiltrate.

Radiographic signs of bronchial pattern:

1. Thickened end-on bronchi appear as rings or “donuts”
2. Thickened longitudinal bronchi appear as parallel radiopaque lines or “tramtracks”
3. The lungs surrounding the thickened airways are still well aerated, sometimes hyperinflated

Etiologies of bronchial pattern

1. Chronic bronchitis secondary to allergic, infectious, inflammatory causes
 - a. May also see overexpanded lung fields due to air-trapping, either chronic or transient
 - b. Radiographic and clinical signs do not always correlate well
 - c. Acute bronchitis rarely shows radiographic signs (insufficient time for bronchial wall thickening to be visible radiographically)
2. Feline asthma
 - a. Thickened bronchial walls sometimes difficult to see due to small size
 - b. May have associated right middle lung lobe atelectasis due to bronchial plugging
 - c. May have overexpanded lung fields due to acute bronchoconstriction and air trapping
 - d. May have diaphragmatic tenting
3. Bronchiectasis
 - a. Irreversible dilation of bronchi due to very chronic airway inflammation

- i. Dilated bronchi filled with fluid/mucus, and seen end-on, may appear as nodules
- 4. Infection
 - a. bacterial, parasitic (toxoplasmosis)
- 5. Chronic irritation
 - a. eg smoke exposure
- 6. Diffuse neoplasia
 - a. Rare, cats with metastatic mammary adenocarcinoma; can be asymptomatic
- 7. Atypical peribronchial cardiogenic edema (think “cats” again)
- 8. Bronchial mineralization

Lists are not a complete complication of differentials

INTERSTITIAL PATTERN

Can be unstructured or structured (nodular).

Occurs when there is thickening, fluid or cellular infiltrate in the interstitium. As disease gets worse and radiographic changes progress can develop into alveolar pattern. This pattern can often be mimicked by exposure artifacts.

Radiographic signs of an unstructured interstitial pattern:

1. Overall increase in hazy, often linear, opacities
2. Vasculature still visible but fuzzy

Etiologies of unstructured interstitial pattern

1. Artifact
 - a. Expiratory film
 - b. Underexposure
 - c. Obesity and scatter radiation causing "grayness" of the film
2. Geriatric fibrosis: benign "old age" changes
3. Interstitial pulmonary edema (early stages of edema; can progress to more severe alveolar pattern if not treated)
4. Hemorrhage (less severe form of hemorrhage; can progress to alveolar pattern if severe)
5. Interstitial pneumonia: viral, early or resolving bacterial pneumonia
6. Pulmonary fibrosis .
7. Neoplasia
 - a. Lymphosarcoma, some rare primary lung neoplasias, metastatic pulmonary neoplasia

Etiologies of structured interstitial pattern

1. Artifact of thoracic wall such as skin tumor, nipple, tick
2. Primary pulmonary neoplasia
3. Metastatic pulmonary neoplasia
4. Fungal granulomas
5. Abscess (more common in equine, ie rodococcus)
6. Hematoma
7. Fluid/blood filled bulla

8. Cavitated mass/nodule (both air and soft tissue opacity)
 - a. neoplasia, abscess, traumatic bulla, parasitic cyst (Paragonimus)

Lists are not a complete complication of differentials

ALVEOLAR PATTERNS:

Occurs when air in alveoli are replaced with fluid, cell or surrounding tissues become consolidated (atelectasis, hemorrhage, infiltration with tumor)

Radiographic signs of an alveolar pattern:

1. Uniform, homogenous fluid opacity (faint ranging up to fluffy or solid)
2. Lobar sign – when opacity extends to edge of one lung lobe and the adjacent lung lobe has a more normal level of aeration
3. Border effacement between lung and other soft tissue opaque structures, eg. Heart or diaphragm
4. Air bronchogram – walls not seen, only bronchial lumen
5. Can't see blood vessels
6. Usually focal, diffuse alveolar pattern very rare unless very severe disease

NOTE: when the alveolar pattern is the dominant pattern it will silhouette with the other patterns and obscure them. This pattern can happen quickly and the clinical picture may not be consistent with radiographs (eg. A dog with severe aspiration pneumonia may be very sick but not show the typical pattern on initial radiographs; serial radiographs may be required to assist in diagnosis).

Etiologies of alveolar pattern

1. Pneumonia: appearance depends on route of infection
 - a. Bronchopneumonia and aspiration pneumonia: typically have a ventral distribution, most commonly affecting the right cranial, right middle, and left cranial lung lobes
 - i. Lesions begin at periphery and extend towards hilus as severity worsens
 - b. Hematogenous pneumonia: diffuse distribution; more common in foals
2. Pulmonary edema (severe)
 - a. Cardiogenic edema (left sided congestive heart failure): dorsal and hilar distribution
 - i. Typically also have enlarged left atrium and ventricle, venous congestion
 - ii. In acute cases, more severe distribution in right caudal lung lobe may occur
 - iii. Cardiogenic edema in cats has a random distribution
 - iv. Response to diuretics may occur radiographically within 12-24 hours
 - b. Non-cardiogenic edema
 - i. Causes: electrocution, seizure activity or head trauma, near-drowning, acute severe hypoxia (such as acute airway obstruction), smoke inhalation; many other causes
 - ii. Typically caudal lung lobes most severely affected; starts at periphery, and extends towards hilus when severe
3. Hemorrhage
 - a. secondary to trauma; may have any distribution, and can be very extensive

- i. check for other signs of trauma such as rib fractures, pneumothorax
 - b. secondary to coagulopathy
4. Atelectasis
- a. Alveolar opacity associated with loss of volume and mediastinal shift
 - b. Associated with bronchial obstruction or prolonged recumbency
5. Neoplasia
- a. Rare cause of alveolar pattern; consider when the alveolar opacity has an atypical distribution (entire lobe affected without infiltrate anywhere else), or doesn't respond to therapy

SUMMARY CHARTS

<i>Common Causes of Bronchial Patterns</i>	
Diagnosis	Etiology, distribution and/or extra info
Allergic airway disease	Common in cats, may have hyperinflation of lungs/tented diaphragm; acutely may be no changes
Infection	Bacterial, parasitic (toxoplasma)
Chronic irritation	Eg. Smoke exposure
Diffuse neoplasia	Rare, cats with metastatic mammary adenocarcinoma, can be asymptomatic with terrible rads
Atypical peribronchial cardiogenic edema	Cats
Bronchial mineralization	“Old dog lung”, hyperadrenocorticism
Pulmonary Fibrosis	

<i>Common Causes of Unstructured Interstitial Pattern</i>	
Diagnosis	Etiology, distribution and/or extra info
Artifact	Expiration, increase BCS, underexposed
Fibrosis	“Old dog lung”, idiopathic
Pulmonary Edema	Cardiogenic or non-cardiogenic
Hemorrhage	
Interstitial Pneumonia	Viral (distemper), leptospirosis (may be nodular)
Neoplasia	Diffuse think lymphoma

<i>Common Causes of Structured Interstitial Pattern</i>	
Diagnosis	Etiology, distribution, and/or extra info
Neoplasia - metastatic	Multiple nodules or military pattern
Neoplasia - primary	Primary pulmonary carcinoma (caudodorsal); histiocytic sarcoma (ventral right middle)

Granulomas	Fungal – geography, lymphadenopathy
Abscess	May be cavitory; often inflammation around lesions
Rule outs	Osteomas, end on blood vessels, external structures; all of these often times more mineral in appearance; if <5mm is likely mineral opacity

<u>Common Causes of Alveolar Pattern</u>	
Diagnosis	Etiology, distribution and/or extra info
Pneumonia	Aspiration and bronchopneumonia often ventral; hematogenous diffuse
Pulmonary edema (severe)	
Hemorrhage	Trauma or coagulopathy
Atelectasis	Anesthesia, prolonged recumbancy, bronchial plugging in cats with asthma
Neoplasia	Histiocytic sarcoma (R middle most common) or primary carcinoma (caudal LL's most common)
PTE	May see focal alveolar infiltrate OR hyperlucency

Have a Heart – Review of Cardiac Radiology

Lynn Griffin, DVM, MS, DACVR, DACVR(RO)

Radiographs work well as a basic screen tool to help rule out marked abnormalities

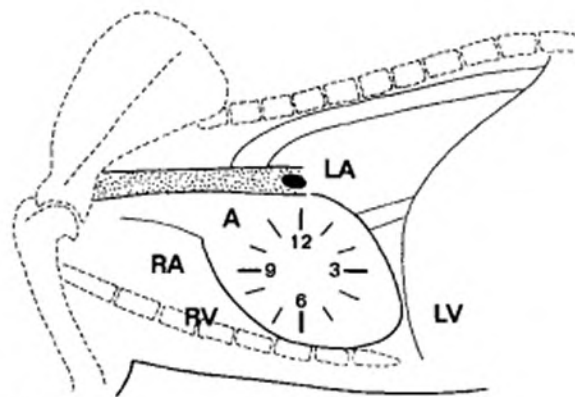
- An echo almost always needed to confirm findings and determine functionality

When looking at the heart on radiographs it's easiest to evaluate by asking yourself these questions

- How is my technique? Positioned well? Proper exposure?
- Is the heart normal in size? Too big? Too small?
- Which chamber is affected?
- Are any of the great vessels enlarged? What about the rest of the pulmonary vessels?
- What about everything else in the thorax?

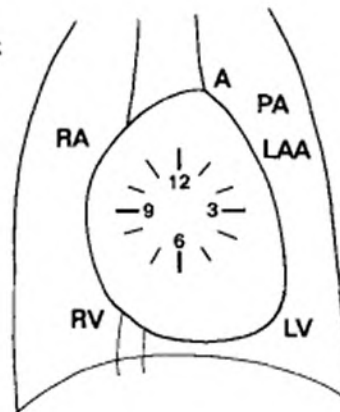
Vertebral Heart Scores

- Sum of the long and short axis of the heart measured against the vertebrae, starting at T4
- 9.7 +/- 0.5 vertebral bodies is "normal" in dog; range from 8.5-10.5 with breed variations
- Normal VHS for cat is 7.5 +/- 0.3 (remember in geriatric cats their hearts become more horizontal and they can develop an "aortic knob" as a normal variant)

Chamber enlargement (diagram from Suter et al, Thoracic Radiology)

(b)

Their locations are:
 A = 11 to 1 o'clock
 PA = 1 to 2
 LAA = 2 to 3
 LV = 3 to 5
 RV = 5 to 9
 RA = 9 to 11



(c)

Left Atrial Enlargement

- Straightening of caudo-dorsal of heart on lateral; “Cowboy” sign on VD
- If severe changes can start to see enlarged left auricle at 2-3 o’clock on VD

Left Ventricular Enlargement

- May look normal, need severe remodeling to see on radiographs
- May elongate on lateral and/or VD
- Dorsal displacement of trachea

Right Atrial Enlargement

- On lateral bulge along cranial dorsal heart; WARNING: same bulge seen for MPA and aorta, need VD to differentiate
- On VD see bulge at 9-11 o’clock

Right Ventricular Enlargement

- Hypertrophy secondary to heartworm disease or pulmonic stenosis most common
- Increase sternal contact and/or elevation of apex on lateral with “Reverse D” on VD

What Blood Vessels Do We Look at?

- Main pulmonary artery (MPA) on VD is bulge at 1 o’clock; bulge craniodorsal margin on lateral
- Aorta is at 11-1 o’clock on the VD
- Veins are ventral and central; no more than width of 4th rib on lateral 9th rib on VD
 - Symmetry of vein and artery most important
- All BV’s enlarged
 - IVF overload
 - Fluid retention secondary to decreased cardiac output
 - Left to right shunt (PDA, VSD, ASD)
- All BV’s small
 - Hypovolemia, shock, dehydration
 - Addison’s
 - Severe pulmonic stenosis
 - Right to left shunt – ToF, VSD with pulmonic stenosis
- Veins big, arteries normal
 - Volume overload – mitral insufficiency, DCM, HCM
 - LA obstruction
- Veins normal, arteries big
 - HWD or pulmonary hypertension until proven otherwise

What else?

Don’t forget when you are doing a thorough evaluation of your thoracic radiographs you now need to look at everything else

- Pleural lines
 - You shouldn’t be able to see; if you can think effusion or thickening

- Pneumothorax
 - Heart displaced dorsally on lateral (note: may see normally in some deep chested dogs)
 - Blood vessels don't go out to periphery
 - Flattened diaphragm, atelectasis of lungs
 - Tension pneumothorax – EMERGENCY! Barrel shaped chest, mediastinal shift away from side with tension, severe atelectasis
- Pneumomediastinum
 - Can see structures (trachea, esophagus, blood vessels) more clearly because outlined by gas
 - Tracheal rupture, esophageal rupture, Macklin effect, SQ edema from cervical trauma
- Intrathoracic lymph nodes
 - Sternal (dorsal to 2nd/3rd sternebrae)
 - Mediastinal (look at VD to confirm)
 - Tracheobronchial (think of when you have ventral deviation of carina)

INTERPRETING CHALLENGING THORACIC RADIOGRAPHS – LUNG EDITION

Lynn Griffin, DVM, MS, DACVR, DACVR(RO)

Radiographic interpretation of pulmonary disease is a critical part of veterinary diagnostics, but can be one a challenging area of radiographic evaluation. The majority of our cases will be relatively straight forward, but what do we do when we get a complicated case? Going back to the basics by utilizing a good understanding of normal radiographic anatomy as well as an organized, step-by-step approach can be helpful in these cases.

The first thing to do when we are presented with a set of thoracic radiographs, whether it is a straight forward diagnosis or not, is to go through our initial check list and evaluate:

1. Technique and positioning
2. Labelling
3. Anatomy
4. THEN we assess every structure using Roentgen signs
 - a. Size
 - b. Shape
 - c. Margination
 - d. Opacity
 - e. Location

When we find some pulmonary pathology the next thing to do is to look at location:

1. Distribution of the PRIMARY pulmonary opacity (understanding that there is usually a mixed pattern)
 - a. Ventral distribution – Think aspiration (right middle most common) or bronchopneumonia
 - b. Dorsal and hilar – cardiogenic pulmonary edema?
 - c. Diffuse – hematogenous spread?
2. Look at secondary abnormalities and history. Do they support your suspicion?
 - a. Heart enlargement for cardiogenic pulmonary edema
 - b. Signs of rib fractures and/or pneumothorax if you suspect contusions
 - c. History of vomiting if thinking aspiration

Next step to solve the mystery is to try and decide what pattern we are dealing with. This seems straightforward, but patterns are often mixed. If this is the case decide what the PRIMARY and/or MOST SEVERE pattern is to help build your differentials.

SUMMARY:

- Location, location, location

- What's the pattern?
 - Bronchial = airway
 - BAL, TTW
 - Interstitial = interstitium
 - Fine needle aspirate, biopsy
 - Alveolar
 - BAL or Fine needle aspirate/biopsy
- What are the other clues?
 - Mediastinal shift
 - Loss of volume or mass effect
 - Something in the thoracic cavity that shouldn't be there
 - Air, fluid, mass, radiodense foreign material

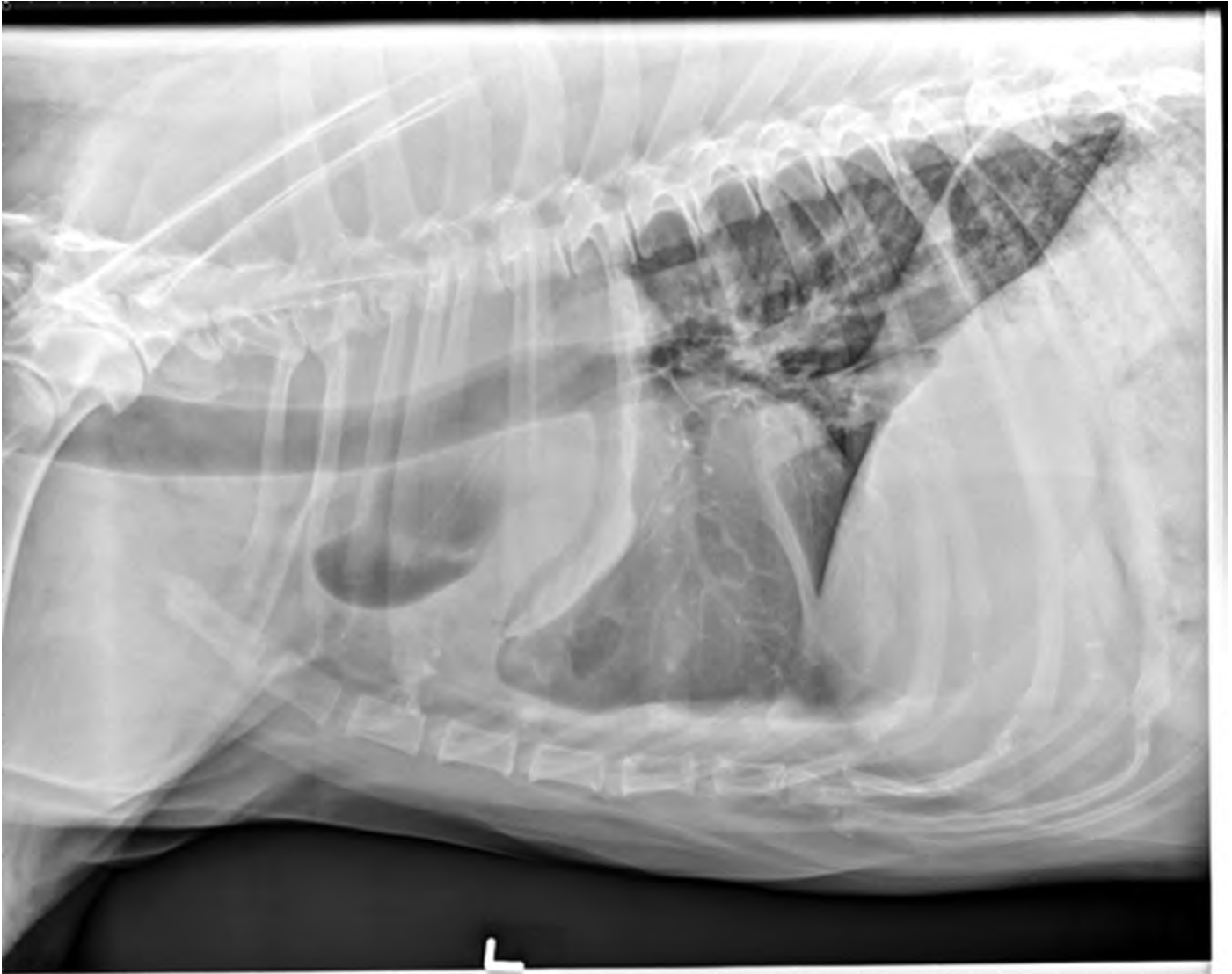
Case 1: “Thunder” is a 1 year old German Short Haired Pointer, FS. Has been having trouble breathing over the last week and it’s getting worse.

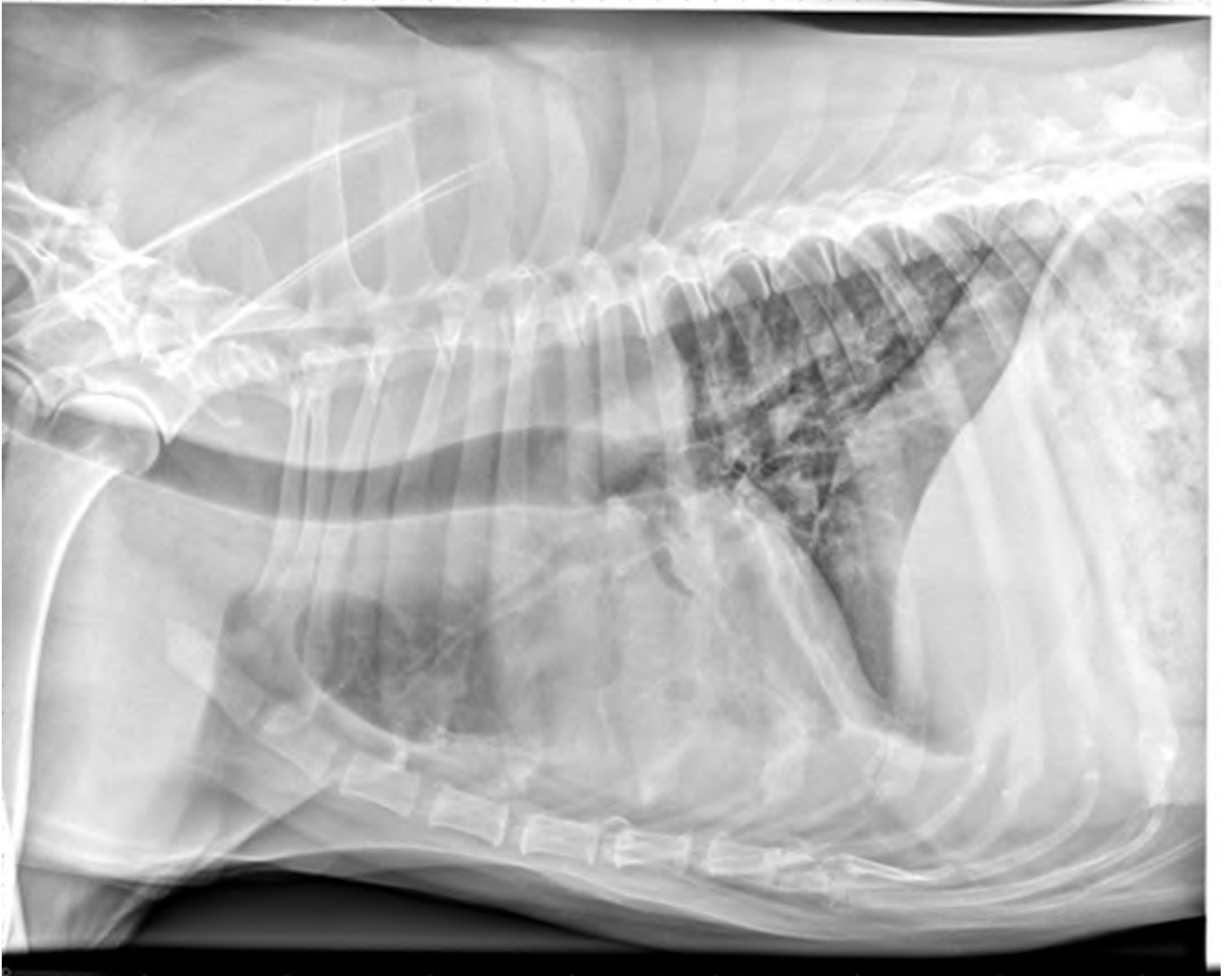






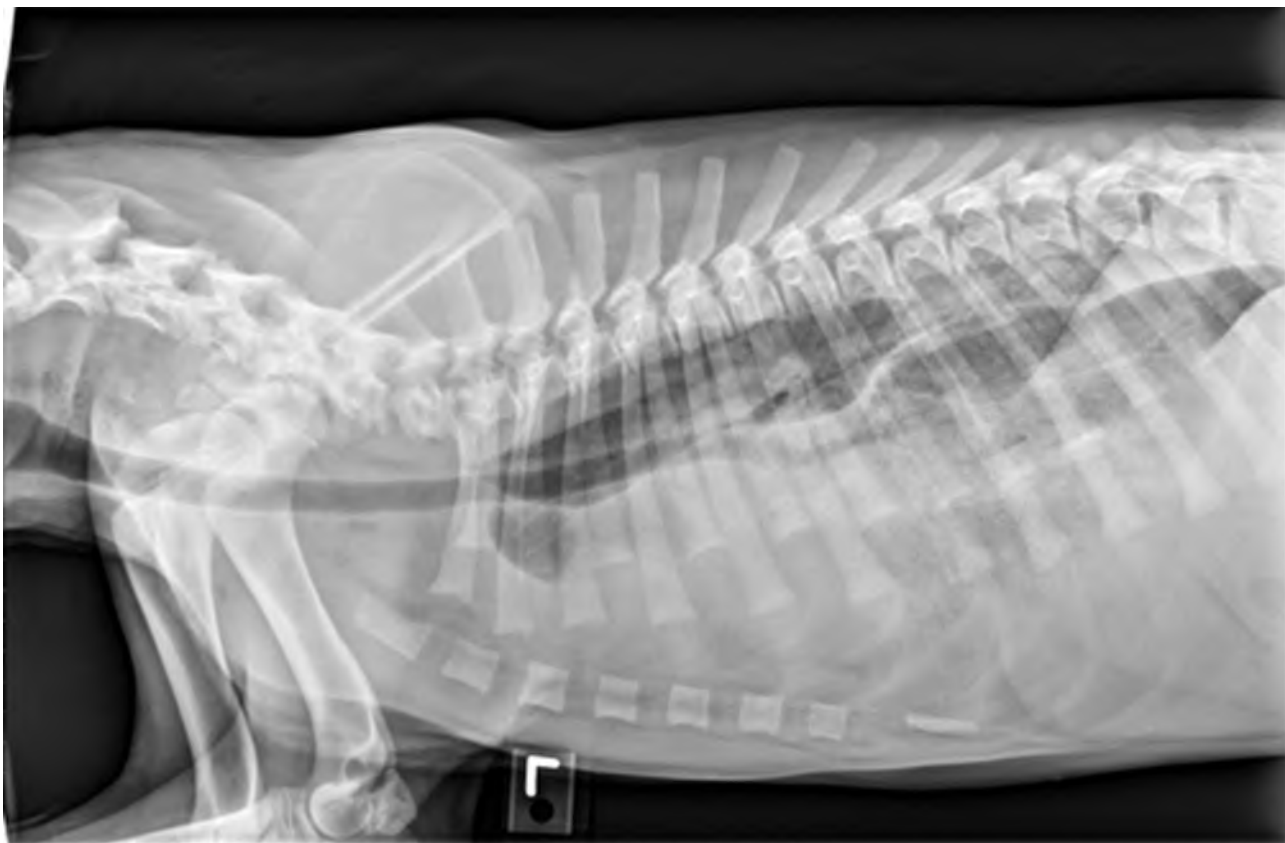
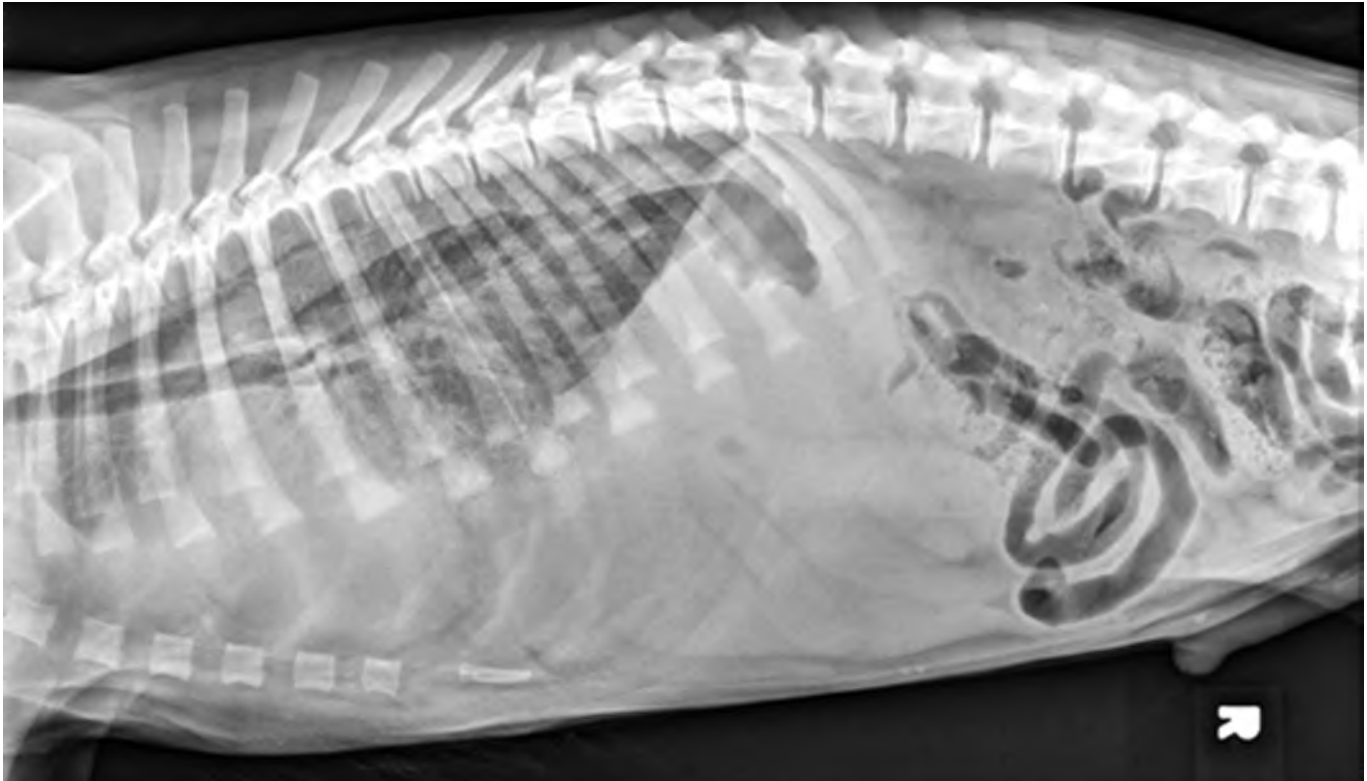
Case 2: "Sage" 11 YO MC Lab, 24 hours of being down on hind legs







Case 3: “Hachi” a 3 month old German Shepherd transferred for history of respiratory difficulty and aspiration pneumonia





To Cut or Not to Cut: Interpreting abdominal radiographs in a vomiting animal

Lynn Griffin, DVM, MS, DACVR, DACVR(RO)

Systematic Approach

1. Clinical signs and history
 - a. Younger animals more likely to have eaten FB, older animals more likely to have cancer
 - b. How long have they been vomiting? Are they holding any food or water down?
2. Physical exam
3. Bloodwork
 - a. Underlying cause for vomiting like kidney disease
 - b. Blood gases?
4. Reported radiographic signs of obstruction
 - a. "2 pops"
 - b. Small intestinal loops that are $>2x$ width of rib or $>1.6x$ L5 vertebral body in dog
 - i. $>12mm$ in cats or $>2x$ height of L4 vertebral body
 - ii. The bigger they are the more likely they are to be obstructed
 - c. Visible foreign material
 - d. Serial radiographs
 - i. 6-8 hours later if see something suspicious
5. Few other things
 - a. Radiography tends to be less accurate than ultrasound for identifying a foreign body obstruction BUT is it not significant AND the accuracy declines if you are not an experienced sonographer
 - b. Big dogs it is TOUGH to see all the loops of intestine with ultrasound and very hard to see pylorus
 - c. CT "faster" than ultrasound to obtain but you still need to interpret and no statistical difference in how accurate it is to detect mechanical obstructions in a dog

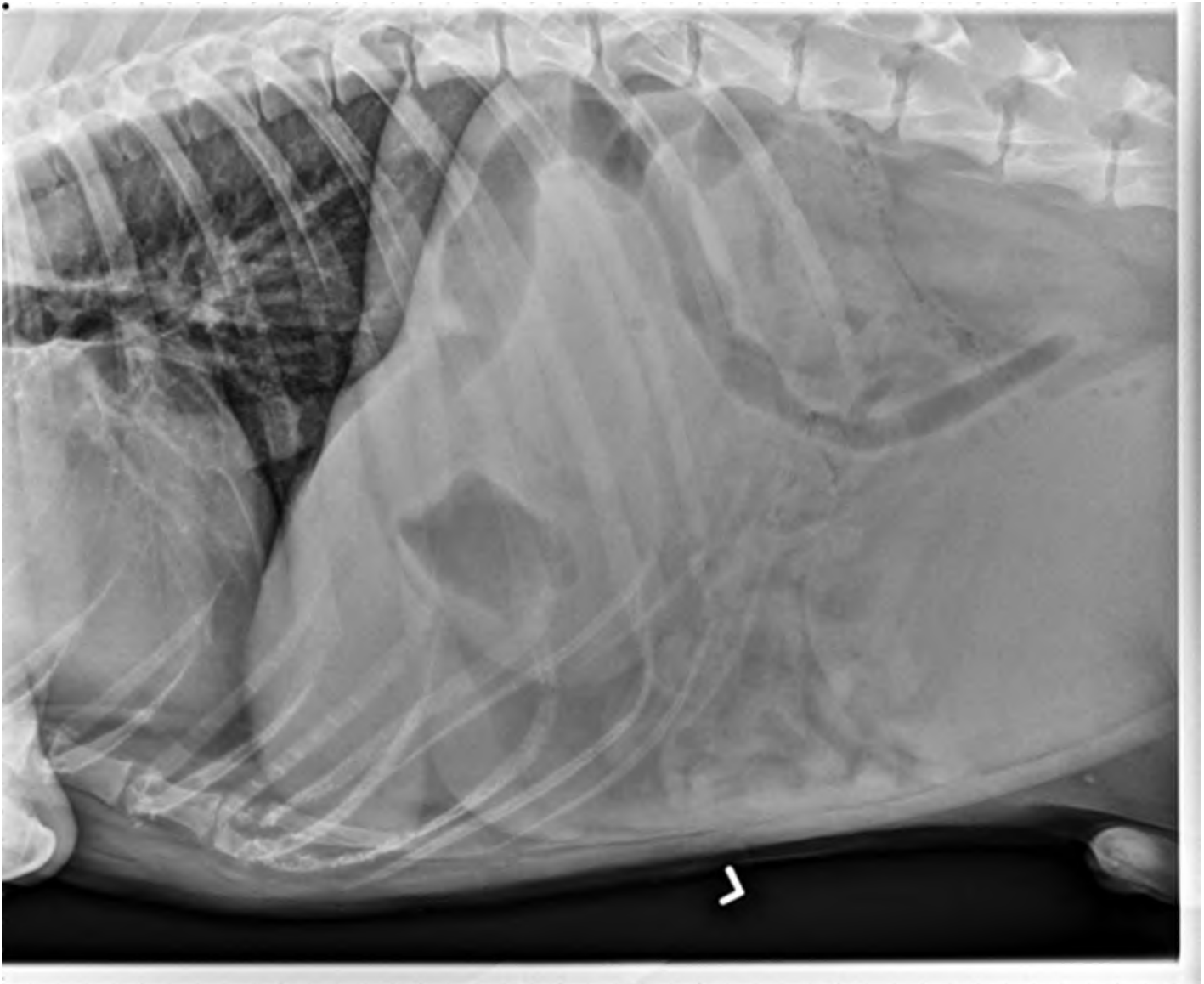
Case 1: "Riley" a 7 YO MC mixed breed dog; has vomiting multiple time, lethargic and painful on abdominal palpation





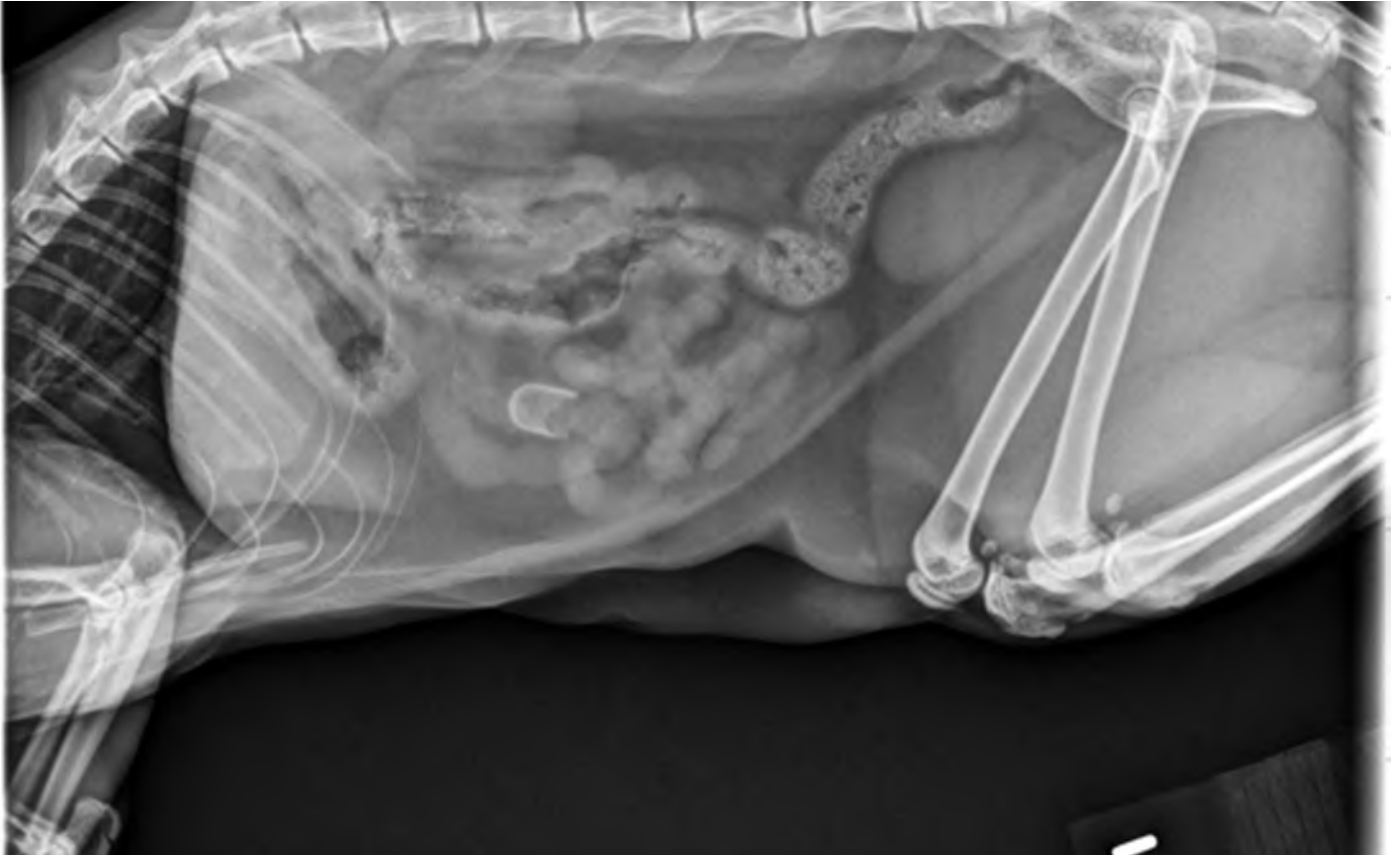


Case 2: "Bentley" – Has been vomiting every 30 minutes since 2:30AM, 10% dehydrated, uncomfortable on abdominal palpation



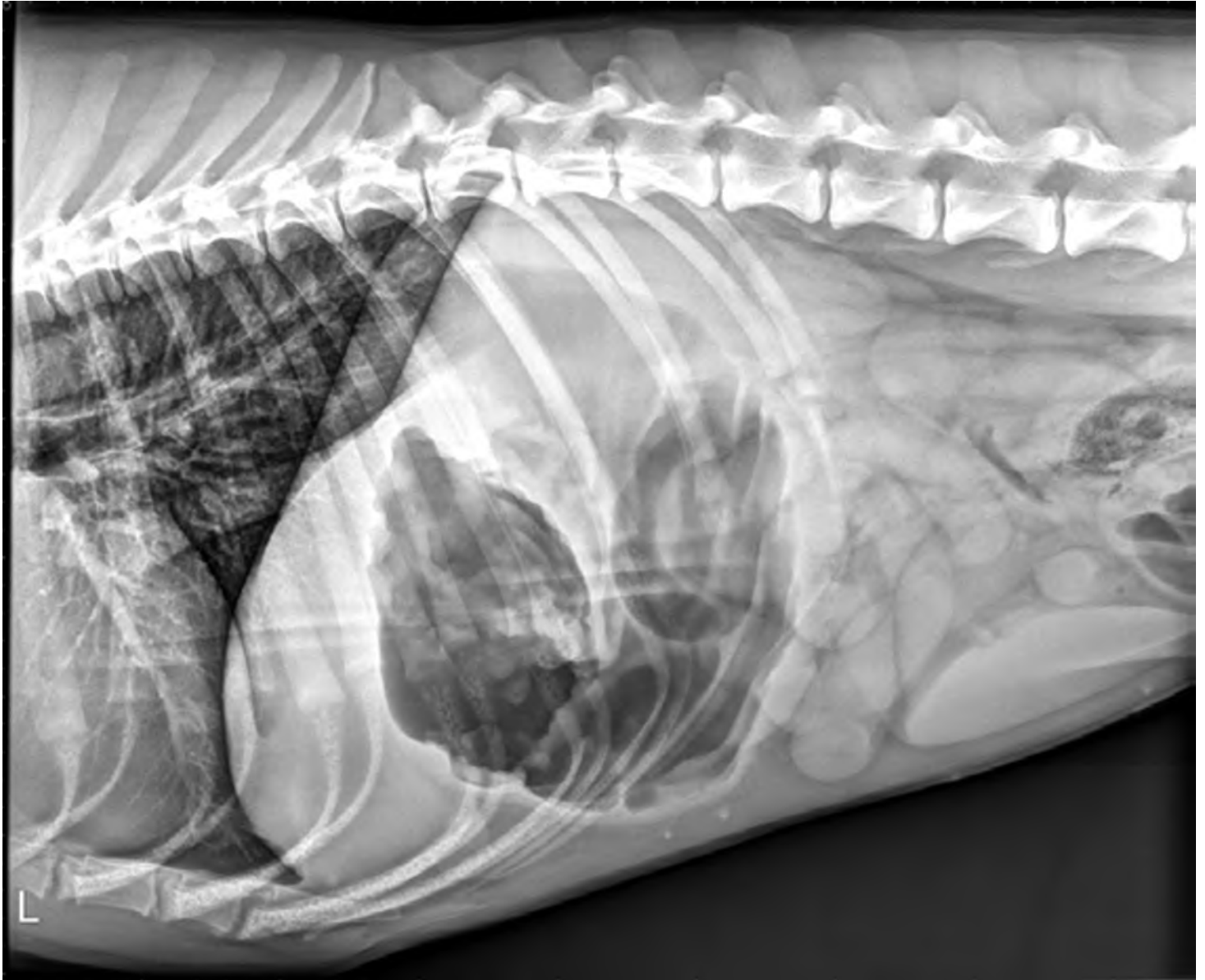


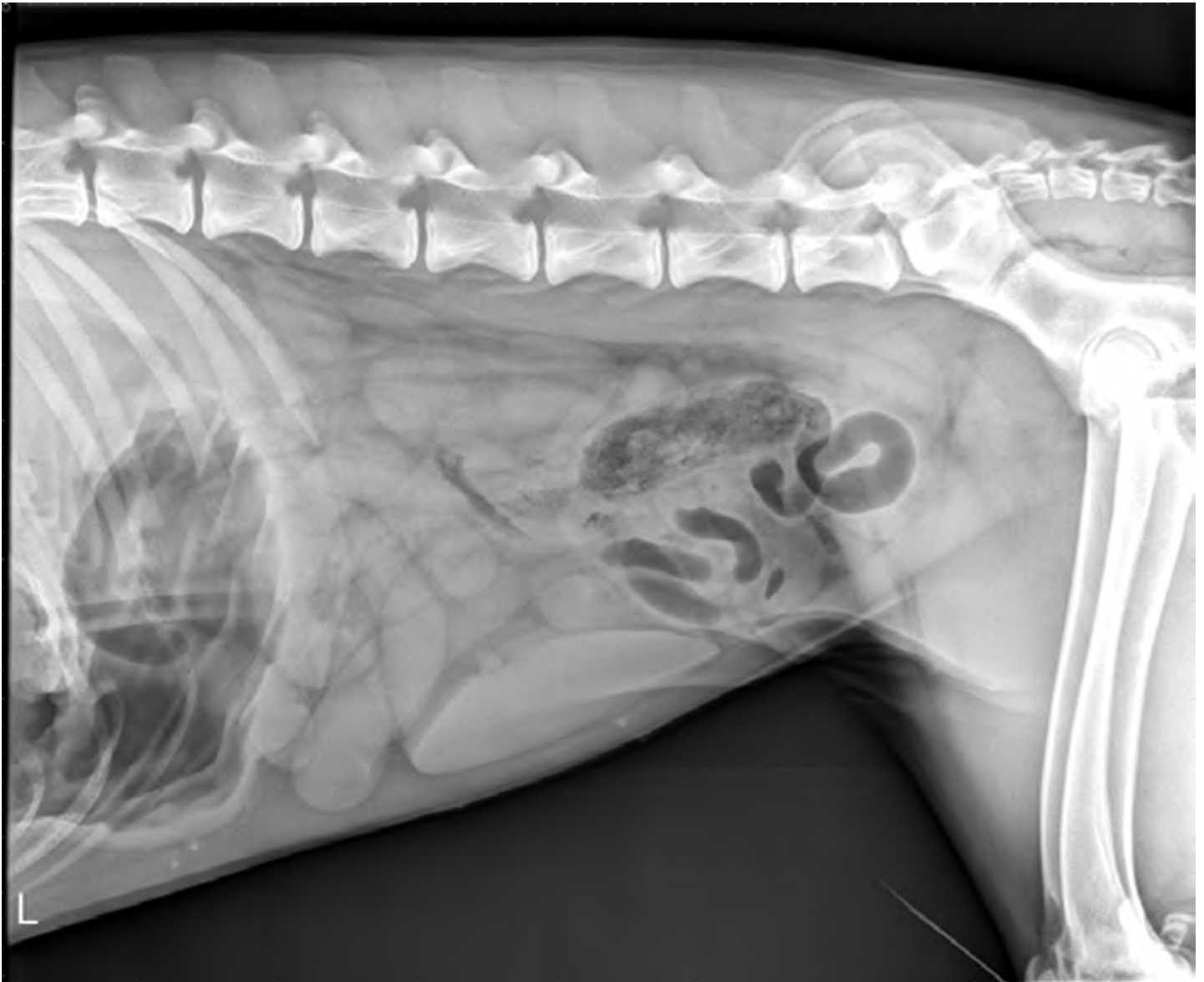
Case 3: "Betty" is a 1 year old DSH that has vomiting a few times this evening and the owner saw some plastic in it; hasn't vomited for a few hours

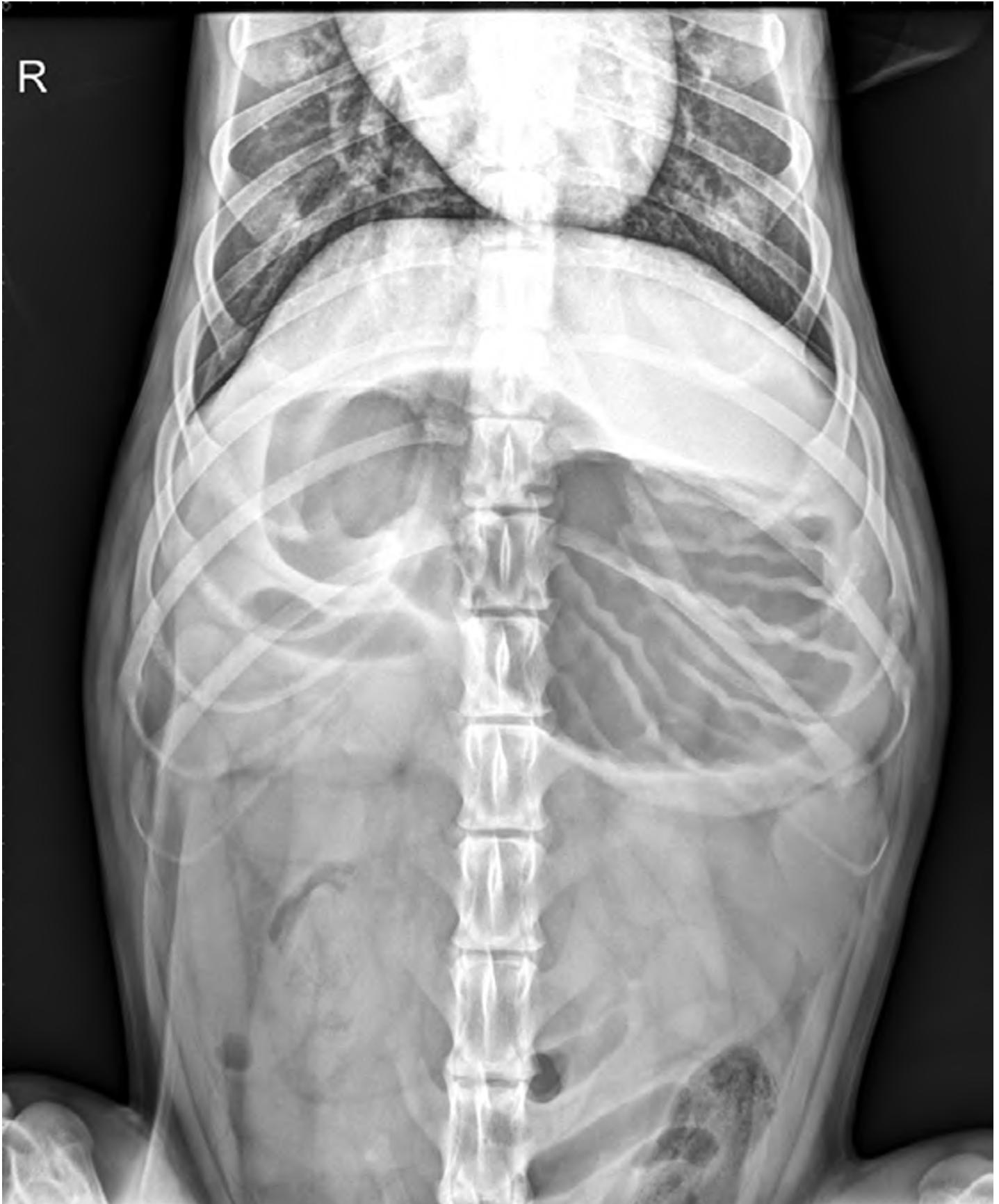




Case 4: "River" – 2 YO MC Great Dane, vomiting









Ultrasound in the Vomiting Animal

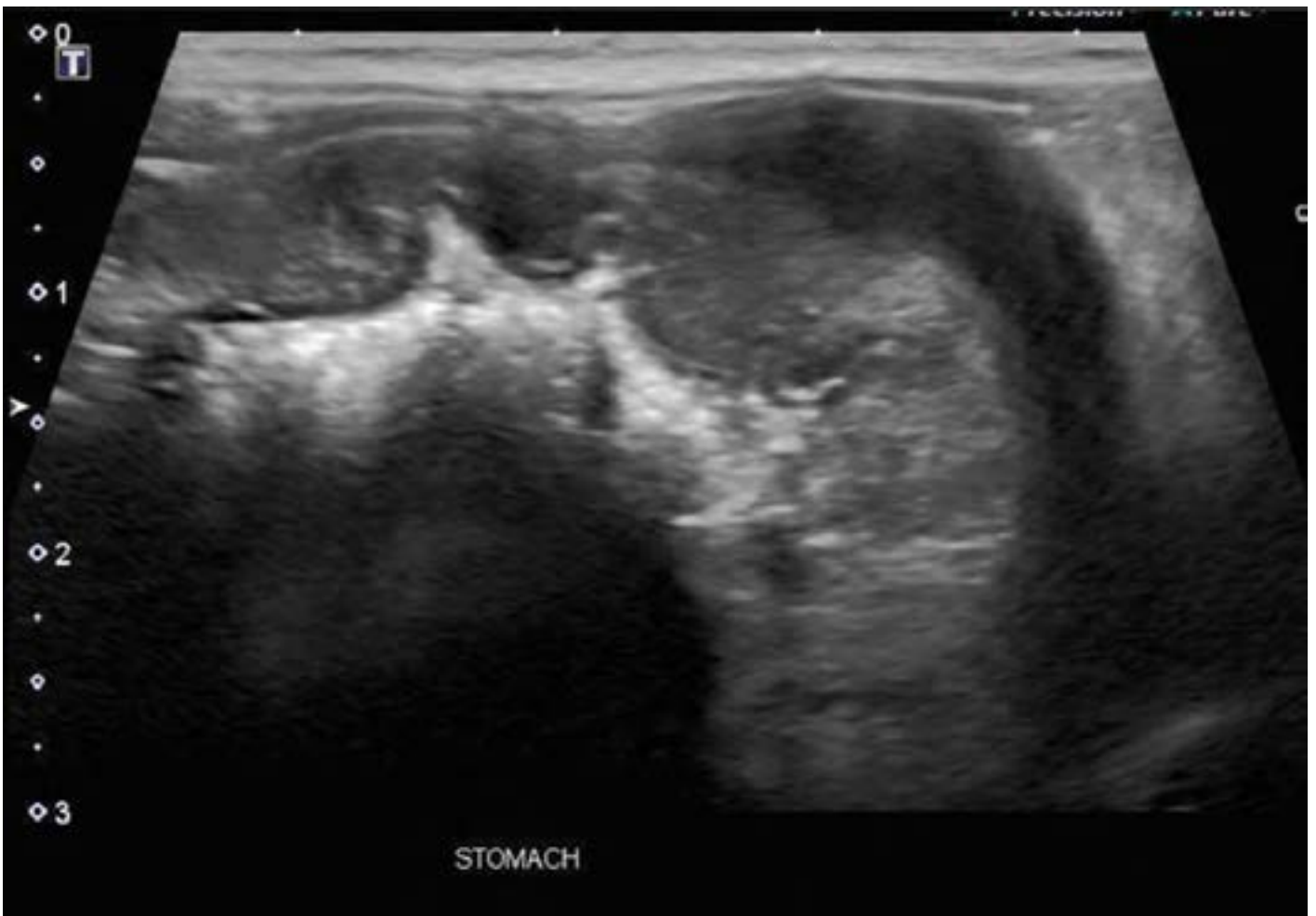
Lynn Griffin, DVM, MS, DACVR, DACVR(RO)

Things to remember when ultrasounding the vomiting animal:

- Normal anatomy
 - Stomach in cat a little more midline than in dog
 - Cats have a much faster intestinal motility so will often have empty stomachs with “wagon wheel” of fat in submucosa that is hyperechoic
 - Descending colon tends to run up along the left side BUT (especially in cats) because the mesocolon is there it can drift
- There are 4 layers in most hollow organs
 - Mucosa, submucosa, muscularis and serosa (note the “M” layers are the black ones on ultrasound!) from inside out
 - Mucosal layer should ALWAYS be the thickest (well except in the ileum of a cat where it is the same thickness as the muscularis layer, so don’t be fooled)
- Abnormal findings on a GI ultrasound include:
 - alterations in wall/wall layer thickness, loss of layering, eccentric thickening, abnormal motility, distention (still thinking about that “2 pops”), abnormal location, mass, plication etc etc
 - Don’t forget to look around the intestines for big lymph nodes, free fluid, inflamed mesentery
 - Big differentials if you think an animal is obstructed are foreign body, intussusception, pyloric outflow obstruction (foreign body, hypertrophic pylorus, mass), infectious infiltrative disease, neoplasia
- GI Foreign body
 - How sick is animal, how much vomiting, what does bloodwork look like?
 - Look for 2 populations of bowel just like on radiographs; find the distended loop with no motility and follow orad and aborad
 - Looking for plication OR hyperechoic intraluminal structure with STRONG distal acoustic shadowing
 - Keep an eye out for gas – that’s really bad if you see it! Think perforation.....

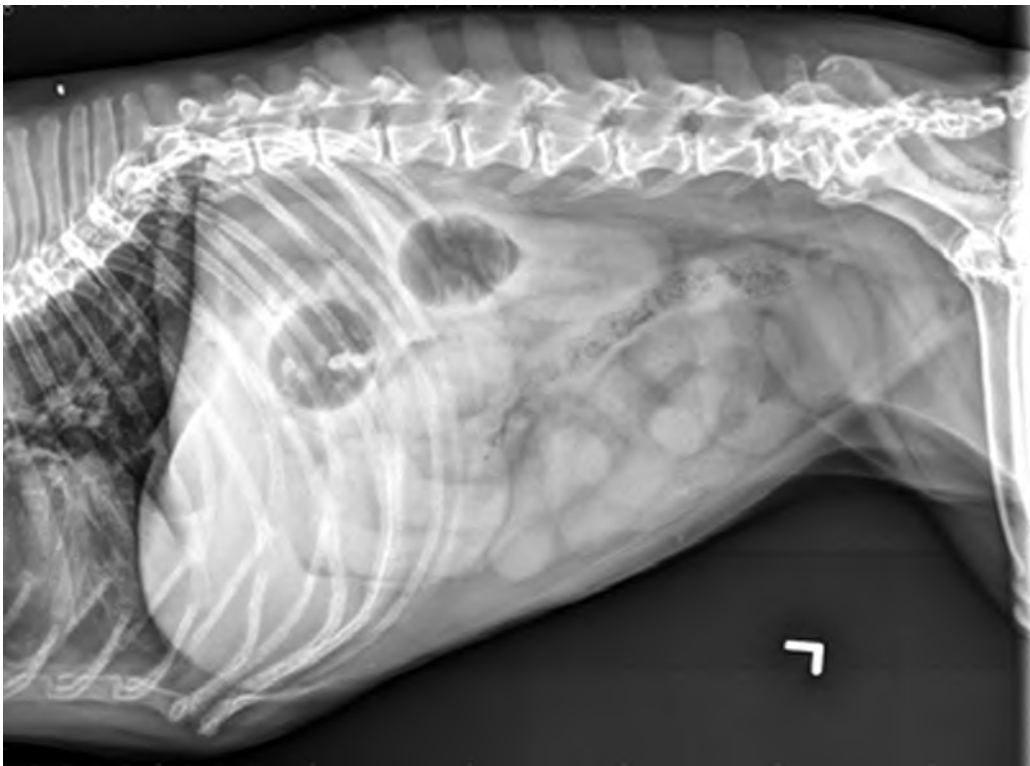
GI TRACT	Dog	Cat
Stomach	3 to 5 mm	2 mm (FAT)
Duodenum	2 to 5 mm Varies with size	2 to 3 mm
Jejunum	2 to 5 mm	2.1 mm
Ileum	2 to 4 mm	3 to 5 mm
Colon	1 to 2 mm	1.7 mm

Case 1: "Henri" 12 YO MC DSH; inappetence noted past few weeks, history of lymphocytic plasmocytic gastritis and enteritis diagnosed a year ago

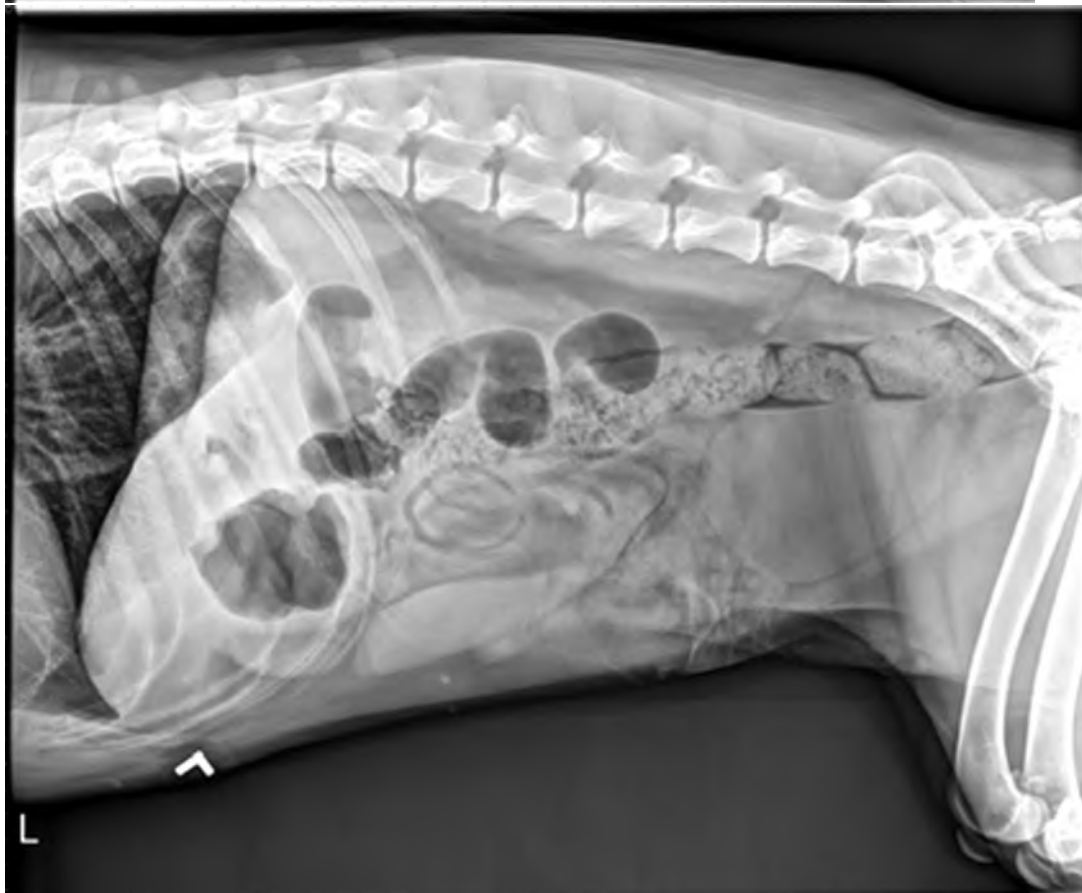


Case 2: "Grub" 12 YO MC French Bulldog; vomiting

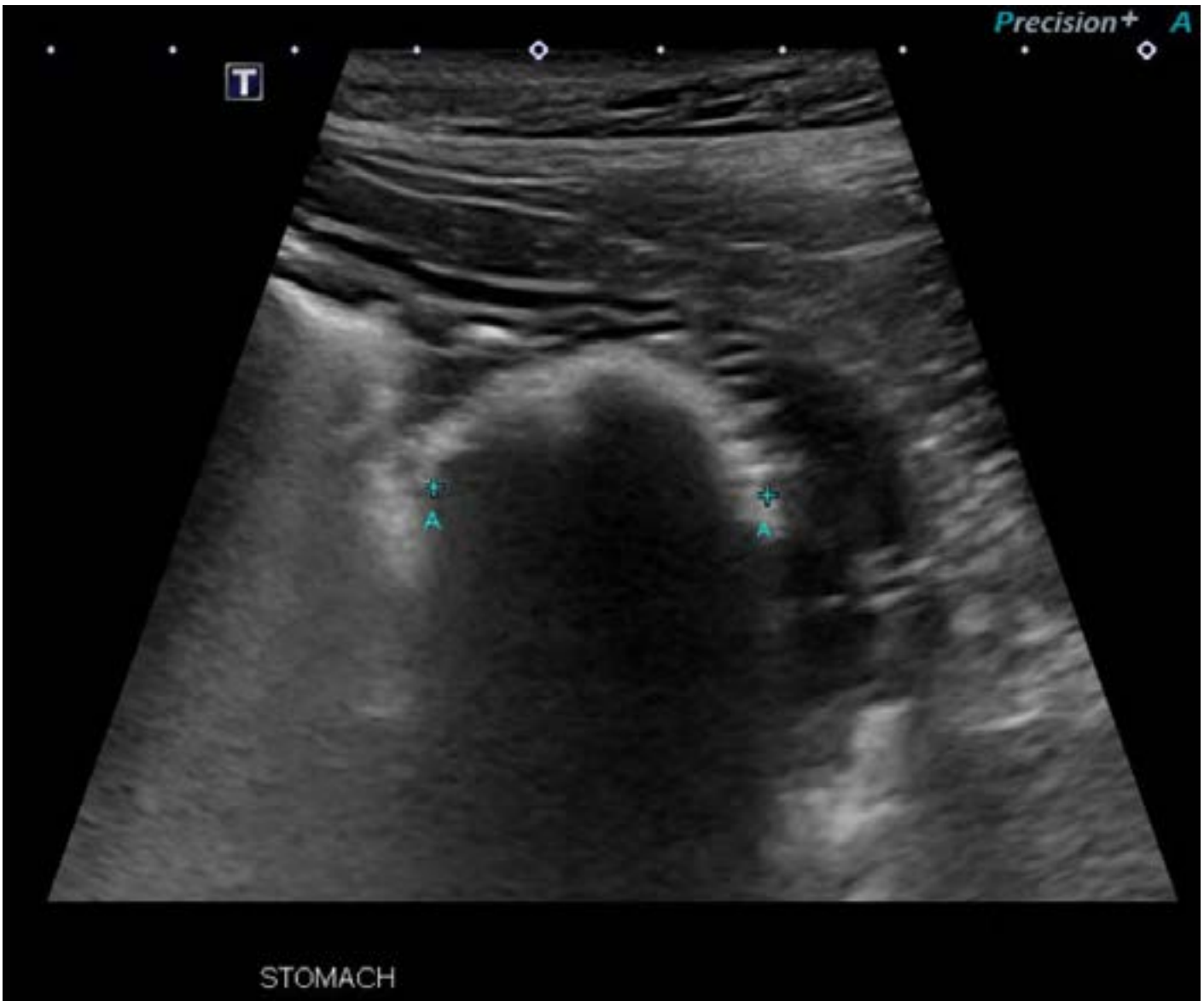




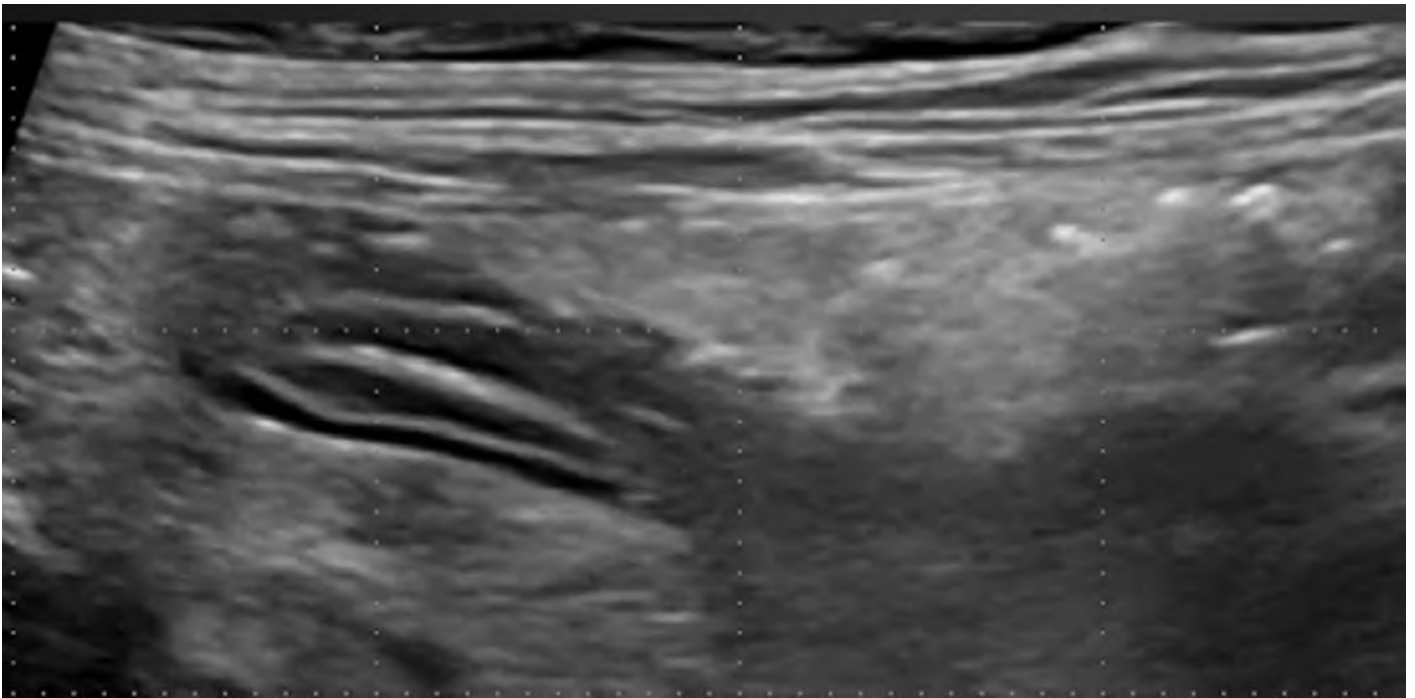
Case 3: "Abby" 1 YO FS Golden; chronic vomiting and dry heaving for last 6 months, has recently improved on new food but still dry heaving at night and it is getting worse







Case 4: “Gizmo” 14 YO MC DSH; abdominal pain, not eating/drinking, history of chronic vomiting



“Endoscopy on the Go”

How Videocapsule Endoscopy put the complete gut at anybody’s reach

Alice Defarges, DVM, MSc, DACVIM (Small Animal)

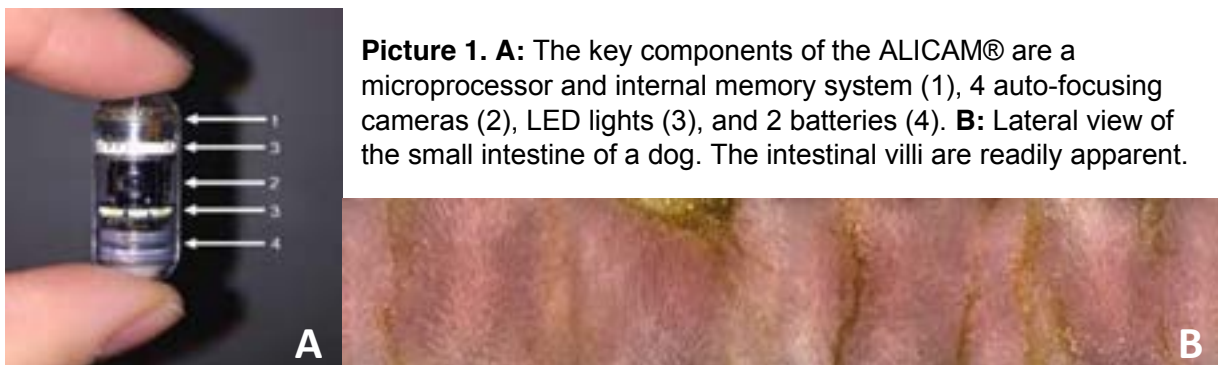
Video capsule endoscopy (VCE) provides a non-invasive endoscopic imaging technique that has been increasingly used for almost 2 decades in people. It involves the recording of the entire luminal gastrointestinal (GI) tract via an ingestible camera capsule. VCE offers several advantages over traditional GI endoscopy including the visualization of the entire small intestine and is performed as an ambulatory diagnostic test (no sedation or general anesthesia required). The main disadvantages of VCE are that GI biopsies cannot be collected and capsule movement cannot be controlled. First, the technology will be presented (focusing on the capsule used in dogs), then the procedure and bowel preparation will be described. Finally, indications, performance, and complications in people and dogs will be reviewed.

TECHNOLOGY

There are two different types of VCE available that differ based on the localization of the cameras within each capsule. Capsules with axial-view have 1 or 2 cameras at the extremity(ies), whereas capsules with lateral-viewing (“panoramic”) have several cameras at the center of the capsule. All commercialized capsules have similar components: a biocompatible plastic capsule, a digital camera, a compact lens, white-light-emitting diode (LED) illumination sources, and an internal battery source. The cameras take 2 to 3 images per second and their battery life ranges from 8 to 21 hours depending on the capsule. Newer generation capsules are smaller, have better image quality, and have longer battery life compared to earlier-generation models. To optimize the visualization of the small intestine, some have an adaptive frame rate system that is able to increase to 6 images per second if the capsule is accelerated by peristalsis. The capsules are single-use devices. Currently available capsules are the size of a large vitamin pill (11 x 31 mm). Several capsule platforms are approved for human use and available worldwide.

VIDEO CAPSULE ENDOSCOPY FOR VETERINARY PATIENTS: THE ALICAM®

ALICAM® (Infiniti Medical, USA) is currently the only device developed for use in veterinary patients. It has been used in people, dogs and horses. The ALICAM® is a “panoramic view” capsule (Picture 1.A). After downloading the pictures, a special software creates a 360° panoramic view from the pictures of each camera (Picture 1.B). No recorder or sensors are required- all pictures are stored in the capsule (versus other types of capsules).



Picture 1. A: The key components of the ALICAM® are a microprocessor and internal memory system (1), 4 auto-focusing cameras (2), LED lights (3), and 2 batteries (4). **B:** Lateral view of the small intestine of a dog. The intestinal villi are readily apparent.

BOWEL PREPARATION

Preparation of the GI tract prior to administration of a capsule is recommended to improve visualization quality, diagnostic yield, and completion rate. Preparation includes fasting with the potential administration of laxatives, antifoaming agents, and/or prokinetics. Like people, there is no standardized preparation protocol in dogs. In human medicine, the duration of fasting of solid food depends on the organ of interest: 2 to 4 hours for an esophageal study; 12 to 24 hours of fasting for visualization of the small intestine; and 24 hours of fasting for a

colonic study (+enemas). In dogs, fasting times from 12 to 48 hours have been described. No difference in the cleanliness of the colon was noted when the dogs were fasted for 24 versus 48 hours.

PROCEDURE

ALICAM® (Infiniti Medical, USA) capsules are available for any veterinarian at a lower cost than conventional endoscopy. No additional equipment nor training is required. They can be ordered through Infiniti Medical. All capsules are activated once disconnected from a magnet in its box. The main route of delivery is oral administration. In patients with dysphagia, abnormal upper GI anatomy or in sedated patients, swallowing of the capsule is contraindicated. For such instances, an endoscopic delivery device (AdvanCE® capsule endoscope delivery device, US Endoscopy) or a net retriever has been developed and used safely in people and in dogs. Patients administered the VCE orally can resume normal activity right after the capsule administration. When the capsule is delivered endoscopically, patients can resume normal activity after recovery from general anesthesia. For small bowel studies in people, a diet of clear liquids can be consumed 2 hours and a light meal 4 hours after swallowing the capsule. In canine studies, an 8-hour fasting time after administration of the capsule is recommended. It takes an average of 3 days for the capsule to be excreted. Because all pictures are stored in the capsule, the ALICAM® needs to be retrieved from feces. Once the capsule is collected and cleaned, the entire capsule is sent to Infiniti and is inserted into a reader that downloads the images. The capsule can be ordered easily from Infiniti Medical, administered at the clinic, and sent back to the Infiniti for interpretation. A report from a board-certified internist is produced within 24 hours. It includes description of findings, pictures and recommendations.

INDICATIONS AND DIAGNOSTIC PERFORMANCE OF VCE IN HUMAN MEDICINE

According to the European and North American guidelines for small bowel VCE, the main indications for use of VCE include small intestinal bleeding, iron deficiency anemia, diagnosis and management of Crohn's disease, celiac disease, as well as detection of small intestinal tumors and polyposis. In general, it is considered a complementary test in patients with GI disease who have had negative or inconclusive endoscopic or imaging studies. In these patients, diagnostic yield has been significantly higher with VCE compared with small-bowel radiograph, angiography, and push-enteroscopy. Because VCE studies soon after GI bleeding have higher diagnostic yields than later studies, it is recommended to perform VCE within 14 days of a bleeding event. In case of ongoing obscure overt GI bleeding events and negative findings of VCE, repeat GI endoscopy and/or VCE are recommended. The diagnostic yield of a single VCE is reported as 38% for the first procedure, 44% for the second procedure, and 63% for the combined findings of back-to-back VCE performed within a 24-hour interval.

INDICATIONS AND DIAGNOSTIC PERFORMANCE OF VCE IN VETERINARY MEDICINE

In contrast to human medicine, VCE is not yet widely used in veterinary patients. More recently, several clinical studies, case reports and abstracts were published describing the use of VCE in dogs, and horses; their use in feline patients has not been reported at the time of writing this proceeding (due to the small diameter of the intestines). The reported weights of dogs range from 6.0 to 62.5 kg.

Overall, the main indication for VCE is GI hemorrhage (either overt or occult/suspected). Investigating the entire gut without general anesthesia is very beneficial in patients with severe anemia that are poor candidates for general anesthesia.

VCE can be a great tool to investigate obscure GI bleeding after negative conventional endoscopy or surgical explore. The recent use of ALICAMs in veterinary medicine has revealed vascular anomalies in dogs that were missed in surgical explores and by conventional endoscopy (Manuscript in review).

Additionally, VCE has shown to be helpful to diagnose various GI diseases (such as ulcers, neoplasia, protein losing enteropathy) when general anesthesia is contraindicated, when mid intestinal disease is suspected, or when clients have financial constraints that preclude referral.

Finally, VCE may be helpful in diagnosing protein-losing enteropathy and GI vascular anomalies in dogs. The use of VCE to diagnose protein-losing enteropathy has the following advantages: no general anesthesia, no fluid therapy, non-invasive test in hypoproteinemic patients predisposed to delayed healing after biopsies and fluid imbalances. The possible role of VCE in diagnosis and monitoring dogs with protein losing enteropathy or inflammatory bowel disease is being investigated.



Picture 2: Still-frame recorded by an ALICAM showing an intestinal ulcer in 10-year-old female spayed Border collie cross (19kg). *Description of the case:* This dog presented for anorexia, melena and lethargy. On complete blood count, there was a mild to moderate anemia with mild polychromasia. The abdominal ultrasound and conventional gastroduodenoscopy did not reveal any abnormal findings. The VCE study revealed the presence of a severe ulcer in the jejunum.



Picture 3: Still-frame recorded by an ALICAM showing dilated lacteals in the small intestine of a 11-year-old female spayed Labrador (38kg). *Description of the case:* The dog presented for lethargy, hyporexia, and weight loss. On physical examination the dog had muscle wasting and distended abdomen. The biochemistry revealed severe panhypoproteinemia. Abdominal ultrasound revealed diffuse enteropathy and abdominal effusion. The abdominal ultrasound did not show any abnormalities except for speckles in the duodenal mucosa. While stabilizing the case, an ALICAM was administered and revealed dilated lacteals in the small intestine. Later on, endoscopic biopsies confirmed the suspicion of lymphangiectasia.

COMPLICATIONS AND CONTRAINDICATIONS

VCE is considered an overall safe procedure. Clinical complications include difficulty or inability to swallow the capsule (<1%), incomplete small bowel study (0 to 30%), and capsule retention (~2%).

Contraindications for VCE in people are known or suspected GI obstruction, strictures or fistula, dysphagia, cardiac pacemakers or other implanted electromedical devices, and pregnancy. In dogs, the use of VCE is limited to patients weighing ≥ 7 kg.

Difficulties in swallowing with oral administration, or aspiration of the capsule have not been reported in dogs. Incomplete small bowel studies are the most commonly reported complications in people and in dogs. Reported rates for incomplete studies in people range from 20% to 30%. Risk factors associated with incomplete studies in people include previous small bowel surgery, previous bowel obstruction, hospitalization, overt GI bleeding, suspected or known Crohn's disease, moderate or poor bowel cleansing, delayed gastric transit time, diabetes mellitus, older age, and male sex. The role of prokinetics and purgatives to improve completion rates of VCE studies is still uncertain. In dogs, rates of incomplete studies has been reported to be 6% to 38%. These differences in completion rates may be due to differences in: health status (e.g., healthy versus sick, hospitalized versus ambulant, acute versus chronic disease), size of dogs, the capsule used (e.g., size, battery life), and preparation protocol (e.g., fasting time, PEG administration).

Capsule retention, defined as the presence of the capsule in the GI tract for a minimum of 2 weeks, is a rare complication in people (never reported in dogs). The rate of capsule retention depends on the clinical condition of the patient; capsule size and patients' age have not been reported as risk factors. Higher incidents of capsule retention (10% to 25% of patients) have been noted in patients with known Crohn's disease, IBD, strictures or obstruction, pelvic or abdominal radiation, previous small bowel resection, chronic use of NSAIDs, or suspected tumor. Removal may be achieved via medical management (e.g., in patients for IBD) or surgical or endoscopic retrieval.

References

1. Gerber, J., A. Bergwerk & D. Fleischer (2007) A capsule endoscopy guide for the practicing clinician: technology and troubleshooting. *Gastrointest Endosc*, 66, 1188-95.
2. Hardy, B. T., J. Gentile-Solomon & J. A. Solomon (2016) Multiple gastric erosions diagnosed by means of capsule endoscopy in a dog. *J Am Vet Med Assoc*, 249, 926-930.
3. Harris, A. N., R. A. Armentano, A. R. Torres & A. E. Gallagher (2016) Use of endoscopic-assisted argon plasma coagulation for the treatment of colonic vascular ectasia (angiodysplasia) in an adult dog. *J Am Vet Med Assoc*, 248, 526-31.
4. Holden, J. P., P. Dureja, P. R. Pfau, D. C. Schwartz, M. Reichelderfer, R. H. Judd, I. Danko, L. V. Iyer & D. V. Gopal (2007) Endoscopic placement of the small-bowel video capsule by using a capsule endoscope delivery device. *Gastrointest Endosc*, 65, 842-7.
5. Höög, C. M., L. Bark, J. Arkani, J. Gorsetman, O. Broström & U. Sjöqvist (2012) Capsule retentions and incomplete capsule endoscopy examinations: an analysis of 2300 examinations. *Gastroenterol Res Pract*, 2012, 518718.
6. Kim, B. S., B. T. Li, A. Engel, J. S. Samra, S. Clarke, I. D. Norton & A. E. Li (2014) Diagnosis of gastrointestinal bleeding: A practical guide for clinicians. *World J Gastrointest Pathophysiol*, 5, 467-78.
7. Lee, A. C., C. Epe, K. W. Simpson & D. D. Bowman (2011) Utility of capsule endoscopy for evaluating anthelmintic efficacy in fully conscious dogs. *Int J Parasitol*, 41, 1377-83.
8. Lee, A. C., J. A. Hostetler & D. D. Bowman (2014) Assessing the speed of kill of hookworms, *Ancylostoma caninum*, by Advantage Multi[®] for Dogs using endoscopic methods. *Vet Parasitol*, 204, 402-6.
9. Lee, M. M., A. Jacques, E. Lam, R. Kwok, P. Lakzadeh, A. Sandhar, B. Segal, S. Svarta, J. Law & R. Enns (2010) Factors associated with incomplete small bowel capsule endoscopy studies. *World J Gastroenterol*, 16, 5329-33.
10. Leguillette, R., M. Steinmann, R. Bezugley & e. al (2017) Capsule Endoscopy (ALICAM) in horses: assessing gastrointestinal tract transit time, image quality and lesions.
11. Leung, W. K., F. K. Chan, S. S. Fung, M. Y. Wong & J. J. Sung (2005) Effect of oral erythromycin on gastric and small bowel transit time of capsule endoscopy. *World J Gastroenterol*, 11, 4865-8.
12. Liao, Z., R. Gao, C. Xu & Z. S. Li (2010) Indications and detection, completion, and retention rates of small-bowel capsule endoscopy: a systematic review. *Gastrointest Endosc*, 71, 280-6.
13. Mabry, K., T. Hill, S. L. Marks & B. T. Hardy (2019) Use of video capsule endoscopy to identify gastrointestinal lesions in dogs with microcytosis or gastrointestinal hemorrhage. *J Vet Intern Med*, 33, 1964-1969.
14. Palerme, J., A. Silverstone, Riedesel E & e. al (2018) Gastrointestinal transit time and mucosa appearance as assessed by capsule endoscopy. *Journal of Veterinary Internal Medicine*.
15. Pennazio, M., C. Spada, R. Eliakim, M. Keuchel, A. May, C. J. Mulder, E. Rondonotti, S. N. Adler, J. Albert, P. Baltes, F. Barbaro, C. Cellier, J. P. Charton, M. Delvaux, E. J. Despott, D. Domagk, A. Klein, M. McAlindon, B. Rosa, G. Rowse, D. S. Sanders, J. C. Saurin, R. Sidhu, J. M. Dumonceau, C. Hassan & I. M. Gralnek (2015) Small-bowel capsule endoscopy and device-assisted enteroscopy for diagnosis and treatment of small-bowel disorders: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy*, 47, 352-76.
16. Pomrantz, J., B. Hardy, A. Sharma & J. Solomon (2016) Feasibility of a Novel Gastrointestinal Imaging Device for use in Dogs [Abstract]. *ACVIM Forum*, Denver, CO.
17. Rondonotti, E., J. M. Herrerias, M. Pennazio, A. Caunedo, M. Mascarenhas-Saraiva & R. de Franchis (2005) Complications, limitations, and failures of capsule endoscopy: a review of 733 cases. *Gastrointest Endosc*, 62, 712-6; quiz 752, 754.
18. Stiller, J., A. Defarges, B. Brisson, A. Bersenas & D. Pearl (2021) Feasibility, results and complications of video capsule endoscopy in dogs with gastrointestinal bleeding. *Journal of Veterinary Internal Medicine*.35(4);1743-1753
19. Stiller, J., A. Defarges, B. Brisson, A. Bersenas, J. Pomrantz, B. Lang & D. Pearl (2021) Diagnostic evaluation of urea nitrogen/creatinine ratio in dogs with gastrointestinal bleeding. *Journal of Veterinary Internal Medicine*.35(3);1427-1438
20. Westerhof, J., R. K. Weersma & J. J. Kornstraa (2009) Risk factors for incomplete small-bowel capsule endoscopy. *Gastrointestinal Endoscopy*, 69, 74-80.

The Arthritis Games- May Rehab Ever Be in Your Favour.

Tiffany Durzi, DVM, CVA, CCRT, CVPP, ABVP (canine/feline)

Charlotte Donohoe, RVT, VTS(ECC), CCRP

Jacy Erling, RVT, CCRP

Ontario Veterinary College Fitness and Rehabilitation Service (OVC FAR), Guelph, Ontario

Veterinary and Client Perceptions

Osteoarthritis (OA) is one of the most frequently diagnosed and treated diseases in veterinary practice. It can be a frustrating disease to manage for both client and veterinarian alike due to several reasons including the progressive nature of the disease, short consultation lengths at the clinic, and a lack of appreciation of a client's prior knowledge, beliefs, and assumptions.¹ Veterinarians can become frustrated with clients who are reluctant to treat patients with chronic OA. Research indicates that clients and veterinarians both want pets to be happy and comfortable, but clear communication and treatment recommendations should be provided.² The clinician should also empathize with the client regarding the negative impact this diagnosis has on the pet and client's quality of life because of the chronic care that is required.³ Regular check-in and recheck appointments may help to ensure that pets and clients feel supported.

Osteoarthritis Theory and Current Medical Therapies

Osteoarthritis (OA), which is also referred to as arthritis or degenerative joint disease (DJD), is a degenerative and progressive condition of the synovial joints that can be primary or secondary. With primary OA, there is an intrinsic problem with the cartilage caused by the normal aging process. With secondary OA joint inflammation is a consequence of an event such as trauma, surgery, or congenital defects. OA is an irreversible condition of the joints which results in a decrease of the articular cartilage layer, fibrosis, osteophyte creation, and pain. It has been suggested that 20-25% of dogs will be diagnosed with OA in their lifetime and that it is the number one cause of chronic pain in dogs.⁴

Clinically, OA is most often associated with pain in the form of lameness. The source of the pain is multifocal and includes physical stimulation of the joint capsule, subchondral bone, muscles, tendons, and ligaments due to effusion and stretch. As well, inflammatory cytokines and ligands stimulate pain in the joint capsule and bone receptors. Osteophytes can also be a major source of pain and inflammation.⁴

Various pain scales have been used in veterinary medicine to quantify pain to better understand the severity of the pain, but also to gauge treatment. The Liverpool Osteoarthritis in Dogs (LOAD) questionnaire was created specifically for dogs with arthritis, to determine if therapy with a non-steroidal anti-inflammatory drug (NSAID) is effective. Clients are provided with a list of questions about their dog's abilities which is then scored and kept on file. After two weeks of therapy, the questionnaire is completed again, scored, and compared to the previous results.⁵ Similarly, the Canine Osteoarthritic Staging Tool (COAST) has been instituted to help practitioners categorize the stage of OA and educate clients about the severity and treatment options for their pet.⁶

The mainstay of medical management of OA is the NSAID based on its anti-inflammatory and analgesic properties. NSAIDs relieve the clinical signs of pain by inhibiting the production of the

enzyme cyclooxygenase and suppressing prostaglandins that are attributed to joint inflammation. However, not all prostaglandins are bad, and the key is to find an NSAID that preserves the positive effects that prostaglandins have on the body while inhibiting the harmful effects on joints. There are many licensed NSAIDs for dogs, however, the preferred ones are COX-1 sparing and COX-2 inhibitory.⁴ There is also a drug in the piperant class of NSAIDs called Grapiprant that is a highly potent and selective antagonist of the PGE2 EP4 receptor.⁸ Other commonly used pharmaceuticals used as adjuncts for OA pain include amantadine⁹, gabapentin, and tramadol.

Practitioners may be reluctant to prescribe long term NSAIDs for the treatment of OA due to perceived side effects and as such may encourage dose reduction and regular blood screening tests. Some strategies such as dosing every other day have not been studied, and so evidence to support this recommendation is poor. It is important to ensure that animal welfare is at the forefront and that pets receive adequate analgesia. It is therefore important for veterinarians to provide clients with adequate information about the frequency of adverse events associated with NSAID use and what signs to monitor at home.⁷

Omega-3 fatty acids can help to decrease inflammation in joints and can be found in certain prescription diets or can be supplemented. The inflammatory cascade is decreased when omega-3 fatty acids replace arachidonic acid in the synovial cell membranes.⁴

Chondroprotectants are substances that help to protect joints from prostaglandins and other inflammatory mediators. Glucosamine and chondroitin sulfate are common components of joint supplements because these substances help stimulate the synthesis of synovial fluid and cartilage and help inhibit enzymes that are destructive to the joint. Polysulfated glycosaminoglycans (Adequan®) and pentosan polysulfate (Cartrophen®) suppress inflammatory mediators thereby reducing cartilage degradation and stimulating glycosaminoglycan synthesis. Green lipped mussels are a natural source of glycosaminoglycans which makes it an effective anti-inflammatory supplement and is also found in some diets.⁴

Achieving an ideal body weight is important for pets that are arthritic. Diets are available on the market to promote weight loss and joint health and often include omega-3 fatty acids. It is important to note that increased weight not only puts additional stress on arthritis joints, but that fat cells are inflammatory in themselves, and contribute to an overall state of inflammation. Using the WSAVA body condition and muscle condition score charts should be used routinely in practice to identify pets that are overweight and/or under muscled.¹⁰

Future areas of research and therapy include platelet plasma therapy (PRP), mesenchymal stem cell therapy, cannabidiol supplementation¹³, and targeting nerve growth factor (NGF) with antibody therapy.

Exercise Recommendations

Physical activity which promotes range of motion of the joints, boosts the circulation and production of synovial fluid. Loss of this fluid causes a gradual decrease in cartilage thickness and increase in friction which is what causes the inflammation and pain associated with the joint degeneration of OA. Lack of regular exercise in patients with OA will cause the joints to become stiff and painful.^{11,12}

Registered veterinary technicians (RVTs) can play a vital role in educating clients on the importance of regular exercise. Low or minimal impact exercises like walking or swimming may be better tolerated and reduce aggravation of painful joints. Clients should be educated to recognize the signs of pain in their pet and understand how to manage symptoms. Passive Range of Motion (PROM) exercises and stretching should be encouraged at home. A formalized canine rehabilitation program may benefit patients and clients that require additional help, support, and/or motivation. Modalities such as laser therapy, underwater treadmill therapy, swimming, therapeutic exercise, heat/cold therapy, acupuncture, transcutaneous electrical stimulation (TENS), and neuromuscular electrical stimulation (NMES) may be incorporated in a rehabilitation plan for OA pets. A formalized rehabilitation program enables closer monitoring of the patient and active treatment adjustments based on progress. Re-evaluations for all patients are recommended typically every two to four weeks based on the individual treatment plan.^{11,12}

Rehabilitation Modalities

Laser – Promotes healing, reduces inflammation, and decreases pain through photobiomodulation.

Acupuncture- Targets pain through neurohormonal pathways and release of endorphins.

Underwater Treadmill- Strengthens muscles with gentle water resistance. Buoyancy of the water reduces impact and load on the joints and improves range of motion.

Swimming- Strengthen muscles, improves range of motion, reduces impact on joints.

Land exercises- Demonstrate exercises that can then be performed at home such as passive range of motion (PROM) and stretching. This helps ensure patient/client are performing them properly. Trained staff are also more likely to make the patient work a little harder than owners therefore speeding recovery time.

Cryotherapy- Reduces inflammation in sore joints, often used in acute pain.

Heat therapy- Soothes and relaxes tight/sore muscles, often used as part of massage and stretching

Transcutaneous Electrical Nerve Stimulation (TENS): Reduces pain by targeting the sensory nerves, which are responsible for sending pain signals to the brain.

Neuromuscular Electrical Stimulation (NMES): Contracts muscles and helps build and re-educate muscles after period of disuse.

References:

1. Belshaw, Asher, L., & Dean, R. S. (2016). The attitudes of owners and veterinary professionals in the United Kingdom to the risk of adverse events associated with using non-steroidal anti-inflammatory drugs (NSAIDs) to treat dogs with osteoarthritis. *Preventive Veterinary Medicine*, 131, 121–126. <https://doi.org/10.1016/j.prevetmed.2016.07.017>
2. Belshaw, Dean, R., & Asher, L. (2020). Could it be osteoarthritis? How dog owners and veterinary surgeons describe identifying canine osteoarthritis in a general practice setting. *Preventive Veterinary Medicine*, 185, 105198–105198. <https://doi.org/10.1016/j.prevetmed.2020.105198>
3. Belshaw, Dean, R., & Asher, L. (2020). “You can be blind because of loving them so much”: the impact on owners in the United Kingdom of living with a dog with osteoarthritis. *BMC Veterinary Research*, 16(1), 190–190. <https://doi.org/10.1186/s12917-020-02404-5>
4. Fox SM, Millis D. Multimodal management of canine osteoarthritis. Manson Publishing, 2011
5. Walton, Cowderoy, E., Lascelles, D., & Innes, J. F. (2013). Evaluation of construct and criterion validity for the “Liverpool Osteoarthritis in Dogs” (LOAD) clinical metrology instrument and comparison to two other instruments. *PloS One*, 8(3), e58125–e58125. <https://doi.org/10.1371/journal.pone.0058125>
6. Cachon, Frykman, O., Innes, J. ., Lascelles, B. D. ., Okumura, M., Sousa, P., Staffieri, F., Steagall, P. ., & Van Ryssen, B. (2018). Face validity of a proposed tool for staging canine osteoarthritis: Canine OsteoArthritis Staging Tool (COAST). *The Veterinary Journal* (1997), 235, 1–8. <https://doi.org/10.1016/j.tvjl.2018.02.017>
7. Wernham, Trumpatori, B., Hash, J., Lipsett, J., Davidson, G., Wackerow, P., Thomson, A., & Lascelles, B. D. . (2011). Dose Reduction of Meloxicam in Dogs with Osteoarthritis-Associated Pain and Impaired Mobility. *Journal of Veterinary Internal Medicine*, 25(6), 1298–1305. <https://doi.org/10.1111/j.1939-1676.2011.00825.x>
8. Rausch-Derra, Huebner, M., Wofford, J., & Rhodes, L. (2016). A Prospective, Randomized, Masked, Placebo-Controlled Multisite Clinical Study of Grapiprant, an EP4 Prostaglandin Receptor Antagonist (PRA), in Dogs with Osteoarthritis. *Journal of Veterinary Internal Medicine*, 30(3), 756–763. <https://doi.org/10.1111/jvim.13948>
9. Lascelles, Gaynor, J. ., Smith, E. ., Roe, S. ., Marcellin-Little, D. ., Davidson, G., Boland, E., & Carr, J. (2008). Amantadine in a Multimodal Analgesic Regimen for Alleviation of Refractory Osteoarthritis Pain in Dogs. *Journal of Veterinary Internal Medicine*, 22(1), 53–59. <https://doi.org/10.1111/j.1939-1676.2007.0014.x>
10. Cline, Burns, K. M., Coe, J. B., Downing, R., Durzi, T., Murphy, M., & Parker, V. (2021). 2021 AAHA Nutrition and Weight Management Guidelines for Dogs and Cats. *The Journal of the American Animal Hospital Association*, 57(4), 153–178. <https://doi.org/10.5326/JAAHA-MS-7232>
11. Millis DL, Levine D. Canine Rehabilitation and Physical Therapy. 2nd Ed. Elsevier, 2013.
12. Zink C, Van Dyke JB. Canine Sports Medicine and Rehabilitation. 2nd Ed. Wiley and Sons, 2018.
13. Gamble, Boesch, J. M., Frye, C. W., Schwark, W. S., Mann, S., Wolfe, L., Brown, H., Berthelsen, E. S., & Wakshlag, J. J. (2018). Pharmacokinetics, Safety, and Clinical

Efficacy of Cannabidiol Treatment in Osteoarthritic Dogs. *Frontiers in Veterinary Science*, 5, 165–165. <https://doi.org/10.3389/fvets.2018.00165>

OMEGAS, GLUCOSAMINE, AND CHONDROITIN, OH MY! NAVIGATING THE YELLOW BRICK ROAD OF NUTRACEUTICALS IN THE REHAB PATIENT.

Tiffany Durzi, DVM, CVA, CCRP, CVPP, ABVP (canine/feline)

Charlotte Donohoe, RVT, CCRP

Jacy Erling, BSc, RVT, CCRP

Ontario Veterinary College Fitness and Rehabilitation Service, Guelph, Ontario

Nutraceuticals comprise a large market in companion animal medicine, but what is a nutraceutical exactly? Dr. Stephen De Felice coined the term in 1989, and defined it as “food, or parts of a food, that provide medical or health benefits, including the prevention and treatment of disease”.¹ Nutraceuticals are an exciting area of veterinary medicine; however, they do come with their downfalls in terms of; regulation (or lack of), false marketing, easy access to pet owners and wide variation in product form/efficacy.²

With a flood of products on the market, both veterinary products and human, it can be difficult to decide which ones you should be selecting for your patients and why. Selecting supplements that are effective for your patients, as well as making sure they are of decent quality and can provide adequate dosages, is challenging. A helpful guide to selecting a nutraceutical is the ACCLAIM method, developed by Stephen M Fox (*Table 1*).

Table 1: ACCLAIM method of choosing a nutraceutical³

A	a company name that you recognize, an established firm that provides veterinary educational materials.
C	clinical experience, i.e. companies that invest in clinical trials, and who publish data for respected journals.
C	content, all ingredients should be clearly indicated on the label
L	label claims, i.e. if they sound too good to be true, they probably are. Reference to clinical trials is better than simple testimonials. Any label suggesting they treat arthritis, cure arthritis or prevent arthritis are likely to be suspect.
A	administration, the dose recommendation should be accurate and easy to calculate
I	a lot identification number to indicate some form of surveillance is possible to test product quality
M	manufacturer information and ideally a link to a website

In our rehabilitation patients, there are several effective oral nutraceuticals that should be discussed: Omega 3 Fatty Acids, green lipped mussel, glucosamine HCl, chondroitin sulfate and ASU (avocado/soybean unsaponifiables). Two common injectable products, Adequan and Catrophen, should also be discussed.

Omega Fatty Acids:

Omega Fatty Acids, specifically Omega-3's, are found to have many important health benefits in companion animals. Omega 3's, notably EPA and DHA, have been shown to be beneficial for inflammatory disorders, such as osteoarthritis.⁴

Omega 3 fatty acids are found in many commercial and veterinary diets, as well as oral supplements, but are not effective unless used in the correct dosages. Dosages for EPA/DHA in dogs are calculated using metabolic body weight, in kilograms.⁴ For osteoarthritis, dosage of EPA/DHA is 310 mg/kg^{75,4}

The most common and efficient source of EPA/DHA for canines are from fish oil. Flaxseed oil, and other plant-based oils, can provide a source of omega 3 in the form of Alpha-linoleic acid (ALA).⁵ ALA is converted to EPA/DHA through desaturation and elongation; however, this process is not efficient in mammals and therefore does not provide a potent source of EPA/DHA.⁵

Omega 3 supplementation in dogs when guided by a veterinarian is low in risk for adverse reactions, but it is important to follow the safe upper limit for dosing in canines.⁵ Safe upper limit for combined amounts of EPA and DHA are equivalent to 370 mg/kg⁷⁵ for dogs and has not been assessed in cats.⁵

There are various prescription veterinary diets on the market that include therapeutic levels of omega 3 supplementation. In a 13-week study of 30 dogs naturally afflicted by osteoarthritis, the group receiving a veterinary therapeutic diet rich in EPA/DHA had significant improvements in peak vertical force when compared to the control group.⁶ This data suggests a therapeutic joint diet may be an important part of the multi-modal approach to treating osteoarthritis in dogs.⁶

Green Lipped Mussel (GLM):

In recent years, the potential benefits of a nutritional supplement formed from green lipped mussel (*Perna canaliculus*) have been assessed.⁷ Green lipped mussel (GLM) contains several anti-inflammatory components and a variety of other nutrients that are beneficial to joint health.⁷ GLM powder analysis has been shown to include: glycosaminoglycans, omega-3 fatty acids, amino acids, vitamins, and minerals.⁷

The mechanism of action of GLM on the inflammatory pathways of OA can be examined by looking at their active constituents. Omega 3 fatty acids possess significant cyclooxygenase (COX-1/COX-2) and lipoxygenase (LOX-5) inhibitory activity.⁸ Glycosaminoglycan content has a role in cartilage anabolism and is beneficial in reducing joint stress, therefore providing chondroprotective properties.⁸ In a study of 81 dogs (43 in treatment group) of mild to moderate DJD of one or more months duration, found that the addition of GLM for 8 or more weeks alleviated clinical signs of DJD.⁹

Dosages of GLM outlined in a study using *Lyproflex 500mg* describe using 20–49 mg/kg/day as a loading dose for 10 days and reducing dose by half for daily maintenance.⁸ Another

source lists 77 mg/kg/day as the dosing requirement of GLM in treating dogs with osteoarthritis.¹⁰

The production of GLM into its consumable state is also important to analyze, as improper manufacturing can yield an ineffective product.⁸ Products first formulated using steam processing showed poor results, so the superior manufacturing process involves temperature-controlled processing, stabilizing with the addition of organic acids to prevent oxidization and freeze drying.⁸

Glucosamine and Chondroitin Sulfate

Glucosamine is an amino-monosaccharide precursor of glycosaminoglycans, which are the building block of proteoglycans and chondroitin sulfate is a polymer of disaccharide units. Both are components of articular cartilage. The combination of the two chondroprotectants has been shown to have a positive effect on osteoarthritic pain.^{11,12}

The recommended dose of glucosamine and chondroitin varies, and some controversy exists regarding the efficacy of the product likely due to pharmacokinetics and the bioavailability of the product.^{13,14} However, improvement in pain score have been noted with consistent use.¹²

Avocado/Soybean Unsaponifiables

Avocado/soybean unsaponifiables (ASU) are plant extracts that are found in many veterinary joint supplements. They are derived from fruits, the seed of avocado and soybean oil. The components are taken from fat and oil. The saponifiable glycerides are excluded from the final compound.

ASU are rich in antioxidants, have anti-inflammatory effects and provide a degree of analgesia. In human studies, patients using ASU have shown a better return to function and less pain related to osteoarthritis compared to baseline scores.¹⁵

In canine models, ASU administration led to increased repair of osteochondral defects but also reduced early changes to joint cartilage in experimentally created anterior cruciate ligament tears.^{16,17}

ASU are potent anti-inflammatory components that have demonstrated benefits to their use in canine osteoarthritis patients by providing a reduction in pain, joint protection and early joint repair.

Pentosan Polysulfate (PPS or Cartrophen^(R)) and Polysulfated Glycosaminoglycans (PSGAG or Adequn^(R))

These injectable disease modifying osteoarthritic drugs (DMOAD) have been shown to improve synovial and subchondral blood flow, to limit cartilage matrix degeneration, and to stimulate hyaluronic acid and proteoglycan synthesis.^{18,19} A new study demonstrated that PPS is a novel inhibitor of IL-1 β -induced iNOS, c-Jun, and HIF-1 α mRNA upregulation and iNOS protein induction which may be beneficial for prevention and treatment OA²⁰. As well,

PPS is a novel-inhibitor of hepcidin facilitated OC formation/function which might be beneficial for treatment of OA and osteoporosis.²¹ The inhibition of chondrocyte proliferation while promoting a chondrocyte phenotype by PPS could be beneficial in the early stages of OA treatment.²²

Various treatment regimens have been documented for these products and the veterinary professional should review on and off label use and side effects accordingly. Contraindications include pets with bleeding disorders.^{18,19}

The use of this medication in cats is extrapolated from dogs and there are no clinical trials evaluating its use. However, it has been used off-label successfully to support feline osteoarthritis. There was one report of a cat that developed widespread hemorrhage following use of PPS, and therefore informed consent is crucial.²³

Concluding thoughts

This is not an inclusive list of all products on the market. There are many more not discussed above (hyaluronic acid, methylsulfonylmethane, eggshell membrane, hyper-immune milk, collagen, *Boswellia serrata*, etc.) that may also be of benefit to our patients. To have success with the addition of any nutraceutical for your patients, the best method is to; familiarize yourself with the research, choose products that provide dosing instructions, be aware of and monitor closely for side effects, source a reputable product and keep it simple!

Citations:

- 1: *The Pharmaceutical Journal*, PJ, July 2000;()::DOI:10.1211/PJ.2021.1.71102
- 2: *Managing Arthritis: What Can be Done? Diet and Nutrition*. (n.d.). Canine Arthritis Management. Retrieved April 12, 2022, from <https://caninearthritis.co.uk/managing-arthritis/diet-and-nutrition/>
- 3: *Managing Arthritis: Diet and Nutrition: Choosing a Nutraceutical*. (n.d.). Canine Arthritis Management. Retrieved April 12, 2022, from <https://caninearthritis.co.uk/managing-arthritis/diet-and-nutrition/choosing-nutraceuticals/>
- 4: Bauer, J. E. (2011). Therapeutic use of fish oils in companion animals, *Journal of the American Veterinary Medical Association*, 239(11), 1441-1451.
- 5: Lenox, C. and Bauer, J. (2013), Potential Adverse Effects of Omega-3 Fatty Acids in Dogs and Cats. *J Vet Intern Med*, 27: 217-226. <https://doi.org/10.1111/jvim.12033>
- 6: Moreau, Maxim & Troncy, Eric & Del Castillo, Jérôme & Bedard, Christian & Gauvin, Dominique & Lussier, Bertrand. (2012). Effects of feeding a high omega-3 fatty acids diet in dogs with naturally occurring osteoarthritis. *Journal of animal physiology and animal nutrition*. 97. 10.1111/j.1439-0396.2012.01325.x.
- 7: Bui, L.M., & Bierer, R. (2001). Influence of green lipped mussels (*Perna canaliculus*) in alleviating signs of arthritis in dogs. *Veterinary therapeutics: research in applied veterinary medicine*, 2 2, 101-11.
- 8: Hielm-Björkman, A., Tulamo, R. M., Salonen, H., & Raekallio, M. (2009). Evaluating complementary therapies for canine osteoarthritis part I: green-lipped mussel (*Perna canaliculus*). *Evidence-Based Complementary and Alternative Medicine*, 6(3), 365-373.

9: Pollard, B., Guilford, W.G., Ankenbauer-Perkins, K.L., & Hedderley, D.I. (2006). Clinical efficacy and tolerance of an extract of green-lipped mussel (*Perna canaliculus*) in dogs presumptively diagnosed with degenerative joint disease. *New Zealand Veterinary Journal*, 54, 114 - 118.

10: Nutraceuticals in Veterinary Medicine. (2019). Germany: Springer International Publishing.

11: McCarthy, O'Donovan, J., Jones, B., McAllister, H., Seed, M., & Mooney, C. (2007). Randomised double-blind, positive-controlled trial to assess the efficacy of glucosamine/chondroitin sulfate for the treatment of dogs with osteoarthritis. *The Veterinary Journal* (1997), 174(1), 54–61. <https://doi.org/10.1016/j.tvjl.2006.02.015>

12: Martello E, Bigliati M, Adami R, Biasibetti E, Bisanzio D, Meineri G, Bruni N. Efficacy of a dietary supplement in dogs with osteoarthritis: A randomized placebo-controlled, double-blind clinical trial. *PLoS One*. 2022 Feb 16;17(2):e0263971. doi: 10.1371/journal.pone.0263971. PMID: 35171954; PMCID: PMC8849458.

13: Aghazadeh-Habashi, & Jamali, F. (2011). The glucosamine controversy; a pharmacokinetic issue. *Journal of Pharmacy & Pharmaceutical Sciences*, 14(2), 264–273. <https://doi.org/10.18433/J3XG6F>

14: Fernandez-Martin,S. Glucosamine and Chondroitin Sulfate: Is There Any Scientific Evidence for Their Effectiveness as Disease-Modifying Drugs in Knee Osteoarthritis Preclinical Studies?—A Systematic Review from 2000 to 2021 *Animals* 2021, 11, 1608. <https://doi.org/10.3390/ani11061608>

15: VISTA, & LAU, C. S. (2011). What about supplements for osteoarthritis? A critical and evidenced-based review. *International Journal of Rheumatic Diseases*, 14(2), 152–158. <https://doi.org/10.1111/j.1756-185X.2011.01619.x>

16: Altunel L, Sahin O, Köse KC, Baş O, Ozen OA, Sarıtaş ZK, Pamuk K. Avokado/soya fasülyesinin sabunlaşmayan ekstresi verilen köpeklerin dizlerinde osteokondral defekt iyileşmesi: Bir karşılaştırmalı morfolometrik analiz [Healing of osteochondral defects in canine knee with avocado/soybean unsaponifiables: a morphometric comparative analysis]. *Eklemler Hastalıkları Cerrahisi*. 2011;22(1):48-53. Turkish. PMID: 21417987.

17: Boileau C, Martel-Pelletier J, Caron J, Msika P, Guillou GB, Baudouin C, Pelletier JP. Protective effects of total fraction of avocado/soybean unsaponifiables on the structural changes in experimental dog osteoarthritis: inhibition of nitric oxide synthase and matrix metalloproteinase-13. *Arthritis Res Ther*. 2009;11(2):R41. doi: 10.1186/ar2649. Epub 2009 Mar 16. PMID: 19291317; PMCID: PMC2688188.

18: Cartrophen Vet. Dosage and usage. <http://www.cartrophen.com/for-vets/dosage-usage> (2016, accessed April 12, 2022).

19: Adequan Canine. <https://www.adequancanine.com/About-Adequan-Canine> (2022, accessed April 14, 2022)

20: Bwalya, Kim, S., Fang, J., Wijekoon, H. M. S., Hosoya, K., & Okumura, M. (2017). Pentosan polysulfate inhibits IL-1 β -induced iNOS, c-Jun and HIF-1 α upregulation in canine articular chondrocytes. *PloS One*, 12(5), e0177144–e0177144. <https://doi.org/10.1371/journal.pone.0177144>

21: Wijekoon, Sunaga, T., Wang, Y., Mwale, C., Kim, S., & Okumura, M. (2022). Pentosan polysulfate regulates hepcidin 1-facilitated formation and function of osteoclast derived from canine bone marrow. *PloS One*, 17(3), e0265596–e0265596. <https://doi.org/10.1371/journal.pone.0265596>

22: AKARAPHUTIPORN, BWALYA, E. C., KIM, S., SUNAGA, T., ECHIGO, R., & OKUMURA, M. (2020). Effects of pentosan polysulfate on cell proliferation, cell cycle progression and cyclin-dependent kinases expression in canine articular chondrocytes. *Journal of Veterinary Medical Science*, 82(8), 1209–1218. <https://doi.org/10.1292/jvms.20-0091>

23: Tong, Romine, J. F., & Hardcastle, M. R. (2021). Acute and severe haemorrhage following pentosan polysulfate injection in a Cornish Rex. *JFMS Open Reports*, 7(2), 205511692110586-.
<https://doi.org/10.1177/20551169211058650>

The ABC's of ANNPE and FCEM in the Canine Rehab patient

Tiffany Durzi, DVM, CVA, CCRT, CVPP, ABVP (canine/feline)

Charlotte Donohoe, RVT, VTS (ECC), CCRP

Jacy Erling, RVT, CCRP

Ontario Veterinary College Fitness and Rehabilitation Service (OVC FAR), Guelph, Ontario

Acronyms and Classification of Intervertebral Disc Disease

Information and understanding of intervertebral disc disease (IVDD) has expanded over the years creating some confusion in classification and terminology of the different manifestations that have been identified. A recent paper published by Fenn in 2020 entitled “Classification of Intervertebral Disc Disease” is recommended for the veterinary professional to review.¹ It has been suggested that the term IVD disease is too broad as it encompasses a range of lesions. With the advancement of genetics and advanced imaging, it is suspected that terminology will continue to evolve as will our understanding.¹

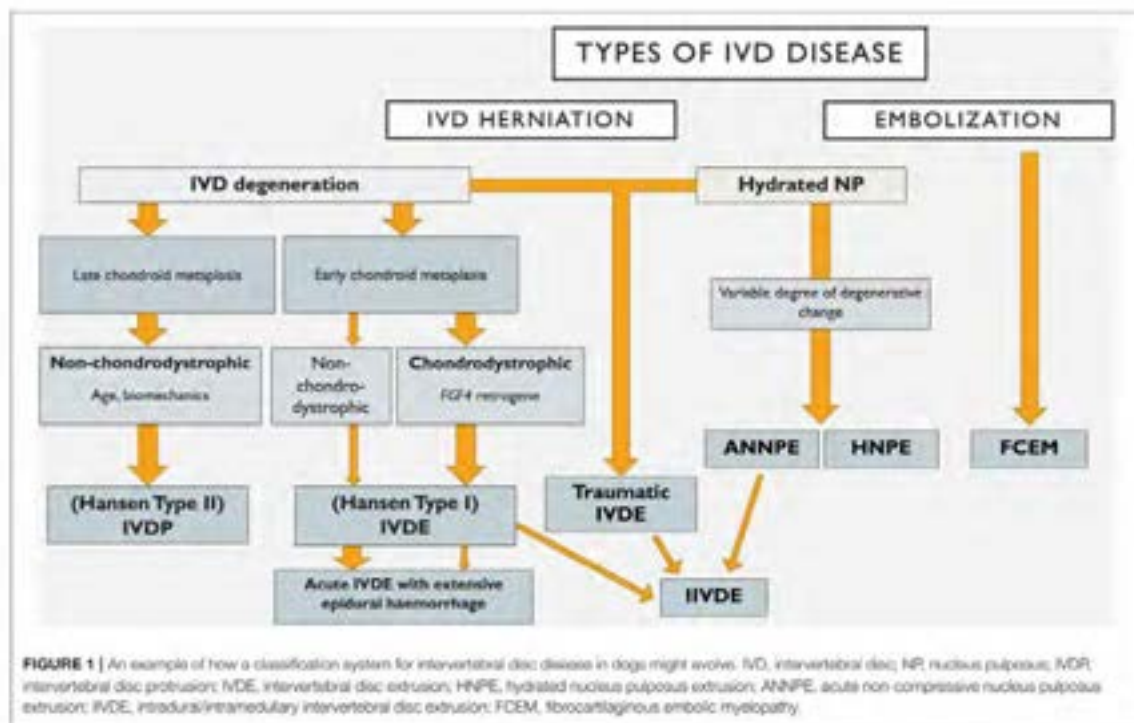
The intervertebral disc (IVD) helps to stabilize the vertebral column and provides support for the axial skeleton, protects the spinal cord, and facilitates the exit/entrance of the peripheral nerves. The IVD consists of four regions which include the nucleus pulposus (NP), the transitional zone, the annulus fibrosus (AF) and the cartilaginous endplates.¹

IVD herniation includes:

- Hansen Type I/Acute IVD Extrusion
- Acute IVD Extrusion with Extensive Epidural Hemorrhage
- Hansen Type II/Chronic IVD Protrusion
- Hydrated Nucleus Pulposus Extrusion (HNPE)
- Acute Non-compressive Nucleus Pulposus Extrusion (ANNPE)
- Traumatic IVD Extrusion
- Intradural/Intramedullary IVD Extrusion (IIVDE)

Embolic Disease Associated with IVD includes:

- Fibrocartilaginous Embolic Myelopathy (FCEM)



This lecture will discuss more specifically ANNPE and FCEM and how canine rehabilitation can help promote a return to function.

Acute Non-compressive Nucleus Pulposus Extrusion (ANNPE)

ANNPE presents as a peracute myelopathy of varying degrees, paresis to paraplegia. Often the client will remark that there was vocalization by the patient at the onset of clinical signs. It is usually associated with strenuous exercise or external trauma, and it most often occurs in the thoracolumbar junction area. ANNPE is non-progressive after the first 24 hours and in most patients, the clinical signs are lateralized. ANNPE has not been reported in dogs less than 1 year of age, but it has been reported in feline patients where 75% are associated with external trauma.^{1,2}

When force is exerted on the IVD during strenuous exercises or blunt trauma, the AF may tear causing a sudden extrusion of nuclear material which leads to a contusion in the spinal cord. No spinal cord compression is noted in ANNPE. ANNPE has also been referred to as an IVD explosion or missile disc because of the nature of the injury¹. Magnetic Resonance Imaging (MRI) is usually required to differentiate between other causes of IVD disease.³ It most often occurs at the spinal segment T12 and L2.¹

Fibrocartilagenous Embolic Myelopathy (FCEM)

FCEM is a disease in which an embolism occurs to the vascular of the leptomeninges and spinal cord. Just like ANNPE, it too has a peracute presentation of paresis or paralysis that is often lateralized and is non-progressing. It has been noted in feline patients as well. At this time, it is still unconfirmed as to the source of the embolized fibrocartilage, but it is thought to originate from the underlying IVD.¹ MRI studies confirm subtle changes in the NP of an IVD near the ischemia. It has been suggested that the fibrocartilage travels from the IVD to the leptomeninges and spinal vasculature. In 30% of the cases, exercise or trauma is reported as the inciting cause. In FCEM, there is hemorrhagic ischemic necrosis of the spinal cord gray matter. Usually seen in non-chondrodystrophic breeds.¹ Reported more often in Staffordshire Bull Terriers and adult giant breeds such as the Great Dane, although 24% of cases are small breed dogs. It has also been reported as Puppy Paralysis or Drag Lag Syndrome in Irish Wolf Hound puppies.² Confirmation consists of clinical signs and MRI findings, although post-mortem histopathology is required.^{1,2}

Similarities Between ANNPE and FCEM

- Peracute presentation of neurologic dysfunction (paresis or paraplegia)
- Strenuous physical activity often noted at onset of dysfunction
- Lateralized clinical signs
- Non-progressing after 24 hours
- Non-chondrodysplasia breeds
- Confirmed cases in cats
- Recovery of voluntary motor activity noted at approximately 6 days

Diagnosis of FCEM and ANNPE antemortem can be challenging and requires an assessment of specific diagnostic imaging features on the MRI. Diagnosis is technically presumptive and requires postmortem histopathology to be certain.³

MRI Features of ANNPE³

- Focal area of intramedullary spinal cord hyperintensity on T2-weighted images that overlies IVD space
- A reduction in volume of the T2W hyperintense NP signal
- Mild narrowing of the associated disc space
- Extradural material or signal intensity change with minimal or no spinal cord compression at this level

MRI features of FCEM³

- Presence of a focal, well-demarcated intramedullary T2W hyperintense lesion, mainly affecting gray matter
- Absence of the above criteria to diagnose ANNPE

Prognosis

Determining the cause of IVD disease is important with respect to predicting the recovery of ambulation, resolution of pain, and the return of fecal and urinary incontinence. The presence of deep pain sensation is the biggest indicator of a worse outcome for most IVD diseases including ANNPE and FCEM. The severity of the presenting neurological symptoms is a useful indicator of potential prognosis.⁴ Dogs presenting with paraplegia are more likely to develop urinary and fecal incontinence compared to nonparaplegic dogs with ANNPE.⁵ Fecal incontinence is five times more likely in the ANNPE patient than the FCEM patient.⁶ Dogs that are prescribed NSAIDs at the time of diagnosis are less likely to develop fecal incontinence.⁵ The development of urinary incontinence, presence of persistence of motor deficits and times to recovery are not that significantly different between ANNPE and FCEM patients.⁶

Rehabilitation for the ANNPE and FCEM patient

A formalized rehabilitation assessment by a certified canine rehabilitation therapist or practitioner is recommended as soon as possible after diagnosis to determine the patients' physiotherapy needs. Since ANNPE and FCEM are non-painful, and non-progressing, therapy can start immediately and should focus on simulated standing motor activities, reducing muscle atrophy, maintaining range of motion, and facilitating proprioception^{7,8}. Therapy may include passive range of motion (PROM), massage, assisted standing and walking exercises, active exercises, neuromuscular stimulation (NMES), underwater treadmill therapy and home exercises.^{8,9}

Good nursing care of the recumbent patient is essential and should be discussed with the client to prevent decubital ulcers, pulmonary atelectasis, and urine scalds. Usage of harnesses, slings, peanut balls, and other equipment may facilitate care at home. Clients may require help learning how to express the bladder several times daily if urinary incontinence develops. Clients can also learn how to manage fecal incontinence at home.

Rehabilitation Modalities

Underwater Treadmill- Strengthens muscles with gentle water resistance. Buoyancy of the water reduces impact and load on the joints and improves range of motion.

Swimming- Strengthen muscles, improves range of motion, reduces impact on joints.

Land exercises- Demonstrate exercises that can then be performed at home such as passive range of motion (PROM) and stretching. This helps ensure patient/client are performing them properly. Trained staff are also more likely to make the patient work a little harder than owners therefore speeding recovery time.

Neuromuscular Electrical Stimulation (NMES): Contracts muscles and helps build and re-educate muscles after period of disuse.

References

1. Fenn, & Olby, N. J. (2020). Classification of Intervertebral Disc Disease. *Frontiers in Veterinary Science*, 7, 579025–579025. <https://doi.org/10.3389/fvets.2020.579025>
2. De Risio. (2015). A review of fibrocartilaginous embolic myelopathy and different types of peracute non-compressive intervertebral disk extrusions in dogs and cats. *Frontiers in Veterinary Science*, 2, 24–24. <https://doi.org/10.3389/fvets.2015.00024>
3. Fenn, Drees, R., Volk, H. A., & Decker, S. D. (2016). INTER- AND INTRA-OBSERVER AGREEMENT FOR DIAGNOSING PRESUMPTIVE ISCHEMIC MYELOPATHY AND ACUTE NONCOMPRESSIVE NUCLEUS PULPOSUS EXTRUSION IN DOGS USING MAGNETIC RESONANCE IMAGING. *Veterinary Radiology & Ultrasound*, 57(1), 33–40. <https://doi.org/10.1111/vru.12289>
4. Olby, da Costa, R. C., Levine, J. M., & Stein, V. M. (2020). Prognostic Factors in Canine Acute Intervertebral Disc Disease. *Frontiers in Veterinary Science*, 7, 596059–596059. <https://doi.org/10.3389/fvets.2020.596059>
5. Mari, Behr, S., Shea, A., Dominguez, E., Ricco, C., Alcoverro, E., Ekiri, A., Sanchez-Masian, D., & De Risio, L. (2019). Predictors of urinary or fecal incontinence in dogs with thoracolumbar acute non-compressive nucleus pulposus extrusion. *Journal of Veterinary Internal Medicine*, 33(6), 2693–2700. <https://doi.org/10.1111/jvim.15626>
6. Mari, Behr, S., Shea, A., Dominguez, E., Johnson, P. J., Ekiri, A., & De Risio, L. (2017). Outcome comparison in dogs with a presumptive diagnosis of thoracolumbar fibrocartilaginous embolic myelopathy and acute non-compressive nucleus pulposus extrusion. *Veterinary Record*, 181(11), 293–293. <https://doi.org/10.1136/vr.104090>
7. Taylor Brown. (2017). Presumptive acute non-compressive nucleus pulposus extrusion in 11 cats: clinical features, diagnostic imaging findings, treatment, and outcome. *Journal of Feline Medicine and Surgery*, 19(1), 21–26. <https://doi.org/info:doi/>
8. Millis DL, Levine D. *Canine Rehabilitation and Physical Therapy*. 2nd Ed. Elsevier, 2013.
9. Zink C, Van Dyke JB. *Canine Sports Medicine and Rehabilitation*. 2nd Ed. Wiley and Sons, 2018.

Idiopathic Vestibular Syndrome-Merrily We Roll Along with Rehabilitation

Tiffany Durzi, DVM, CVA, CCRT, CVPP, ABVP (canine/feline)

Charlotte Donohoe, RVT, VTS (ECC), CCRP

Jacy Erling, RVT, CCRP

Ontario Veterinary College Fitness and Rehabilitation Service (OVC FAR), Guelph, Ontario

Idiopathic Vestibular Syndrome (IVS) is a common peripheral disease of canines and felines that occurs acutely with no specifically identified cause. In the canine patient, the disease is also referred to as geriatric vestibular disease or old dog vestibular disease since it is often seen in older dogs of any breed. Clinically, the animal presents to the clinic with a sudden onset of symptoms including vestibular ataxia, head tilt, nystagmus, and strabismus.¹ The pet is unable to stand and appears to be suddenly rolling, leaning, falling, and circling. This often causes the client to be exceptionally concerned about a fatal condition such as a stroke or a brain tumor.

The practitioner must dutifully perform a thorough physical exam and neurologic assessment. Vestibular ataxia can be differentiated by other forms of ataxia by the involvement of a head tilt, usually on the same side of the lesion.² Once vestibular ataxia is confirmed, the practitioner must then discern between a peripheral or central vestibular lesion because the differential diagnoses and prognosis are vastly different. Therefore, careful attention to neurologic details is required to help guide diagnostics, prognosis, and treatment options.^{3,4}

Common differentials of canine vestibular disease include IVS, otitis media/interna, meningoencephalitis of unknown origin, neoplasia of the brain or middle ear, ischemic infarct, intracranial empyema, and metronidazole toxicity. Common differentials of feline vestibular disease include IVS, otitis media/interna, brain neoplasia, nasopharyngeal polyp, feline infectious peritonitis, thiamine deficiency and intracranial empyema.^{3,4}

There is a commonality of symptoms of peripheral and central vestibular disease including head postural abnormality (head tilt), pathologic nystagmus, vestibular ataxia, and vestibular strabismus. Central vestibular disease involves the brain stem and cerebellum and as such cranial nerve deficits, weakness, vertical nystagmus, and proprioceptive deficits are noted on examination. However, peripheral vestibular disease often involves the inner ear and symptoms including facial nerve paresis/paralysis, Horner's syndrome, and horizontal or rotary nystagmus are common features. Peripheral vestibular disease involves the inner ear receptors located outside of the brain (petrosal part of temporal bone). IVS is considered a peripheral vestibular disease since the patient does not display changes in mental status or proprioceptive positioning deficits. An important feature is that the nystagmus is always in the same direction, either horizontal or rotatory, but never vertical.^{1,5}

Diagnosis includes ruling out other causes of vestibular disease. A complete physical examination, neurological assessment and otoscope exam should be performed. Baseline blood work is often recommended including a CBC, chemistry panel and T4. Secondary diagnostic tests including bulla radiographs, myringotomy, magnetic resonance imaging (MRI), computed tomography (CT), CSF tap, and referral to a neurologist are not always required immediately.¹ According to a study performed in 2021, an important feature is that IVS is acute in onset and is non-progressive.³ Most patients will begin to show improvement in clinical signs within three to five days.^{1,3}

Table 1: Common Signalment, Clinical Exam and Neurologic Findings for Dogs with IVS₃

Older age	Absence of Horner's syndrome
Higher BCS/ weight	No history of previous otitis externa
Presence of pathological jerk nystagmus (horizontal or rotary)	No vertical nystagmus
Concurrent facial nerve paresis	No weakness
Acute onset; improving signs in days to weeks	No proprioceptive deficits

Although there is no known cause of IVS, preliminary evidence through MRI analysis shows that the endolymph is altered on the affected side in most IVS patients. Further studies are required to determine the relevance of this information and whether this will be helpful regarding prognosis.⁶ Another recent study found that significant asymmetry of utricle diameter was identified in dogs with IVS versus unaffected dogs. It is proposed that canine IVS may be correlated with structural atrophy of the vestibular system and again further investigation is warranted.⁷

Most patients can be managed as outpatients, but the client should be educated to understand the demands of caring for a 'down dog' at home. Hospitalization may be required for clients where home care is not a realistic option. Treatment of IVS focuses on managing the clinical symptoms of vertigo and nausea. The associated nausea can be managed with antiemetics such as oral maropitant citrate. Acupuncture has been a favorable treatment option for nausea in humans however, specific studies in pets with vestibular disease have not been performed. The acupoint PC-6 has been studied to prevent drug related nausea but results are variable.⁸ A recent 2021 study highlighted the efficacy of Ondansetron (5-HT₃ receptor antagonist) for the treatment of dogs with IVS and therefore its use is recommended.⁹ Mirtazapine can help with appetite stimulation if required. Daily energy requirements should be calculated and discussed with clients to ensure the pet is consuming adequate calories.

With respect to veterinary rehabilitation, testing, and repositioning maneuvers such as the Epley maneuver have been adopted from human therapy and applied to canine patients with IVS. In many patients, noticeable improvements in the debilitating signs of the condition have been observed immediately following the maneuver including resolution of nystagmus.¹⁰ This requires careful review of the procedure and a large open space with padded floors. It is recommended that a muzzle be placed on the dog to avoid an inadvertent bite. The professional veterinary staff will have to assess the safety of the situation as the technique is physically demanding to perform and it should not be performed on patients with suspected spinal injuries/disease.

Assistive devices such as slings and harnesses can help clients manage pets at home. As much as possible the clients should be encouraged to get the pet up. The pet needs to learn to adjust to their new perspective/orientation of the world. Peanut balls can be helpful to perform assisted standing exercises and to help the client manage general pet care. Home exercises focus on maintaining range of motion, reducing potential muscle atrophy, and gait retraining. Initially, exercises should be performed four to six times daily and should include passive range of motion (PROM) and simulated standing and walking exercises.

Registered Veterinary Technicians can be enlisted to help support clients with regards to the details of nursing care of the ‘down dog’ at home. Of particular importance is the avoidance of urine scalds and potential urinary tract infections. A wheel cart is not usually required for these patients. Once the dog can walk with assistance, a formalized rehabilitation program is encouraged. This includes the development of a personalized home exercise plan and twice weekly underwater treadmill therapy (UWTM).

A study examining clinical and MRI findings in patients with vestibular disease found that a history of previous vestibular episodes was associated with an increased likelihood of resolution of symptoms. The same study also found that contrast enhancement on MRI of cranial nerves VII and/or VIII was associated with decreased resolution of symptoms.¹¹ However, the prognosis for IVS is good, and euthanasia can be avoided. Many pets will continue to have elements of a residual head tilt however, their quality of life is generally good.^{1,3}

References

1. Rossmeisl Jr, JH. Vestibular disease in dogs and cats. *Vet Clin North Am*; 40 (2010) 81–100
2. Casimiro da Costa, R. Ataxia--Recognition and Approach World Small Animal Veterinary Association World Congress Proceedings, 2009.
3. Harrison, Grapes, N. J., Volk, H. A., & De Decker, S. (2021). Clinical reasoning in canine vestibular syndrome: Which presenting factors are important? *Veterinary Record*, 188(6), e61–e61. <https://doi.org/10.1002/vetr.61>
4. Grapes, Taylor-Brown, F. E., Volk, H. A., & De Decker, S. (2021). Clinical reasoning in feline vestibular syndrome: which presenting features are the most important? *Journal of Feline Medicine and Surgery*, 23(8), 669–678. <https://doi.org/10.1177/1098612X20970869>
5. Gredal. (2021). Vestibular syndrome in dogs: how to keep a level head. *Veterinary Record*, 188(6), 223–225. <https://doi.org/10.1002/vetr.329>
6. Foth, Meller, S., De Decker, S., & Volk, H. . (2021). Unilateral decrease in inner ear signal in fluid-attenuated inversion recovery sequences in previously suspected canine idiopathic vestibular syndrome. *The Veterinary Journal* (1997), 277, 105748–105748. <https://doi.org/10.1016/j.tvjl.2021.105748>
7. Won, & Yoon, J. (2020). MRI utricle diameter asymmetry is significantly greater in dogs with idiopathic vestibular syndrome compared with unaffected dogs. *Veterinary Radiology & Ultrasound*, 61(5), 540–544. <https://doi.org/10.1111/vru.12893>
8. Cheong KB, Zhang JP, Huang Y, Zhang ZJ. The effectiveness of acupuncture in prevention and treatment of postoperative nausea and vomiting--a systematic review and meta-analysis. *PLoS One*. 2013 Dec 13;8(12):e82474. doi: 10.1371/journal.pone.0082474. PMID: 24349293; PMCID: PMC3862842.
9. Foth, Meller, S., Kenward, H., Elliott, J., Pelligand, L., & Volk, H. A. (2021). The use of ondansetron for the treatment of nausea in dogs with vestibular syndrome. *BMC Veterinary Research*, 17(1), 1–222. <https://doi.org/10.1186/s12917-021-02931-9>
10. Kraeling. (2014). Proposed Treatment for Geriatric Vestibular Disease in Dogs. *Topics in Companion Animal Medicine*, 29(1), 6–9. <https://doi.org/10.1053/j.tcam.2014.04.004>
11. Orlandi, Gutierrez-Quintana, R., Carletti, B., Cooper, C., Brocal, J., Silva, S., & Goncalves, R. (2020). Clinical signs, MRI findings and outcome in dogs with peripheral

vestibular disease: a retrospective study. BMC Veterinary Research, 16(1), 159–159.
<https://doi.org/10.1186/s12917-020-02366-8>

REHABILITATION OF THE ICU PATIENT

Charlotte Donohoe RVT, VTS(ECC), CCRP

Tiffany Durzi DVM, DVM, CVA, CCRT, CVPP, DABVP (canine/feline)

Jacy Erling BSc, RVT, CCRP

The veterinary intensive care unit is populated by patients who most often require extended hospitalization in order to overcome their neurologic, orthopaedic or physiologic disease(s). The degree of illness experienced by ICU patients frequently leads to limited mobility or prevents them from being ambulatory for some period of time. The decreased mobility affecting critically ill animals has several side effects that can prolong hospital stay and cause lasting changes to the patient that can ultimately decrease quality of life after discharge.

Non-ambulatory patients have increased risk of developing scalding due to urine and/or fecal matter from which they are unable to distance themselves. Lengthy recumbency without appropriate bedding and availability of timely positional changes results in ulceration of skin overlying major points of weight bearing and pressure. Prolonged pressure on bony prominences can lead to inflammation, pain and tissue ischemia. Postural muscles suffer early in the disuse phase and muscle strength decreases rapidly in the first week of immobility. Joints that are not moving through normal range of motion (ROM) while the patient is recumbent are subject to several changes that can be difficult to reverse. Cartilage atrophy and thinning, decreased synovial fluid production, and decreased delivery of oxygen and nutrients to the joint are but a few of the deleterious effects of disuse.

Many side effects associated with long ICU hospitalization can be mitigated, and in some cases avoided, by prescribing and implementing a rehabilitation program for appropriate candidates. Studies observing early mobilization of paediatric ICU patients identified improvements in length of ICU stay, length of hospitalization, number of days on ventilatory support and an overall decrease in cost of care.¹ Similar studies in adult patients illustrated that early and progressive mobilization of ICU patients lead to fewer days in ICU than patients receiving traditional physiotherapy visits as well as a more complete return to the patient's ability to perform activities of daily living.²

Each patient's rehabilitation plan requires collaboration between the primary clinician, the criticalist, the ICU technicians and the rehabilitation practitioner. The team must assess the patient to determine whether rehabilitation and physical exercises can be tolerated. Hemodynamically unstable patients, unstable spinal fractures and increased intracranial pressure are examples of conditions that may make the patient unsuitable for assisted movement or therapeutic exercises. Once the patient's condition is stable, the team should coordinate efforts in order to facilitate physical rehabilitation sessions that will fit smoothly into the medical treatment plan.

ICU patients pose logistical challenges to the rehabilitation practitioner in that they are often connected to telemetry, oxygen therapy, intravenous fluids, central lines, continuous suction or enteral or parenteral nutrition. Careful consideration is required in order to prescribe exercises

that are achievable for these patients and in order to carefully schedule around sedation, diagnostic procedures and treatment times.

Patient Positioning

Patients that cannot move or turn themselves from side to side require strategic positioning until they are able to change positions on their own. Appropriate postural placement can improve patient comfort in several ways. Swollen and edematous appendages should be mildly elevated to prevent gravitational accumulation of additional fluid. Similarly, placing cushioned bedding under pendulous body parts or supporting fractured limbs will reduce strain on associated muscles and ease discomfort.

It is important to consider the patient's respiratory needs when arranging bedding and posture. Ideally the animal should be positioned such that the work of breathing is minimized, atelectasis is avoided, and lung volume is maximized. Prevention is key and can be achieved by changing the animal's position every 2-4 hours. Animals with asymmetrical contusions or pathology should be positioned so that the less affected, more functional side is less restricted and is freer to move and facilitate oxygen transfer. Pneumonia, pulmonary abscesses and pulmonary contusions are conditions that benefit from positioning techniques that allow for increased thoracic drainage. The goal is to position the patient so that the bronchi are vertical to the lung and excess fluids drain via the mainstem bronchi and the trachea.³

Thoracic percussion is an additional strategy employed to facilitate movement of pulmonary secretions. *Coupage* is performed on the affected side of the thorax by gently tapping the side of the patient with a cupped hand. The practitioner can treat both sides simultaneously in animals with bilateral lung pathology. *Coupage* also causes lung atelectasis and as such must be used only when appropriate. Gas exchange has been shown to improve post treatment despite atelectasis caused by thoracic percussion. Ideally it is performed after the patient has been positioned for optimal postural drainage and is administered for 3-4 minutes at a time. Thoracic percussion is not a suitable therapy for animals with flail chest, who are hemodynamically unstable, with traumatic myocarditis, thrombocytopenia, pulmonary tumors or pleural space disease.

Massage

Therapeutic massage increases blood flow to affected tissues. Increased circulation in treated tissues can help decrease edema and reduce swelling. In addition, massage can reduce the severity of muscle contracture and decrease muscle spasm. Massage has the added benefit of allowing the practitioner to have hands on the dog in a soothing fashion; a treatment that can relax the patient but also be beneficial in strengthening the human animal bond and potentially soothe the provider as well.

Maintaining Mobility

Recumbent animals quickly develop joint and muscle stiffness unless they are guided through some form of mobilization. Range of motion exercises are used to maintain joint and cartilage health, protect tendons and ligaments, and minimize or avoid muscle contracture.

Passive range of motion (PROM) refers to the assisted movement of the limb so that a joint's range of motion (normal degrees of flexion and extension) is explored without the patient's active effort. The rehabilitation practitioner provides support to the limb and moves it through the movement it would naturally undertake if the animal were to ambulate on its own. PROM can be performed with the patient in lateral recumbency if required but can also be performed with the patient in any comfortable position that allows access to the limb. The limb to be treated cannot bear weight during the treatment if passive exercise is the goal. Active range of motion (AROM) also moves a joint through its available space but requires the active muscle use to move the joint. AROM is less commonly used in recumbent ICU patients. PROM can be performed 3-4 times daily and each of the joints can be flexed and extended 10-15 times per session. Flexion and extension of the joint may initially be difficult if the patient has been recumbent for a period prior to the initiation of physical rehabilitation exercises.

Transitions

Before the patient can move on their own, the practitioner can begin assisted transitions with the animal remaining in their ICU bedding. Movements from lateral to sternal recumbency and from sternal to lateral recumbency can be repeated several times throughout the day. The animal is encouraged to make the change on their own but requires guidance and support to execute the complete postural change.

Assisted Standing

Assisted standing is a convenient and beneficial treatment that is performed cage side. Transitioning the recumbent patient to a standing position requires great care and attention not only to patient comfort, but also to catheters, lines and telemetry equipment attached to the patient.

Assistive devices such as exercise peanuts, foam wedges and slings or harnesses help support the weight of the animal and allow exercise of postural muscles while minimizing the risk of over exertion. Support peanuts and wedges are typically placed under the torso with forelimbs in front of device and hind legs behind the device. The animal's feet should be placed appropriately on the ground and positioned correctly to encourage some weight bearing. Initially, the animal may only be able to stand for 1-2 minutes at a time. Heart rate and respiratory rate and quality should be monitored during all session to ensure that the patient is not decompensating due to sudden postural changes or increases in activity and effort. Once the patient is more comfortable and able to support some of its own weight, rebounding and weight shifting exercises can be introduced. These are achieved by gently swaying the animal's fore or hind quarters from side to side just enough to engage the muscles to stabilize posture. The animal does not need to take sideways steps at this stage. Gentle downward pressure over

the animal's pelvis and hind quarters in a soft bouncing motion also engages postural muscles and initiates muscle contraction without requiring the patient to take steps.

Assisted Walking

Slings, harnesses, carts and cranes are used to facilitate walking in patients with extreme weakness or neurological deficits. Typically, these are reserved for patients that require less telemetry equipment and whose intravenous fluids and urine collection systems can be transported with them. Slippery floors should be avoided, and surfaces should be flat and smooth enough to wheel support equipment over if necessary. Patients that do not move limbs with intention can be encouraged to do so through gait patterning. The rehabilitation practitioner focuses on forelimbs or hind limbs and moves the limbs in a pattern that mimics the animal's normal gait. A firm placement of the feet on the ground stimulates awareness and helps with proprioception.

Hydrotherapy

Underwater treadmill (UWTM) walking and swimming are the mainstays of hydrotherapy. Appropriate candidates for UWTM therapy are those who have reached a point in their recovery where they are not obligated to be on oxygen therapy, do not have open wounds, have surgery sites that are sealed and that are cardiovascularly stable. Underwater treadmill exercise is most suitable for the ICU patient due to its ability to select water volume and depth. In addition, slings, harnesses and hoists are very useful for non-ambulatory patients in the UWTM. With the patient's weight supported, the practitioner can practice gait patterning at the walk, or place each foot appropriately and encourage correct stance or practice weight shifting. The movement of the belt contributes to the animal's awareness of their limbs and leads to an improvement in proprioception. Polytrauma patients can begin to move again and bear weight on recently repaired orthopaedic injuries with the benefit of being buoyant in the water.

Photobiomodulation

Laser therapy is an excellent tool for reducing inflammation and providing pain relief in veterinary patients. Depending on the class of laser in use, treatment may not be available cage side in the ICU. Class IV lasers require a controlled environment in which the user and all attending care providers must adhere to safety regulations. Due to the busy nature of most ICUs this is difficult to achieve in situ. Once the patient can be moved to a specific treatment location for laser therapy the clinician should consider the benefits afforded by this modality.

Electrical stimulation (NMES and TENS)

Neuromuscular electrical stimulation (NMES) and transcutaneous electrical nerve stimulation (TENS) are two forms of electrical stimulation commonly used in rehabilitation therapy. TENS is used primarily for pain control and utilizes low voltage electrical current that is delivered through adhesive electrode pads on the patient's skin. TENS typically does not cause a

complete muscle contraction that creates joint movement. NMES is useful as an adjunctive therapy for muscle re-education in patients that are recumbent for long periods of time. Muscle contraction with NMES helps prevent the muscle atrophy that is encountered with prolonged disuse. In addition, ROM is preserved or regained and blood flow to the treated area is increased.

Thermal and Cryotherapy

Warm and cold packing can be used strategically before and after ROM exercises or as a scheduled treatment for ambulatory or non-ambulatory patients. Applying warm packs to focal areas allows some passive warming and improves collagen elasticity to facilitate ROM and stretching exercises. Most often heat packs are reserved for chronic injuries, but in the acute/peracute patient they are also useful to minimize muscle contractures and resolve hematomas. Applying cold packs after exercise, or as scheduled daily treatments helps decrease inflammation and pain and is particularly helpful in post-surgical or post traumatic patients. These are most effective in the first 24-48 hours but can be continued longer.

Packs must be wrapped in a layer of protective material and should never be in direct contact with the patient's skin. The practitioner should check the area every 5-8 minutes to examine the skin and ensure patient comfort. Treatments should last for 10-20 minutes if well tolerated by the animal.

Electrohydraulic Shock Wave Therapy (ESWT)

Shock wave therapy uses high energy acoustic waves applied to deep muscle tissue. The energy stimulates improved tissue healing, neovascularization, release of anti-inflammatory proteins and provides analgesia to the affected area. Historically patients have required mild sedation for ESWT treatments but newer technology allows for more comfortable treatments and may require less sedation.

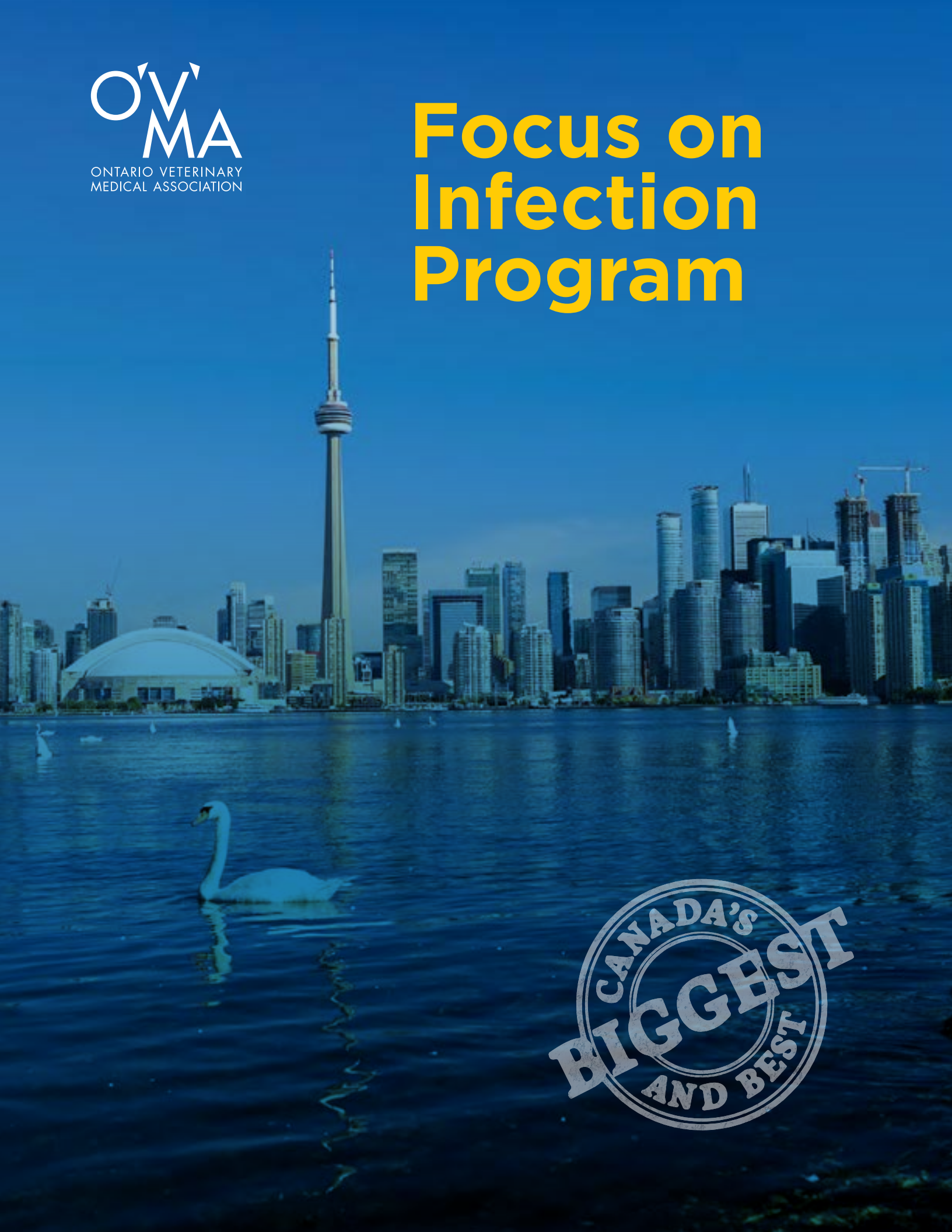
References

1. Kupferschmid, Tripathi, S., & Gehlbach, J. (2021). 1121: Move 2 Improve: The Introduction of an Early Mobility Program in a Pediatric Intensive Care Unit. *Critical Care Medicine*, 49(1), 562–562. <https://doi.org/10.1097/01.ccm.0000730372.04571.c7>
2. Schujmann, Teixeira Gomes, T., Lunardi, A. C., Zoccoler Lamano, M., Fragoso, A., Pimentel, M., Peso, C. N., Araujo, P., & Fu, C. (2020). Impact of a Progressive Mobility Program on the Functional Status, Respiratory, and Muscular Systems of ICU Patients: A Randomized and Controlled Trial. *Critical Care Medicine*, 48(4), 491–497. <https://doi.org/10.1097/CCM.00000000000004181>
3. Dunning, Halling, K. B., & Ehrhart, N. (2005). Rehabilitation of medical and acute care patients. *The Veterinary Clinics of North America. Small Animal Practice*, 35(6), 1411–1426. <https://doi.org/10.1016/j.cvsm.2005.08.008>

4. Allen, Glasziou, P., & Mar, C. D. (1999). Bed rest: a potentially harmful treatment needing more careful evaluation. *The Lancet (British Edition)*, 354(9186), 1229–1233. [https://doi.org/10.1016/S0140-6736\(98\)10063-6](https://doi.org/10.1016/S0140-6736(98)10063-6)
5. Olby, Halling, K. B., & Glick, T. R. (2005). Rehabilitation for the neurologic patient. *The Veterinary Clinics of North America. Small Animal Practice*, 35(6), 1389–1409. <https://doi.org/10.1016/j.cvsm.2005.08.004>
6. Schujmann, Teixeira Gomes, T., Lunardi, A. C., Zoccoler Lamano, M., Fragoso, A., Pimentel, M., Peso, C. N., Araujo, P., & Fu, C. (2020). Impact of a Progressive Mobility Program on the Functional Status, Respiratory, and Muscular Systems of ICU Patients: A Randomized and Controlled Trial. *Critical Care Medicine*, 48(4), 491–497. <https://doi.org/10.1097/CCM.0000000000004181>



Focus on Infection Program



Feline Infectious Peritonitis- An Evolving Disease

Matthew Kornya, BSc, DVM, ABVP (Feline) Residency Trained, Resident ACVIM (SAIM)

Background

Feline Infectious Peritonitis (FIP) is an enigmatic, complex, and often poorly understood disease by veterinarians and cat owners alike; as is evidenced by its very name (as it not directly infectious, and causes diverse signs which may or may not include peritonitis). First described in 1963, our knowledge of FIP has increased dramatically in the last half century, however in the last few years there have been dramatic advances in the diagnostic and treatment options available. A future vision of FIP as a readily diagnosed, treatable disease appears within reach for the first time.

Pathophysiology of FIP

FIP is caused by a combination of infection with Feline Coronavirus (FCoV), mutation of the virus to the FIP virus biotype (FIPV), and a dysregulated immune response to the virus. A complex interplay of exposure to the pathogen, the immunogenetics of the cat, and random chance is necessary for FIP to emerge. While more complex than many diseases, FIP is readily understood when the disease is broken into a series of steps.

Initial infection occurs with the enteric biotype of FCoV, here abbreviated as FeCoV. This is a ubiquitous pathogen that is spread feco-orally and infects up to 70% of cats in multi-cat environments. The virus has an enterocyte tropism and infects the lining of the bowel, where it causes mild, self limiting enteritis. Immunity is weak and non sterilizing, and cats may be repeatedly infected with the virus, though there is no carrier state. In the gross majority of cats, infection ends here.

In a small percentage of cats, FeCoV undergoes a mutation to the surface “spike” protein, resulting in a change in tropism from enterocytes to macrophages. A variety of different mutations have been described that result in this change, and multiple mutations may be required in order to alter tropism. Mutation rate in these viruses is high due to a lack of proofreading ability of the viral RNA dependant RNA polymerase.

This alteration in tropism means the virus is no longer shed in the stool, and circulates systemically within infected macrophages. In some cats, a strong “TH1 biased” cell mediated immune response occurs, with effective viral killing resulting in clearance of the infection. If, however, a “TH2” humoral response predominates, viral killing is ineffective. Large numbers of ineffective antibodies accumulate bound to viral antigen, resulting in a type 3 hypersensitivity response. Macrophages and lymphocytes are recruited to the site of infected macrophages, but are unable to effectively kill infected cells, resulting in granuloma formation.

Cats who maintain a degree of cell-mediated immunity form granulomas in multiple tissues. The clinical signs and laboratory abnormalities that occur will depend on the organs involved. Common sites of inflammation include the eyes, brain, ileocolic junction, spleen, and kidneys, though involvement of lungs, heart, liver, and most other organs have been reported. This diffuse, granulomatous inflammation associated with FIP is classically referred to as “Dry FIP” and may last from days to months.

Cats with a very poor cell mediated response and a large TH2 bias produce large numbers of antibodies, which bind to antigen to form circulating immune complexes. These deposit in vessel walls and create a systemic vasculitis, resulting in inflammation and fluid transudation within the abdomen, thorax, or

other cavities. This syndrome of cavitory effusion is referred to a “Wet FIP” and when it occurs is generally fatal in days to weeks.

Note that this paradigm is not as black and white as it may seem. Most cats will mount a combination of TH1 and TH2 responses, and the Wet-Dry classification should be seen as a continuum rather than a dichotomy. Many cats with dry FIP will develop a stronger humoral response over time, resulting in a transition from dry to wet. It does not appear that cats naturally transition from wet to dry.

Regardless of the position of a patient on the wet-dry continuum, FIP is associated with systemic inflammation, vasculitis, and immune complex formation. The elevated circulating antibodies are manifested as increased globulins. Acute phase proteins (serum amyloid A, haptoglobin, and alpha-1 acid glycoprotein) are generally elevated. Albumin is often decreased both as a negative acute phase response and as a component of fluid transudation. Neutrophilia occurs as a consequence of systemic inflammation, and a waxing/waning fever is often seen. Anemia often occurs as a result of RBC destruction in inflamed blood vessels, with a secondary increase in bilirubin. As FIP progresses, cavitory effusion, anemia, and organ dysfunction become more severe. Anorexia is common, and animals will lose body condition and muscle. Death occurs as a result of anemia, organ failure, starvation, or pleural effusion.

Exposure to FCoV is common in young animals, or in older cats exposed to a new kitten. While disease is classically noted in cats less than a year old, it may occur in animals of any age. It has been suggested that the stresses of weaning, vaccination, neutering, and rehoming experienced by kittens, combined with an underdeveloped immune system, may predispose to FIP development. FIP incidence has a biphasic distribution, with peaks in young and geriatric cats, however the incidence is not zero at any age.

Pathophysiology of FIP- Recent Updates

Recently the pathophysiology of FIP has been elucidated in greater detail. One fact that has become clear is that systemic infection with the enteric form of FCoV is possible, meaning that the isolation of coronavirus from tissues or bodily fluids is not sufficient to diagnose FIP.

It has also become clear that there are numerous genetic factors influence a cat’s predisposition to develop FIP. It has long been recognized that purebred cats are over represented as FIP cases. While this may be due in part to greater exposure to FeCoV in catteries, it is also clear that immunogenetics play a role in a cat’s ability to clear the infection. Genes for interferon, IL-10, and severe other immune genes have been implicated. It has recently been suggested that rather than the influence of a single or cluster of genes on the immune response to FIP, it is a general loss of heterozygosity that alters their immune response.

Clinical Presentations

Due to the diverse nature of syndromes associated with FIP, cats may present with a variety of clinical signs. These may range from mild hyporexia or “poor doing’ in kittens with early dry form, to the moribund presentation of animals with late stage wet form. Several “classic” presentations exist that are commonly seen, including:

- Neurologic - Often diffuse CNS signs including seizures, ataxia, and blindness associated with brain and meningeal inflammation
- Ocular-Uveitis, often seen in association with neurologic disease

- Ileocolic- An uncommon presentation that occurs as a mass-like lesion surrounding the ileocolic junction, often associated with gastrointestinal signs
- Effusive- Large volumes of ascites, pleural effusion, or both

There are also a wide variety of nonspecific signs that can occur, and so FIP is a reasonable differential in any cat with unexplained systemic disease, especially if it is found in combination with elevated globulins, fever, or anemia.

The effusion present in cats with FIP is often described as “straw coloured” for its pale yellow, slightly cloudy appearance. It is generally mildly viscous, with a “sticky” character. The effusion may vary, however, from translucent serous fluid to serosanguinous or chylous effusion. Abdominal lymphadenopathy is often identified either on palpation or diagnostic imaging. Splenomegaly and renomegaly may be present. Fever is common, but often waxes and wanes over the course of days.

Diagnosis- Traditional Techniques

Definitive diagnosis of FIP is notoriously difficult, and traditionally antemortem diagnosis has largely been based on exclusion and strong clinical suspicion. In a cat with clinical signs consistent with FIP, consistent hematologic and biochemical findings include: Mild to moderate non regenerative anemia ;Mild to moderate hyperbilirubinemia; Neutrophilia with or without left shift; and Elevated globulins, low albumin, and an A:G ratio <0.4. Cytology of ascitic or pleural fluid generally shows a high protein transudate or exudate with sterile suppurative to pyogranulomatous inflammation.

An inexpensive and readily available screening test for FIP is the Rivalta test. To perform this test, a drop of glacial acetic acid is added to a tube of distilled water (a larger volume of table vinegar is often substituted in clinical practice). A drop of effusion is then gently placed onto the top of the fluid, and observed as it descends. In a positive test, the fluid remains intact and descends as a “jellyfish” or “lava lamp”. In a negative test, the drop dissolves.

A positive Rivalta test indicates a fluid contains a high concentration of inflammatory proteins. In a kitten with abdominal effusion, it is highly specific for FIP; however it is less specific in older cats, where neoplasia and septic effusions will also be positive.

Due to the lack of fluid to sample, dry FIP is traditionally more difficult to diagnose than wet. Tests suggestive of dry FIP include elevated acute phase proteins, consistent findings on fundic exam, brain MRI, or abdominal ultrasound, consistent cytology from tissue aspirates, or definitive diagnosis by IHC on organ biopsy.

Diagnosis- Recent Updates

In recent years, PCR has become one of the most useful diagnostic tests for FIP. This was made possible by the discovery that a set of distinct mutations to the Spike (S) protein gene are responsible for the generation of FIPV from FeCoV. The development of reverse-transcriptase quantitative PCR for these mutations allows for the identification of FIPV in effusion or bodily fluids. This is less invasive than collection of biopsies, is less costly and operator dependant than immunohistochemistry or immunocytochemistry for coronavirus, and offers rapid turnaround.

Based on this, a recommended paradigm for diagnosis of FIP in cats with consistent clinical signs is to perform PCR on affected fluids, first for FCoV and if positive, for the FIPV biotype. PCR should be performed on cavity effusion, if present. If not, aqueous humor or CSF should be used in animals with uveitis or neurologic signs respectively. In cases of dry FIP with no ocular or neurologic signs, it is

recommended to submit fine needle aspirates of liver, spleen, kidneys, and abdominal lymph node, along with EDTA whole blood for PCR.

Advantages of PCR over other diagnostics are listed above. The finding of FIPV by PCR in any fluid or tissue of an animal with consistent clinical signs is strongly supportive of a diagnosis of FIP, and confirmation by biopsy and IHC is rarely needed. A negative PCR result for FCoV does not rule out FIP, but should prompt clinicians to pursue other diagnoses.

There are several drawbacks to the FIPV PCR. The first is the possibility that mutations which generate FIPV may occur which are not identified by the primers used in the test. This is of particular concern when a positive FCoV PCR of the FeCoV biotype is present in a cat with consistent clinical signs. In this case, the possibility of occurrence of a novel mutation causing FIP must be weighed against the possibility of incidental systemic FeCoV infection with a concurrent primary disease.

Treatment and Prognosis

Treatment of FIP has traditionally been considered futile, with therapies focused on minimizing clinical signs and prolonging quality of life for short periods. Until recent years, the disease has been considered almost 100% fatal.

Basic supportive care including fluid support, appetite stimulants, pain control, and antinauseants has formed the core of therapy. The use of steroids has been controversial; some endorse their use to decrease the immune response and reduce inflammation, while others feel the immunosuppression may result in increased viral replication. Regardless, either NSAID or steroid use is generally advocated to reduce inflammation.

The use of interferons has been proposed to help bias the immune system to a TH1 response and improve viral killing, though limited efficacy has been noted. The use of other immunostimulants such as Polyphenyl Immunostimulant (PPI) and Lymphocyte T Cell Immunoactivator (LTCl) has also been suggested, however studies are limited to non-existent and repeatable treatment success has not been observed.

Treatment and Prognosis- Recent Updates

Recent advances in antiviral therapy have opened the door to effective, durable, curative therapy for FIP. In the past several years several drugs have been developed which effectively halt viral replication. These include the nucleoside analogue GS441524, its prodrug Remdesivir, and the protease inhibitor GC376. GS 441524 and GC376 have been demonstrated to effectively inhibit FECV replication in vitro, and to induce lasting remission in both experimental and natural infection. Several studies have been published demonstrating the effectiveness of these drugs, with evidence suggesting GS441524 may be the more efficacious of the two.

While commercialization of GC376 is underway, development of GS441524 has been delayed due to its development by the patent holder for several human diseases including COVID-19. However, several international manufacturers have been producing large quantities of the drug and exporting it to North America. This grey-market drug is readily purchased online, either directly through the companies or via social media buying groups. In the author's experience, clients are generally able to attain drug within 24 hours of a FIP diagnosis. Treatment is via a SQ injection administered every 12 hours for ~80 days. Cats with neurologic or ocular involvement may require higher doses. A course of therapy is generally \$4000-

6000 depending on the brand used, and many companies offer guarantees of cure. Dosing regimens are widely available online.

The existence of these widely available drugs poses a dilemma for Canadian veterinarians. The drugs are produced as research chemicals without permission of the patent holder. There is no guarantee of efficacy, quality, or safety, and indeed no assurance that the drug is what it is labelled as. Veterinarians are not legally permitted to recommend the off label use of a research chemical as a therapeutic outside of a clinical trial.

The contrary viewpoint is that FIP is an incurable disease with virtually 100% fatality in a short period of time, and so even if the drug is ineffective, it is unlikely harmful. It is legal for owners to purchase these “research chemicals”, and treatment of their own pets is permitted as long as it is not considered inhumane. While these drugs have no guarantees, several researchers have analyzed batches of drug and found them to contain GS441524 as expected. Furthermore, there are currently thousands of anecdotal reports of successful treatment, and the author has personally witnessed several cats with confirmed FIP fully remit.

Hopefully, a legal, widely available, affordable version of an anti-FIP drug becomes available in the near future. Until this occurs, veterinarians must decide what degree of involvement they wish to have in recommending, supporting, endorsing, or discouraging the use of these drugs. Vets must also remember that the first thing most owners will do when confronted with a FIP diagnosis is to google “FIP Treatments”, and so they will be exposed to and purchasing these drugs with or without our support.

The Future of FIP

The future of FIP will revolve around the multitude of treatment options entering the market. It is unclear at this point which treatment will become most readily commercialized and effective in FIP therapy, however the rapid expansion in treatment options presents many potential routes for effective therapy.

While FIP vaccines have been notoriously difficult to produce and ineffective (sometimes resulting in antibody dependant enhancement), current research into SARS-COV-2 vaccines may open doors to technologies and strategies to vaccinate for FIP as well.

References

1. Tasker S. Diagnosis of feline infectious peritonitis: Update on evidence supporting available tests. *J Feline Med Surg*. 2018;20(3):228-243. doi:10.1177/1098612X18758592
2. Tekes G, Thiel HJ. Feline Coronaviruses: Pathogenesis of Feline Infectious Peritonitis. In: *Advances in Virus Research*. Vol 96. Academic Press Inc.; 2016:193-218. doi:10.1016/bs.aivir.2016.08.002
3. Brown MA, Troyer JL, Pecon-Slattey J, Roelke ME, O’Brien SJ. Genetics and pathogenesis of feline infectious peritonitis virus. *Emerg Infect Dis*. 2009;15(9):1445-1452. doi:10.3201/eid1509.081573
4. Jaimes JA, Millet JK, Stout AE, André NM, Whittaker GR. A tale of two viruses: The distinct spike glycoproteins of feline coronaviruses. *Viruses*. 2020;12(1). doi:10.3390/v12010083

5. Golovko L, Lyons LA, Liu H, Sørensen A, Wehnert S, Pedersen NC. Genetic susceptibility to feline infectious peritonitis in Birman cats. *Virus Res.* 2013;175(1):58-63. doi:10.1016/j.virusres.2013.04.006
6. Hsieh LE, Chueh LL. Identification and genotyping of feline infectious peritonitis-associated single nucleotide polymorphisms in the feline interferon- γ gene. *Vet Res.* 2014;45(1):57. doi:10.1186/1297-9716-45-57
7. Felten S, Hartmann K. Diagnosis of feline infectious peritonitis: A review of the current literature. *Viruses.* 2019;11(11). doi:10.3390/v11111068
8. Addie D, Belák S, Boucraut-Baralon C, et al. Feline infectious peritonitis ABCD guidelines on prevention and management. *J Feline Med Surg.* 2009;11(7):594-604. doi:10.1016/j.jfms.2009.05.008
9. Hartmann K, Binder C, Hirschberger J, et al. Comparison of Different Tests to Diagnose Feline Infectious Peritonitis. *J Vet Intern Med.* 2003;17(6):781-790. doi:10.1111/j.1939-1676.2003.tb02515.x
10. Kennedy MA, Abd-Eldaim M, Zika SE, Mankin JM, Kania SA. Evaluation of antibodies against feline coronavirus 7b protein for diagnosis of feline infectious peritonitis in cats. *Am J Vet Res.* 2008;69(9):1179-1182. doi:10.2460/ajvr.69.9.1179
11. Felten S, Matiasek K, Gruendl S, Sangl L, Wess G, Hartmann K. Investigation into the utility of an immunocytochemical assay in body cavity effusions for diagnosis of feline infectious peritonitis. *J Feline Med Surg.* 2017;19(4):410-418. doi:10.1177/1098612X16630357
12. Barker EN, Stranieri A, Helps CR, et al. Limitations of using feline coronavirus spike protein gene mutations to diagnose feline infectious peritonitis. *Vet Res.* 2017;48(1):60. doi:10.1186/s13567-017-0467-9
13. Porter E, Tasker S, Day MJ, et al. Amino acid changes in the spike protein of feline coronavirus correlate with systemic spread of virus from the intestine and not with feline infectious peritonitis. *Vet Res.* 2014;45(1). doi:10.1186/1297-9716-45-49
14. Felten S, Weider K, Doenges S, et al. Detection of feline coronavirus spike gene mutations as a tool to diagnose feline infectious peritonitis. *J Feline Med Surg.* 2017;19(4):321-335. doi:10.1177/1098612X15623824
15. Emmler L, Felten S, Matiasek K, et al. Feline coronavirus with and without spike gene mutations detected by real-time RT-PCRs in cats with feline infectious peritonitis. *J Feline Med Surg.* 2019. doi:10.1177/1098612X19886671
16. Ishida T, Shibana A, Tanaka S, Uchida K, Mochizuki M. Use of recombinant feline interferon and glucocorticoid in the treatment of feline infectious peritonitis. In: *Journal of Feline Medicine and Surgery.* Vol 6. W.B. Saunders Ltd; 2004:107-109. doi:10.1016/j.jfms.2003.08.011
17. Ritz S, Egberink H, Hartmann K. Effect of feline interferon-omega on the survival time and quality of life of cats with feline infectious peritonitis. *J Vet Intern Med.* 2007;21(6):1193-1197. doi:10.1892/06-302.1
18. Legendre AM, Bartges JW. Effect of Polyprenyl Immunostimulant on the survival times of three cats with the dry form of feline infectious peritonitis. *J Feline Med Surg.* 2009;11(8):624-626. doi:10.1016/j.jfms.2008.12.002
19. Murphy BG, Perron M, Murakami E, et al. The nucleoside analog GS-441524 strongly

inhibits feline infectious peritonitis (FIP) virus in tissue culture and experimental cat infection studies. *Vet Microbiol.* 2018;219:226-233. doi:10.1016/j.vetmic.2018.04.026

0. Kim Y, Liu H, Galasiti Kankanamalage AC, et al. Reversal of the Progression of Fatal Coronavirus Infection in Cats by a Broad-Spectrum Coronavirus Protease Inhibitor. *PLoS Pathog.* 2016;12(3):e1005531. doi:10.1371/journal.ppat.1005531
1. Pedersen NC, Kim Y, Liu H, et al. Efficacy of a 3C-like protease inhibitor in treating various forms of acquired feline infectious peritonitis. *J Feline Med Surg.* 2018;20(4):378-392. doi:10.1177/1098612X17729626
2. Pedersen NC. An update on feline infectious peritonitis: Virology and immunopathogenesis. *Vet J.* 2014;201(2):123-132. doi:10.1016/j.tvjl.2014.04.017

AN UPDATE ON TICKS AND TICK-BORNE DISEASES IN ONTARIO

Katie M. Clow, DVM, PhD, Assistant Professor, Ontario Veterinary College

Overview

Range expansion of several tick species continues to be an issue of high relevance to domestic animal health. Climate change, in combination with land use changes and anthropogenic activities, such as global movement of animals and people, have contributed to this ongoing process [1]. Notable tick species of animal health significance include the blacklegged tick, the lonestar tick, the Asian longhorned tick and the brown dog tick. These tick species pose a risk due potential transmission of tick-borne pathogens as well as burden associated with high levels of infestation [2-5].

Blacklegged tick

The blacklegged tick, *Ixodes scapularis*, has undergone significant range expansion in Ontario over the last several decades. Previously restricted to focal areas along the northern shores of Lake Erie and Lake Ontario, this tick species has now been widely detected in forested across southern, central, and eastern Ontario [6]. Eastern Ontario as well as the area north of Toronto towards Lake Simcoe and Lake Huron appear to be the areas of greatest range expansion currently [7,8].

Monitoring the range expansion of this tick species has been a strong focus of public and animal health researchers. The Canadian Lyme Disease Research Network, which brings together researchers from a wide range of disciplines, public health professionals, physicians, veterinarians, and patients, launched the Canadian Lyme Sentinel Network (CaLSeN) in 2019 [9]. CaLSeN has established sentinel regions in each province to conduct intensive monitoring for blacklegged ticks. In Ontario, the current sentinel regions include Guelph/Hamilton, Kingston, Ottawa/Gatineau and Muskoka. In 2022, sentinel regions will be added around London, Peterborough, Sudbury, and Sault Ste. Marie. In each region, tick dragging is conducted at 5 to 10 sites on an annual basis and all blacklegged ticks are submitted to the National Microbiology Laboratory for pathogen testing.

High densities of blacklegged ticks were detected at sites in the Kingston and Ottawa/Gatineau regions, while minimal (Guelph/Hamilton) to no (Muskoka) blacklegged ticks were detected in other regions [9]. This is consistent with past longitudinal surveillance initiatives [8]. The infection prevalence of *Borrelia burgdorferi*, the causative agent of Lyme disease, was >30% in both the Kingston and Ottawa/Gatineau regions. *Borrelia miyamotoi* and *Anaplasma phagocytophilum* were detected in the Ottawa/Gatineau and Kingston regions, respectively, but at low levels ~1% [9]. Again, this is consistent with previous surveillance work [8]. However, testing of ticks collected from a year-long national study of ticks on companion animals, called the Canadian Pet Tick Survey, highlighted a potentially higher risk of *A. phagocytophilum* exposure in eastern Ontario (~5% infection prevalence) [10].

Our research group at the University of Guelph has recently launched a pilot study to evaluate the utility and effectiveness of integrating veterinary surveillance into CaLSeN. Previous research has illustrated the value of monitoring tick bites and *B. burgdorferi* seroprevalence in dogs for both human and animal health. In Fall 2021 and Spring 2022, we collected ticks and data on canine tick-borne pathogen serological testing from participating clinics in the four sentinel regions of Ontario. We are now analyzing this data to determine how veterinary surveillance can be integrated into the national network.

When assessing risk of blacklegged tick bites, a dog or cat living in an area with established blacklegged tick populations is clearly at higher risk of tick bites and subsequent exposure to tick-borne pathogens. An animal's lifestyle also influences that risk, as exposure occurs when an animal frequents blacklegged tick habitat, which is generally forested and brushy areas. Demographic factors, which may be a proxy for lifestyle factors, have also been shown to be associated with a higher odds of blacklegged tick bites. Through the Canadian Pet Tick Survey, we collected demographic information on all cats and dogs from which a tick was collected. Dogs of herding, mixed breed large, sporting, terrier and toy breed groups were all at higher odds of having a blacklegged tick bite, when compared to bites from other tick species [11]. The combination of a dog's age and sex also appeared to modify the risk, with intact females under one year of age consistently being at higher risk of blacklegged tick bites when compared to other age and sex combinations. For cats, being under one year was protective for blacklegged tick bites, while being a spayed female was associated with higher odds of a blacklegged tick bite [11].

Lonestar tick

Established populations of the lonestar tick, *Amblyomma americanum*, have not yet been detected in Canada [12]. However, monitoring potential range expansion of this species remains a key priority as predictive models illustrate high climatic and habitat suitability in several areas of the province [13]. Adventitious introduction of this species happens on an annual basis in Ontario and thus it is not uncommon to receive reports of lonestar tick bites on companion animals [12]. Risk of lonestar tick bites is highest for companion animals that travel to the United States, especially eastern and south-central states. All lonestar tick submissions received through the Canadian Pet Tick Survey were from animals that travelled to the United States [14]. Lonestar ticks are aggressive feeders and can form high infestations. They can also transmit *Ehrlichia ewingii*, which can cause a type of ehrlichiosis in dogs, and *Cytauxzoon felis*, which can cause the potentially fatal disease of Cytauxzoonosis in cats [3,4].

Asian longhorned tick

The Asian longhorned tick, *Haemophysalis longicornis*, was first recognized in 2017 in New Jersey and subsequently detected across many eastern and central states [15]. It is believed to have been introduced several years prior to being recognized. This tick species poses a significant animal health concern as it can heavily infest cattle and other livestock species, leading to heavy blood loss and potential death [5]. It is also a known vector for *Theileria orientalis*, the causative agent of theileriosis in cattle, and cases have now been detected in the United States [16]. Other vector-borne pathogens have been detected in this tick species, but the significance of these findings have yet to be established.

Predictive models have illustrated that current and future ecological conditions in areas of Canada, including Ontario, can adequately support the survival and reproduction of this species [17]. Significant concern exists for the establishment of this species because this tick has parthenogenetic reproductive capabilities, which means a female can generate offspring without a male.

Brown dog tick

Although Canada does not have suitable climatic conditions to support reproducing populations of the brown dog tick, *Rhipicephalus sanguineus*, it is routinely detected on companion animals that have been imported from tropical areas around the globe. This was the most common

exotic tick species detected during the Canadian Pet Tick Survey and most dogs with bites from this tick species had travelled, were imported internationally, or had a history of contact with a dog that had either travelled or was imported [14]. As there are minimal importation requirements, this remains a high-risk practice for the introduction of brown dog ticks, and thus an ongoing concern for companion animal health [18]. These ticks can form massive infestations in a home and transmit several pathogens of concerns to dogs [2].

Prevention

Regular use of a parasiticide with activity against the tick species of relevance to that animal's geographic area and lifestyle (including travel) remains the mainstay of tick bite and thus tick-borne disease prevention [19]. Duration of use will vary geographically as each tick species has different seasonal activity patterns, which are also influenced by annual climatic variations. In Ontario, particularly southern and eastern Ontario, it is not uncommon now for 'tick season' to last from March to November or December. Depending on the winter, if there are periods where temperatures above freezing and the snow melts, ticks can also become active.

Tick checks are another cornerstone of tick bite and tick-borne disease prevention, regardless of whether an animal is administered a parasiticide. Tick checks should be conducted at least daily and ideally every time an animal comes in from tick habitat. Examination of tick-bite location on the body through submissions to the Canadian Pet Tick Survey has highlighted the ears, head, and shoulders as the most common location of American dog and blacklegged tick bites [20]. Therefore, if time is limited, these areas are the most important to target.

One Health

Tick bites and exposure to tick-borne pathogens are not only of concern to the health of domestic animals, but humans as well. Many ticks carry pathogens which can cause disease in humans, including *B. burgdorferi* and *A. phagocytophilum*. As veterinarians, we have the opportunity to discuss shared environmental risks between animals and humans, and ticks are a prime example. If an animal is encountering ticks, it is highly likely that the owner is with their animal in that environment and at risk of tick bites, too. Advising clients to be tick smart and direct them to resources offered through the local public health unit can be a great starting point.

References

1. Swei A, Couper LI, Coffey LL, Kapan D, Bennett S. Patterns, drivers, and challenges of vector-borne disease emergence. *Vector-Borne Zoonotic Dis.* 2020;20(3):159–70.
2. Dantas-Torres F. The brown dog tick, *Rhipicephalus sanguineus* (Latreille, 1806) (Acari: Ixodidae): From taxonomy to control. *Vet Parasitol.* 2008;152(3–4):173–85.
3. Goddard J, Varela-Stokes AS. Role of the lonestar tick, *Amblyomma americanum* (L.), in human and animal diseases. *Vet Parasitol.* 2009;160(1–2):1–12.
4. Little SE. Ehrlichiosis and anaplasmosis in dogs and cats. *Vet Clin NA Small Anim Pract.* 2010;40(6):1121–40.
5. Heath ACG. Biology, ecology and distribution of the tick, *Haemaphysalis longicornis* Neumann (Acari: Ixodidae) in New Zealand. *N Z Vet J.* 2016;64(1):10–20.
6. Clow, KM, Ogden, NH, Lindsay LR, Michel P, Pearl DL, Jardine CM. Distribution of ticks and the risk of Lyme disease and other tick-borne pathogens of public health significance in Ontario, Canada. *Vector-Borne Zoonotic Dis.* 2016;16(4):215-222.

7. Clow KM, Leighton PA, Ogden NH, Lindsay LR, Michel P, Pearl DL, et al. Northward range expansion of *Ixodes scapularis* evident over a short timescale in Ontario, Canada. *PLoS One*. 2017;1–15.
8. Robinson EL, Robinson, E.L., Koffi, J.J., Jardine, C.M., Russell, C., Lindsay, L.R., Dibernado, A., Clow, K.M. Range expansion of *Ixodes scapularis* and *Borrelia burgdorferi* in Ontario, Canada, from 2017 to 2019. *Vector-Borne Zoonotic Dis*. 2022. *In review*.
9. Guillot C, Badcock J, Clow K, Cram J, Dergousoff S, Dibernardo A, et al. Sentinel surveillance of Lyme disease risk in Canada, 2019: Results from the first year of the Canadian Lyme Sentinel Network (CaLSeN). *Canada Commun Dis Rep*. 2020;46(10):354–61.
10. Jacob A, Rousseau J, Weese JS, Clow, KM. Spatial patterns of *Borrelia burgdorferi* and *Anaplasma phagocytophilum* detected in *Ixodes* spp. ticks from Canadian companion animals. 2022. *Zoonoses Public Health*. *In preparation*.
11. Dewinter S, Bauman C, Weese JS, Peregrine A, Clow KM. Assessing the spatial and temporal patterns and risk factors for acquisition of *Ixodes* spp. ticks on companion animals across Canada. 2022. *Ticks Tick Borne Dis*. *In preparation*.
12. Nelder MP, Russell CB, Clow KM, Johnson S, Weese JS, Cronin K, et al. Occurrence and distribution of *Amblyomma americanum* as determined by passive surveillance in Ontario, Canada (1999–2016). *Ticks Tick Borne Dis*. 2019;10(1):146–55.
13. Ludwig A, Ginsberg HS, Hickling GJ, Ogden NH. A dynamic population model to investigate effects of climate and climate-independent factors on the lifecycle of *Amblyomma americanum* (Acari: Ixodidae). *J Med Entomol*. 2016;53(1):99–115.
14. Clow KM, Weese JS. Pets and Ticks. Canadian Pet Tick Survey. 2021. Available from: www.petsandticks.com
15. Rainey T, Occi JL, Robbins RG, Egizi A. Discovery of *Haemaphysalis longicornis* (Ixodida: Ixodidae) parasitizing a sheep in New Jersey, United States. *J Med Entomol*. 2018;55(3):757–9.
16. Dinkel KD, Herndon DR, Noh SM, Lahmers KK, Todd SM, Ueti MW, et al. A U.S. isolate of *Theileria orientalis*, Ikeda genotype, is transmitted to cattle by the invasive Asian longhorned tick, *Haemaphysalis longicornis*. *Parasites and Vectors*. 2021;14(1):1–11.
17. Raghavan RK, Barker SC, Cobos ME, Barker D, Teo EJM, Foley DH, et al. Potential spatial distribution of the newly introduced long-horned tick, *Haemaphysalis longicornis* in North America. *Sci Rep*. 2019;9(1):1–8.
18. Anderson MEC, Douma D, Kostiuik D, Filejski C, Rusk R, Weese JS, et al. Report of the Canadian National Canine Importation Working Group. 2016; Available from: <https://www.canadianveterinarians.net/documents/canadian-canine-importation-working-group-report>
19. Canadian Parasitology Expert Panel. Canadian Parasitology Expert Panel Guidelines. 2019; Available from: <https://research-groups.usask.ca/cpep/index.php>
20. Dewinter S, Bauman C, Weese JS, Peregrine A, Clow KM. Species-specific infestation patterns of ticks parasitizing Canadian companion animals, and preventative behaviours. 2022. *Vet Prev Med*. *In preparation*.

THEY CAN RUN BUT THEY CAN'T HIDE! PARASITE PREVENTION STRATEGIES FOR ALL CATS.

Kelly A. St. Denis, MSc, DVM, DABVP (feline practice)

There is a misconception that indoor cats don't get internal or external parasites. This seems to stem from the belief in a mystical bubble that indoor cats live in, protecting from all infectious diseases. The belief may also stem from the fact that cats hide illness so well. When it comes to external parasites, the cat's ability to meticulously groom their fur to pristine cleanliness and free of marauding critters doesn't help. When it comes to internal parasites in cats, these may not cause any clinical signs, or clinical signs may be mistaken for other disease. As a result, these go unidentified and underdiagnosed. Indoors or out of doors, cats are at risk of parasite exposure and infection.

Top 5 Myths about Cats and Parasites

1. Cats that live strictly indoors live in a Big Mythical infectious disease-free Bubble
2. Cats don't get heartworm disease
3. Cats aren't susceptible to tick-borne pathogens
4. The absence of fleas or flea dirt on a cat eliminates fleas as a concern
5. Cats don't need regular, broad-spectrum parasite prevention

Endoparasites

Fecal testing is an important part of every preventive healthcare examination. Indoor and outdoor cats should be tested annually or as needed when clinical disease occurs. Testing assists in diagnosing infections but also helps to assess compliance in patients that are on routine prevention. Multiple tests should be run in the first year of life. These tests can coincide with booster visits. Fecal sedimentation floatation is less reliable than fecal centrifugation floatation techniques. These tests can be conducted in-house or through referral laboratories. Fecal antigen ELISA testing for certain parasites is likely to be more sensitive than fecal floatation. It is important for the clinician to understand that a 'no eggs observed' or 'NEO' result does not rule out intestinal parasites, and therefore testing does not negate the value of consistent parasite prevention or treatment as a possible differential.

Nematodes

Roundworm infections (*Toxocara cati*, *Toxascaris leonina*) are common in cats and kittens. Infection can occur by ingestion of contaminated food and water or infected paratenic hosts. Trans-mammary infection does occur, but transplacental infection has not been reported. The reported prepatent period for *T. cati* is 8 weeks but may be as short as 3 weeks depending on the mode of infection (e.g., ingestion of an egg or paratenic host, or trans-mammary infection). The reported prepatent period for *T. leonina* varies but is generally accepted to be 7 to 10 weeks. Hookworm infections (*Ancylostoma spp*) are uncommon in cats. Infection occurs via ingestion of contaminated food or water, consumption of a paratenic host, or transdermal larval migration. Trans-mammary infection has not been reported in cats. The prepatent period ranges from 19 to 28 days. Hookworm infestations can cause severe, life-threatening anemia. While uncommon in Canada, *A. braziliense* can also infect dogs which is a consideration in multi-pet households. Whipworm infection (*Trichuris felis*, *Eucoleus aerophile*) is less common in the feline species and occurs via ingestion of embryonated eggs in feces. *Eucoleus* (*Capillaria*) *aerophila* should be considered when eggs with bipolar plugs are identified by fecal examination.

Cestodes

While tapeworm infection is often diagnosed by finding tapeworm segments (proglottids) in the cat's perineal area, on feces, or on bedding, this evidence is not always available. Therefore, the possibility of tapeworm infection must be based on the patient's individual risk factors. At each preventive healthcare visit, the cat should be assessed for evidence of fleas. Since many caregivers will seek

out over the counter flea treatment without veterinary advice, the caregiver will need to be asked about historical flea infestations. The cat's hunting habits should also be established. Hunting of rodents and rabbits as sources of tapeworm should be considered high risk behaviour, regardless of whether the caregiver has noted ingestion of the prey. Echinococcus is a zoonotic disease and people exposed to contaminated feces are at risk for developing severe illness.

Not all products have broad-spectrum activity against all tapeworm species, so it is important to identify which species is implicated. For example, fenbendazole will not eliminate tapeworm infection (*Dipylidium caninum*) secondary to flea ingestion. It is not necessary to treat all in-contact animals because cestodes require an intermediate host for transmission. Note should be made if exposure to common intermediate hosts (e.g., fleas in the household or access to rodents) exists as this increases the possibility of infection in other pets in the household. Repeated treatments for tapeworm infection should not be necessary in cases where the source of infection has been successfully eliminated. When repeat exposure occurs, such as in cats consuming rodents, a regular deworming plan for *Taenia taeniaeformis* is recommended. Similarly, if fleas are not successfully controlled, repeated therapy will be needed for *D. caninum*. All kittens should receive at least 1 deworming with a product effective against tapeworms during their initial deworming series. Adult cats should receive periodic treatment based on risk factors. Cats living in apartment buildings are at higher risk of flea exposure and may require regular flea control as well as regular deworming effective against *D. caninum*.

Heartworm

We are all familiar with the life cycle of heartworm in dogs. Exposure in cats starts the same, with exposure to larvae from an infected mosquito. Beyond that similarity, the infection in cats is unique. The *Culex spp* of mosquito which is the most common species of mosquito in urban areas, feeds on dogs and cats with equal prevalence. Once the heartworm larvae have been deposited on the cat by the mosquito, the L3 larvae undergo the tissue phase, developing into L4 over approximately 2 months. At 3-4 months post-infection, as the larvae arrive in the pulmonary vasculature, the host cat may develop an acute vascular and parenchymal inflammatory response. This condition is called heartworm associated respiratory disease (HARD). It is often misdiagnosed as asthma. If adult heartworms are in fact able to develop in the cat following this inflammatory response, only a few develop. These live for only about 2 years, a considerably shorter time-period than in the dog. The presence of even 2-3 adult heartworms in a cat's heart and pulmonary vessels can cause significant disease. The death and degeneration of the adult worm can cause pulmonary inflammation, thromboembolism, and fatal acute lung injury. In coughing cats, the bronchiolar pattern noted on thoracic radiographs can occur secondary to asthma, HARD, chronic bronchitis, lungworm infection and *Mycoplasma spp* infection. Before reaching for those steroids, it is important to consider these possibilities. Unfortunately, HARD is very hard to diagnose, and the clinical signs are frustratingly like those of asthma. Truly differentiating this disease from asthma can be challenging. At times, a diagnosis of HARD will be a diagnosis of exclusion or a presumptive diagnosis. Treatment goals include controlling the inflammatory response with steroids, ensuring the patient is on heartworm prevention to avoid further exposure, and monitoring over the next 6-12 months or so to determine if adult heartworms develop.

In addition to suspected clinical signs of HARD or adult heartworm infection, there are 4 approaches to testing that will help with the diagnosis. Two or more months after exposure to immature adults, the patient may develop antibodies to heartworm of either sex. The antibodies last for an undetermined amount of time dependent on the progression of the disease, number, and persistence of adults. Heartworm antibody testing can be employed to detect exposure, but a clinical diagnosis may not be clear. The heartworm antigen test is used to detect adult female heartworm infection in dogs. Since cats rarely develop adult infections, since they often have unisex adult infections when they do and since these could be all male worms, the antigen test does not always tell us what we need to know. Radiography can be useful in both HARD and adult heartworm infection. If the patient has HARD, radiographs will reveal a similar pulmonary pattern to what see with asthma: bronchiolar or bronchoalveolar changes. In the presence of adult heartworms, on the ventrodorsal view we might

expect to see enlarged pulmonary vasculature. In this case the pulmonary vessels are larger than the 9th ribs where they cross the 9th ribs. Echocardiogram may reveal the presence of heartworms or vascular changes consistent with the presence of adult heartworms. Unlike dogs, we cannot use the adulticide drugs (ex. thiacetarsamide) in cats due to their high level of toxicity. Other than manual removal of the adult worms, supportive treatment may be the only option. Similarly, for HARD, treatment of the inflammatory response in the lungs is the main option for treatment. Following this, as noted, cats with HARD should be monitored closely over 6-12 months for the development of adult worms. These difficulties further enhance the need to establish good prevention routines. There are multiple safe and effective heartworm prevention drugs available on the veterinary market. Since many of these also cover for other parasites, they will have much value to the client. Indoors or outdoors, cats need heartworm prevention.

Lungworm

Transmission of lungworm occurs primarily through ingestion of transport hosts that have consumed intermediate hosts. Transport hosts include rodents, birds, amphibians and reptiles. A common lungworm in the cat, *Aelurostrongylus abstrusus*, can cause lower respiratory signs, such as coughing and/or difficulty breathing, which can often be mistaken for asthma. Radiographic patterns may be bronchiolar to bronchointerstitial. Additional changes include bronchial thickening and poorly defined pulmonary nodules. During the heaviest period of larval shedding a generalized alveolar-interstitial pattern may be observed. Treatment may include fenbendazole (Panacur) at 50 mg/kg PO q24h 3 days. Alternatively, imidacloprid/moxidectin, emodepside/praziquantel, selamectin, fipronil/methoprene/eprinomectin/praziquantel or milbemycin oxime/praziquantel can be administered every 2 weeks for 3 treatments.

Ectoparasites

Fleas

Outdoor cats are at obvious risk for fleas, but cats that live indoors can become infested when fleas are carried in on fomites such as peoples' clothing, used furniture and of course other pets (new pets, visiting pets etc). Cats that live in apartment buildings are potentially living in the highest risk category for fleas. Apartment buildings provide a year-round, optimal temperature environment with multiple pets and lots of spaces for the different life stages to develop. Once there is a flea infestation in one apartment, it's easy for this to spread to other apartments and other pets. Pupae can delay emergence from their cocoon for up to ONE year, until ideal conditions are present for their survival. Clients moving into new homes where previous owners had pets may be getting more than they bargained for, and even bringing used furniture or carpets into the home could pose a risk. During the fall, a surge of fleas often occurs, increasing the risk of infestation at a time when caregivers and veterinarians are assuming the risk is waning. Cats may consume as many as 75% of adult fleas through grooming. With 25% of the day being spent grooming, living fleas and even flea dirt may not always be found on the patient.

Fleas not only cause itching and irritation as they feed on their blood meal from the pet, in large numbers they can cause anemia due to excess blood consumption. For some cats, hypersensitivity to the flea bite or Flea Allergy Dermatitis can cause significant painful skin disease. Fleas also act as carriers for many infectious diseases including the tapeworm *Dipylidium caninum*, blood borne parasites such as *Mycoplasma hemofelis* (more anemia!) and the agent that causes Cat Scratch Fever in humans: *Bartonella henselae*.

Ticks

Ticks can be active any time the temperature is above freezing and are commonly found in woody, grassy or brush areas. There is increased activity from March to mid-May and from mid-August to November. Most provinces offer a map showing high risk areas, particularly for Lyme carrying ticks,

sometimes for ticks in general. [Public Health Ontario's Lyme disease page](#) has a map (called "Ontario Lyme disease estimated risk areas map, 2021") that shows areas in Ontario where they estimate you are more likely to find blacklegged ticks. While the maps are helpful to identify high risk areas, it is possible to find infected ticks almost anywhere in Ontario. Ticks are being observed more commonly on cats in the last several years. The [Canadian Pet Tick Survey](#) conducted from April 2019 to March 2020 showed that 16-25% of Ontario tick submission were from feline patients. Cats will be at an increased risk of being exposed to ticks through other pets in the family; because of increased tick numbers due to climate change; movement of deer and birds; and suburban sprawl. Cats can become infected with different species of ticks, and they may be infected with larval, nymph or adult life stages. All 3 life stages feed off their host and can potentially transmit infectious disease, putting the cat and owner at risk. Cats that have been exposed to common infectious agents that ticks carry (ex. Lyme), may be positive for DNA from or antibodies against that agent. While this confirms exposure, the disease incidence of tick-borne diseases such as Lyme disease is low in cats. Agents causing Tularemia, Hemobartonellosis, Cytauxzoonosis and possibly Bartonella may be carried to cats through ticks. Although uncommon in Canada at this time, carrier of *Cytauxzoon felis* (lone star tick) may be observed if there is travel to impacted US states or as the tick's geographical range expands with climate change. Cytauxzoonosis has high mortality rates. With the increasing observations of ticks on domestic cats, choosing broad spectrum preventive treatments which include activity against ticks is ideal.

Lice and mites

Kittens and newly adopted cats should be evaluated for infection with ear mites (*Otodectes cyanotis*). Ear mites are contagious between dogs and cats and treatment should include all in-contact pets. Patients presenting with pruritus, scaling, excoriation, and hair loss should also be evaluated for feline lice (*Felicola subrostratus*), mites (*Cheyletiella spp*, *Notoedres cati* and others), and demodicosis (*Demodex cati* or *D. gatoi*). Feline lice and mites cause pruritis, excoriation, scaling, and alopecia. Feline lice are not contagious to other species, while interspecies contagion of mites varies with the mite species.

Appropriate diagnostic tests include skin scrapings, flea combings, hair trichograms, acetate tape preparations, and fecal examinations. Appropriate therapy should be based on the availability of approved products, available published data, and the specific diagnosis.

Prevention

Prevention protocols should be tailored to each individual cat, taking into consideration that cat's lifestyle, age, and risks of exposure. The prevalence of the parasites in question should be evaluated and a list of parasites posing risks developed for each unique geographical region. As climate change advances and the risks of infection increase even in previous low-risk, colder climates, it is now ideal to start prevention early and finish late in the year. For Southern Ontario regions, considering risks and the spectrum of activity of the anti-parasitic being used, year round use may make the best sense.

Intestinal parasitism is common in the kitten, acquired in utero, through lactation and through exposure to other infected cats. New kittens in the household, insufficient deworming during kittenhood and failure to deworm all in contact susceptible species are likely contributing factors to infection of indoor cats.

For ease of use, topicals tend to work well in most cats, and a broad spectrum product will reduce how many products we need to administer. Our caregivers need to have buy in to the concept of parasite risks in their cat and will quickly develop fatigue if they must purchase and administer multiple products.

References & Resources

[American Heartworm society](#)

[Cat Healthy Protocols Parasite Prevention and Control](#)

[Companion Animal Parasite Council](#)

[European Advisory Board on Cat Diseases ABCD Lungworm](#)

INFECTIOUS DISEASE AND FELINE VACCINOLOGY: WHAT YOU NEED TO KNOW

Kelly A. St. Denis, MSc, DVM, DABVP (feline practice)

Vaccination is a key practice in the provision of preventive veterinary care for cats. Despite so many other factors which should and do drive care for cats, vaccination is still an important overall component of feline veterinary care. Vaccination protocols for cats are no more a 'one size fits all' proposal than protocols for dogs. While there are fewer vaccination options for feline infectious diseases of concern, these still need to be tailored to the individual patient's needs.

The 2020 AAHA/AAFP Feline Vaccination Task Force divides vaccinations for cats into two main categories: core versus non-core.¹ Core vaccines are those vaccines recommended for all cats regardless of lifestyle, including those with unknown vaccination history. Core vaccines should offer good protection against prevalent diseases of known significant morbidity and mortality. They include those vaccines which protect against zoonotic disease, such as the rabies virus. The 2020 AAHA AAFP Feline Vaccination Task Force has designated Feline herpes virus-1 (FHV-1), Feline Calicivirus (FCV), Feline Panleukopenia Virus (FPV), and rabies as core infectious agents against which vaccines should be administered to all cats. Since kittens have an increased risk of infection with FeLV upon exposure, vaccination against FeLV is recommended for all kittens regardless of lifestyle.²

Non-core vaccinations are those vaccines considered optional based on exposure risk, geographic distribution, patient lifestyle or possible lifestyle. Vaccinations designated non-core by the Task Force include FeLV for adult cats, feline immunodeficiency virus (FIV), Chlamydia and Bordetella.¹ Diseases of low clinical significance, with good response to treatment, those with minimal to no field evidence for vaccine efficacy, or with relative increased risk of vaccine adverse events (VAE) are designated as 'not recommended'. Vaccinations currently not recommended by the task force include feline infectious peritonitis virus (FIPV) vaccine.

Important Infectious Agents in Feline Vaccinology

FHV-1 is ubiquitous in the domestic feline populations. Many cats do not have clinical signs, but when they do, these can range from mild cases of watery eyes or sneezing to severe upper respiratory signs and secondary bacterial infections. Permanent damage to eyes, tear ducts and nasal passages can result. Vaccination reduces severity and frequency of flareups and protects from new infection.³ FCV and FPV will vary in their prevalence based on target population and geography, but these are still relatively common. FCV has moderate morbidity, although more aggressive strains have been identified in certain circumstances.^{4,5} FPV comes with high morbidity and mortality, with kittens being at highest risk.⁶ While human cases of rabies are rare in Canada and the USA, the disease is invariably fatal (with one exception). Wildlife species carry the rabies virus and can transmit to unvaccinated dogs and cats. Most provinces and states have mandatory rabies vaccination requirements. FeLV is transmitted between cats through bodily secretions such as saliva. FeLV-associated diseases include neoplasia (primarily lymphoma), bone marrow suppression (anemia, thrombocytopenia, leukopenia, pancytopenia), and neurologic disease.² Cats with progressive FeLV infection are also susceptible to infectious and neoplastic diseases, as well as chronic gingivostomatitis, secondary to retrovirus-related immunosuppression.² Compared with adult cats, kittens have an increased susceptibility to progressive FeLV infection if exposed to the virus. FeLV vaccination should be administered to all kittens followed by a 1 year booster. All cats that may interact with other cats of unknown FeLV status should also continue vaccination against FeLV.^{1,2}

Understanding Vaccine Design

Vaccines are designed using a variety of strategies including, but not limited to, inactivated (killed), modified live (attenuated), and genetically engineered recombinant subunit vaccines. Each vaccine design is based on different strategies to induce immunity, with choice of design depending on many factors including the infectious agent itself, applicable vaccine technology, host immune response, and potential side effects. A basic understanding of these differences as well as an awareness of which vaccine design is being administered, is critical to understanding the impact on the patient including type of immunity, efficacy, and potential VAE.

Killed vaccines contain inactivated viral particles incapable of setting up an active infection in the patient. Appropriate stimulation of the immune response often requires additional vaccine ingredients which may include the use of adjuvants. Adjuvants enhance inflammation at the site of injection, stimulate the innate arm of the immune system and trigger the necessary immune responses. Adjuvants which have been utilized in vaccine products include Complete Freund's Adjuvant, aluminum salts, lipids in water emulsions, Saponin-based adjuvants, and ligands (oligonucleotides). Response to vaccination with a killed vaccine is primarily antibody/humoral in nature. Killed vaccines generally produce a weaker immune response compared with other technologies, with immunity lasting for shorter time periods.

Modified live (attenuated) virus (MLV) vaccines contain viral particles that have partial viability, with an attenuated ability to infect host cells. This attenuated viral activity generates an immune response that mimics protection from natural infection and involves both humoral (antibody-mediated) and cell-mediated immunity (CMI) without inducing actual disease. The response to MLV is generally more rapid in comparison to killed vaccines. In the absence of maternally derived antibodies (MDA), only one dose of vaccine may be sufficient to provide protection.

Recombinant vaccines contain a gene or genes encoding protein(s) from the infectious agent spliced into the genetic material of an unrelated species' virus. For example, the gene for the rabies surface antigen was spliced into the Canary Pox Virus to create a recombinant rabies vaccination. The vaccine vector cannot cause disease in the feline species but allows presentation of a targeted viral antigen to the immune system.

Vaccine Injection Site Recommendations

Feline injection site sarcomas (FISS) are extremely invasive locally, requiring aggressive surgical and oncological intervention. These generally have a guarded prognosis. While other agents may play a role in FISS, the association between FISS and vaccination is difficult to refute. As a result, it is our responsibility as veterinarians to follow the vaccination injection site recommendations of the Task Force.¹ All feline vaccinations should be administered low in the limbs, below the elbow or stifle, allowing the potential for life saving limb amputation with 2 surgical planes, should the cat have the misfortune to develop this type of tumour. Although the incidence of FISS is as low as 1 in 5 to 10000, it is important to remember that nearly 100% of cats with FISS have a loving caregiver that has just been given devastating news.

The following injections should be administered as described:

- Rabies vaccine (and rabies combination vaccinations) should be administered in the right hind below the stifle,
- FeLV vaccine should be administered in the left hind below the stifle
- FVRCP (unless in combination with rabies) should be administered in the right forelimb below the elbow.

These low injection sites are relatively easy to accomplish, and possible even in kittens, with appropriate positive reinforcement, distractions, and Cat Friendly Handling. An alternative option for vaccine injection site is subcutaneously on the distal tail.

The fictitious indoor cat ‘bubble’

It is a common misconception that indoor cats are not at risk of exposure to infectious agents including those preventable by vaccines, as well as infectious parasites such as intestinal worms, fleas, ticks, and heartworm. This misconception along with the concern about stress during veterinary visits, has been a notable contributor to a distinct lack of preventive care for indoor cats. While the risks for indoor cats may be somewhat lower, they are in fact at risk for many of the same infectious diseases as their outdoor counterparts, and do not exist in a magical protective forcefield or ‘bubble’. For indoor cats, infectious agents may be transmitted to them on fomites, through respiratory secretions, on parasites such as fleas, or carried by bats and other wildlife. Indoor cats do not always stay indoors, and whether they make the great escape on their own, or are in fact out in the yard, on the deck, or ‘no further than the neighbour’s yard’, their risks will increase. Veterinary teams often need to ask multiple versions of the same question to ascertain the true lifestyle of the feline patient. Lifestyle changes may also be impending or have occurred, further emphasizing the need to ask these questions at every visit. There are many changes that may occur in that cat’s lifestyle that will necessitate early boosters or additional non-core vaccinations. These changes include cats going into boarding or other high-exposure, stressful situations or if the caregivers are planning on bringing a new cat into the environment. Revaccination against FVRCP 7–10 days prior to boarding may be warranted, particularly if the cat has not been vaccinated in the preceding year. Addition of the FeLV vaccine with or without a booster may be needed when new cats are coming into the home or when indoor cats start to venture out of doors.

Be Cat Friendly

In 2012 the International Society of Feline Medicine (ISFM) and American Association of Feline Practitioners (AAFP) developed the Cat Friendly Clinic and Cat Friendly Practice Programs, respectively. Since that time, Cat Friendly care has become a well-established principle in feline medicine around the world. Veterinary visits should include Cat Friendly interactions with plenty of positive reinforcement, conducted with minimal restrictive handling or restraint. These visits are setting the stage for the patient and client’s comfort with future veterinary visits. They promote ease of care and forge a stronger veterinary client patient relationship. Development of Cat Friendly care can start with small changes in the clinic, working to provide an ideal Cat Friendly environment and ideal Cat Friendly interactions. Programs through the ISFM and AAFP include the [Cat Friendly Practice](#) and [Cat Friendly Clinic program](#), respectively. Individuals within practices may also elect to become [Cat Friendly Certified](#) through the AAFP. The Cat Friendly Certificate Program offers 3 different certificates: Cat Friendly Veterinarian, Cat Friendly Veterinary Professional and Cat Friendly Veterinary Advocate.

Forceful restraint and aggressive handling just so we can ‘get the job done’ or because the ‘cat won’t cooperate’ will set everyone up for failure during future visits. We need to take a patient-focused approach that seeks ways to put the cat at ease, distracting with food, toys, head-rubs, and other accepted forms of positive reinforcement. Where patient anxiety leads to defensive behaviour, the visit should be rescheduled to a more suitable time when the patient can receive pre-visit anti-anxiety medications such as gabapentin. Even small Cat Friendly changes will make a difference in the veterinary experience for kitten/cat, caregiver, and the veterinary team.

1. Stone AE, Brummet GO, Carozza EM, Kass PH, Petersen EP, Sykes J, et al. 2020 AAHA/AAFP Feline Vaccination Guidelines. *J Feline Med Surg*. 2020;22(9):813–30.
2. Little S, Levy J, Hartmann K, Hofmann-Lehmann R, Hosie M, Olah G, et al. 2020 AAFP Feline Retrovirus Testing and Management Guidelines. *Journal of Feline Medicine & Surgery* [Internet]. 2020;22(1):5–30. Available from: <http://eutils.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&id=31916872&retmode=ref&cmd=prlinks>
3. Thiry E, Addie D, Belák S, Boucraut-Baralon C, Egberink H, Frymus T, et al. Feline herpesvirus infection. ABCD guidelines on prevention and management. *J Feline Med Surg*. 2009;11(7):547–55.
4. Radford AD, Coyne KP, Dawson S, Porter CJ, Gaskell RM. Feline calicivirus. *Veterinary research* [Internet]. 2007;38(2):319–35. Available from: <http://eutils.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&id=17296159&retmode=ref&cmd=prlinks>
5. Radford AD, Addie D, Belák S, Boucraut-Baralon C, Egberink H, Frymus T, et al. Feline Calicivirus Infection: ABCD Guidelines on Prevention and Management. *J Feline Med Surg*. 2009;11(7):556–64.
6. Truyen U, Addie D, Belák S, Boucraut-Baralon C, Egberink H, Frymus T, et al. Feline panleukopenia. ABCD guidelines on prevention and management. *J Feline Med Surg*. 2009;11(7):538–46.

THE AAFP RETROVIRUS MANAGEMENT GUIDELINES: WHAT'S NEW IN FELINE RETROVIRUSES

Kelly A. St. Denis, MSc, DVM, DABVP (feline practice)

Feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) are two of the most common infectious diseases found in cats worldwide. (“Testing kittens for FeLV and FIV (Proceedings)”) An updated version of the AAFP Guidelines for Retrovirus Testing and Management was published in 2020.¹ The document highlights the significant progress in our understanding of these viruses, outcomes of infection, diagnostic testing, and management.

Feline Leukemia Virus (FeLV)

Feline leukemia virus is shed mainly in saliva. It is less commonly shed in nasal secretions, milk, urine, or feces. The virus is transmitted mainly via the oronasal route but may also be transmitted via bite wounds. In this way, FeLV spreads horizontally among cats that live together or fight. The virus can also spread vertically and horizontally from infected queens to their kittens. Kittens are more susceptible to becoming progressively infected than adult cats.

The outcomes of exposure to FeLV

1. An abortive infection is defined as exposure to the virus, followed by complete clearance of the virus. The patient is not infected. Patients able to mount an immune response but are unable to eliminate viral replication become regressively infected with FeLV. Patients that fail to sufficiently respond following virus exposure become progressively infected. These patients will develop FeLV-related disease. The outcome of exposure is thought to be dependent on both infection pressure and a cat's immune status. Abortive infections are the most likely outcome of exposure to FeLV.
2. Regressively infected cats can mount an initial immune response to the virus but are unable to prevent viral replication. The FeLV integrates into the cat's genome. Integration into the DNA can lead to lymphoma or bone marrow suppression. Regressively infected cats are at low risk of developing FeLV-associated diseases but can still transmit infection if used as blood donors. They are not actively shedding the virus into the saliva or other body fluids. These patients have a small risk of virus reactivation resulting in progressive disease.
3. Progressively FeLV infected cats are unable to mount an effective immune response to FeLV. Extensive viral replication commences in the lymphoid tissues leading to primary viremia. Infection then extends to the bone marrow, followed by mucosal and glandular epithelial tissue, where secondary viremia may develop. These patients are actively shedding the virus and are infectious to other cats. Progressively infected cats have a shortened survival time, developing FeLV-related diseases and succumbing within several years. Clinical diseases and symptoms include leukemia, lymphoma, other neoplasia, infection, and non-specific illness.

Feline Immunodeficiency Virus (FIV)

FIV is shed mainly in saliva. Transmission occurs mainly via bite wounds but may also be transmitted via FIV-infected white blood cells. Transmission from queens to kittens is uncommon in natural infection, and transmission between cohabitating cats is uncommon without fighting. Sexual transmission is uncommon, even though the virus is shed in semen.

Following virus exposure, cats enter an acute phase. This phase may be asymptomatic, or patients may experience malaise for a short duration. This phase is often unnoticed by cat owners. During the acute phase, viral particles can be detected by culture and by PCR in the blood within 14 days

following infection, with a peak around 8 to 12 weeks. CD4+ and CD8+ T cell numbers decline. In response to the acute phase, the patient raises an immune response resulting in suppression of the circulating virus. An asymptomatic phase ensues, which can be slow and occur over years. The asymptomatic phase results in progressive dysfunction of the immune system. FIV antibodies are produced by 60 or more days post infection. At this time, circulating virus is suppressed, CD8+ T cells increase above pre-infection levels, and there is an inversion of the CD4:CD8 ratio. Over time, both the CD4 and CD8 lymphocytes gradually decrease in numbers. The FIV asymptomatic phase can last for many years. Due to T cell suppression, and progressive immune dysfunction, there is an increased risk of chronic and recurrent infections. Neoplasia is 5 times more likely to occur. Cell-mediated immunity is more affected than humoral immunity. Hyperglobulinemia may occur. Despite these changes, survival time can be similar to that of non-FIV infected cats.

Testing & Prevention of Spread

The most important measure for the control of FeLV/FIV is the identification and segregation of infected cats. Cats and kittens should be tested for FeLV and FIV as soon as possible after acquisition. Testing should be repeated 30+ days for FeLV and 60+ days for FIV, following initial negative testing to rule out recent exposure. Other indications for testing include exposure to infected cats or cats of unknown infection status, prior to vaccination against retroviruses, and any cat presented for clinical illness. Previous negative tests do not always rule out the possibility of infection, and any sick cat should be retested regardless of previous testing status. Given the unique pathogenesis of FeLV and FIV, infected cats may not present with clinical signs of disease in the short or long term. It is not always possible to determine infection status with a single test; therefore, repeat tests using different methods may be necessary. Positive confirmatory tests generally confirm infection, but negative confirmatory tests result in an unclear infection status.

For initial retrovirus testing, an in-house point of care, or referral laboratory test for FIV antibody, can be used. Patients testing negative should be retested in 60 days for FIV, particularly in cases where there is a high or unknown risk of recent exposure. A positive point of care for FIV test indicates the presence of FIV antibodies. Confirmatory testing is ideal and may include a different manufacturer's point of care test, a PCR test, or a Western Blot test. A positive confirmatory test confirms infection. If the confirmatory test is negative, the patient's infection status is unclear, and further testing should be considered.

A positive point of care for FeLV indicates the presence of viral antigen (p27). Confirmatory testing is ideal and should include FeLV quantitative real time PCR. Other confirmatory FeLV tests include a different manufacturer's point of care test, referral laboratory microtiter antigen tests, and/or immunofluorescence assays, or IFA for short. IFA tests will only be positive after bone marrow infection and secondary viremia. IFA tests are subjective in nature and false negatives and false positives may occur. Positive confirmatory tests generally confirm infection but do not necessarily clarify a regressive versus progressive infection. Negative confirmatory tests are discordant, leaving patient infection status unclear.

Depending on the stage and type of infection, the results of FeLV testing may vary. Progressively and regressively infected cats will be positive for FeLV antigen 30 or more days after exposure to the virus. Prior to that time, these cats may test negative for FeLV. On level 2 diagnostic testing, 30 or more days after exposure, progressively infected cats will be positive for viral antigen and have a high copy number of proviral DNA by quantitative PCR. Regressively infected cats may have variable results. They may be microtiter antigen test negative or positive and positive for low levels of proviral DNA by quantitative PCR. Alternatively, regressively infected cats may be microtiter antigen positive and negative for proviral DNA by quantitative PCR. Used together, antigen testing and quantitative

PCR can help differentiate between regressively and progressively infected cats. In cases where results have been inconclusive, pursuing quantitative real-time PCR for FeLV proviral DNA can provide clarification. This test quantitates the number of proviral DNA copies present. Progressively infected cats will have proviral DNA > 1 million copies per mL. If the patient has proviral DNA in numbers <1 million copies per mL, regressive infection is most likely. Note that regressive patients may be positive or negative on point of care and microtiter antigen testing but may still be positive for proviral DNA.

Cats infected with the virus will be positive for FIV antibodies 60 days or more after infection occurs. Cats previously vaccinated against FIV may also be positive for FIV antibodies. Although the FIV vaccination is no longer available in North America, previously vaccinated cats may retain FIV antibodies for 7 or more years. Some point of care tests are able to differentiate between antibodies from true infection versus vaccination. For more detail, please refer to the 2020 AAFP Retrovirus Testing and Management Guidelines.

FeLV vaccine is categorized as a non-core vaccine. Kittens have increased susceptibility to infection and therefore should be vaccinated during their primary kitten series and 1 year later. Cats should be considered at-risk and vaccinated if they have regular outdoor activity, particularly if they might be interacting with other cats. Cats are also at risk if they are living with or interacting with cats of unknown FeLV infection status. Cats that live in a single cat household or with cats of known negative status, and cats that have outdoor activity in safe enclosed spaces are at lower risk of disease exposure. The FIV vaccine has not been available in North America since 2015. Previously vaccinated cats may retain antibodies for 7 years or more and will be positive on testing. Assessment of a cat's vaccination status is critical when a cat tests positive for FIV. As the virus is spread primarily via saliva and other bodily fluids, prevention of FIV transmission is best accomplished by minimizing fighting between cats.

Since retroviruses are very labile outside of the host, simple precautions such as routine cleaning with veterinary disinfectants will eliminate the virus in the environment. However, the viruses are still transmissible via body fluids, and proper sterilization of equipment, such as dental instruments and endotracheal tubes, is appropriate. Since retrovirus infected cats may be immunosuppressed, they should not be housed in areas with cats or dogs contagious with infectious diseases, such as an upper respiratory tract infection, panleukopenia, canine parvovirus, or *Bordetella bronchiseptica*. Cats used as blood donors should be screened for FIV by antibody, FeLV by antigen and PCR testing.

Treatment

Antiretroviral options for retrovirus treatment are limited in cats. There are limited large, controlled, long-term studies available in cats and these studies have not demonstrated long-lasting benefits. Additionally, many of these drugs require long-term use, are costly, and have mild to severe toxic side effects. In cases with stomatitis or neurologic signs associated with retrovirus infection, zidovudine may be beneficial. Interferons are often used in retrovirus infected cats as antivirals and immunomodulators. Unfortunately, well-designed studies using these drugs are lacking, or have failed to show benefit. Two separate studies have shown some benefit from parenteral feline omega interferon, however, controlled studies using oral feline interferon omega have not been published to date.

Retrovirus infected cats, especially those with FIV, can live for many years with a high quality of life. The management of retrovirus infected cats should focus on preventive healthcare strategies, as well as prompt identification and treatment of illness. Infectious disease prevention amongst cohabitating cats will help reduce morbidity in immune suppressed retrovirus infected cats. The AAFP and the

Association of Shelter Veterinarians do not recommend euthanasia of cats solely based on retrovirus infection. Careful management of retrovirus cats in a multi-cat household can reduce the chances of viral spread. Transmission of FIV is possible but limited where cohabitating cats do not fight or reproduce. Effort should be made to reduce the risk of inter cat fighting. Transmission of FeLV is more likely because of the sharing of food and water bowls, allogrooming, and alloplay. Cat owners will need to employ strategies to reduce stress, including resource and environmental needs management. Infected cats should be housed indoors with access to enclosed outdoor structures only. Longevity appears to be best in cats living in low-density household.

References & Resources

1. Little S, Levy J, Hartmann K, Hofmann-Lehmann R, Hosie M, Olah G, et al. 2020 AAFP Feline Retrovirus Testing and Management Guidelines. Journal of Feline Medicine & Surgery [Internet]. 2020;22(1):5–30. Available from: <http://eutils.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&id=31916872&retmode=ref&cmd=prlinks>

[AAFP Retrovirus Educational Toolkit](#)

[AAFP Cat Friendly Certificate Veterinarian Program](#)

[Merck Veterinary Manual Online FeLV](#)



ONTARIO VETERINARY
MEDICAL ASSOCIATION

Equine Program



Developing a Rehabilitation Plan in the Field

Dr. Valerie Moorman, DVM, PhD, Diplomate ACVS-LA

INTRODUCTION

Rehabilitation of the equine athlete can feel like a daunting task for both owners and practitioners. While it may be tempting to prescribe strict stall rest for horses with musculoskeletal injuries, research has shown that controlled exercise promotes healing and health of joints and soft tissues[1,2]. In fact, a rehabilitation program can help shorten recovery time and get horses back into work faster[3]. Rehabilitation centers are great options for some, other clients may not be able to afford the cost associated with an all-inclusive rehabilitation program. Additionally, the time spent by an owner rehabilitating their own horse can strengthen the bond between the horse and rider. Development of a rehabilitation program in the field can be successful with use of simple, inexpensive tools.

MUSCULOSKELETAL EXAMINATION

While most rehabilitation programs will focus on one specific injury (i.e. deep digital flexor tendinopathy), a successful program involves identifying and addressing comorbidities: i.e. secondary sites of pain and/or stiffness, but also areas of weakness and dysfunction. Therefore, the musculoskeletal exam should include static palpation, functional exam, and dynamic exam.

Static Palpation

Static palpation of the entire horse should be performed and any areas of pain, tissue thickening, or other abnormalities should be identified and documented. This static examination encompasses the basic musculoskeletal examination performed with most lameness evaluations. Additionally, palpation of the axial skeleton (cervical spine through sacroiliac region) should also be performed, as stiffness or pain through these regions will also need to be addressed.

Functional Exam

The functional exam includes evaluation of range of motion and flexibility. Any areas of stiffness or dysfunction should be identified and documented. It should be noted if there are areas where range of motion is stiff versus painful, as this may change how your rehabilitation protocol is developed. Function exercises include the following:

- 1) Sternal lifts
- 2) Lumbosacral tucks
- 3) Back wiggles
- 4) Tail pulls (caudal, lateral)
- 5) Wither pulls
- 6) Lateral bending (cervical, thoracolumbar)
- 7) Protraction/retraction (fore, hind)
- 8) Scapular glide
- 9) Shoulder circumduction
- 10) Joint range of motion

Dynamic Exam

The dynamic exam can be highly variable, depending on the horse's injury and degree of lameness. If the horse is severely lame, your initial dynamic exam may be limited to the walk. When possible, the dynamic exam should be performed on multiple surfaces at the walk and trot. This will allow the practitioner to guide where the horse's rehabilitation work is best performed to maximize the horse's comfort level. In the field, the dynamic exam is usually graded using a subjective scale (such as the AAEP lameness scale); however, objective analysis (inertial sensor system, video) can also be performed to track the horse's progress. This allows a more accurate assessment of the horse's progress rather than relying on memory. The dynamic examination may also include some components of a neurological examination, such as tight circles, stepping over obstacles, or walking up and down a slope.

EXAM SUMMARY: PUTTING IT ALL TOGETHER

Once you have performed your thorough evaluation, it is useful to list all of your rehabilitation issues and how you can address each one. Focus on the biggest issues you have identified, leaving small or insignificant issues for later in the rehabilitation process. The client's time and abilities must also be taken into consideration. What are the client's time constraints? How cooperative is the horse? How experienced of a horseman is the client? If too many/difficult exercises are prescribed, the client is unlikely to be compliant. The practitioner should always demonstrate the exercises for the client and then have the client perform them as well to ensure that they are comfortable and confident.

WHAT SHOULD I PRESCRIBE?

Unfortunately, there is no recipe to follow for rehabilitating the equine athlete. Even two horses with the exact same primary pathology (i.e. proximal suspensory desmopathy) need to be treated differently, as they will have different pain thresholds, comorbidities, and temperaments. For a rehabilitation program to be successful, it must be individually tailored to the patient. However, in general, rehabilitation programs all have similar goals. These include: 1) decreasing/eliminating pain, 2) promoting tissue healing 3) restoring neuromuscular control/function, 4) restoring normal tissue range of motion/flexibility, 5) improving overall strength. Reducing and eliminating pain must be addressed first—if pain remains, the other goals cannot be reached. Simple tools to address each of these issues is discussed in the next section. In general, horses should be prescribed a controlled, gradually increasing exercise program as well as physiotherapy exercises (such as the ones used for the functional exam). Core strengthening exercises should be incorporated into the rehabilitation program—these exercises have been shown to improve the size and symmetry of the multifidus muscle in the thoracolumbar spine, as well as improve postural stability[4,5], which can help the horse better protect themselves from re-injury.

FOLLOW-UP

Regular follow-up evaluation is necessary to help further guide the rehabilitation program. Recheck exams should include the same static, functional, and dynamic assessments as the initial evaluation. This allows the practitioner to determine 1) what is improved, 2) what is static, and 3) what is worse. This allows appropriate changes in the rehabilitation program to be performed. If the horse is improved, perhaps additional/more difficult exercises can be undertaken or exercise can be increased. If the horse is static, perhaps additional

treatments/modalities can be added to the program, especially if sites of pain are not improving or there become new painful areas. If the horse is worse, perhaps exercise needs to be decreased/changed to different footing, additional treatments need to be performed, or additional diagnostic should be explored (repeat blocking, imaging). The timing for follow-up appointments should be more frequent at the beginning of rehabilitation and can often be spaced out further as the horse progresses. Owner finances, as well as their time-line, often affects how often horses are re-examined.

If frequent, in-person recheck examinations are not possible, the practitioner can have the client video the horse walking or trotting at weekly intervals. This may be sufficient to allow the practitioner to help guide exercise recommendations.

SIMPLE TOOLS FOR REHABILITATING THE EQUINE ATHLETE

The tools described below are simple to use, relatively inexpensive to purchase, and can help enhance your rehabilitation program. These tools can be used in addition to the physiotherapy exercises listed above.

Tools for Pain Modulation

Icing

Icing of the limb is an inexpensive way to reduce inflammation and pain in an injured limb. While “dry icing” methods (ice packs) are very simple and easy to use, they are ineffective at cooling deeper structures[6,7]. Having the horse stand in a bucket or boot filled with ice water is the most effective way to sufficiently cool the limb; however, some horses will not tolerate this procedure. Having a hay net in front of the horse will help improve the client’s chance of success. If the horse is not tolerant of standing in an ice boot/bucket or if the area of injury is proximal (above the carpus/tarsus or back), ice packs can be applied. Be sure to wet the area of anatomy first to maximize the cooling effect. Icing should be performed after exercise to help sufficiently reduce inflammation.

Heating

Heat can provide analgesia as it improves blood flow and reduces muscle spasms. Horses with primary or secondary back pain respond well to heat application before exercise. Heat can also help improve range of motion if scar tissue is present. If heat is applied to an area of injury, the timing of the injury is very important. Heat should not be applied to acute injuries, as this may disrupt the initial healing process. However, if the injury is chronic in nature, applying heat prior to exercise or performing passive range of motion exercises can improve the horse’s comfort level and increase range of motion. Heat can be applied using a heating pad or a warm compress.

Tools to Improve Proprioception and Strength

Resistance Bands

The Equicore Complete Equiband system® uses elastic resistance bands placed behind the hindquarters and/or under the abdomen. This system encourages the horse to use their core properly and improves proprioception and neuromotor control. This system was shown to improve back kinematics after 4-weeks of use[9]. Horses in a rehabilitation program can be

handwalked or ridden in this system. However, horses fatigue quickly with use, so it must be introduced very gradually (i.e. walking 5-10 minutes for the first week, then increasing by 5 minutes every 1-2 weeks, depending on the horse's level of fatigue). If used under saddle, the total riding time should be reduced (i.e. if the horse is normally ridden for 30 minutes, add in the Equiband system® for 5 minutes, and reduce the total ride time to 20-25 minutes).

Proprioceptive Balance Pads

Proprioceptive balance pads can help improve proprioception, neuromotor control, and core strength. There are pads of various firmness (SureFoot® or Theraband® pads) or clients can purchase foam of various firmness and make their own. Typically, a horse is started on the firmest pads on just the front or hind feet for 5 minutes 1-2 times daily. Once the horse is stable on 2 pads (does not visibly sway), the horse can stand on firm pads on all four feet or switch to softer pads. The softer the pad, the more the horse has to engage their core to maintain balance. Performing physiotherapy exercises (tail pulls, wither pulls, sternal lifts) while on the pads provides a more advanced exercise.

Pole Work

Walking over poles helps improve proprioception and neuromotor control. It can also help increase eccentric loading of tendons/ligaments in the distal limb. Typically start with poles on the ground. These poles can be spaced for stride if one of your rehabilitation goals is to help increase cranial phase of the stride. Poles can also be gradually raised if you are trying to increase joint range of motion. Poles can then be placed on a diagonal at various heights to further challenge the horse's proprioception.

Backing

Backing in hand or under saddle requires engagement of the core and hindend musculature, as well as proprioception and neuromotor control. Horses can initially be asked to back on flat, firm ground. Once the horse gets stronger, you can ask them to back up a small incline.

Changes in Footing

Simply walking the horse on different surface types can stimulate and enhance proprioception. If your client has a gravel or asphalt driveway with adjacent grass, you can simply ask them to walk the horse in a serpentine pattern from the driveway onto the grass. This exercise is ideal for horse's with proprioceptive deficits. For the horse with musculoskeletal injury, you may gradually change where the horse is walked based on their primary injury. For example, a horse with a deep digital flexor tendon tear should initially be walked on firm ground. As the tendon heals, you can gradually walk the horse on softer ground to promote more eccentric loading of the tendon and prepare the horse for a return to arena work.

Tools to Increase Range of Motion

Jangles (Tactile Stimulators)

Jangles are devices that are placed around the pastern or fetlock region and stimulates hyperflexion of the limb. These devices are best used in the hindlimbs, as negligible effect occurs in the forelimbs. A cat collar, bell boot, or even a bandage can be used as a jangle. It's important to try the jangles on the horse yourself to see how they respond—some horses will

have an exaggerated flexion of the limb which may not be appropriate for their stage of healing while others will have no response at all. Horses habituate the stimulus quickly[9] (within a few minutes), so jangles must be used frequently throughout the day to have an effect.

Pole Work

As described above, walking over poles can help improve limb range of motion.

SUMMARY

A rehabilitation program can help shorten recovery time, improve healing, and improve function. When developing a rehabilitation program, a global approach must be used rather than focusing only on the primary injury. In addition, each program must be tailored to the individual patient if you are to have success—there is no one recipe to follow. A key component is frequent re-evaluation of the horse so that the rehabilitation plan can be altered to fit the current needs of the horse.

REFERENCES

1. Stemberger, R. and Kersch-Schindl, K. (2013) Osteoarthritis: Physical medicine and rehabilitation - Nonpharmacological management. *Wiener Medizinische Wochenschrift* **163**, 228–235.
2. Roos, E.M., Engström, M., Lagerquist, A. and Soderberg, B. (2004) Clinical improvement after 6 weeks of eccentric exercise in patients with mid-portion Achilles tendinopathy--a randomized trial with 1-year follow-up. *Scand. J. Med. Sci. Sport.* **14**, 286–295.
3. Holcombe, S.J., Shearer, T.R. and Valberg, S.J. (2019) The Effect of Core Abdominal Muscle Rehabilitation Exercises on Return to Training and Performance in Horses After Colic Surgery. *J. Equine Vet. Sci.* **75**, 14–18. <https://doi.org/10.1016/j.jevs.2019.01.001>.
4. Stubbs, N.C., Kaiser, L.J., Hauptman, J. and Clayton, H.M. (2011) Dynamic mobilisation exercises increase cross sectional area of musculus multifidus. *Equine Vet. J.* **43**, 522–529.
5. Ellis, K.L. and King, M.R. (2020) Relationship Between Postural Stability and Paraspinal Muscle Adaptation in Lameness Horses Undergoing Rehabilitation. *J. Equine Vet. Sci.* **91**, 103108. <https://doi.org/10.1016/j.jevs.2020.103108>.
6. Kaneps, A.J. (2000) Tissue temperature response to hot and cold therapy in the metacarpal region of a horse. *Proc. Am. Assoc. Equine Pract.* **46**, 208–213.
7. Haussler, K.K., Wilde, S.R., Davis, M.S., Hess, A.M. and McIlwraith, C.W. (2020) Contrast therapy: Tissue heating and cooling properties within the equine distal limb. *Equine Vet. J.* 1–8.
8. Pfau, T., Simons, V., Rombach, N., Stubbs, N. and Weller, R. (2017) Effect of a 4-week elastic resistance band training regimen on back kinematics in horses trotting in-hand and on the lunge. *Equine Vet. J.* **49**, 829–835.
19. Clayton, H.M., White, A.D., Kaiser, L.J., Nauwelaerts, S., Lavagnino, M. and Stubbs, N.C. (2008) Short-term habituation of equine limb kinematics to tactile stimulation of the coronet. *Vet. Comp. Orthop. Traumatol.* **21**, 211–214.

A REVIEW OF REHABILITATION MODALITIES

Valerie J Moorman, DVM, PhD, DACVS-LA

INTRODUCTION

There are a number of rehabilitation modalities that are being used in horses. Some of these are available in rehabilitation centers, but many are portable and can be used on farm. Much of what we know about these modalities comes from research and clinical use in people and dogs. However, more information is becoming available from equine specific research investigations.

EXTRACORPOREAL SHOCKWAVE THERAPY

Shockwave therapy has been used in equine medicine for treatment of musculoskeletal injuries for many years. Shockwave uses compressed ultrasound waves, which are lower frequency waves compared to traditional diagnostic ultrasound. These waves also have a rapid release of energy. There tends to be a greater release of energy at the interface of different tissue interfaces (i.e., junction of bone and ligament). Shockwave does have several effects, including analgesia and stimulation of healing [1-3]. Micro-mechanical trauma to tissues and cavitation from the ultrasound waves are thought to induce these effects.

While shockwave has beneficial attributes, it is not innocuous. In one study in ponies, normal superficial digital flexor and common digital extensor tendons were subjected to shockwave therapy. Shortly after treatment (3 hours), there was disorganization of collagen, which persisted at 6 weeks post-treatment. There was also an increased degradation of collagen at 3 hours. There were increases in gene expression for collagen remodeling at 6 weeks, indicating healing [4]. The results of this study suggest that exercise restriction following shockwave is a good idea and that chronic tendinopathy could benefit from shockwave re-stimulating the tendon.

LASER THERAPY

Laser is an acronym for “light amplification through stimulated emission of radiation”. Therapeutic lasers have wavelengths in the 600-1200nm range and tend to fall within infrared or near red spectrum. There are 3 properties of laser light that differ from visible light. First, the light is monochromatic; visible light will separate into multiple colors when it goes through a prism. Second, laser light is coherent, which means its photons travels in the same direction and are all in phase with each other. Lastly, laser light is collimated, meaning it stays within a straight line. These traits allow laser light to penetrate skin and reach deeper tissues.

There are four classes of lasers. Classes I and II include laser pointers and are the lasers used to read laser discs. These do not have adverse effects on skin or eyes. Class III lasers are known as low-level lasers or cold lasers and have lower power levels compared to Class IV lasers. These lasers are safe for the skin but do have ocular risks. Class IV lasers are high intensity lasers and have more risk of injury to skin and eyes. These lasers can generate heat and can burn a horse’s skin. Class III and IV lasers are used as therapeutic modalities.

For both class III and IV lasers, there have been a number of benefits identified in people. These include pain reduction, increased range of motion, reduction in inflammation, and acceleration of tissue healing.

In horses, there have been a few studies examining Class IV laser therapy. In one study, both patient preparation and skin pigment were found to be important variables for laser penetration [5]. This study identified that clipping and cleaning the limb resulted in greater energy penetration. Additionally, horses with non-pigmented skin had greater penetration compared to medium and dark skin. In a study of horses with naturally occurring tendinopathy/desmopathy, lameness and ultrasound scores were improved after 2 weeks of high-intensity laser [6]. In a third study, a 4 week course of high-intensity laser resulted in better fiber alignment, less type III collagen, and reductions in lesion size on histopathology in surgically created suspensory branch lesions [7].

THERAPEUTIC ULTRASOUND

Therapeutic ultrasound can be divided into athermal and thermal effects. Athermal effects occur using pulsed waves and the tissue is not heated. These effects are most useful in acute injuries and can include resolution of inflammation and collagen synthesis: specifically, conversion of type III to type I collagen. Thermal effects occur when the waves are continuous and the underlying tissues are heated. This results in increases in metabolic rate, blood flow, and tissue elasticity. This is beneficial when injuries are chronic and scar tissue/inelasticity need to be addressed. For example, therapeutic ultrasound may be used to heat the tissue prior to performing passive range of motion of a joint. Therapeutic ultrasound can also be used to drive a medication, such as DMSO, into a tissue. This is known as phonophoresis.

There is a small amount of equine literature regarding the use of therapeutic ultrasound. One study demonstrated that the superficial and deep digital flexor tendons can be heated using thermal settings [8]. In another study, epaxial muscles could not be effectively heated using thermal settings, because of the required penetration depth [9].

PULSED ELECTROMAGNETIC FIELD THERAPY

Pulsed electromagnetic field therapy, or PEMF, covers a number of commercial products, including magnawave, assisi loop, and BEMER products. The mechanism of action of PEMF involves creation of a magnetic field by creating an electric current through a coiled wire. The magnetic field creates small currents inside a tissue without the production of heat. PEMF stimulates bone healing/remodeling by creating an electrical signal in bone which stimulates osteogenesis. This is a similar effect that happens in normal bone during weight-bearing. In people, PEMF has shown benefits in treatment of delayed union long bone fractures [10]. PEMF also has shown positive effects in treatment of pain in people with osteoarthritis and for pain and improved function when used in early treatment of fractures [11,12].

While PEMF has been investigated to a lesser degree in horses, there have been some documented beneficial effects. In one study in the 1980s, PEMF treatment resulted in improved cancellous bone graft incorporation in ponies [13]. In a recent study, twice daily treatment with a BEMER blanket for a 3 day period resulted in improvements in back pain, spine flexibility, and postural stability [14].

TENS

Transcutaneous electrical nerve stimulation (TENS) can be very effective at modulating pain and is typically well tolerated by the horse. TENS units can modulate pain via the Gate Control theory (acute) or via release of endogenous opioids (chronic), depending on how it is applied.

For Gate Control theory, a high frequency (>100Hz) and a short pulse duration (50us) are used. For endogenous opioid release, a low frequency (<20Hz) and a long pulse duration are used (200us) [15]. When the acute setting is used, pain reduction occurs immediately but only occurs while the TENS is in place. When the chronic setting is used, pain reduction takes longer to occur but lasts for several hours after the TENS is removed. If the chronic setting is used, the TENS can be placed anywhere on the horse. If the acute setting is used, it is most effective if the unit is placed close the site of pain.

WHOLE BODY VIBRATION THERAPY

Whole body vibration is used with the goal of improving muscle and core strength. The mechanical oscillations of the plate stimulate eccentric and concentric muscle contractions through the activation of alpha-motor neurons. The vibrations also provide mechanical loading which facilitates mechanotransmission to bone leading to osteogenesis. There are several types of vibration plates with differences involving direction of the vibration amplitude: vertical or horizontal/rotary.

In humans, vibration therapy has demonstrated improvements in muscle and bone strength, postural stability, and power. It has also been shown to reduce pain in people with osteoarthritis. There is some evidence in horses with improved symmetry and increases in muscle size of the multifidus muscle after 60 days of therapy [16]. A second study showed no long term improvements in chronic lameness after 60 days of use [17]. In one other study by the same research group, there were improvements in hoof growth up to 60 days after whole body vibration use [18]. Lastly, a study by another research team found that whole-body vibration resulted in maintenance of bone mineral content in stalled horses, which was similar to horses in light daily exercise [19].

UNDERWATER TREADMILL

Aquatic exercise has been commonly employed in people for a number of musculoskeletal disorders. Aquatic therapy can increase joint motion, enhance muscle activity, reduce inflammation, and improve neuromuscular control. The buoyancy of water also allows an individual to exercise while minimizing the vertical forces. By walking a horse in water up to the level of the tuber coxae, there is an approximate weight reduction of 75% [20]. Additionally, walking through water provides resistance to motion, which results in stabilizing effects on joints as well as work for the muscles [21].

There have been several investigations into the effects of underwater treadmill walking in horses. One study looked at the effect of water height on joint range of motion and percentage duration of phase of stride [22]. Two studies demonstrated positive effects in horses with joint pathology that were exercised in the underwater treadmill [23,24]. However, the results from another study suggested that walking for 8-week period in an underwater treadmill may not alone provide sufficient fitness to return to high intensity work [25].

CONCLUSIONS

There are a number of therapeutic modalities available for use in horses. When choosing modalities for a specific case, it is important to have generated a list of rehabilitation goals for the horse. Understanding the current stage of healing for the primary injury of the horse is also important for identifying appropriate modalities.

REFERENCES

1. Dahlberg JA, McClure SR, Evans RB, Reinertson EL. (2006) Force platform evaluation of lameness severity following extracorporeal shock wave therapy in horses with unilateral forelimb lameness. *J Am Vet Med Assoc* 229:100-103.
2. Trager LR, Funk RA, Clapp KS, Dahlgren LA, et al. (2020) Extracorporeal shockwave therapy raises mechanical nociceptive threshold in horses with thoracolumbar pain. *Equine Vet J* 52:250-257.
3. McClure SR, VanSickle D, Evans R, Reinertson EL, Moran L. (2004) The effects of extracorporeal shock-wave therapy on the ultrasonographic and histologic appearance of collagenase-induced equine forelimb suspensory ligament desmitis. *Ultrasound Med Biol* 30:461-467.
4. Bosch G, de Mos M, van Binsbergen R, van Schie HTM, et al. (2009) The effect of focused extracorporeal shock wave therapy on collagen matrix and gene expression in normal tendons and ligaments. *Equine Vet J* 41:335-341.
5. Duesterdieck-Zellmer KF, Larson MK, Plant TK, Sundholm-Tepper, Payton ME. (2016) Ex vivo penetration of low-level laser light through equine skin and flexor tendons. *Am J Vet Res* 77:991-999.
6. Zielinska P, Nicpon J, Kielbowicz Z, Soroko M, et al. (2020) Effects of high intensity laser therapy in the treatment of tendon and ligament injuries in performance horses. *Animals* 10:1327. Doi:10.3390/ani10081327.
7. Pluim M, Heier A, Plomp S, Boshuizen B, et al. (2022) Histological tissue healing following high-power laser treatment in a model of suspensory ligament branch injury. *Equine Vet J*. doi:10.1111/evj.13556.
8. Montgomery L, Elliott SB, Adair HS (2013) Muscle and tendon heating rates with therapeutic ultrasound in horses. *Vet Surg* 42:243-249.
9. Adair HS and D Levine (2019). Effects of 1-MHz ultrasound on epaxial muscle temperature in horses. *Front Vet Sci* 6:177. doi.10.3389/fvets.2019.00177.
10. Shi H-F, Xiong J, Chen Y-X, Wang J-F, et al. (2013) Early application of pulsed electromagnetic field in the treatment of postoperative delayed union of long-bone fractures: a prospective randomized controlled study. *BMC Musculoskelet Disord*. 15:35. Doi:10.1186/1471-2474-14-35.
11. Wuschech H, von Hehn U, Mikus E, Funk RH. (2015) Effects of PEMF on patients with osteoarthritis: results of a prospective, placebo-controlled, double-blind study. *Bioelectromag* 36:576-585.
12. Krzyzanska L, Straburzynska-Lupa A, Raglewska P, Romanowski L. (2020) Beneficial effects of pulsed electromagnetic field during cast immobilization in patients with distal radius fractures. *BioMed Res Int* 6849352. Doi.org/10.1155/2020/6849352.
13. Kold SE and J Hickman (1987) Preliminary study of quantitative aspects and the effect of pulsed electromagnetic field treatment on the incorporation of equine cancellous bone grafts. *Equine Vet J* 19:120-124.
14. King MR, Seabaugh KA, Frisbie DD (2022). Effects of a bio-electromagnetic energy regulation blanket on thoracolumbar epaxial muscle pain in horses. *J Equine Vet Sci* 111:103867. Doi.org/10.1016/j.jevs.2022.103867.
15. Levine, D. and Bockstahler, B. (2014) Electrical Stimulation. In: *Canine Rehabilitation and Physical Therapy*, 2nd ed., Eds: D.L. Millis and D. Levine. pp 342–358.
16. Halsberghe BT, Gordon-Ross P, Peterson. (2017) Whole body vibration affects the cross-sectional area and symmetry of the m. multifidus of the thoracolumbar spine in the horse. *Equine Vet Educ* 29:493-499.

17. Halsberghe BT. (2017) Long-term and immediate effects of whole body vibration on chronic lameness in the horse: a pilot study. *J Equine Vet Sci* 48:121-128.
18. Halsberghe BT. (2018) Effect of two months whole body vibration hoof growth rate in the horse: a pilot study. *Res Vet Sci* 119:37-42.
19. Hulak ES, Spooner H, Hoffman R, Brzezicki A. (2015) Influence of whole body vibration on bone density in the stalled horse. Thesis, Middle Tennessee State University: UMI 1588250.
20. McClintock SA, Hutchins DR, Brownlow MA. (1987) Determination of weight reduction in horses in flotation tanks. *Equine Vet J* 19: 70-71.
21. King MR. (2016) Principles and application of hydrotherapy for equine athletes. *Vet Clin N Am Equine Pract* 32:115-126.
22. Mendez-Angulo JL, Firshman AM, Groschen DM, Kieffer PJ, Trumble TN. (2013) Effect of water depth on amount of flexion and extension of joints of the distal aspects of the limbs in healthy horses walking on an underwater treadmill. *Am J Vet Res* 74:557-566.
23. King MR, Haussler KK, Kawcak CE, McIlwraith CW, Reiser RF. Effects of underwater treadmill exercise on postural sway in horses with experimentally induced carpal joint osteoarthritis. *Am J Vet Res* 74:971-982.
24. Potenza KN, Huggons NA, Jones ARE, Rosanowski SM, McIlwraith CW. (2020) Comparing racing performance following arthroscopic surgery of metacarpophalangeal/metatarsophalangeal and carpal joints in Thoroughbred racehorses rehabilitating using conventional and underwater treadmill therapies. *Vet Rec* 187:355. doi:10.1136/vr.105745.
25. Firshman AM, Borgia LA, Valberg SJ. (2015) Effects of training at a walk on conventional and underwater treadmills on fiber properties and metabolic responses of superficial digital flexor and gluteal muscles to high-speed exercise in horses. *Am J Vet Res* 76:1058-1065.

REGENERATIVE THERAPIES: WHAT IS AVAILABLE AND HOW TO USE THEM

Valerie J Moorman, DVM, PhD, DACVS-LA

INTRODUCTION

Regenerative therapies have become widely available to equine veterinarians over the past several decades. These therapies have many beneficial effects and can be administered in a number of different ways. There is a growing body of knowledge on these therapies, but not all of the effects of these treatments are currently known.

MESENCHYMAL STEM CELLS

The use of mesenchymal stem cells has become very common in equine medicine during the 21st century. Stem cells, or stromal cells, are thought to be multi-potent, meaning that they can differentiate into different cell types, such as bone, cartilage, and tendon/ligament. Stem cells can be collected from numerous sites in the body, such as blood, bone marrow, placenta/umbilicus, muscle, fat, dental pulp, and skin; these cells have been labeled mesenchymal stem cells (MSCs). Bone marrow and fat derived MSCs have been the most studied to this stage. In addition, when collected from any source, there are typically not a large enough number of MSCs in the sampled tissue to provide an adequate “dose”. Thus, the MSCs are culture expanded, which can take several weeks. This does allow for cells to be cryopreserved and saved for future use.

Beneficial effects of mesenchymal stem cells have been identified for both tendon and intra-articular injuries. One study of meniscal injuries in horses found improvements in return to function after Grade III meniscal tears when horses received arthroscopy and intra-articular mesenchymal stem cells [1]. In a study in racehorses, horses with SDFT injuries treated with mesenchymal stem cells (MSCs) had a lower reported re-injury rate compared to untreated horses [2]. Several more recent studies have found that the tendon tissue following MSC treatment has improvements in collagen type, vascularity, and cellularity and shows less stiffness than control tendons [3,4].

It is still unclear whether it is the MSCs that aid in direct tissue healing by morphing into another the type of tissue, or if it the growth factors that are released from the MSCs which aids in tissue healing.

BONE MARROW ASPIRATE CONCENTRATE

Bone marrow aspirate concentrate (BMAC) is a source of a small number of MSCs, but is also a source of white cells, growth factors, cytokines, and platelets. Bone marrow aspirate concentrate can be collected in a similar manner to collecting bone marrow for mesenchymal stem cell culture; typically from the sternum or wing of the ilium. One benefit of BMAC over MSCs is that the product is available same day as collection, as it only requires a centrifugation step, not a full culture expansion.

There have been several studies in horses with proximal suspensory desmitis demonstrating its benefits. In one study of a large number of horses with fore and hind proximal suspensory desmitis, 89% of horses were sound after BMAC [5]. In another study of chronic suspensory desmitis in hindlimbs, horses treated with BMAC had improved lameness scores and return to performance compared to rehabilitation alone [6].

AUTOLOGOUS CONDITIONED SERUM (IRAP)

Autologous conditioned serum (ACS), also known as interleukin 1 (IL-1) receptor antagonist protein (IL-1Ra) (IRAP) has been used commonly for treatment of arthritis and synovitis. It is a blood-derived product that requires an 18-24 hour incubation period prior to processing. As IL-1 is a key inflammatory mediator in joints, IRAP works by blocking IL-1 from binding to its intra-synovial receptors and stops the inflammatory cascade. There are other anti-inflammatory factors within IRAP that also likely play beneficial roles in joints, including IL-4, IL-10, and Insulin-like growth factor 1 (IGF-1). IRAP has been used in horses with osteoarthritis, with intra-synovial soft tissue injuries (meniscal damage, tendon damage within a tendon sheath), and as a post-operative intra-articular therapy. This product can be collected, processed, and stored for a prolonged period of time (1 year). Most protocols using IRAP involve a series of intra-synovial injections: three injections at 7 to 10 day intervals.

In a recent study of horses with naturally occurring lameness, just over 50% of horses showed improvements in both lameness and flexion; those horses also showed higher levels of IL-1Ra and IGF-1 [7]. In another recent study in vitro, IRAP treated synovial tissues showed disease-modifying responses, and the authors concluded that it may be more beneficial for treatment of osteoarthritis compared to traditional steroid (triamcinolone) injections [8].

Autologous conditioned serum has been reported as a treatment for tendon healing. In one study in horses with naturally occurring tendinopathy, there were beneficial effects seen in both acute and chronic stages of tendinopathy following a single injection [9].

AUTOLOGOUS PROTEIN SOLUTION (Prostride)

Autologous protein solution (APS), known under the tradename Prostride®, is blood-derived product that can be processed stall-side. This product contains high levels of anti-inflammatory molecules (IL-1 Ra, IL-10, IGF-1) as well as a number of growth factors stemming from platelets (TGF, PDGF). In the initial equine study of this product in horses with naturally occurring osteoarthritis, horses receiving APS had significant improvements in lameness and joint range of motion following treatment [10]. In 2 recent studies in vitro, APS demonstrated disease-modifying effects in synovial and cartilage tissues [9,11]. Autologous protein solution has been used in a similar manner to IRAP, but has the benefits of not requiring a long incubation period, and it is typically administered as a single dose.

There has started to be some investigation on the effects of APS on tendon healing. One recent study evaluated its use in an experimental model of SDFT injury and found some improvements in gene expression [12]. This may indicate that APS could aid in healing of tendons, or at least would not be detrimental.

PLATELET RICH PLASMA

Platelet-rich plasma (PRP) is a blood-derived product that involves processing the blood to concentrate the platelets. The premise behind platelet-rich plasma is that there are a great number of growth factors within the α -granules within platelets, which makes this product a regenerative therapy. There are multiple methods of processing PRP, including passive sedimentation, single, and double centrifugation techniques. There are a variety of commercial test kits, as well as other non-commercial methods. Many of these commercial kits are readily useable stall-side. The processing method has an impact on platelet concentration, white blood cell count, and red blood cell count.

Another important factor for PRP is activation of the platelets, which allows for release of α -granules and the growth factors within them. This can be accomplished with addition of calcium +/- thrombin, or performing freeze-thaw to disrupt the platelet membrane [13]. Initially, it was thought that just injecting PRP and exposing it to collagen would lyse the platelets, but this was found to only deliver a fraction of the growth factors within the platelets [14]. In a recent study, extracorporeal shockwave therapy was found to increase the release of growth factors from PRP *in vitro* [15].

Currently PRP is used for treatment of equine tendon and ligament disease, such as SDF tendinopathy and suspensory ligament injury. It has also been used for treatment of joint disease including SI joints. As there have been numerous processing methods used in individual studies, it has been challenging to extrapolate findings from most of these studies.

CONCLUSIONS

There are becoming a wide variety of regenerative therapies available for use in horses. For tendon and ligament injuries, MSCs, BMAC, and PRP are reasonable treatment options, while MSCs, ACS, and APS are good choices for intra-articular injection.

REFERENECES

1. Ferris DJ, Frisbie DD, Kisiday JD, McIlwraith CW, et al. (2014) Clinical outcome after intra-articular administration of bone marrow derived mesenchymal stem cells in 33 horses with stifle injuries. *Vet Surg* 43:255-265.
2. Godwin EE, Young NJ, Dudhia J, Beamish IC, Smith RKW. (2012) Implantation of bone marrow-derived mesenchymal stem cells demonstrates improved outcome in horses with overstrain injury of the superficial digital flexor tendon. *Equine Vet J* 44:25-32.
3. Smith RKW, Werling NJ, Dakin SG, Alam R, et al. (2013) Beneficial effects of autologous bone-marrow derived mesenchymal stem cells in naturally occurring tendinopathy. *PLOS-One* 8: e75697. Doi: 10.1371/journal.pone.0075697.

4. Romero A, Barrachina L, Ranera B, Moreno B, et al. (2017) Comparison of autologous bone marrow derived and adipose tissue derived mesenchymal stem cells, and platelet rich plasma, for treating surgically induced lesions of the equine superficial digital flexor tendon. *Vet J* 224:76-84.
5. Herthel DJ. (2001) Enhanced suspensory ligament healing in 100 horses by stem cells and other bone marrow components. *Proc Annu Conv Am Assoc Equine Pract.* 47:319-321.
6. Maleas G, Mageed M. (2021) Effectiveness of platelet-rich plasma and bone marrow aspirate concentrate as treatments for chronic hindlimb proximal suspensory desmopathy. *Front Vet Sci* 8:678453. Doi: 10.3389/fvets.2021.678453.
7. Marques-Smith P, Kallerud AS, Johansen GM, Boysen P, et al. (2020) Is clinical effect of autologous conditioned serum in spontaneously occurring equine articular lameness related to ACS cytokine profile? *BMC Vet Res* 16:181. Doi: 10.1186/s12917-020-02391-7.
8. Alvarez AV, Boone LH, Pondugula SR, Caldwell F, Woolridge AA. (2020) Effects of autologous conditioned serum, autologous protein solution, and triamcinolone on inflammatory and catabolic gene expression in equine cartilage and synovial explants treated with IL-1 β in co-culture. *Front Vet Sci* 7:323. Doi: 10.3389/fvets.2020.00323.
9. Geburek F, Lietzau M, Beineke A, Rohn K, Stadler PM. (2015) Effect of a single injection of autologous conditioned serum (ACS) on tendon healing in equine naturally occurring tendinopathies. *Stem Cell Res Ther* 6:126. Doi: 10.1186/s13287-015-0115-0.
10. Bertone AL, Ishihara A, Zekas LJ, Wellman ML, et al. (2014) Evaluation of a single intra-articular injection of autologous protein solution for treatment of osteoarthritis in horses. *Am J Vet Res* 75:141-151.
11. Linardi RL, Dodson ME, Moss KL, King WJ, Orved KF. (2019) The effect of autologous protein solution on the inflammatory cascade in stimulated equine chondrocytes. *Front Vet Sci* 6:64. Doi: 10.3389/fvets.2019.000064.
12. Gaesser AM, Underwood C, Linardi RL, Even KM, et al. (2021) Evaluation of autologous protein solution injection for treatment of superficial digital flexor tendonitis in an equine model. *Front Vet Sci* 8:697551. Doi: 10.3389/fvets.2021.697551.
13. Fukuda K, Kuroda T, Tamura N, Mita H, Kasashima Y. (2020) Optimal activation methods for maximizing the concentrations of platelet-derived growth factor-BB and transforming growth factor-B1 in equine platelet-rich plasma. *J Vet Med Sci* 82:1472-1479.
14. Textor JA, Norris JW, Tablin F. (2011) Effects of preparation method, shear force, and exposure to collagen on release of growth factors from equine platelet-rich-plasma. *Am J Vet Res* 72: 784-794.

15. Seabaugh KA, Thoreson M, Giguere S. (2017) Extracorporeal shockwave therapy increases growth factor release from equine platelet-rich plasma *in vitro*. *Front Vet Sci* 4:205. Doi: 10.3389/fvets.2017.00205.

CO-MORBIDITIES IN LAMENESS/REHABILITATION CASES: WHAT DO WE DO?

Valerie Moorman, DVM, PhD, DACVS-LA

INTRODUCTION

It is common for horses that have a musculoskeletal injury that is receiving rehabilitation to have other ongoing conditions or co-morbidities. This may include axial skeleton pain that is either primary or secondary, as well as other soft tissue or osseous musculoskeletal injuries. These conditions cannot be overlooked and many times require additional treatment in the overall rehabilitation plan. Additionally, some of these co-morbidities have contradictory treatment plans so creativity has to be included in the development of a rehabilitation plan and many of our therapeutic modalities may be used to help address these other conditions. In some of our older equine athletes, systemic conditions such as PPID and/or equine metabolic syndrome may be co-morbidities. Treatment of these conditions also needs to be addressed as they can be contributing factors in regards to tissue healing.

OVERALL CASE APPROACH

For the initial development of a rehabilitation plan, a complete history for the horse is important. This should include any management strategies that are necessary for a specific horse, currently administered medications, any known medical conditions, as well as any diagnostics/treatments that have been administered since this owner/trainer has been in possession of this horse. A complete musculoskeletal evaluation, including static, dynamic, and functional examination, as previously described in “Developing a Rehabilitation Plan” should also be performed to identify any additional abnormalities.

GASTRIC ULCERS

It is not uncommon for competition horses to receive anti-gastric ulcer medication for either known or suspect gastric ulcers. Common clinical signs include decreased performance, dull hair coat, signs of abdominal discomfort, and decreased appetite [1]. In a study of 50 actively showing horses, 58% of horses had gastric ulcers [2]. In a study of Thoroughbred racehorses, 82% of horses that were in active training had evidence of squamous ulcers, of which 39% of horses had clinical signs consistent with gastric ulcers [3]. In a group of 30 high-level endurance horses, the prevalence of gastric ulcers during the competition season was 93% [4]. These studies demonstrate that it is common for these horses to have gastric ulcers even if clinical signs are not apparent.

There are also several management changes that occur in horses with musculoskeletal injuries. First, it is also common for horses with musculoskeletal injuries to receive pain medications, such as NSAIDs. A recent study identified that prevalence of gastric ulcers was increased after a 10-day course of either phenylbutazone or firocoxib [5]. Second, horses with injuries often have drastic changes to their environment, such as stall rest and changes to diet. Both of these can increase the risk of gastric ulcers [1]. Thus, a history of either diagnosis or treatment of gastric ulcers may indicate that gastric ulcer prophylaxis may be indicated, especially in horses that are receiving NSAIDs. Dietary modifications, such as continuous access to hay may also need to be employed.

AXIAL SKELETON PAIN

Back pain is becoming an increasingly investigated area of poor performance and behavioral abnormalities in horses. It is not always clear in every case whether the pain is primarily due to an abnormality within the spine or if back pain is secondary to a musculoskeletal abnormality within a hindlimb. In a large group of dressage horses in the United Kingdom, the prevalence of back pain was 25% [6]. In general, the degree of back pain and the degree of lameness need to be examined to see if they correlate. For instance, horses with primary back pain tend to be sound to minimally lame, while horses with secondary back pain have more severe lameness.

Primary Sources of Pain

Thoracolumbar and sacral pain are well documented causes of poor performance in the horse [7]. In one study of Warmblood horses, approximately 75% of horses with back pain had a lameness [8]. There are a number of clinical signs that are common with horses with primary back pain. These include inability to work, poor performance, alterations in limb placement, and mild lameness [7]. The most common sources of back pain reported in a study in 2016 were kissing spine and thoracolumbar facet osteoarthritis [7].

Treatment of primary back pain has included local injections with corticosteroids, extracorporeal shockwave therapy, bisphosphonates, muscle relaxers, and complementary therapies, such as chiropractic and acupuncture. Additionally, exercise is often modified in these horses; however, many of these horses do benefit from some degree of exercise as they are being treated for their primary pathology.

ENDOCRINOPATHIES

Middle aged to older horses are often at peak competition age and have often demonstrated their athletic abilities making them worthwhile rehabilitation candidates. It is this population of horses that are also commonly affected by endocrinopathies, such as pituitary pars intermedia dysfunction (PPID) and equine metabolic syndrome. The prevalence of PPID in the older equine population has been estimated to be 15 to 30% with the identification of clinical signs in horses between the ages of 18 and 20 [9]. Equine metabolic syndrome (EMS) is characterized by obesity and insulin dysregulation, and these clinical signs may be found in 18 to 50% of horses [10]. Additionally, there are many horses that have overlapping signs of PPID and EMS, with up to 30% of PPID horses showing regional obesity and 60% showing insulin resistance [9]. EMS and insulin resistance/insensitivity are more common in inactive animals, making overweight horses more at risk for complications with this when they are being rested for a musculoskeletal injury.

It is well known that horses with endocrinopathies, such as PPID and EMS, are at increased risk for laminitis. This is thought to be from altered insulin regulation and or sensitivity and abnormalities in cortisol metabolism [9]. However, there are a number of other potential effects from the endocrinopathic imbalances in these horses. Free, unbound cortisol, which is the active form, has been identified at higher concentrations in horses with PPID in comparison to healthy horses [11]. Additionally, an increased quantity of glucocorticoid receptors has been found within the suspensory ligaments of horses with PPID, as well as an increase in the enzyme 11 β HSD1, which converts cortisol to its active form [12]. In this same study, the suspensory ligaments of PPID horses had evidence of degeneration (proteoglycan accumulation). Exogenous corticosteroids have been found to have negative effects in both

animal models and humans, which has resulted in rupture, decreased mass, and decreased load to failure [13].

In both people and animals, obesity has been associated with systemic low grade chronic inflammation. Recently, resistin, which is an adipokine that has been associated with metabolic problems and inflammation was identified in horses with severe insulin dysregulation [14]. Additionally, in these horses, there was an increase in serum amyloid A indicating an inflammatory status in them. A prolonged inflammatory stage can be detrimental to healing.

Treatment of EMS, i.e., obesity and insulin dysregulation, typically revolves around weight-loss and dietary restriction. In a recent study, low-intensity exercise in conjunction with exercise was shown to improve insulin sensitivity and decrease systemic inflammation (serum amyloid A) in a group of obese horses [15].

CONCLUSIONS

There are a number of co-morbidities that can affect horses with musculoskeletal injuries, including gastric ulcers, axial skeleton pain, and endocrinopathies. It is important to incorporate these into an overall treatment plan. Special considerations should be taken into account for older, obese horses as they may not respond to treatment as expected. Investigation of endocrinopathies may be warranted and additional medications and dietary modifications should be made as indicated. Low-intensity exercise is also an important consideration, and should be included to the degree that is dictated by the primary injury of the horse.

REFERENCES

1. Reese RE and Andrews FM. (2009) Nutritional and dietary management of equine gastric ulcer syndrome. *Vet Clin North Am Equine Pract* 25:79-92.
2. McClure SR, Glickman LT, Glickman NW. (1999) Prevalence of gastric ulcers in show horses. *J Am Vet Med Assoc* 215:1130-1133.
3. Vatisstas NJ, Snyder JR, Carlson G, Johnson B, et al. (1999) Cross-sectional study of gastric ulcers of the squamous mucosa in Thoroughbred racehorses. *Equine Vet J Suppl.* 29:34-39.
4. Tamzali Y, Marguet C, Primenko N, Lyazri F. (2011) Prevalence of gastric ulcer syndrome in high-level endurance horses. *Equine Vet J* 43:141-144.
5. Richardson LM, Whitfield-Cargile CM, Cohen ND, Chamoun-Emanuelli AM, Dockery HJ. (2018) Effect of selective versus nonselective cyclooxygenase inhibitors on gastric ulceration scores and intestinal inflammation in horses. *Vet Surg* 47:784-791.
6. Murray RC, Walters JM, Snart H, Dyson SJ, Parkin TDH. (2010) Identification of risk factors for lameness in dressage horses. *The Vet J* 184:27-36.
7. Riccio B, Frascchetto C, Villanueva J, Cantatore F, Bertuglia A. (2018) Two multicenter surveys on equine back-pain 10 years a part. *Front Vet Sci* 5:195.
8. Landman MAAM, De Blaauw JA, van Weeren PR, Hofland LJ. (2004) Field study of the prevalence of lameness in horses with back problems. *Vet Record* 155:165-168.
Doi:10.3389/fvets.2018.00195.

9. McFarlane D. (2011) Equine pituitary pars intermedia dysfunction. *Vet Clin North Am Equine Pract* 27:93-113.
10. Durham AE, Frank N, McGowan CM, Menzies-Gow NJ, et al. (2019) ECEIM consensus statement on equine metabolic syndrome. *J Vet Intern Med* 33:335-349.
11. Hart KA, Wochele DM, Norton NA, McFarlane D, et al. (2016) Effect of age, season, body condition, and endocrine status on serum free cortisol fraction and insulin concentration in horses. *J Vet Intern Med* 30:653-663.
12. Hofberger SC, Gauff F, Thaller D, Morgan R, et al. (2018) Assessment of tissue-specific cortisol activity with regard to degeneration of the suspensory ligaments in horses with pituitary pars intermedia dysfunction. *Am J Vet Res* 79:199-210.
13. Galdiero M, Auriemma RS, Pivonello R, Colao A. (2014) Cushind, acromegaly, GH deficiency and tendons. *Musc Lig Tendons J* 4:329-332.
14. Fuentes-Romero B, Munoz-Prieto AM, Ceron JJ, Martin-Cuervo M, et al. (2022) Measurement of plasma resistin concentrations in horses with metabolic and inflammatory disorders. *Animals* 12:77. doi.org/10.3390/ani12010077.
15. Bamford NJ, Potter SJ, Baskerville CL, Harris PA, Bailey SR. (2018) Influence of dietary restriction and low-intensity exercise on weight loss and insulin sensitivity in obese equids. *J Vet Intern Med* 33:280-286.

EQUINE REHABILITATION CASES

Valerie J Moorman, DVM, PhD, DACVS-LA

INTRODUCTION

There is no exact science to the design of a rehabilitation plan for a specific horse. Frequent re-assessments of the horse to determine response to a specific treatment plan is important to fine tune the plan. This is a very dynamic process and can go quickly in some cases and be prolonged in others. Making sure that owners and trainers are on the same page throughout the rehabilitation process is important.

REHABILITATION PLAN DEVELOPMENT

When devising an equine rehabilitation plan for a specific case, there are a number of variables that need to be considered. First, is the horse going to be housed at a rehabilitation center being overseen by a veterinarian (i.e., you) or is this a plan that you are devising that will be implemented by an owner, trainer, or caretaker. This can not only dramatically change what modalities and tools that will be employed, but can also change the amount of time per day spent on rehabilitation of the case. Second, the stage of injury (acute versus chronic) and the degree of injury will be important in determining what type of rehabilitation can be performed both in intensity and duration. It is key to think about the stages of rehabilitation when thinking about an injury: pain, proprioception, flexibility, strength, and endurance. If a horse is painful, it will not be able to progress to the next phase of rehabilitation. Thus, this horse will require more pain controlling modalities during this phase so that it can move up the rehabilitation ladder.

HOUSING/ENVIRONMENT

The housing and direct environment for a horse undergoing rehabilitation is a key parameter to assess. If a horse is going to be undergoing a rehabilitation plan at its normal stable, there are a number of factors that need to be assessed. Will this horse tolerate stall rest? What was this horse's previous schedule? Where in the stable will the horse be kept? What is the schedule of the other horses? Does this horse need a companion (horse/goat/etc)? Are additional medications/sedatives necessary for the horse and handlers to stay safe?

Environmental enrichment can be very helpful for many horses. This may include the ability of a horse to put its head out the window or walk out into a small run off the stall. Treat balls can also be useful to divert a horse's attention. Feeding hay in a hay net or a slow-feeder net can increase the amount of time it takes a horse to eat its hay, which may decrease boredom.

Many of the horses undergoing rehabilitation are high level athletes and are used to having attention by their owner, trainer, or caretaker on at least a daily basis. It is important that these horses continue to have this attention not only by receiving direct rehabilitation exercises, but also through grooming.

While stabling is a key parameter to consider, it is also important to think about the non-stall environment. What kind of footing is available when the horse is outside of the stall to be exercised? If there is an arena, what kind of footing is there? How will exercise be carried out in implement weather? Is there an indoor area that can be utilized?

REHABILITATION GOALS

When devising the initial rehabilitation plan, it is key to make a list of rehabilitation goals. This will typically include addressing the area of injury and any significant co-morbidities. Typically, the rehabilitation plan will include more modalities and may cover more co-morbidities at a rehabilitation center. However, there are some stables with a significant collection of equipment and dedicated personnel to provide substantial physiotherapy.

STAGES OF REHABILITATION

Pain

When beginning a rehabilitation program, it is very common to treat pain from the injury. This may include systemic or local pain medications, most commonly NSAIDs. Even if a horse does not require pain medication initially, some may require some as they start to progress through a program. Ice or some form of cryotherapy is both anti-inflammatory and aids in pain management. It is most helpful following exercise. For horses with muscle pain or those with restricted movements in some part of their body, heat can be used pre-exercise to improve blood flow and increase elasticity of tissues.

As one of the cardinal signs of inflammation is pain, anti-inflammatory methods can also be employed to indirectly treat pain. These can include laser and therapeutic ultrasound.

Proprioception

Proprioception and neuromuscular control are the next key stage in rehabilitation. These pathways involve the integration of sensory signals to provide motor feedback. Core exercises and perturbations are part of this stage of rehabilitation. This includes sternal lifts, wither pulls, tail pulls, and lumbosacral tucks.

Balance exercises are also included in this stage. Altering surface type, while both standing and walking, are utilized in this stage. Standing a horse on proprioceptive pads can challenge a horse's balance and the level of stiffness of the pads can be adjusted as a horse progresses through a rehabilitation program. Additionally, once horses can stand effectively on these pads, perturbation exercises can be added.

Flexibility

Flexibility is often addressed for both whole horse and the primary area of injury. Many of the core exercises are also used to achieve flexibility throughout the axial skeleton. Ventral baited or carrot stretches can be used to achieve flexibility in both cervical and thoracolumbar regions, depending on the level of the horse's nose: chest, carpus, fetlocks. Likewise, lateral baited stretches help achieve flexibility from cervical to thoracolumbar spine, and the flexibility through the thoracolumbar spine increases the further the horse brings its head around.

Passive range of motion of a specific joint region can help maintain flexibility in an injured area. In more chronic injuries, heat may be needed first prior to these range of motion exercises. Incorporating the therapeutic ultrasound using continuous settings can heat the tissues and then range of motion exercises can be performed. During dynamic tasks, such as walking, joints are taken through an active range of motion. Using tactile stimulators, walking a horse over poles, or walking a horse in water (underwater treadmill) can also increase joint range of motion.

Strength

Strength is achieved by loading a tissue. This is done incrementally in a rehabilitation program. This typically begins with hand-walking. Addition of weight (saddle, saddle bags, weighted surcingle, light rider) is added incrementally so that an injured tissue is allowed to respond to the load and remodel. As a horse progresses further into a program, the level of work increases so that faster gaits are added. The addition of resistance band systems, such as the Equicore Equiband system®, can be used to add proprioceptive stimulation which also helps with strength training. The addition of hill work can be added to change the type of load on a tissue. Eventually, sports specific activities are added in.

Endurance

It is impossible for a horse to be able to go back to work without developing some degree of endurance. As a horse gains strength through increases in intensity and duration, it also develops endurance. Endurance is important in prevention of re-injury of a tissue, as fatigue can result in tissue failure. While the amount of daily exercise is important for endurance, so is the amount of weekly exercise. However, while it is important for horses to undergo controlled exercise, they also should have rest days, especially when they are receiving more exercise. Providing a rest day or two spaced out in a weekly exercise regimen is important. The daily exercise routine can also be varied in intensity. Incorporation of low-level exercise days interspersed with more intense exercise can be beneficial in building endurance.

CONCLUSIONS

It is important when devising a rehabilitation plan for a specific case that many horse, caretaker, and environmental factors be considered. Keep in mind the main goals, which can change over time. Also consider which stage or stages of rehabilitation that need to be addressed at a single point in time.

DELIVERING A SUCCESSFUL PREPURCHASE EXAMINATION

Harry W. Werner, V.M.D.

Part 1: Introduction, Ethics, Workflow and Communications

Litigation against veterinarians performing prepurchase examinations sees most cases settled for the plaintiff *not* due to breaches of sound medical practice, but to the failure to record and report examination findings properly and communicate clearly and proactively with the client.

Veterinarians can minimize the risk of such claims if they: 1. Identify areas of potential liability connected with this service; 2. Craft a deliberate, stepwise process for performing the service; 3. Create a comprehensive record of information gathered from the prospective buyer, seller, and designated agents; 4. Document all findings and communications linked to the service accurately and completely; 5. Communicate proactively and in understandable terms with all parties involved throughout the process; 6. Create a carefully worded, accurate final report for the prospective buyer; and 7. Include in the final report a statement of disclaimer, such as: “This prepurchase examination report is a record of the examination findings and my interpretation of those findings; it is not a recommendation to purchase or not to purchase (name of horse).”

This session will discuss the history of the examination of horses for sale and the legal and ethical elements that must be considered in delivering a successful prepurchase examination. Prepurchase examination of horses for racing, breeding soundness and at auction sales as well as actual fees for services will *not* be discussed. The use of a “pre-flight checklist” approach to facilitate a smooth and thorough operational process will be explained and templates for recording and reporting information will be presented.

In one form or another, the examination of horses for sale is a procedure that has existed for centuries and was performed by horsemen and farriers long before veterinary medicine existed as a recognized profession. It has evolved exponentially in its scope, use of technology and legal implications over the past 50 years. Today, a properly performed examination remains heavily dependent upon the “*art of practice*” and, thus, competency in performing this service is an acquired skill.

The prepurchase examination has rightly assumed a prominent role in equine practice and is a frequently requested service. When done properly, it is supportive of the horse industry, can benefit the horse’s health and can enhance practice growth and profitability. A successfully delivered prepurchase examination is a thorough and relevant examination that incorporates a thorough disclosure of the horse’s health at the time of the physical examination and includes indications of any clinical abnormalities that deserve remedial or management attention. Such a service provides information that can help the prospective buyer make an informed decision regarding purchase and reinforces the value of such professional veterinary services to all parties involved (seller, agents, prospective buyers, etc.).

To the contrary, an unsuccessful prepurchase examination can be defined as a service that specifically directs the buyer whether or not to purchase the horse. Such an experience often leaves the prospective buyer with unanswered questions or concerns, can marginalize the seller and/or can leave significant clinical abnormalities which require remedial action undisclosed.

The prepurchase examination is fertile ground for communication error, displeasure and litigation. As equine practitioners we must communicate and deliver perceived value to our clients. To do so, we must utilize available tools and technologies and educate/empower our veterinary and lay staff. The prepurchase examination challenges us to address client expectations, develop examiner confidence, avoid conflicts of interest, understand our liability exposure, provide timely and proactive communications, deliver services effectively and efficiently maintain comprehensive and inter-operable medical records.

Prepurchase examination myths. Many individuals in today's horse-buying public assume certain *myths* to be true. They often believe that buying a horse should be “*risk free*”, i.e. If something ‘goes wrong’ after the sale...someone must be at fault. They place high-levels of confidence in *technology* and assume it will point indisputably to the right sale decision for them. They commonly believe that the prepurchase examination can predict a horse's future health, athletic success, behavior and even appreciation as an asset. Often, prospective buyers will erroneously assume that the examination is an appraisal of current *financial value*, a predictor of *athletic ability*, an assessment of *suitability* for a particular rider or driver and/or a recommendation to *buy or not to buy*. Myths and faulty assumptions are best addressed by clear, relevant, and pre-emptive communication between the veterinarian and the prospective buyer and/or authorized agents.

Informed consent is an element of equine clinical practice that, in this author's opinion, is often over-looked – and not just within the prepurchase examination venue. The consequences of overlooking the importance of obtaining informed consent can be serious. We must pay attention to the details specific to each prepurchase examination, to respect the legitimate rights and expectations of both prospective buyer and seller and to document every case-related interaction with all parties involved.

Self-confidence in performing prepurchase examinations can be lacking and can increase the chances for error. This situation may be due to unfamiliarity with a specific intended use, anxiety regarding risk exposure, insufficient clinical education and/or experience, the lack of the necessary technical equipment and/or an inadequate support staff; these factors can introduce risk of liability and create anxiety for the equine practitioner.

The American Veterinary Medical Association's Professional Liability Trust (PLIT) perennially lists prepurchase examinations as the most common legal action taken against equine practitioners and, in dollars, second only to human injury claims. Nondisclosure of pre-existing issues missed lameness, misinterpretation of radiographs, conflicts of interest and incomplete examinations are frequently complaints that result in claims by unhappy buyers.

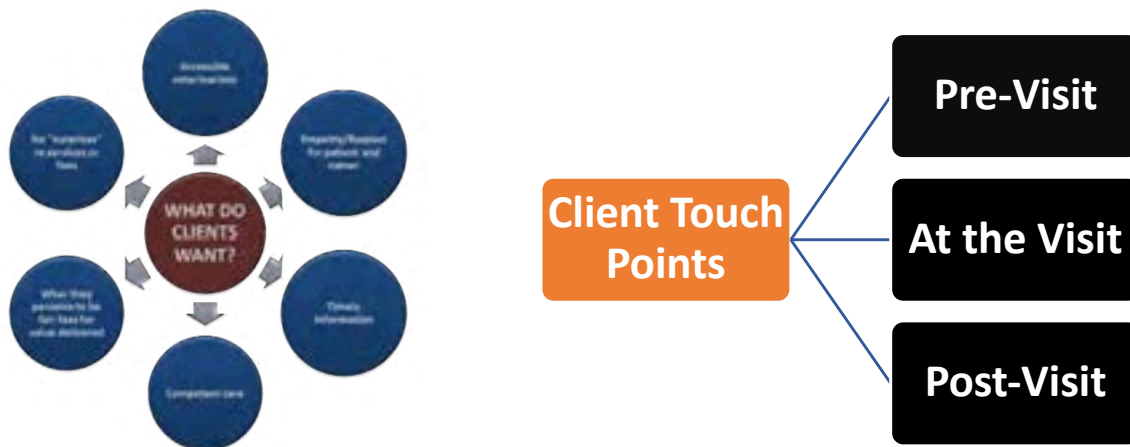
The key to delivering a successful prepurchase examination easily and effectively lies in developing repeatable and successful processes for clinical procedures/administrative elements that involve lay staff as well as the examining veterinarian. Identify your service goals, plan out timely/accurate gathering, sharing, and recording of case-related information and perform a competent, professional physical examination. The process concludes with a timely, accurate report delivered to the prospective buyer that invites feedback. The end-results should be a positive perception of value by all parties, minimal liability risk exposure for the practice, comprehensive/accurate/inter-operational medical records and, hopefully, repeat client contact.

In communications with the parties involved, it is equally important to understand and convey what a successful prepurchase examination is not. It is not a service or experience that (1)

directs the prospective buyer whether or not to purchase the horse; (2) leaves the prospective buyer with unanswered questions or concerns; (3) unprofessionally marginalizes the seller or (4) fails to disclose significant clinical abnormalities that may require remedial action.

Make every effort to understand what your clients want regarding the service .. and then decide and communicate what you can deliver. Timely, pro-active communication is paramount.

Define your Standards of Patient Care and Client Service for the overall examination service and develop a consistent **practice message** that practice members deliver at every opportunity for interaction with the parties involved (“Touchpoints”). Be proactive, make “*No Surprises*” your mantra regarding patient care, client service, fees and communications. **Automate**: create repeatable processes using tools (software, templates, etc.) and staff to deliver better patient care and client service. **Delegate**: tasks that can be performed by non-veterinarians to your staff. **Deliver**: great service at all Touchpoints. **Evaluate** the success/failure of your standards and processes. **Adapt** as the needs of your client and patient bases, skill sets/tools, the marketplace and practice change.



Pre-Visit actions include initial contact information gathering, veterinarian-client discussion of proposed service, pre-visit information conveyed to client and/or authorized agent(s).

At the Visit – see Part 2 below.

Post-Visit Actions include reviewing and finalizing the written report, delivery of report, invoice and receipt to Prospective Buyer and/or authorized agents; delivery of report copy to regular veterinarian, etc.

Part 2: At the Visit: The Physical Examination

This section covers on-site communications and procedures before, during and after performance of the actual physical examination and ancillary studies at the visit - as well as management of the various circumstances that can affect the quality of the examination results and/or client satisfaction. Arguments both for and against the use of kinematic analysis (aka – “lameness locator”) in the prepurchase examination will be presented.

Customize the experience for each specific client within the framework of what is possible. Determine your Standard of Care based on expressed intended use, history of horse and client input.

Utilize a *pre-exam, exam, post-exam* approach at the visit.

Elements of the ***pre-exam*** include appropriate introductions, patient history review (as previously collected by the veterinarian or staff), completion of the liability release template, initial data entry into the worksheet and identification photos of the horse.

Components of the ***actual physical examination*** should consist of studies and techniques chosen by and familiar to the veterinarian and performed in her/his chosen sequence.

During the ***post-exam*** period, report and discuss all findings with the prospective buyer and/or authorized agent(s), invite any questions and concerns and clearly explain when any pending data (e.g., laboratory tests) can be expected to be reported. Document all such interactions.

User friendly templates and processes can facilitate the proper construction and timely delivery of the written report to the buyer. Performing “*remote prepurchase examination consults*” (i.e., evaluation of examiner’s report and supporting information absent your actual physical examination) can introduce the risk of professional liability but this risk can be minimized using specific precautions.

Part 3: Case Studies and Considerations

The final section will be interactive and will present actual cases for the audience to consider and comment upon. Cases will be illustrated with still and video images and will include a variety of medical, physical and behavioral abnormalities as well as ethical/legal challenges.

References

1. International Museum of the Horse. **What we theorize: when and where did domestication occur?** Available at: www.imh.org. Accessed March 9, 2012.
2. Youatt W. **History, treatment and diseases of the horse.** Philadelphia: JB Lippincott; 1868. P. 361.
3. Bhreatnach C, Bhreatnach A. **Portraying Irish Travelers: histories and representations.** Newcastle upon Tyne (England): Cambridge Scholars Publishing; 2000. P. 15.
4. Stevart DR. **The law of horses.** Family library of veterinary medicine. Medford (MA). Cummings School of Veterinary Medicine. Tufts University.
5. Beeman GM, Soule SG, Swanson TD. **History and philosophy of the medical examination of horses for purchase.** VCNA: Equine Practice 1992; 8(2); 258.
6. **Online Etymology Dictionary.** 2010 Douglas Harper. Available at: www.etymonline.com. Accessed March 9, 2012.
7. **US Army Medical Department: Office of Medical History.** Available at: www.history.amedd.army.mil. Accessed March 9, 2012.
8. Vaughan JT. **Professional Liability in equine practice, risk management and loss control.** AAEP Proc 2008; 54:112.
9. Armatage G. MRCVS. **The horse: management in health and disease.** London (England): Frederick Warne & Co; 1893.

10. O'Grady D. **Physician revives a dying art.** The New York Times, October 11, 2010.
11. Port M. **Everybody's doing it.** American Express Open Forum Small Business, Available at: www.openforum.com. Accessed February 3, 2010.
12. Haynes AB, Weiser TG, Berry WR, et al. **A surgical safety checklist to reduce morbidity and mortality in a global population.** N Engl J Med 2009; 360:491-9.
13. Snow D. **Service Excellence in Veterinary Practice: It Does Matter.** 57th Annual Convention of the American Association of Equine Practitioners. San Antonio, TX. November 17-20, 2011.
14. Scoggins G. **Legal considerations concerning patient medical records.** AAEP Proc. 2005; 51: 515-9.
15. Meagher D. **A review of equine malpractice claims.** AAEP Proc. 2005; 51: 508-14.
16. Moyer W, Werner H. **Risk reduction in the reporting of the purchase examination.** AAEP Proc 1999; 45:24 – 6.
17. Moyer W, Werner H. **Purchase examination guidelines for risk reduction.** Forensics and Risk Management. Proc. Of the 70th Western Veterinary Conference. Las Vegas (NV); 1998. P. 92-8.
18. Werner H. **Prepurchase examination in ambulatory equine practice.** VCNA: Equine Practice 2012; 28(1); 207 - 247.
19. Werner H. **Legal Considerations for Prepurchase Examination.** Merck Animal Health PARTNERS IN PRACTICE 2012.

EXAMINATION OF THE EQUINE FOOT

William Moyer, DVM, ACVSMR

Harry Werner, DVM

Stephen O'Grady, DVM, MRCVS

INTRODUCTION

This presentation is intended to deal with the most basic and important aspect of veterinary practice and that is conducting a "hands-on" examination. The physical examination is the beginning point; it is the one aspect of veterinary medical practice that is expected, affordable to the consumer, and remains the single most useful overall determinant in arriving at a diagnosis or diagnoses; treatment without an accurate diagnosis is problematic. The intent is to be complete, consistent, and ultimately it will become habit. Over the past few years our knowledge of anatomy;^{1,2} technological advances in imaging;^{3,4} and the use of diagnostic anesthesia⁵ have advanced. A consistent and thorough physical examination in combination with an accurate history is often the only entity to 'point the way' to a diagnosis.

The success of any physical examination is dependent upon a working knowledge of anatomy, **the ability to control the animal**, experience and a willingness to be thorough and consistent. Imaging advances, however, have limited value without an accurate history and thorough examination. The old platitude, "more diagnoses are missed from not looking rather than from not knowing" persists. This paper is about the "Looking part."

Foot problems, considered as a group, are generally thought be amongst the most common cause of lameness in horses. The list of conceivable insults and problems is extensive. Foot and shoeing problems are thought to influence or act as initiators of problems elsewhere on the muscular-skeletal system. Any given foot may demonstrate several co-existing abnormal findings or be found concurrent with problems elsewhere on the muscular-skeletal system. Abnormal findings must be interpreted with the whole horse and in light of the clinical history. A practiced and consistent examination procedure is likely to provide accurate results.

The following list represents possibilities by their location:

coronet - direct trauma/bruising, foreign body penetration and infection, laceration, avulsion, displacement, dermatopathies (fungal, chemical, allergic, parasitic, neoplastic, idiopathic), and cracks and scars.

hoof wall - cracks at any location (to include the bars), wall separations, wall loss or avulsions, hoof wall growth abnormalities (focal absence of growth and shape changes such as flares, dishing, bulging, and ring formation), excessive or inadequate growth, and poor hoof quality (flaky, brittle, excessively soft/weak).

sole - subsolar bruising; external solar penetration and infection; solar laceration or loss/avulsion; solar prolapse via the 3rd phalanx (severe laminitis); excessively thin, weak, and/or flat.

laminae tissues - laminitis, keratoma, infection, hematoma and tearing, invasion via canker/sarcoma/squamous cell carcinoma, abnormally cornified, wall separation, "white line disease," disorientation of laminae patterns such as selenium toxicity.

frog - thrush, canker, penetration and infection, loss via avulsion, bruising, and atrophy.
heel bulbs - direct trauma and bruising, laceration, avulsion, dermatopathies (fungal, chemical such as “soring” practices, allergic, parasitic, neoplastic), abscessation and infection, and cracks.

navicular bone - absence (agenesis), navicular disease, fracture, ligamentous damage (impar and suspensory ligaments), osteomyelitis, proximal displacement (impar ligament disruption), and incomplete ossification.

navicular bursa - non-infectious and infectious bursitis and partial or complete obliteration.

deep digital flexor tendon and sheath – tendonitis (degenerative, adhesive, infectious), severance or detachment at the 3rd phalanx, and flexor tendon contracture.

Ligaments – desmitis, calcification, disruption of the medial and lateral collateral ligaments of the coffin joint, impar and suspensory ligaments of the navicular bone.

digital cushion - atrophy, absence, penetration and infection, canker or thrush.

third phalanx - fractures (types I-V); septic osteitis; bone loss, rotation and/or displacement within the hoof capsule; absence (agenesis) and incomplete ossification; pedal osteitis (this is a radiographic finding and not be considered a diagnosis); focal loss of bone as a result of space occupying lesions (keratoma); avascular necrosis; extensor process damage (fractures and calcification of common/long digital extensor tendons).

coffin joint - arthropathies (infectious, traumatic, iatrogenic, subluxation, luxation), ligamentous damage [collateral ligaments], osteochondrosis, and intra-articular fractures of 2nd or 3rd phalanges); extensor process damage (fractures, common/long digital extensor tendinitis at attachment, focal calcification of common/long digital extensor tendons (can be mistaken for an extensor process fracture).

collateral cartilages (medial and lateral) - ossification (sidebone), infection or aseptic necrosis (quittor), and fracture.

palmar digital artery - occlusion (thrombus) and transection.

palmar digital nerve - transection and neuroma

The above abnormalities often exist in combinations. For example, the same foot may demonstrate third phalanx rotation, septic osteitis and bone loss, penetration of the sole; deep flexor tendon contracture, and subsolar infection. Horses with quartercracks often show evidence of subsolar bruising, long toe/low heel conformation, and radiographic evidence of P3 marginal changes (so-called “pedal osteitis”). Failure to recognize the total situation could easily lead to inappropriate/incomplete therapy and/or inaccurate appreciation of the prognosis.

HISTORY

Obtaining a useful and accurate history is critical to performing a good examination. Hopefully, it is an ability that improves with experience and coaxing useful information from clients/owners/trainers/farriers. It is also very important to understand that the useful and critical information may not be known or forthcoming. Many feet are affected, for better or worse, by horseshoeing. The art and science of horse shoeing in an ancient practice but unfortunately clear and universally accepted terminology exists but is not universally utilized. The questions asked in obtaining a good history will vary with the patient. Many

answers are often obvious and assumed, while others must be pursued and based on the individual. The following represents some salient questions and their rationale:

1. What is the presenting problem and how long has it existed? Does a pattern of problems exist? 2. The breed, and as important the sport type, may provide information regarding the likelihood of certain foot problems. There appears to be a predilection for certain problems based on sport type and breed. 3. Establish when the horse was last shod or trimmed and did the farrier discover any problems or has had to deal with ongoing shoeing problems? 4. Evaluate the environment that the horse lives in, trains on, and competes on: and the management scheme the horse is subjected to. In the authors' experiences, the **environment and management play a major role in the condition of the hoof capsule and the genesis of foot damage**. 5. Ask how the horse has been shod in the past (with what type of shoe and at what intervals). A change in shoe types may be the problem as well as the solution. 6. Information about the previous history of foot problems and other lameness problems is essential. 7. Obtain reasonable detail about the previous treatments if you are examining the horse for the first time. 8. Discussing the horse and problem(s) with those involved and the horse's farrier can be problematic – **thus ask and suggest rather than criticize**. A private conversation with the farrier may be indicated.

EQUIPMENT

Specific equipment is necessary to completely examine the foot. The use of some equipment requires expertise and experience to be used properly. The following is a suggested list: 1. **hoof testers** 2. **shoe pullers** 3. single nail ("crease") pullers 4. **hoof knives and sharpening tools** (a dull knife can be useless as well as dangerous). 5. **Rasps** 6. clinch cutters. 7. hoof nippers. 8. **shoeing apron (for safety and grip of the lower limb or foot)** 9. **shoeing hammer**. 10. **flexible probes** (exploring abscesses, tracts, and defects). 11. **portable motorized tools** (variable speed) 12. **wire foot brushes** (significantly improve the ability to thoroughly examine the weight bearing structures as well as enhance radiographic quality). 13. **Hoof gage** (hoof protractor) is optional. 14. **Digital camera!!!!** This is invaluable at some many levels.

Most of this equipment has obvious application and requires very little explanation.

EXAMINATION PROCEDURE

The feet and horse are best examined initially at a distance of approximately twenty feet on a flat surface. This allows for comparison of all four feet. One is assessing the size, shape, toe and heel length, approximate angles (toe, heels, quarters), and the position of each foot relative to each limb (limb conformation) and to each other. Subtle differences in foot shape and angle are best appreciated at a distance. Overall conformation should also be assessed as it clearly affects foot shape and wear.

Examination in the Weight Bearing Position

Each foot is examined with the leg in the weight bearing position. Palpate and carefully examine the following areas:

- Palpate the palmar digital vein, artery and nerve bundle. Check for neurectomy scars (clipping the hair and/or wetting the skin may assist in their detection if necessary or suspected). Lightly palpate the character of the arterial pulse and compare with other

limbs if in doubt as to whether it is normal or abnormal A very useful test, especially when examining horses without clear evidence of where on the limb or limbs the lameness (or performance related problem) is originating from is to subjectively evaluate the digital pulse intensity prior to exercise – followed by an immediate (as the horse pulls up) evaluation.

- Examine the heel bulb area. This is a common site of various dermatopathies, damage from trauma, as a point of exit for underlying focal and generalized infections. The position of one heel bulb to its mate.
- Palpate the deep digital flexor tendon and the digital sheath at the level of the pastern and continue the palpation as the structures disappear into the heel bulb region.
- Palpate and manipulate the collateral cartilages (medial and lateral).
- View and palpate the coronet from the medial and lateral heel bulbs to the central toe region. On the normal foot the coronet should sweep evenly.
- The approximate location of the dorsal aspect of the coffin joint is just proximal to and under the palpable coronary cushion and thus should be palpated to appreciate the presence or absence of joint effusion. Coffin joint effusion is often subtle, thus, compare the feel with other feet.
- Palpate and examine the entire hoof wall carefully for the presence of fissures, cracks, bulges, growth abnormalities, local heat, wall loss or breakage, etc. Often quarter and heel cracks begin as very fine fissure defects, these fissures can be easily missed but may be a cause of foot pain and lameness. Note the quality of the horn and the presence of variation away from the normal parallel horn arrangement. Examine the nail exit position relative to the bearing surface of the foot

Gently tap the hoof wall with a closed pair of hoof testers or a shoeing hammer as one may detect evidence of pain or wall separation.

Reminder – hind feet deserve the same degree of consistent evaluation as do the front feet.

Examination with the Foot in the Non-Weight Bearing Position

Each foot is then examined in the non-weight bearing position. Again, it is good practice to wear a shoeing apron to protect yourself. Learn how to assume the stance and posture that an experienced farrier uses as this will provide greater comfort for both the examiner and the horse as well as place the examiner in a better mechanical position. The suggested procedure is as follows with the **unshod foot**.

1. Begin by cleaning the bottom of the hoof using the dull side of a hoof knife, steel brush, hoof pick or the handle of the hoof testers to accurately visualize the frog, sulci of the frog, sole, and white line if the horse is unshod. The cleaner the bearing surface of the foot the greater the likelihood of finding abnormalities (example- bar cracks, subsolar bruising). Assess the symmetry of the bearing surface.
2. The bulbs of the heels are examined to determine their relative position (height) to one another. The strength of the caudal foot is assessed manually by attempting to distract the two bulbs from one another in a vertical direction as well as determining caudal foot mass.⁶

3. Lightly support the leg at the cannon bone and allow the foot to drop naturally. Position your line of vision so as to appreciate foot balance and levelness of the walls. Examine the entire bottom of the foot to determine the relative proportion that the divisions of the foot (toe, quarters, heels, and frog) occupy. Imagine a line drawn through the center of the axial skeleton of the limb, transecting the bottom of the foot and then determine the relative proportion of the medial and lateral foot to this imaginary line.

4. The foot is next examined with **hoof testers**. It is prudent to always begin hoof tester application with light pressure to make a subjective evaluation regarding the individual horse's response. Abnormal responses should be compared to the other feet and repeated to be sure they are consistent. A suggested sequence is by beginning with the medial bar to the medial heel wall. Place the testers on the medial sole to medial heel wall and continue at approximately 1" intervals to the lateral wall and lateral bar. Be sure to include each exit point of the shoeing nails. At each interval look carefully at the junction of the wall and sole as you are not just attempting to determine the presence or absence of pain but also is characterizing the strength and character of the hoof capsule. Place the testers at the medial quarter wall, midway between the bearing surface of the foot and the coronet, to the lateral middle aspect of the frog. Repeat this procedure on the opposite side of the foot. Place the testers in the middle bearing surface of the frog to midway between the coronet and the bearing surface at the toe. Finally, place the testers across the medial and lateral quarters in an attempt to isolate the length of the navicular bone. Keep in mind that hoof testers are essential, but not foolproof. Hoof testers do not apply pressure to the foot in the same direction and manner that the foot experiences with contact with the ground and the depth and strength of wall and sole material have a protective influence. Gently tap the structures on the bearing surface of the sole and frog with the rounded end of either closed hoof testers or a shoeing hammer. Palmar flexion of the lower limb is performed with the fetlock in somewhat of a fixed position. One is manipulating both the pastern and coffin joints to determine range of motion and presence or absence of a painful reaction. Rotate (twist) the foot medially and laterally around the vertical axis of the pastern. In the event of a positive reaction, it is prudent to repeat this portion of the examination after the horse has been jogged to determine if this either creates or enhances lameness.

It is best to not remove a shoe or shoes prior to observing the patient in motion.

Examination with the Horse in Motion

This aspect of the examination of the foot is best accomplished with the horse being led, ridden/driven, or lunged on a flat, hard surface, if available. The authors prefer that horse and client be prepared to ride. Soft, forgiving surfaces like expensive arenas are not very helpful. The process begins at a walk. Depending on the appearance or lack thereof of lameness determines the next step – trotting, circles, intermittent application hoof tester pressure, flexion, torsion, or at higher speeds/over fences, etc. **Unless there is an obvious diagnosis, diagnostic anesthesia is necessary.**

- **References available from the author(s) on request.**



Practice Management Program



SELLING TO CORPORATE – FINANCIAL CONSIDERATIONS

Darren Osborne, MA

Arguably the most notable disrupter in veterinary medicine, corporate veterinary medicine has establishing a firm foothold in Ontario and appears to be gaining momentum. Every year there are more veterinary hospitals selling to corporate consolidators and every year there are more corporations coming into the market. The corporations hold their cards close to their chest but at the same time, they are very candid about their intentions to grow and their desire to improve the overall veterinary community. The following article answers questions veterinarians have about corporate medicine.

How Big is Corporate Veterinary Medicine?

Corporate veterinary medicine controls more than 10% of veterinary hospitals in Ontario and probably 20% of veterinarians. The term “probably” is used for the number of veterinarians because there is no record of veterinarians working in corporate practice. There is a record of corporate practices.

The percentage of veterinarians working for corporate practices is higher than the percentage of practices because corporate only buys larger than average practices. To minimize their risk and keep acquisition costs down, corporate players are more interested in practices with revenues of \$1.5 million or more, which have two or more veterinarians.

The percentage of specialty and emergency hospitals in Ontario owned by corporations is more than 30%.

When Does Veterinary Capitalism become Veterinary Corporatism?

What is the difference between a veterinarian who owns multiple practices and corporate? Externally, there are not a lot of differences. They both share brand names between hospitals. One of the big corporate players brands all their hospitals. Similarly, many (non-corporate) multiple practice groups also brand all their hospitals. The concept of branding hospitals is not new to veterinary medicine. Smaller veterinary hospitals have been branding their main and satellite clinics for ever.

There are a lot of internal similarities between corporate and multiple practice groups as well. Both multi-practice owners and corporations are run by veterinarians or people with a lot of experience in the veterinary industry. In the tug of war between clinical and financial concerns, clinical wins out in both camps. Even in corporate veterinary practice, veterinarians and staff will not let the corporation compromise their standard of care. It is veterinary medicine first and money second.

Financially, both try to exploit economies of scale with bundled purchasing to get better rebates from suppliers and share staff between hospitals to maintain productivity and keep expenses down. Corporate medicine is often criticized by veterinarians as being too rigid with their purchasing restricting veterinarians to once brand of anti-biotics and vaccines but even a one doctor practice streamlines brands of food, antibiotics and vaccines.

The big difference between multi-practice and corporations is venture capital. Multiple practice groups rely on banks and their own personal savings to finance expansion. Banks are very friendly to veterinarians but there are limits. A veterinarian can go into almost any Canadian bank and get 100% financing (no money down) at prime to purchase a veterinary practice. They can do this twice and they

might even be able to get the bank to give them the same deal for three practices, but after that, the bank sees them not as veterinary practice owner but as a veterinary investor. When a veterinarian goes to the bank as an investor it's a different experience; they will need to come up with a 25% down payment and the lending rate will probably be higher. For this reason, it is difficult for an individual or group to grow beyond three practices.

Corporate veterinary groups have venture capital behind them fueling new purchases. Venture capitalists get their money from wealthy individuals, pension funds and investment banks. Venture capitalists provide money in return for an ownership stake and an expectation of a large return down the road. With venture capital behind them, there is no limit to the number of veterinary practices a corporation can buy.

How Can a Corporation Own a Veterinary Practice in Ontario?

According to the College of Veterinarians of Ontario (CVO), to own a veterinary hospital, you have to be a CVO licensed veterinarian. So how does a corporation own a veterinary hospital in Ontario? If you search the CVO for any corporate veterinary hospital you will find that they have a veterinarian listed as the Facility Director. Some have the same veterinarian listed for all the hospitals, others have different veterinarians listed. As long as a licensed veterinarian applies for the certificate of accreditation for a veterinary facility, it is within the rules. What arrangement the Facility Director makes with a management corporation behind the scenes is between the veterinarian and the management corporation. As long as the facility director maintains independence from the management corporation, it is of no concern to the College. If there is a complaint against a corporate veterinary hospital, the College deals with the facility director and the practice owner.

How Big Do You Have to Be to Sell to Corporate?

Corporate veterinary groups buy larger hospitals to minimize acquisition costs and minimize risk. Buying larger practices helps minimize acquisition costs. Consider two options. Option one is buying five veterinary practices each with one doctor. Option two is to buy a single five doctor practice. The first option leaves you with five legal bills, five accounting bills and five separate times negotiating price. It is a lot cheaper to make one purchase. In this scenario, the potential savings in legal and accounting fees is close to \$100,000.

Another reason why the corporate players want larger veterinary hospitals is to limit their risk. When a multi-doctor practice loses one veterinarian, the remaining veterinarians can step up and absorb the workload until a new veterinarian is found. If a one doctor practice loses its only veterinarian, it's a big deal.

There are always exception to the size limits. For example, if a small town has a one doctor practice and one large corporate practice the corporation may have interest in the smaller practice because of the proximity. Since they are already in that town, the corporate group may be interested in buying the smaller practice because, if they lose the veterinarian or key staff from the smaller hospital, they can use staff and doctors from their larger hospital to fill the gap.

How Big is the Corporate Offer?

Corporations pay more for practices than private deals. This can be a blessing if you are selling a practice and a curse if you are an associate trying to compete with a corporate offer. Veterinary practices are valued based on their ability to generate a profit. A valuator examines the revenue, expenses (including the replacement salary for an owner operator) and net income and comes up with a figure called Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). The value of practice is determined by multiplying the EBITDA by a figure that represents the current value of future EBITDA, adjusting for factors such as risk and potential growth.

In the olden days (before corporate veterinary medicine) the most a veterinarian could typically sell their practice for was five times EBITDA. The limit was five because the most banks would lend a veterinarian to purchase a practice was five times EBITDA. It's not just veterinarians either; banks have been using the five times limit in health care for decades. Dentists, physicians and chiropractors were limited with the same five times multiple. Stuck with the ceiling lending limit of five times, the most a veterinarian could borrow was five times so the most a practice would sell for was five times EBITDA.

Veterinary corporations do not get their money from banks, so they are not limited to five times EBITDA when they make an offer. The venture capitalists who supply the money allow corporate purchasers to pay well in excess of five times. The result is corporate offers upwards of fifteen times EBITDA. Now the fifteen times offer comes with restrictions; the veterinarian who is selling must stay on for two or three years and they must reach revenue targets, or they have to pay back some of the money.

How Can Corporate Afford to Pay More?

Once corporations get big enough, they can benefit from pooling their resources for higher rebates from their suppliers. Food and pharmaceutical manufacturers, equipment providers and labs provide bigger rebates and better pricing with higher volume. Consider the discount a single veterinarian would get if they upped their order from one microscope to 50 microscopes, or their vaccine purchases from 4,000 doses to 40,000 doses. The discounts big corporate players get help to reduce their costs and improve the bottom line. Total discounts from supplies can amount to a savings equivalent to 3% of gross revenue. For the average veterinary hospital, that represents \$45,000 per year.

Corporations also achieve cost savings by pooling their internal resources. They can have one accountant spread across 50 hospitals, coordinate all advertising through head office, offer their own continuing education conference, share management staff across several hospitals and shuttle staff between hospitals to make better use of key staff. The savings can amount to another 3% or \$45,000 in savings for the average hospital.

Do You Have to Sell it All at Once?

When veterinary corporations first came into Canada, a sale to corporate meant selling 100% of the practice. A few years ago, veterinary corporations started offering joint ventures or partnership opportunities to veterinarians selling their practices. Now most veterinary corporations will purchase a portion of your practice but it must be more than 51% so they get control of the management decisions.

Joint ventures are popular with veterinary corporations because a practice owner who retains an ownership stake in the practice is still invested (both literally and figuratively) in the practice. Even as a minority shareholder, the previous owner continues to do what owners do; they stay late without asking, solve problems for other people, accommodate the double-booked client and motivate the rest

of the staff. In contrast, when a practice owner sells everything and works as an associate, what was once a passion can turn into a job. The owner/operator workhorse who was once the go-to problem solver can find themselves less charitable with their time when the sole beneficiary is the corporation.

What about Mixed and Large Animal Practices?

Corporations will purchase mixed and large animal practices. Most corporate practices are exclusively companion animal hospitals but in the last few years, mixed and large animal practices in Ontario have sold to corporate groups. The sheer number of mixed and large animal practices in Ontario is not that great but the collective volume of revenue large enough to make it appealing to corporate purchasers.

Can You Buy In?

With more and more corporate consolidators coming into the province every year, newer corporate players are coming up with new business models to try and distinguish themselves. The latest trend in corporate veterinary medicine is a model where practice owners can swap their shares in their veterinary hospital for shares in the corporate giant. Swapping shares provides selling veterinarians an opportunity to keep their investment in veterinary medicine without the requirement of physically working in a practice. The swap deals are a win for the corporations because it provides the corporation with more money to go out and buy practices.

What Will Corporate Veterinary Medicine Look Like in Ten Years?

As long as there is access to venture capital, corporate veterinary medicine will continue to grow. If the economy pulls back or the stock market takes a dive, a lot of that capital will dry up and without venture capital, corporations can't grow.

The Roman Empire fell because they grew too big and could not maintain supply routes. As corporate practices get getting bigger and bigger and they risk suffering the same fate. As they get bigger and more players come into the market, they are working with a diluted talent pool for qualified managers and will be forced to hire less than stellar candidates. In the US where corporations are 10 times larger veterinarians talk about how, "they used to be great and then they got too big and started hiring the wrong people."

Another concern is that corporations could become victims of their own success. As more and more corporations set up in Ontario competition will drive up the price for practices. While the veterinarians selling their practices are benefiting like never before corporations will be forced to work harder to pay off the ever-mounting cost of acquiring practices. At some point, it has to stop working.

One factor that could contribute to the future success of corporate veterinary practices is their size. Some of the larger players have taken advantage of their size to bring in staff training programs and technology that would be too expensive for a smaller hospital. The biggest users of myVETstore are corporate practices. They are the early adopters for client communication software, centralized call centres and wellness plans. If the momentum they have built up over the last tens years is an indication of the next ten, corporate veterinary medicine will be a key player in veterinary medicine.

BLAME THE PANDEMIC: WHY YOU NEED TO RAISE YOUR FEES

Darren Osborne, MA

Practicing socially distanced veterinary medicine has taken its toll on staff. It takes twice as long to do half as much but fortunately, pet owners have been very appreciative of the continued level of service and continue to support their local veterinarian. Demand for veterinary medicine remains at an all time high. Internally, the same factors are driving the cost of running a veterinary hospital to an all time high as well. For 2022, veterinary practices could see their expenses rise more than 8% requiring an even higher increase in professional fees.

In an effort to protect veterinarians and staff, most hospitals (87% nationally) pivoted to curbside and have maintained this ever since. It was a struggle to explain to clients why they needed to stay outside of the building in the summer when COVID cases were trending down, but given the latest figures, most now understand and appreciate the move.

Internally, curbside medicine is taking a toll on staff. Carting animals, bags of food, medication, payment terminals back and forth to clients waiting outside, along with increased cleaning and disinfecting, has made all appointments more time consuming, making most days non-stop. To make matters worse, the schedule is jammed for the next few weeks, and there seems to be no end in sight.

As if that wasn't enough, just when all hands are needed on-deck, hospitals are facing the highest absentee rate ever seen. Many staff have young families, and childcare related absences are increasingly common. "Sorry, my kid's classmate just tested positive, so I need to take the next two weeks off to quarantine with my son."

In the average hospital, it is estimated that the cost of hiring more staff to cope with curbside medicine, as well as the accelerating wage pressure for many non-DVM positions will increase staffing costs by 10%; this is the combination of higher pay and more bodies.

In many hospitals, the amount spent on bank fees is climbing, particularly as they are conducting "card not present" transactions, by taking payment over the phone in order to remain physically distanced from their clients. This can push bank fees up by 25%, costing an average three-DVM practice an additional \$10,000.

Drug and supply costs are likely to rise as well, not only to account for the increased expense of providing stacks of PPE to veterinary staff, but because manufacturers are having to incur these costs and physically distance their plant workers, thus driving up their costs and the prices they charge.

Similarly, maintenance costs are predicted to rise as suppliers pass on their increased costs and equipment requirements, for the same reasons discussed above.

Perhaps the only expense that is expected to decline is continuing education. The savings from attending a virtual conference, in registration, travel, meals and hotels will be noticeable.

Overall, total hospital expenses are expected to increase by 5%, equating to 3.5% of gross revenue; in the average hospital, total non-DVM expenses are 70% of gross revenue, so a 5% increase takes these to 73.5% of revenue.

However, this doesn't account for yet another substantial rising expense that has either hit, or is just about to hit, more veterinary hospitals: veterinarian compensation. Even before COVID-19, the demand for veterinary labour was pushing to unprecedented levels. While it slowed temporarily at the height of lockdowns, it has since surged back upwards, with the number of help wanted advertisements printing new records despite the pandemic. It seems that 2022 will feature more of the same, with demand continuing to climb. As a result of this, veterinarian compensation is expected to increase well above inflation.

If hospitals hope to cover these costs, their professional fees will need to increase quite steeply. In the average companion animal hospital, professional services make up approximately 60% of revenue. The remaining 40% is generated from dietary, pharmaceutical, and retail sales. Thus, increasing professional fees by 5% would only increase revenues by 3%, falling short of covering the higher expenses discussed above. To cover all of the increased costs, a robust fee increase closer to 10% is necessary. The good news is clients are positioned to accept the increase.

From many clients' perspective, a historic large pile of household savings, as well as a 30% surge in new puppies and kittens has combined to make veterinary medicine more attractive than ever. Many pet owners are working from, spending all day with their pets, and thus have a heightened awareness of any pet health issues.

Clients are also going to the veterinarian more often and spending greater sums. Most hospitals have seen an increase in revenue in the second half of the year; one third of this has been fueled by new pet owners, while the other two thirds a result of increased spending from existing clients.

Pet owners have not been able to spend money on family trips, restaurants, and bars and those working from home are saving a fortune on commuting, dry cleaning and work clothes. This new money is burning a hole in their pockets. Economists call this phenomenon "consumption smoothing." Consumers will strive to maintain a consistent spending level, so when they overspend in one area, they will save more than normal to get back on track. In the times of COVID-19, when spending is heavily restricted due to lockdowns and closures, they are forced to save, and many will overspend to get back on their personal consumption track.

If the looming surge in hospital expenses, combined with the readiness of clients to spend more on their pets isn't enough to motivate you to increase your fees, take solace in the notion that when you increase your fees by 10%, you boost your margin and can afford to lose 25% of your clients while keeping your net income consistent.

Reprinted from the OVMA Fee Guide

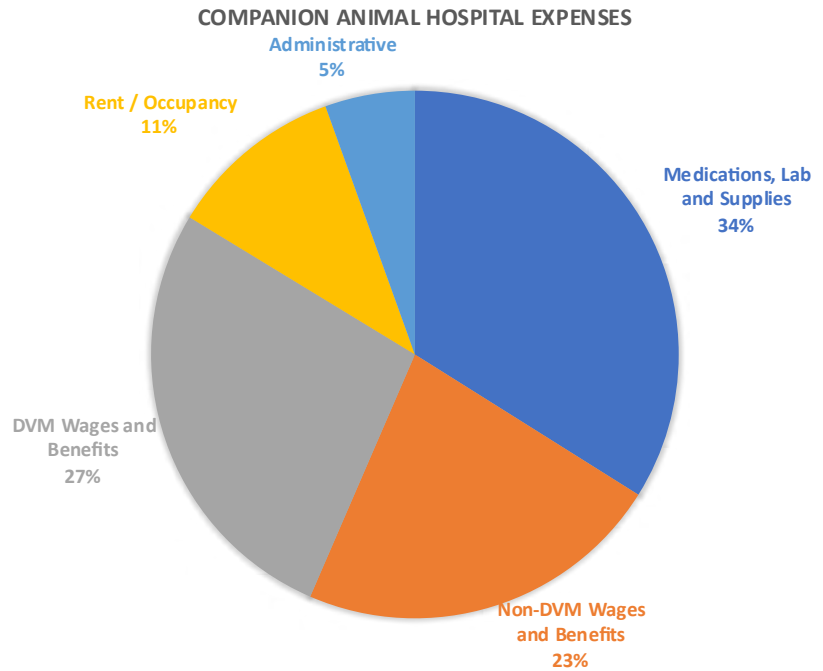
Why The Fees in the Fee Guide Are Higher for 2022

Unprecedented demand for veterinary services, a shortage of skilled veterinary staff and resurgent inflation are expected to propel veterinary hospital expenses to all time highs for 2022. The shortage of labour alongside extraordinary demand for services is expected to increase DVM wages as much as 15% for 2022 and non-DVM labour may go up as much as 12%. Supply shortages and bottlenecks are driving up the price of medications, pet food and laboratory supplies, and more, all of which are expected to

increase at a rate above inflation. Inflation projections are increasing as more reporting comes available, and could drive occupancy and administrative expenses 6% higher in 2022. Taking into account the contribution these expenses have on the average companion animal hospital; the overall impact is a 10% increase in the total cost of running a veterinary hospital in 2022. Veterinary fees need to go up in step with these higher expenses to allow veterinarians to offer competitive wages to both DVM and non-DVM staff, cover the cost of running a veterinary hospital and continue to provide high quality care to their patients.

Projected Inflationary Increases in Expenses for 2022

- DVM Wages + 15%
- Non-DVM Wages + 12%
- Medications / Lab + 9%
- Occupancy + 6%
- Administrative + 6%
- Overall Change + 10%



KEEPING UP WITH WAGES

Darren Osborne, MA

Over the last few years, OVMA has explored the cost benefit analysis of both hiring an associate veterinarian and offering a them a competitive salary in line with what current Help Wanted Advertisements, as well as recent trends in associate compensation. This latest article takes on a darker perspective by exploring the cost to a practice if they were to lose an associate veterinarian. The objective of this exercise is to determine the maximum amount a practice owner could pay a veterinarian.

Quick Recap:

Cost Benefit of a New Associate: To cover the adding a veterinarian, the practice only needs to earn 22.5% more revenue than the associate's salary. As an example, if the associate veterinarian is paid a salary and benefits of \$100,000, the practice would need to generate only \$122,500 in revenue to cover all of the additional marginal costs of employing this person. This assumes there are no changes to non-DVM staff or the physical practice. The conclusion was that in most cases, the benefit far exceeded the risk.

Cost Benefit of Paying \$125,000 Associate Salary: Associate salaries soared in 2021 with many Help Wanted Ads offering over \$125,000 for a full time associate. Even if the hospital were to add non-DVM staff, and raise other expenses (in contrast to the above paragraph where most expenses are kept consistent), the practice could pay the posted salary and break even with only a \$277,000 increase in revenue.

Background

The cost of running a veterinary hospital per DVM is consistent and scalable. Each veterinarian needs so many exam rooms, roughly the same number of staff, they will recommend approximately the same number of laboratory tests and dispense similar amounts of medications. In a stable practice, expenses are predictable and steady. A three veterinary practice will typically have three times the revenue of a one doctor practice and three times the expenses.

For this article, assume a hypothetical practice has three full time veterinarians, each generating the average revenue and incurring average expenses.

Losing A Veterinarian

Now, assume that one veterinarian leaves the practice. The first metric to be impacted would be revenue. With this veterinarian gone, one third of the revenue will be lost, and the projected revenue for the next year would fall from \$2,032,500 to \$1,355,000 (the expected revenue for a two-doctor practice). In a perfect world, a practice losing one third of their veterinary workforce would also be able to reduce their expenses by a third; they could lay off 33% of their non-DVM staff, board up one third of the practice, send back a third of their equipment and inventory, and reduce all of their expenses down to the level of a two DVM practice. In reality, on the expense side of the equation, little will change.

There are some expenses that will automatically go down. The salary and employment benefits assigned to the lost veterinarian like professional dues, continuing education will go down as will costs

associated directly to revenue - drug and supply costs and laboratory expenses. Lastly, some administrative expenses like bank fees and insurance will fall.

However, most expenses will be unaffected by the loss of a veterinarian. Facility costs (rent and utilities, and repair and maintenance), as well as the bulk of the administrative expenses (office supplies, advertising, accounting & legal, and equipment rental) will remain the same.

Adapting to the Change

The expense that will be hardest to change is non-DVM wages. Non-DVM wages could go one of two ways. One scenario could see staff levels unchanged as the remaining veterinarians try to improve their productivity by utilizing all available staff. Under this scenario, it is assumed that total practice revenue increases by 10%. This higher revenue though, is not enough to offset the expenses carrying over from the three-doctor practice, and practice profit falls from \$240,600 as a three-doctor practice to \$7,919 as a two-doctor practice, a decline of \$232,681.

A second scenario could see the staff pared down to the appropriate number for a two-doctor practice. This would involve laying off a third of non-DVM staff. Revenue would fall back to a two-doctor level and the resulting profit would fall to \$78,105, a decline \$162,495. There may also be additional legal fees associated with dismissing four staff members.

The decline in profit that occurs when a three DVM practice loses one of their veterinarians ranges from \$162,495 to \$232,681. Changing the beginning number of veterinarians in the practice does not change the outcome of losing a veterinarian; whether you start with a two-doctor practice losing a veterinarian or a five-doctor practice, since the costs are scaled to the number of veterinarians, the result is the same. The cost of losing a veterinarian is substantial regardless.

This exercise helps answer the underlying question, “how much can you afford to pay to keep a veterinarian”? The most recent OVMA Help Wanted Ads for veterinarians are offering top salaries of \$200,000. The people posting these ads have obviously done the math.

Paying Non-DVM Staff a Living Wage

Wages are the single highest expense for a veterinary hospital. For every dollar of revenue, 23 cents go to paying veterinarians and another 19 cents to non-veterinary staff wages and benefits. When the provincial government increased minimum wage to \$14 per hour, it was expected that non-DVM wages as a percentage of gross revenue would go up two or three percent. They did not – total wages as a percentage of gross revenue went down.

While there were only a handful of non-DVM staff earning less than the new minimum wage, many suspected raising this floor would set loose a cascading effect on all wages in the veterinary hospital. If the kid working in the kennel got a one dollar raise to the new minimum wage, the receptionist (who is already earning more than minimum wage) should get a one dollar raise to maintain the premium between reception and kennel assistant; then the veterinary assistant would get one dollar more to maintain the premium between veterinary assistant and reception, and so on all the way up to registered technicians and the practice manager.

As the hourly rates and cascading increases were working their way through veterinary hospitals, demand from clients was stronger than ever and revenues were climbing close to 10% year-over-year.

Most hospitals found that even after giving significant raises to their non-DVM staff, the growth in revenue was more than enough to offset this increased expense. With revenue growth outpacing wage growth, we can see how wages as a percentage of gross revenue declined.

The 23% increase in minimum wage (\$11.40 to \$14.00) came as a jolt, causing some veterinarians to take a closer look at their non-DVM wages and asking themselves, “am I paying enough?”

The Ontario Living Wage Network is one group that helps to answer that question, by providing an hourly rate that “ensures that a person working full-time, full-year, earns enough to participate in the normal life of their community” (source: livingwage.ca). The living wage is presented by region to reflect the different costs of living around the province. For example, according to Ontario Living Wage Network, the living wage in Toronto is \$22.08 per hour, suggesting that a full-time employee needs to earn at least this much to live a normal life in the city.

For many veterinary hospitals in Toronto, this living wage presents a challenge because it is higher than existing wage rates for many of their non-DVM staff. According to the OVMA Non-DVM Wage Report, practice managers are the only employee group in Toronto that earn above this level.

If veterinarians across the province were to adopt the living wage as the new floor value on their wages, how much would it cost, and what level of fee increases would recoup that expense?

To calculate the cost of paying non-DVM staff a living wage, the first step is to determine how far down the staff list do you go to in adopting a living wage as the minimum wage paid. Do you increase the minimum wage kennel assistant to \$22.08, or do you limit the increases to select staff? According to some employers participating in the Living Wage Network, their expectation is to pay full time staff a living wage and move part-time people closer to the living wage over the next few years. Since most kennel assistants are part time, it would seem appropriate to start with lowest earning full-time staff members - receptionists.

The average veterinary receptionist in Toronto earns \$18.12. This is quite a bit below the living wage, so an increase to meet this criterion would involve a 22% increase in reception wages. The rest of the staff would likely require raises as well, in order to maintain the existing wage premiums between different non-DVM staff positions. For example, registered technicians would require an increase to \$29 per hour, to maintain the \$7 premium over receptionists.

Some could argue that, even though managers already earn above a living wage, their wages would need to increase 20% in order to maintain the wage premium between them and other employees.

All in all, the full impact would be a 31% increase in non-DVM wages, at a cost of \$38,153 per full-time equivalent veterinarian per year.

The cost of the increase in wages should be borne by clients. The argument for increasing wages goes like this - staff don't earn enough to participate in a normal life because “life” in their region is too expensive. If everything is more expensive in that region, veterinary fees in that region need to be higher to reflect that. For the average veterinary hospital in Toronto, a fee increase of 10% would be required to offset the increase in wages to a living wage. A 10% increase would cover the 31% increase in wages. If the goal was to reach a living wage in steps, the increase could be brought in gradually over two or more years.

Outside of Toronto, it is easier to reach. Most regions are within 10% of providing a living wage, and nominal fee increases of 3% or less could bridge the gap. Veterinary Hospitals in Ottawa and the GTA have average wages 13% below the living wage and would require a 4% increase in fees to cover the cost of providing a living wage.

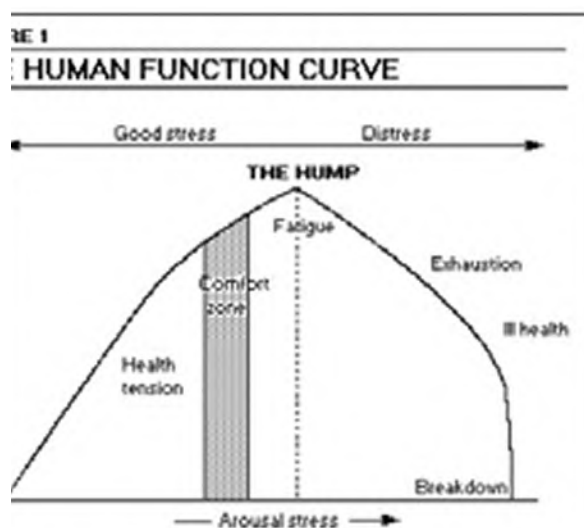
Aside from the social benefits of paying a living wage, drastic increases in wage rates would help attract trained veterinary staff back into clinical practice, as well as boosting retention. Finding qualified veterinary staff is one of the biggest issues facing the profession. A 2016 National Association of Veterinary Technicians of America study of veterinary technicians revealed that most certified technicians leave the profession because of low pay. Increasing wages speaks directly to this issue.

HOW COVID HAS CHANGED VETERINARY MEDICINE

Darren Osborne

2021 Has been a banner year financially, but it is fast becoming the most stressful year many veterinarians and staff have ever experienced. COVID triggered a pet population explosion and the rigors of social distancing with clients have taken a toll on veterinarians and staff. Veterinarians and staff pivoted to curbside medicine and met the needs of their clients before many other industries but along the way they forgot that they have needs too. Its time for veterinarians to pivot internally and stop ruining their lives so their clients can have a perfect one.

At the turn of the last century (circa 1908), two researchers came up with the Yerkes-Dodson Law that showed increased stress can increase performance but there are limits. When they explored performance and arousal, they found that performance increased with increased arousal – but only up to a point. Eventually, arousal becomes too much, and the result is a decrease in performance. Consider doing a puzzle on your day off. With little to distract you, whiling away the day with a 1,000-piece puzzle can be a great stress release. Now consider you are a few pieces away from finishing the puzzle and you look at the clock and realize you only have 25 minutes before you have to pick up your kids from school. You got this – you embrace the challenge and smile knowing you can accomplish both. Then the dog throws up on the carpet and wakes the baby. How much fun is that puzzle now?



Dr. David Posen (past presenter for OVMA) is an expert in stress and how it affects professionals. His book, “Is Work Killing You,” could be retitled, “Is Your Veterinary Hospital Killing You”. In his book he presents an updated Yerkes-Dodson Law with a chart developed by P. Nixon that can help a professional personalize their stress and expected performance. Nixon’s Human Function Curve shows how performance increases with arousal but eventually starts to level off and even decline. There is a “comfort zone” where sustainable performance is fueled by a certain amount of arousal. Increasing stress can push someone out of their comfort zone and lead to decreased performance. At the extreme, too much stress will

not only decrease performance, but it can also cause fatigue, sickness and even complete breakdown.

Prior to COVID, many veterinarians were in or around the “comfort zone” with enough healthy stress to keep them productive. The COVID induced pet population boom and productivity challenges with social distancing have pushed many veterinarians’ way out of the comfort zone, over the hump, and on the side of distress. To get back into the comfort zone, veterinarians must find ways to reduce stress at their work.

Rethinking Your Schedule

When veterinarians think of their schedule, they think in terms of how many appointments, surgeries or clients did I see that day or week. Dr. Posen recommends the development of a healthy stress schedule with rest, family time and personal time placed in the schedule to recharge from daily stresses. A checklist for a healthy stress schedule would include ways to relax and reduce stress and this schedule would get as much respect as the daily work schedule.

- Make sure people take their holidays
- Schedule time off for family functions
- 20 minute walk during lunch
- Quiet lunch break

Limit Your Outbound Calls

Call backs are an essential to the success of a veterinary hospital. At the end of the day, many veterinarians will have call backs to clients regarding surgery, diagnostics and treatments. There is a limit to the number of calls a veterinarian can make. Determine what that number is for you and set a limit. If you exceed that limit, consider delegating call backs to a certified technician or set aside another gap in the day for callback's so there are fewer at the end of the day.

Limit Your Inbound Calls

A straightforward way to reduce the number of inbound calls per day is not to answer the phone or open emails from clients when the hospital is closed. Unless you are on call, no one expects to get in touch with their veterinarian after hours. In many cases, if they can't get a hold of you, they will find someone else to solve their problem (eg. Emergency Clinic or After-Hours Clinic).

Track Client Compliments

Client complaints can cast a dark shadow on an otherwise sunny day and social media can compound the problem because it is too easy to re-read the complaint. Most client complaints are due to communication issues and don't require any policy changes – stuff happens. When put into perspective, the percentage of people who complain is incredibly low but human nature being what it is, we tend to focus too much attention to the bad news. Tracking client compliments and positive reviews can help provide balance for veterinarians and staff. Reading the compliment during a staff meeting or posting the compliment on a bulletin board where it can be re-read can provide a healthy surge of happiness and relieve some stress. Done right, the positive reviews will overshadow the negative ones.

New Compliant Clients

The biggest challenge with COVID is to service a surging population of pets during a labour shortage. Many veterinary hospitals are struggling to meet the needs of their existing clients and as a result, they are not taking new clients. Some veterinarians are finding that these circumstances provide an opportunity to hand select only the best clients. One hospital is only opening their doors to new clients who sign up for a wellness plan. Wellness plans are the cornerstone of this hospital's business model

they are using COVID as an opportunity to sift through new clients and only select clients that they think will fit with their hospital.

Count the Number of Times You Say “No”

Even before COVID, many veterinarians were ruining their life so their clients could have a perfect one. To stop this cycle, veterinarians have to start drawing boundaries. One way to draw a boundary is to start saying “no.” In his book, Dr. Posen offers some tips on how to say “no” acceptably. The easiest way to say “no” is to get someone else to say it for you. If the appointment book is full and a non-urgent appointment request comes in, the receptionist should be the person to say “no”. In many hospitals, the receptionist comes back and asks the veterinarian if they can squeeze in another appointment. This makes the veterinarian the bad guy forcing them to be the one to say “no”. This can be stopped at the reception desk by empowering the receptionist to say no to non-urgent cases.

Some phrases that can help temper the “no” response are”

I really wish I could help you but I simply can’t
I have a family function
We can see you next month
This might seem time sensitive to you but it can wait

Reducing the amount of stress will improve your production, your mental and your physical health. Rethink your work schedule and set healthy boundaries for clients and colleagues. Start tracking the number of times per day you take a five minute break and make sure it exceeds the number of call backs you have at the end of the day. Treat your self as well as you have been treating your clients.

Charging for No Shows

On any given day of COVID, veterinary hospitals in Ontario are booked solid. And for the receptionist, “solid” translates into, “I’m sorry, but we don’t have an available appointment until next month.” The perfect storm of clients working from home having more time and money available plus the surge in COVID puppies and kittens has created an unprecedented demand for veterinary medicine. For veterinary staff, who used to be able to offer clients several appointment options same day or within a day, its challenging.

So, when a client fails to show up for their appointment, staff are frustrated because the brief opportunity to catch up on their chores is overshadowed by the notion that you are just kicking the can down the road. That no-show has to be rescheduled so now instead of just having one appointment, you have to call the client, schedule another appointment, call them to remind them (again), and then see them when they do show up for their appointment. All the time wondering if they are even going to bother to show up.

Dr. Liz Dennis, practice owner at Wellington Animal Hospital in Woodstock Ontario protects her staff from chronic no-show clients by charging a fee for not showing up. “Especially now, with so many people trying to get in to see us, it’s a big deal if someone doesn’t show up,” Dr. Dennis explains. “We agree on a time weeks in advance and we called them the day before to confirm. There is no excuse for

not showing up for an appointment.” Dr. Dennis charges no-show clients \$31.50 for missing their appointment.

When a client misses their appointment, Dr. Dennis’s staff phone to tell them they missed their appointment. If the client says, “I forgot,” or they don’t have a good reason for missing their appointment they are charged a \$31.50 fee which has to be paid before they can book another appointment. Many clients are apologetic, pay the fee and reschedule but a lot of new puppy and kitten clients will avoid the call, avoid the fee and never show up again. According to Dr. Dennis, that is part of the plan. Dr. Dennis admits that she errs on the side of getting rid of no-show clients. “If a new client is going to miss their first appointment and they don’t have a good reason, I probably don’t want them as a client anyway. We have a lot of people who are happy to take their appointment spot.”

Dr. Dennis has a family herself so she knows “stuff” happens so if a client has a really good reason for missing the appointment, they are not charged.

Valuing Emergency Medicine

Like most veterinary hospitals Wellington Animal Hospital is fully booked with preventive care appointments, but they always leave “sickie slots” available each day for their regular clients who need to have their pet seen immediately. In the days of COVID, those sickie slots fill quickly, so when they run out of sickie slots, clients wanting to be seen same day are told there are no regular appointments available but they can squeeze them in as an urgent care appointment for a \$30 fee.

Dr. Dennis has found that telling clients there is a \$30 fee for urgent care causes many to reconsider whether or not their pet needs to be seen that day. When confronted with the \$30 urgent care fee, many clients offer to take the next emergency appointment – often available the next day. Some pay the urgent care fee to be seen same day but a universal finding is that no one has a problem with the fee.

Dr. Dennis has no problem justifying her urgent care fee when asked. “We are booked solid so the only way for me to squeeze another appointment in is for me to work through my lunch and there is a charge for that.”

New Client Appointment Deposit

Dr. Tim Zaharchuk, a practice owner of Derrydale Veterinary Hospital in Brampton asks his new clients for a deposit on their first appointment. “We were getting frustrated with new puppy and kitten clients booking an appointment and then not show up. When we called them, they would say they found a hospital that would take them sooner.” Now, they require new clients to provide a \$50 deposit that is deducted from their first appointment charge. If they client does not show up for their appointment, they surrender their deposit.

“Appointments are so hard to find these days,” Dr. Zaharchuk explains, “we had to do something to motivate new clients to show up for their appointments.”

Surcharges and appointment deposits are new transactions that few veterinarians would have ever thought possible even a year ago. With demand for veterinary services expected to remain high for the foreseeable future, these new transactions could be the new normal. Dr. Dennis offers a simple explanation for the extra charges in her hospital, “It helps us maintain our mental health.”

State of the Industry Report

Bash Halow, CVPM, LVT
Owner Halow Consulting
Bashhalow.com

The Pandemic leveled the playing field for big and small businesses alike. Everyone has had to scramble to find new ways of doing business in an age of fast change. The good news is that certain trends in consumer habits, technology, and pet ownership have converged to give small veterinary practices a considerable competitive edge. Here's a look at the most impactful changes in the market, the veterinary business world and the tools available to help capture these exciting new opportunities.

Changes In Consumer Habits Help Us To Narrow Our Focus On What We Need
Sure there have been a lot of changes over the past year, but there have only been a few big changes. These are the changes that practice leaders should focus on when deciding where to invest most of their energy.

Inflation and then Recession Primed to Pack a One Two Punch

Though the veterinary profession has been historically fairly resistant to economy downturns, the upcoming recession could prove to be unlike any of us have seen in our lifetime. At the time of this writing, U.S. inflation is at 7.9%. and the unforeseen complications of ongoing supply disruptions due to COVID, the war in Ukraine, and sanctions against Russia are anyone's guess.

Hopefully none of it will happen, but the good news is that preparing for a recession is a solid management practice in any economy. The steps practice leaders should undertake to create a business that is more resilient to the effects of inflation/recession are too numerous to list here. Please go to bashhalow.com and type 'recession' into the search bar for a manager's checklist of things to do. Takeaway: It's likely that the world will experience a significant recession before the end of 2022. The downturn could impact cash flow, clients' ability to pay, profit margins, worker availability, supplies, and even regional security. Prudent business practices, HR protocols, client communication, and safety awareness are more important now than ever. Discuss with your team how a significant economic downturn could affect your business and create a list of policies and protocols you may want to dust off or revisit.

More Consumers Are Working From Home

In May of 2020, Facebook CEO Mark Zuckerberg announced that by 2025 as much as 50% of Facebook's staff would be working from home. According to Zip Recruiter, the job listings that advertise work-from-home positions have increased 11 fold! In January 2021, The Atlantic Monthly reported that since the pandemic, a whopping 90% of Morgan Stanley's employees have continued to work, but they are working outside of the office.

While some of these employees will return to the office space, nearly every economic forecaster projects that the economy won't achieve pre-pandemic numbers. During 2020, companies caught a glimpse of the enormous savings opportunities inherent in a work-from-home workforce. As a Morgan Stanley executive is quoted as saying on the topic, "The lesson has been learned." Takeaway: Working from home is now an established way of earning a living. Veterinary leaders should consider how they can leverage the work-from-home trend to reduce the impact of chronic staff shortages, keep practices operational during additional waves of COVID infection, reduce payroll, and meet increasing employee demands for work/life balance.

Pet Adoption Is Up

With no office workers to chitchat with and days on end of stay at home orders, consumers filled the void with pets. For some it was a chance to foster, for others it was an addition to an existing fur family, and for yet another set, a long overdue chance to finally own a dog or cat. A 2020 poll of 1000 veterinary professionals by VitusVet showed that practices saw an overall 16% increase in new pet owners and a 12% increase in new pets. The not-for-profit Shelter Animals Count reported that overall adoption rates in the U.S. jumped by 15% in 2020, and Packaged Facts predicted that the final count of 2020 would show a 4% increase in pet ownership.

Takeaway: Leaders should burnish up new client marketing tactics, revisit how phone shoppers are handled, and look for additional ways to compete for a share of these newly available clients.

Consumers Connected With Online Stores

Big box stores with e-retail outlets saw as much as a 45% increase in business during the 2022. In June, e-Marketer predicted an 18% increase in sales by year's end. More importantly, once consumers got a taste of online shopping, they returned for more. Geo-location devices on cell phones and desktops, and millions of online partnerships to collect, store, and sell consumer online browsing habits kept pressure on consumers to purchase. Most of you have already marveled that after one visit to a site that sells bed sheets, ads for bedding follow you all over the internet. Similarly all of us have experienced an increase in phone notifications. The apps on our phones are sharing our browsing habits and our physical location with online advertisers so promotions find us at just the right time and place for us to make a purchase.

Takeaway: Food, pharmacy, and OTC products that make up to 30% of our gross sales took another impactful hit. These sales are not coming back. Leaders should reexamine their sales strategy and make sure that the team is focused on service, not product sales. Remember, if you don't build a strong case for relevancy in the next few years to come, online stores and corporate competitors will deep six your business.

Growing Interest In Installment Payments

More financial institutions are helping clients manage the cost of pet healthcare by offering payment plans. Companies like Vetbilling provide clinics the tools and knowledge to run soft credit checks on consumers and then, based on that credit score, write a payment plan that won't end in default. Vetbilling has been very successful at collecting payments from clients. They have a 0% default rate for clients with high credit scores and only a 20% default rate with clients who have the lowest credit scores. Clinics that use Vetbilling to manage their accounts receivable collect 100% of loans, provided the client does not default.

Consumers Got Tech Savvy

In the Before Times, some veterinary practices took a stand against technological progress by arguing that their clients wouldn't be able to keep up. That's all in the past. 2020 ushered in a big jump in consumer's interest in technology and an ability to use and manage it and 2022 is no different. A 2020 study by Sage summarized it well, "43% of respondents used text messaging more often. This was followed by an increase in voice calls (36%), social media (35%), and video calls (30%). Almost a quarter of people more frequently used email (24%), and just over one fifth played online games more often (22%). Taking all modes together, 46% of respondents had only increased their digital communication, without decreasing any of the methods."

Takeaway: Don't worry about your clients not being able to keep up. The entire world is applying pressure on young and old to plug in and play in the digital fray. If you encounter a tech-adverse pet owner, make a concession for that person's needs, otherwise forge ahead.

Consumers Tried Telehealth

According to the CDC, "During the first quarter of 2020, the number of telehealth visits increased by 50%, compared with the same period in 2019, with a 154% increase in visits noted in surveillance week 13 in 2020, compared with the same period in 2019."

Frost & Sullivan, global growth forecasters, predict a sevenfold growth in telehealth by 2025 – a five-year compound annual growth rate of 38.2%. Though patient reviews about their telehealth experience have been mixed, this industry is not going to go away. The opportunities in time savings, cost savings, and convenience are just too great.

Takeaway: Start exploring how telehealth can help you to manage chronic staff shortages, to manage additional corona virus shutdowns, and to stay competitive. Whether you believe in the service or not, your clients are likely going to expect it based on their experience with their own healthcare.

New Technology and Tools

Online Scheduling

Many of us are already managing our own healthcare online. Technology in the human space allows existing and prospective clients to search for a doctor or dentist, review his or her website, book an appointment time (not *request* an appointment), and fill out a pre-visit questionnaire from their phone, tablet, or desktop computer. The experience is fast, hassle free, and available on demand.

Managing one's appointment online is becoming increasingly available across a wide range of businesses and it's starting to become an expectation for consumers. Just think of the efficiency of booking a flight online versus the time and cost of booking it over the phone. Veterinary practices that onboard online booking technology enable clients to schedule pet appointments at any time of day or night. They have better website-visitor conversion rates and decrease the amount of time client service reps spend fussing over the schedule.

Vetstoria is one of our industry's best scheduling platforms. It allows clients to actually book, not request, an appointment. Rapport also provides clients with the ability to book directly into the software. Both services save practices precious payroll dollars and improve the client service experience.

Apps That Improve The Client Experience

Companies like AirVet have packaged a suite of services inside their app that, in addition to facilitating a live, virtual appointment, can greatly assist practices with time management and give clients more of the on-demand time they seek from their pet care providers. Review this list of services available in telehealth apps like AirVet and see if it doesn't spark ideas on how implementing such a platform can better serve your clients and your business.

- Online scheduling
- Push notifications
- Video telehealth
- Monetized rechecks and follow-up phone calls
- Effortless one-click pay
- Reminders
- Easy transfer of all client interactions into the PMS
- Two-way communication
- Automatically generated electronic to-do lists for employees so client requests don't get missed

Telehealth is a big topic. For more information as well as ways that other practices have integrated it into their service line up visit

<https://www.bashalow.com/6-reasons-why-veterinary-telemedicine-is-poised-to-go-off-the-hook/>

Electronic Medical History Forms

Since we can't seem to find any vets and licensed techs to hire, it's up to us to manage the ones we do have more efficiently. One way to do that is to eliminate the time we spend taking a history from a client. Practices where technicians start an appointment typically add 10 minutes to the client appointment time with little added value.

Instead of wasting time taking a history during the visit, send the client a digital pre-visit patient history questionnaire. Once build, links to the form can be automatically sent to clients when they receive their reminders, when their appointments are confirmed, or even after they enter the parking lot. Because they are mobile responsive, they can be read on a tablet, phone or desktop, and clients can respond to questions and submit answers directly on the screen. Responses go to the email of your choice and can be easily copied and pasted into the medical history. You can find out more about how what these forms look like and how to construct them by visiting this page: <https://www.bashalow.com/how-to-build-a-veterinary-history-form/>

Digital Checkin, Records Management, and More

Companies like SnoutID, Pet Pro Connect offer a suite of customer service and patient management tools designed to pull hours of administrative work off the shoulders of our already over-taxed crew. Services like digital check in, previous-medical-history records management, Rx refill requests, and friendly, text reminders to clients improve compliance, streamline your team members' work, and are more in step with current consumer trends. These apps can erase hours of admin work usually assigned to our busy CSRs and free your front desk up to engage in more meaningful work like making personal connections with our clients and patients.

TikTok

TikTok is emerging as an excellent way to keep your existing clients entertained and educated at the same time. The learning curve for this very popular platform is an easy climb and its video editing capabilities are great. Video the fun and learning that happens at your practice every day (you only need 15 to 60 seconds of footage); upload it to TikTok; edit as needed using the app's amazing tools; and then share it with any one of your existing social media audiences on Facebook or Instagram. Because of a glitch on the TikTok side, the video links in this resource don't work on Safari or on iPhones, but otherwise, here is a great way to learn more about the app and how to use it to effortlessly promote your practice: <https://www.bashalow.com/using-tiktok-to-promote-your-veterinary-practice/>

Health Insurance

2022 may be the year that American pet owners turned the corner in pet insurance compliance. Industry insiders believe that the number of pet owners that signed up for pet insurance in 2020 jumped by 45% and is still climbing in 2022! Still, effectively educating clients about pet insurance options without swamping your team with more time consuming responsibilities is very hard.

Practices have had great success with Pawlicy Advisor. Pawlicy Advisor is a marketplace for veterinary pet insurance that takes the extra step of helping clients make choices on pet insurance based on the pet's individual needs and the owner's budget. Their success rate at helping clients pick a policy is ten times that of what we achieve in practices. Pawlicy provides free lunch and learns for your team to help them understand the value of pet insurance and to market it successfully to your clients.

Conclusion

Yes, it's been a challenging year, but technology and consumer habits have converged to provide us with lots of opportunities to conquer long standing operational issues. Review the changes that I have cited, identify those that you believe will be most impactful to your team and client base, and then discuss some of the tools or ideas that you think will be of the greatest help to your business.

Going With The Flow

Bash Halow, CVPM, LVT
Owner Halow Consulting,
Bashhalow.com

Practices countrywide are trying to push through staff callouts, packed appointment books, and an evaporated labor pool, but what's needed isn't more push, but *pullback*; an assessment of how we're serving our clients and whether it's a battle worth fighting.

A Dearth Of Innovation

You know what to expect when you go to the vet. Arrive, check in, warm the bench in the lobby, give a medical history to a nurse, wait for a doctor, repeat some (if not all) of the medical history, wait for the patient to be taken to treatment, wait for medications, navigate to the lobby for checkout (usually while trying to hold onto a child, a leash, a purse, and a bag of meds); plop down everything you are carrying to pay, go home, and repeat. The appointment itself is scheduled for 30 minutes, but the ordeal, from start to finish, is more like 1 hour not including coaxing the pet into the car, the drive to and from the care facility, and sometimes a stop at Starbucks for a Pup Cup bribe.

I suspect that at some point in the past, the design for outpatient flow made sense: it potentially leveraged the doctor's time and it may have created enough checks and balances to reduce communication and medical errors, but was it ever a joy ride for our clients and our patients?

As we work against the challenges of online sales, ongoing staff shortages, clients' increased impatience with waiting, and higher expectations for service, we have to ask ourselves why we are continually trying to tweak a system that by itself was never that great to begin with.

When attempting to address thorny problems like wait time and inadequate staffing, pandemic-era practice teams have focused on changes in two areas: 1) Offloading communication and some admin work to technology and 2) changing the fundamentals of the client cycle of service.

Improved Efficiency With The Use Of Technology

Phone Trees: In the before times, phone trees were a turnoff to many clients, but now that practices are short of team members and inundated with calls, phone trees have become essential in streamlining the work of your client care reps. To make them more appealing to clients, try these ideas:

Skip the long intro.

"Welcome to Happy Trail Animal Hospital. We're so glad you called..." This is just mindless filler. It's like the instructions on a voicemail...we are all very much

aware that after the tone we need to talk. Cut to the chase. “You’ve reached Happy Trail Animal Hospital, if this is a medical emergency press 1…”

Record the message with a familiar voice.

Don’t use the generic voice that comes with your phone package. Record the voice of the practice owner or a familiar one of the team.

Direct clients to the website when possible.

“Want to schedule an appointment? Go to our website and click the ‘Schedule an appointment’ icon at the top of the page.” Having an automated way for clients to schedule their own appointment, as opposed to *requesting* an appointment, will prevent the tedious step of your CSRs having to check a message, call the client back, coordinating the schedule, etc.

Two-way texting: Communicate in real time with clients using the app on your phone or on the desktop of your business. Your personal phone number is never revealed to the client and you have the ability to send automatic ‘We’ll get back to you soon’ messages when it’s after-hours so you can improve your team’s work/life balance. Explore apps in our vendor hall during the breaks.

Pre-visit electronic surveys: Don’t waste time getting a verbal patient history. Send the client an electronic form that can be filled out on any device and sent to the email inbox of your choice. There’s no printing or scanning; the client just touches a link on their phone, tablet, or desktop, fills out the form, and sends it on its way. Because the form is built in conditional logic, you’ll only need to build one form that then adjusts itself based on the client’s responses. Sound beyond your technical abilities? It’s actually easy as pie. Use this QR code for more information:



Automated Medical Records Requests: Busy client care representatives or clients can use some apps to set up a medical records request prior to their appointment. Thereafter, the company automatically sends a gentle email reminder to the referring vet to complete the medical records transfer.

One-touch Pay: Who wants to touch a germly credit card these days? One-touch pay allows you to send a link to the client’s handheld or desktop device. Through the link, the client can enter their own credit card information and pay for their visit. Think of the time that saves your practice team or how much one-touch pay has increased your own online shopping and brand loyalty.

Automated Appointment Confirmation: I hope you aren’t still doing this manually. Busy practices can waste as much as an hour per day working their way through

appointment confirmations. Through many telemedicine apps, all of this automated.

Automated Check-in and Check out: Clients no longer have to announce their arrival to a client care representative who may already be juggling three to four tasks. Automated check-in-and-out means that clients use the app to announce their arrival to the whole team and that their method of payment is already loaded and ready for charge out. This service has been a huge boon for those practices still doing care curbside.

Lose The Paper: Stop asking clients if they want a printed invoice. Instead conclude the visit with, “That’s it! I already emailed you an invoice so you have all your receipts in one place. We’ll see you Wednesday at 3pm for Bingo’s next appointment. That information too is on the bottom of the invoice I sent to you.” If you have a patient management software like Cornerstone, all of this can be automated.

Automated Rx Refills: Many telemedicine/ veterinary communication apps aim to keep pharmacy sales in-house with push notifications to clients alerting them when their pets’ medication needs refilled, and then giving them a chance to order and pay for their pet’s meds *through the practice’s pharmacy* with a push of a button.

Push Notifications: These are pop ups that you get on your cellphone. Push notification have an almost 100% read rate, far better than any other type of communication including email and postcards.

Changing the Way We See Outpatients

As a technician, I’ve started my fair share of outpatient appointments. I loved it. I loved meeting the pet and pet owner, learning more about the presenting complaint, and doing what I could to ensure an efficient exam when the doctor came into the room. As a business advisor, I’ve seen countless outpatient appointments done this way. I’ve also had a chance to watch doctors and technicians, sometimes with an assistant in tow, start appointments all at once. To my chagrin, *the latter is dramatically more efficient and a better overall client service experience*. Here’s how veterinary offices see outpatients as teams instead of incrementally in a series of steps by various medical professionals.

Have a technician greet the client and escort them to the exam room.

Having already filled out the electronic medical history form and checked themselves in using the above-mentioned technology, the client is met at the practice door by an assistant or technician and taken directly into an exam room where a doctor is waiting. This skips the time-wasting steps of the client checking in at the desk and warming the bench in the lobby.

Have the doctor meet the client in the exam room.

When the client enters the exam room, have her met by the doctor, a technician, and (if you have enough team members) a veterinary assistant. Having read the medical history questionnaire, the doctor should be ready to start the examination straight away. The assistant takes her position as holder for the animal, and the technician serves to record all findings in the electronic medical history and to anticipate the needs of the vet by preparing things like instruments, medications, vaccines, etc. based on what she overhears.

Doctor announces medical plan to everyone present.

No need to repeat herself; everyone who needs to know what are the next steps for the pet are present in the room. The doctor announces the plan, charges the technician and the assistant with all the treatment orders, thanks the client, and leaves to prepare for the next exam.

Technician and assistant complete the examination.

Both team members complete as many of the treatments as they can *in the exam room* including blood draws and injections. Additionally one will briefly excuse herself to fill meds or interface with a floater in the pharmacy to do so. Back in the room, the tech or assistant will invoice the client, schedule any additional appointments, and take payment for the visit using wireless card readers or links that allow the client to pay through an app. Once the payment is complete, the client can collect her pet, the pet's meds, her personal belongings and then exit the building without stopping at the front desk, usually another step that is fraught with hiccups, confusion and unnecessary delays. Sound too complicated? Nope. Most all of this can be easily managed with the integrated technology of many of the apps on the market.

Take Control

We're in agreement that we have some serious issues to contend with these days, but we don't have to be victimized by what's happening around us. Things aren't so bad that we don't have considerable control of our behavior and our workplace. As a business leader, help your team succeed at delivering great care by creating a streamlined path to more efficient and productive work. Completing a job successfully gratifies nearly everyone. Though you may be busy, if you find a way for individual team members to finish their work and succeed, you'll mitigate stress and improve job satisfaction and client service.

Keys To The Asylum

Bash Halow, CVPM, LVT
Owner Halow Consulting
Bashhalow.com

Ready for one of the best presents you've had in years? Here it is: I absolve you of ever having to undertake one employee review or coaching session in your management life. Here's why.

What's The Point?

Take a piece of paper and pen and jot down all the goals you hope to accomplish by doing annual reviews for your employees. Go ahead. I'll wait. Got them all down? Does the list look something like this?

- Check in with an employee to see how he or she is doing
- Explore ways how you can facilitate greater engagement and professional development
- Give him or her goals
- Document progress (or lack thereof)
- Justify a wage increase (or not)
- Help him or her to improve

Now, I'd like to ask you a question: Is it working?

Annual Reviews, A Personal Retrospective

Obviously, I have strong feelings on the matter. Before becoming a manager, I remember sitting on the receiving side of annual reviews fuming. My thoughts weren't, "Why thank you for taking the time to illuminate some of my faults for me! Goodness, whatever did I do prior to having you in my life as a boss?" They were more along the lines of, "Have you considered taking some of your own advice?"

I'm embarrassed to tell you that as a manager I continued the tradition of annual reviews at my hospital despite any evidence that my 'review' of an employee's performance was met with anything more than resignation or worse, resentment. With time, I collected a long list of reasons to question the value of annual reviews:

- **They are extremely unlikely to change behavior.** Think about how many times you were told that your employee needed 'coaching', then think about how many times the coaching actually worked long term. Just to keep things in perspective therapists with doctorate degrees spend 45 minutes once or

twice a week with patients talking about *nothing other than change* and that therapy can take *years* to move the needle. Yet somehow head-receptionist-turned-front-office-manager, Sally Ann, is going to ‘coach’ an employee towards better behavior with thirty minutes of company time, a jar of Hershey’s Kisses and a box of Kleenex. Right.

You want to know what works in getting employees to change *some* behavior? I’ll be murdered for saying it, but it’s true: fear. Fear of termination, of reprisal, etc. After years of watching how managers in all sectors keep employees reasonably in line, I’m convinced that fear works. Still, there’s a catch. No one likes to be threatened into submission, so while it may work to stop one undesirable behavior, threatening employees usually creates three or more *new* undesirable behaviors including resentment, an intentional decrease in productivity, disengagement, bad mouthing the employer to coworkers, etc. So, it’s back to the drawing board we go.

- **They required hours of time and thought.** Reviews took me hours to prepare and then usually required another hour or two of time to run the finished product past my supervisor for additional input. Where was my R.O.I.?
- **They were shamefully transparent.** However hard I tried, I felt like everyone involved saw right through the format. They seemed like a long preamble to a discussion about money. Then to add insult to injury, they were built like a compliment sandwich, with a thick slice of s&*t in the middle. They went something like this:
“Wow, Sally, what a great year you’ve had with us.
Unfortunately, a lot of your coworkers think you’re a lousy team player.
But hey, you’re always on time for work. Way to go!”
- **I had no training.** After years of making employees suffer through my annual reviews, I had a horrible realization: no one on my management team, not the owner, nor any of the doctors, and least of all me, had ever been trained on how to do reviews, had agreed on the purpose of annual reviews, or had figured out how to measure their effectiveness.
- **There were no measurable goals.** Short of trying to justify a wage increase, what were reviews trying to accomplish? Change in behavior? When I looked back, I couldn’t think of a single example where we succeeded at making a creating measurable changes in employee behavior.
- **They were hypocritical.** How could I defend our company’s insistence that employees were ‘are our most valuable asset’ when I was waiting a whole *year* to check in with how they were fairing with our company?

- **They were unintentionally demoralizing.** Since I knew that employees anticipated a raise at the end of the review, I always felt like the review had to be sufficiently critical to justify the small wage increase that I was to spring on them in the end. Consequently, the talk wasn't uplifting, it was defeating and came with the added humiliation of a 25-cent raise in the end.
- **They had bulls%\$t premises built into them.** Remember when they told you that they had to include an improvement plan for the employee? Or a career path? I was supposed to help the employee layout a trajectory not just for their careers at our hospital, but for their *lives*. Me. The guy who was fostering 6 cats and a dog with kidney disease. If I was supposed to be these employees' chance for a life coach, they would have been better off getting a new life.

Don't Take My Word For It

But you don't have to take my word for it. Numerous papers have been written on the topic. I've compiled a list to make of the most recent articles to give you a jumpstart on your own research. A scan of the titles will tell you that others have drawn similar conclusions about annual reviews.

- More Harm Than Good: The Truth About Performance Reviews, Gallup, May 2019
- The Performance Management Revolution, Harvard Business Review, 2016
- Annual Reviews Don't Work-Here's Why, SyncHR 2020
- Performance Reviews are Pointless and Insulting, Forbes 2014
- Annual Performance Review Bows Out, SHRM,2021
- Performance Reviews are Dead, INC 2021

Alternatives

Annual reviews are so entrenched in our management thinking, that if I were to tell you we should stop doing them, your knee jerk response might be, "But what do you want me to do instead?" Yet asking about an 'instead' implies that the thing we are replacing is worth replacing in the first place. In most cases, I would argue that's not true. Annual reviews likely have no place in most veterinary hospitals for all kinds of reasons that I'll let you explore on your own. (And I would encourage you to thoughtfully discuss the value of formal reviews with your hospital team!)

Still, for those of you needing to wean yourself away from annual reviews more slowly, consider the following. These ideas may help you improve while you *review* the value of your long-term employee coaching protocol.

- **Determine your goals.** What do you want to accomplish? Change employee behavior? Motivate an employee? Demonstrate concern? Explain a change in salary? Write your goals down and then do some research online as to how other businesses have succeeded in this area.
- **Consider the efficacy of a write up or threats of termination:** As I said earlier, I have witnessed the efficacy of the threat of termination as a way to change behavior, but I have also seen a lot of serious side effects to that approach. True, threats make employees pay attention, but smacking a dog for peeing on the floor gets the dog's attention too; it doesn't mean it's the best way to stop the dog from peeing. If the 'three strikes' rule is in your coaching playbook, consider how many games you've won with the strategy and tweak things accordingly.
- **Go in with the intent of growing a relationship:** You can't change an employee's behavior; the best you can do is to inspire him or her to change. Go into the meeting with three goals and a plan to: 1) *listen* to the person's thoughts and position on whatever topic is at hand, 2) *demonstrate that you care* about him or her and, 3) *express your belief that the individual can and should change*, for his or her own benefit and the benefit of the practice.
- **Consider how your efforts can be measured.** By trying to determine whether your 'review' efforts can be measured and how to measure them, you'll build a review system that's more likely to return tangible results.
- **Provide feedback in real time.** If there are any employees out there that like reviews, they are probably workers that want acknowledgement and affirmation by their supervisor. Stop making them wait for a whole year. Watch and praise them in real time.
- **Review the team, not the individual.** When you think about it, it's silly to review a single member of a veterinary practice, since so much of our work is predicated on how well the others that we work with are doing their jobs. Why not review the entire team's efforts? Agree on 6 main goals for every client/patient experience, and then spend 3 days in one month assessing how the entire group achieves these goals. Don't you think that discussion will ultimately be more productive in fixing broken systems and making lasting, positive changes to performance?
- **Be creative.** Management comes with a lot of weighty responsibility. Mete out the more difficult aspects of management with a powerful infusion of creativity and fun. Helping each other work together more happily and successfully doesn't have to be hard, indeed it's what you're all trying to

achieve. Let your imagination sit behind the desk for awhile. Success doesn't have to come at the expense of joy.

Office Bickering, Infighting and Cattiness
Bash Halow, CVPM, LVT
Owner Halow Consulting
Bashhalow.com

Intraoffice bickering and workplace incivility in the veterinary space take an exhausting toll on all of us. Create civility and psychologically healthy standards for your veterinary office to end the emotional, physical, and monetary cost of this pervasive workplace phenomenon.

The Cost of Workplace Bickering and Incivility

Christine Porath, Associate Professor of Management at the McDonough School of Business at Georgetown University, conducted a poll of 800 managers and employees in 17 industries. Her work showed that of the employees that fell victim to workplace incivility:

- 48% intentionally decreased their work effort.
- 47% intentionally decreased the time spent at work.
- 38% intentionally decreased the quality of their work.
- 80% lost work time worrying about the incident.
- 63% lost work time avoiding the offender.
- 66% said that their performance declined.
- 78% said that their commitment to the organization declined.
- 12% said that they left their job because of the uncivil treatment.
- 25% admitted to taking their frustration out on customers.

Profile of a Veterinary Practice Primed For Fighting

Veterinary practices where intra-office fighting is more pervasive share some common characteristics. These are:

- Job demands regularly exceed the workers' emotional, physical abilities to keep up.
- The caseload regularly exceeds the workers' skill levels.
- Workers are regularly left out of decision-making processes. They do not feel that they have 'a say' in how things should operate.
- Rewards, praise, recognition are regularly withheld either intentionally or unintentionally.
- A sense that decisions are made without due process and consideration to the needs of the employees, their safety, their wellbeing, and their ability to succeed.
- Employees don't have a sense of belonging to the organization because there is no sense that management 'has their back'.
- Employees don't have a chance to succeed or 'win' at their jobs because of the breadth of the caseload, the complexity of the case load, a lack of training, a lack of staffing, or other factors that are often commonplace in veterinary hospitals.

What to Do

The U.S. CDC acknowledges the importance of workplace psychological health and safety and lists resources for employers, but the Canadian government has released a much comprehensive standard that's available for free download called Psychological

Health and Safety in the Workplace-prevention, promotion, and guidance to staged implementation.

The standard outlines a five-step process by which businesses can improve the psychological safety and wellbeing of their employees. The steps are:

- **Plan:** Outline a vision of what you want for your business's culture and the employee behavior that you would like to be a regular part of your operations.
- **Train:** Get the training your leaders need to roll out and maintain a psychologically healthy workplace.
- **Implement:** Using the Psychological Health and Safety in the Workplace as a resource, implement the plan that your leadership (and hopefully your team) has devised.
- **Measure:** Measure the results of your efforts. Look for increased signs of employee engagement, a decrease in bickering, and an increase in productivity as signs that your efforts are having a positive impact on your culture and your team.
- **Correct:** Adjust your plan and your management practices according to the feedback you receive from your team and your analytics.

Practices That Support a Psychologically Healthy Workplace and That Decrease Bickering:

- Create a written commitment to a strong culture. Define what it means and why it is important.
- Create a written civility guide for the practice that outlines clear expectations for behavior between employees.
- Train management to effectively demonstrate empathy to employees that are experiencing psychological stress related to the workplace or other employees.
- Review the operations and caseload of the practice and ensure that it is
 - doable,
 - allows for balance,
 - and is safe.
- Push employees enough to keep them engaged and growing, without being overwhelming.
- Visibly reward and praise employees for their achievements.
- Involve employees in the decisions that affect their psychological and physical safety at work.
- Ensure a safe work environment.
- Insist that employees are responsible for their own physical and mental health by trying to check their own bad behavior and abstaining from habits like drinking or drug taking that thwart one's ability to behave in a civil manner.
- Create an environment where it is safe for employees to share their feelings with one another and with their employers.
- Schedule employees so that they have adequate time to rest, eat, and participate in activities outside of work.
- Hire for civility, a history of positive workplace behavior, and emotional intelligence.
- Promptly address interpersonal conflict and acts of incivility and ensure that you follow through with consequence for the behavior if it persists.
- Conduct exit interviews.

Hiring For Civility

Before Halow Consulting spends time physically talking with perspective candidates for employment, we send them a survey that, among other things, evaluates the candidate's understanding and appreciation of workplace civility. Our questions ask for brief essay responses. Please reach out to Bash with questions on how to create one of these online surveys. Christine Porath, writing for the Harvard Business Review, recommends using these questions when interviewing potential candidates.

- *What would your former employer say about you — positive and negative?*
- *What would your former subordinates say about you — positive and negative?*
- *What about yourself would you like to improve most? How about a second thing? A third?*
- *Tell me about a time when you've had to deal with stress or conflict at work. What did you do?*
- *What are some signals that you're under too much stress?*
- *When have you failed? Describe the circumstances and how you dealt with and learned from the experience.*
- *What are some examples of your ability to manage and supervise others? When have you done this well?*
- *What kind of people do you find it most difficult to work with? Tell me about a time when you've found it difficult to work with someone. How did you handle it?*

She also recommends looking for these behaviors

- *Did the candidate arrive promptly for the interview?*
- *Does the candidate speak negatively of former employers or others?*
- *Does the candidate take responsibility for behaviors, results, and outcomes, or do they blame others?"*

Christine Porath, Harvard Business Review, February 6th, 2016

Coaching Employees Embroiled in Interpersonal Conflict

Employees may need to work through their conflict with another employee by talking with a leader of the practice. In such cases, it's important that a leader demonstrates empathy, but refrains from taking sides. Other tips include:

- Allow employees to talk through their situation, but call their attention to bad psychological habits like always blaming others and all-or-nothing thinking.
- Set boundaries for the amount of time employees can spend talking through their interpersonal issues.
- Hold employees accountable for taking responsibility for their own happiness whenever possible.
- Underline how intra-office fighting lowers everyone's happiness and productivity.

Other Things Leaders Can Do To Limit Intra-office Bickering and Improve Workplace Civility

Leaders can positively influence their workplace's psychological health by:

- Modeling good behavior;

- Asking for feedback on problematic interactions from sources outside the veterinary practice;
- Seeking out psychological help for their own behavioral patterns that may be complicating work situations.

Conclusion

Intra-office bickering is common to our profession and detrimental to productivity, care and safety. Given the severity of the consequences of intra-office unrest, managers should prioritize a proactive approach to workplace civility.

Talk To The Animals
Bash Halow, CVPM, LVT
Owner Halow Consulting
Bashhalow.com

Addressing angry clients, talking to grieving pet owners, telling an employee that it's time to go... swallow that lump in your throat. Let's get these difficult discussions right by remembering six essential elements to delivering bad news.

Start With Goals

It may seem obvious, but it's important that you walk into a difficult conversation with a goal greater than, "I'd like to get something off my mind that's been bothering me." If the employee has done something that is outside the boundaries of company policy, pick a short list of what you want the employee to understand after the meeting is over. This may seem obvious ("Don't show up late to work or you will be terminated"), but there may be other things you'd like to accomplish during the meeting:

- **Learn about the problem** from the employee's perspective to ensure you understand the full picture. Most employee behavioral issues are a byproduct of a broken workplace, not a broken employee. Go into the meeting eager to learn.
- **Telegraph you care.** Soften your voice and relax your face. Played right, this 'difficult' meeting could be an opportunity for you to show that you genuinely care about the employee and grow the bond that the two of you share.
- **Underline that this meeting is important.** You may be interested in underscoring the gravity of the situation. Setting time aside to speak to someone in a room *where you will not be interrupted* underscores the gravity of the situation.

If the conversation is bad news about the health of a pet, your goals for the conversation might include.

- To be open and honest.
- To learn what's most important to the client with respect to his or her pet's illness.
- To demonstrate that you are empathetic, not just to what the pet parent is going through, but how the pet may be feeling.
- To demonstrate that the pet owner and pet are in capable hands.

Having goals helps to focus your thoughts and to hone the words you'll use when talking to an individual. Goals will help you appear in control and capable; you'll also be make more efficient use of everyone's time.

Be Ready to Listen and to Empathize

The first step to any difficult conversation is a genuine interest in the wellbeing of the person you are talking to and a willingness to listen to what they have to say. This is no small feat, especially if you are leader or doctor that has to manage many such discussions per week or even per day. Here are some tips that will help you present an image of someone that's caring and ready to listen.

- **Compose Yourself.** Prior to entering a difficult discussion, take a moment to think about the other party. What do expect their chief thoughts and concerns to

be? Ask yourself if you care and if so, why? This exercise isn't an invitation to read the other person's mind, indeed, you shouldn't presume you know anything that the other party is thinking or feeling. Presumably, that is why you having this 'discussion' in the first place, but the exercise primes you to be empathetic. You won't walk into the room with your agenda; rather, you'll walk into the room with genuine concern and an interest to know more, two qualities that will always improve the odds that a 'difficult conversation' won't be so difficult at all. Lastly, if you are feeling emotional, put the conversation on hold until you are able to get your feelings under control.

- **Extend an invitation for everyone to sit down:** Sitting is less confrontational. Depending on your goal for the conversation, consider sitting next to the person you are speaking to as opposed to opposite the individual. The latter may appear to be more confrontational.
- **Keep open body posture:** Don't cross your legs or your arms and relax your face. Remember, you are leading both this meeting and its tone. Use body language to signal that this is not a time for alarm and that your shared discussion space is safe.
- **Bring a colleague:** And, depending on the goal of the meeting, you can let the other party know that they too can have someone sit with them. Adding a third party can signal a number of things: that the subject of the meeting is grave, that the additional person is there to make the party feel more at ease, or to provide additional, helpful insight. If you bring a colleague to a meeting, make sure that both of you understand what you're trying to accomplish.
- **Invite someone else to do the talking:** Don't like the individual? Find someone who is truly empathetic to do the talking. Faking it will be more than ineffective; it will also telegraph that you think the other party is too dense to recognize that you don't care.

Start With How The Other Party Feels

Frustrated and angry individuals want to be heard by someone they believe cares. If the difficult conversation you are about to undertake is with a mad client or upset employee, start by giving them the floor. Don't ask for things like, "Can I get you to confirm your name, your telephone number, etc." That kind of an intro alienates the party and signals that your needs outrank theirs. Create a listening setting as described above and hear what the other person has to say. Here are some thoughts on how to make this part of the dialogue most successful:

Ensure you won't be interrupted: As stated previously, pick a space and a time that will give you the privacy you both need. Tell others to refrain from interrupting you until you leave the meeting.

Have a paper and pen handy: Explain at the outset that you'd like to take notes. Taking notes helps you to remember, but also signals that you are taking this part of the conversation seriously. It can also set a tone for speaking more civilly with one another.

Give yourself time: Upset individuals are experiencing a flood of emotions. Consequently, when you invite them to talk, you can get a flood of words. Be patient. Sometimes people have talk out their thoughts as a way to understand what they are thinking.

Be ready with questions: Some people are may have a head full of thoughts, but don't know how to express them. Have some questions ready to draw the other party into talking:

- “You and Rye have been through a lot in the past 24 hours. How are you doing?”
- “What you experienced out on the floor looked upsetting. Do you need to talk to me before we review everything that happened?”
- “I'm going to do whatever I can to address your service concerns, Mr. Halow, and have some questions prepared so that I can better understand everything you experienced, but do you need a chance to talk to me before we begin?”

Be Ready To Learn More

The chief reason why difficult conversations escalate is because parties believe that they are right before they've had a chance to listen to the other side's point of view. Big mistake. Almost invariably there is more to every story than meets the eye. A genuine interest in learning more about the big picture and asking appropriate questions will not just lead to better understanding, but will signal to the other party that you are fair and someone that they can trust.

Be Open and Honest

We live in a real world, with real mistakes, real tragedies, real sadness. Whatever has happened, there's no getting around the fact that what's done is done and what is, is. When delivering bad news, tell the party the news plainly and sympathetically. Here are some examples.

- “I want to talk to you about Rye's health. This is important information. Can you manage this on your own, or would you like to call a family member or friend and have her on speaker?”
- “I'm sorry to tell you that the growth we removed from Rye's thigh is cancerous.”
- “Adam, our efforts to improve the way we work together have failed and regretfully, I have to terminate your employment.”
- “Susan, this has been a good discussion, but positive work culture is critical to our workplace. I'm going to formally document that you've been warned about behavior that is viewed by your coworkers as bullying. This is part of a series of steps that can lead to termination if you don't improve.”

After you deliver the bad news, wait. Keep your body language open. Demonstrate that you are ready to listen to any kind of a response that the opposite party might have. Silence in these sorts of settings can feel deafening, but you want to make sure that you give the other party time to digest what they've just heard and to think about it. Watch her face and read her body language. Here are some gestures and short sentences that you can use in cases where you feel you need to additional say or do something.

- Hold eye contact. Signal that you are empathetic. Read the person to determine whether you need to look down so that they don't feel confronted, but remain silent and waiting.
- Count to 10 and then ask, “That's a lot. Do you need more time or have any questions?”

- If they begin to look emotional, shift a box of tissues in their direction or offer them some water.
- In the case of a patient with a poor prognosis, you may want to verbally invite the pet owner to speak or to further guide the discussion by saying something like, "I have given Rye's case considerable thought, but I don't want to overwhelm you. Would you like to take a moment to sit with your family member and talk privately or to call a friend? I can leave you a number to text when you are ready for me to return to talk about the treatment plan."

Focus On Shared Goals

Sorrow, shame, vulnerability...these emotions are often expressed as anger. Hurting clients or employees may be ready to come out swinging thinking that 'venting' is going to make them feel better, but that's not what is accomplished. Venting is rarely a cogent, respectful review of why you are upset; rather it's an angry myopic declaration. Something like, "Disaster, the story of my life!" "Why is it always me that this happens to!" Etc. Venting feels cathartic in the short term, but in retrospect leaves individuals feeling isolated and ashamed of how they behaved. When the party that you are talking to chooses to express themselves with anger, help them pivot back to a shared goal: the wellbeing of a pet, a solution to a problem, or simply acknowledgement.

- "I understand that you are angry and I'm empathetic. Now, let me get the resolution that you need."
- "You want me to understand the uncomfortable position that you feel you've been placed in. I hear you. It's a legitimate feeling. Let's resolve this so that you aren't feeling boxed into such an unpleasant predicament."
- "What that client did to you would upset anyone, but my takeaway from this matter is that you managed that client with poise, professionalism and empathy. That's exactly the kind of behavior that we hold in the highest regard at our practice."

Conclusion

If you are fearful of a difficult conversation, readjust your approach using the tips we have shared above. Talking to upset clients or employees is an opportunity to show that you are committed to being a fair, kind, empathetic leader and care provider.

Performance Management - Why, What How?

**Dave Nicol, BVMS Cert Mgmt MRCVS
CEO, VetX International**

Underperformers can cause a lot of grief for managers and business owners. When someone doesn't pull their weight in practice, it can cause delays, stress, and tension.

Though it can be frustrating, there are many reasons why someone may be performing at a sub-par level. Whether that's due to confidence, inexperience, or misdirection, how you manage underperformers in practice is important if you want to see positive results.

In this article, we discuss how to manage poor performance at work- without killing everyone's mojo in the process.

Reframing Performance Management

Often, the reason why veterinary leaders struggle with underperformance is due to the fact they lack the processes needed to handle it.

When most practice owners and managers think of performance management, they think of the disciplinary side. You know, what happens AFTER something goes wrong, and you are having a 'come to Jesus' moment with a wayward employee.

But this is not what we should consider performance management. The disciplinary action described above is often the result of an upstream performance management failure.

Performance management should instead be considered as the very heart of your people and work management operating system.

It's the series of scheduled and off-the-cuff actions that help everyone on your team understand what their work is, how to do it well and how to tell if they are achieving the required standard; plus what to do to course-correct should things stray off track.

At the heart of this system are five main activities. Goal setting, training/action, measurement, feedback, and recognition/reward.

Goal Setting

Effective performance management begins with clear goal-setting.

The reason why veterinary professionals struggle with their role in practice has less to do with their skills, and more with their lack of clear direction.

If your team doesn't understand their roles and how their job fits into the bigger organizational picture, they are far more likely, indeed almost inevitably going to struggle to meet the required (yet invisible) standard.

Effective leaders ensure that all roles have a set of clear objectives that describe what things an individual must achieve in their work in order to be successful. Most jobs can be suitably captured in 10-12 objectives which follow the S.M.A.R.T. convention and therefore allow clarity for both employee and manager about expectations.

Invest In Training

In veterinary medicine, we work hard to hire staff, but often neglect to train our people effectively once they start working with us. New starters, if they are lucky, may get some training on workplace operations (at best!). But more likely they are left to sink or swim, learning by trial and error as they work out 'how we do things around here'.

Would you go on a long hike in unknown terrain without a map? Of course not! So why would you get someone to do a job without training and expect a great outcome?

Without proper training, most people are going to be unconsciously incompetent, and thus be more prone to be labeled as underperformers. This is something practice owner and VetX CEO Dr. Dave Nicol has observed before.

'It's a huge mistake to assume competence- better to assume people are starting from zero and train things the way you want them to be done. I've been in multiple situations where practice owners are exasperated about the way a technique is being performed by a colleague, but when quizzed on it, they haven't actually ever been given training- they left it to chance.'

Working like this increases the chance of a mistake happening and risks reputational damage for individuals and the practice.

Instead, build an onboarding training program and use ongoing performance meetings to identify learning opportunities to continue skill growth. Doing anything less risks setting teammates up to fail.

Measure Performance & Give Feedback

Measuring performance is the only way to objectively assess someone's progress. But it is of little to no use if we don't share these findings through feedback.

If you are struggling with an underperformer, ask yourself:

Have I made it abundantly clear what my expectations are? Do they know what we are measuring as a marker of success, and can they easily access this measurement?

If not, then this may be why you're in this situation in the first place.

As Dr. Nicol explains:

'If a doctor is not performing neutering operations as fast as you would like... that may be a problem as it clogs up the schedule.'

Feedback to help the team member improve is essential. Such feedback is best presented objectively, allowing little room for argument about the result, or the improvement needed. The savvy leader can then use a more facilitative coaching style to help the doctor explore the challenges, asking questions and formulating their own plan for improvement. Once a standard is set and achievement measured against it. Some example exploratory questions might be:

What went well during the operation today?

What did not go as you would have liked?

What reasons might there be for these things?

When you are next faced with this situation, what will you do differently to move closer to meeting the target?

What help or support do you need to get there?

Having short and regular feedback and coaching conversations help facilitate trust between teams and their leaders. A habit all leaders bake into their routine.

Rewards And Recognition

The final ingredient to this secret sauce of performance success is utilizing positive reinforcement.

Human behaviour is all too often driven by some form of incentive. Although financial rewards have their place in practice, recognition trumps reward in the long run. While a bonus or pay rise can make someone feel good in the moment, recognition makes people feel valued, appreciated, and capable on a much deeper level.

Recognition is a great motivator as it meets many of our intrinsic needs. Praise for a job well done, or for behaviours that support culture, should be a fundamental and frequent part of your feedback process. It costs nothing but has a massive impact.

And yes, pay your people fairly for their work too!

When Performance Management Falls Flat

So what if you are doing all these things, yet you still have an underperformer on your hands?

Sometimes, despite your best efforts, you will have individuals on the team who don't match your business values or simply do not have the skills needed for the role they are being asked to perform.

In these circumstances, you are going to have to bite the bullet and accept that things are not working. Is there a more suitable role for this person in your practice? Or are they just a bad fit entirely?

What you do next depends a lot on where you live (due to legislative and cultural variations) and is beyond the scope of this article. But know that the conflict avoidance pathway of doing nothing is a very bad decision. One with negative consequences that compound over time.

Better, and kinder, to all to deal with organizational misfits quickly, and compassionately so everyone can move on.

Of course, it is better to hire well in the first place, so your chances of this happening are vastly reduced.

To find out how you can do this, check this article on [The Top Three Hiring Mistakes Practice Owners Make](#)

You might also like to check out our Leaders webinar. This webinar covers the common pitfalls leaders make in practice and how to overcome them. Watch it here.

Step Up or Step Back...Managing Teams Through Change

Dave Nicol, BVMS Cert Mgmt MRCVS
CEO, VetX International

Change is hard. Change is scary. Change is everywhere. There is no way to escape the curve balls that life inevitably and mischievously seems to throw. When managed badly, change can inhibit performance greatly or rip teams apart. But when it is managed well, it can galvanize the team and bring about incredible performance. In this session we'll work with three frameworks to help manage change and see some first-hand results of how to lead from behind.

Human Needs Model

Humans have certain psychological needs that drive all behavior. When we as individuals understand this driving force we can take far greater control of our own actions to intentionally or consciously act in a way that meets our needs in a positive way.

When we as leaders understand this model and how the people we lead like their own needs to be met, we stand a better chance of building emotionally stable teams that stay together.

These needs are:

Certainty

Freedom

Significance

Love

Growth

Contribution to a purpose greater than oneself.

Since emotions are fundamentally generated in order to drive behaviors, it makes sense that when our needs are met we generate positive emotions. It is also true however that when our needs are not met, that we will likely generate significantly negative emotions.

Since burnout, in the context of a workplace, is the result of chronic emotional and/or physical stress it therefore follows that one of the best “vaccines” against burnout is to place yourself in a situation where your needs are met as frequently as possible.

How this relates to change is important as leaders frequently are faced with making changes big and small. Change, theoretically, represents a threat to the status quo, and therein a threat to certainty. 'What does it mean?' - A question all who find themselves facing change will ask.

Leaders therefore would do well to ensure that the impacts and perceived of change are well thought out and communicated in a way as to allay fears.

Team Performance Model - Tuckman

Tuckman theorized a model for how teams move through several stages of development during the process of working. This model is a useful mental concept for all leaders to grasp as it goes some way to predicting the impact of change on teams.

Tuckman theorized that when a team comes together there are five phases:

Forming - the team forms and there is anticipation, excitement, nervousness.

Storming - roles are established, skills become clear, conflict can ensue

Norming - norms begin to form as players become aware and somewhat familiar.

Performing - the team begins to click and performance skyrockets as people gel and maximize their output and quality.

Adjourning - the project is completed or things move on (again a change related input).

At each stage certain actions will help move the team forward to the nirvana of high performance. However, a failure by the team to move from one stage to the next can (and frequently does) cause things to stall. The result is that many teams fail to leave the storming stage, characterized by infighting, high turnover and unresolved stress. Sound familiar?

Leaders need to use the skills associated with each stage in order to successfully catapult their teams toward a higher performance stage.

The House of Change Model

Another useful mental model to help build a deeper understanding of team performance is the House of Change (see figure 1). Originally created by Claes Janssen, I have adapted this model slightly as it seemed to be missing an element of positive uncertainty bridging two locations.

This model theorizes the team journey as a passage through an imaginary house. One where the team has several passageways around the house available. These passageways are:

- The Room of Contentment.
- The Room of Denial.
- The Room of Confusion.
- The Basement of Pain.
- The Playroom (my adaptation).
- The Room of Renewal.

Each room denotes the overriding emotional state or mindset encountered in the various phases through a change process and each demands a different management approach.

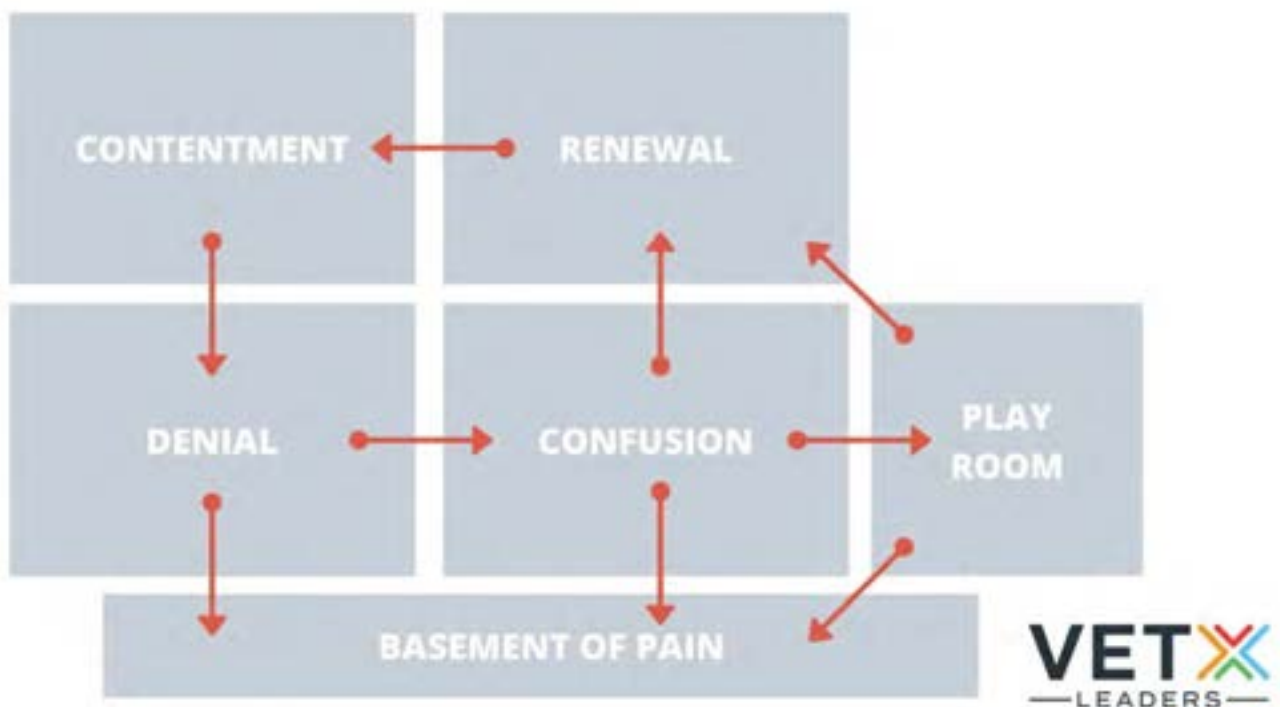


Figure 1 - The Room of Change (Adpated)

Through the skillful application of communication and leadership skills, the astute team lead can help speed up the progress through this cycle, eventually resulting in a reborn enthusiasm for the task in hand. And, just as importantly, avoiding the often visited basement of pain.

Awareness and application of these three models and the leadership principles associated are extremely helpful for leaders managing in change situations.

The Biggest Obstacle to Good Leadership is... TIME! But How Can You Make More of It?

Time management is 'the process of organizing and planning how to divide and arrange schedules amongst specific undertakings in order to maximize effectiveness in an efficient manner'¹. Time is a strategic resource in businesses and is a fundamental element of workplace organization². However, many veterinary leaders can't seem to get enough of it.

Although leaders (and veterinarians) are working fewer hours than they did back in 2014 and 2010, the most frequently cited reason for planning to leave the profession was poor work-life balance³. Excessive workloads, work hours, and work-home interference emerged strongly as problems in veterinary literature⁴. Recent surveys have shown that 74% of professionals in the industry were concerned about stress and burnout⁵, and other studies have shown that work-life balance remains an important theme for both employers and employees in terms of career longevity⁶.

Though many leaders are driven by the enjoyment of their jobs and by the desire to make a difference, work-life balance problems remain, and the lack thereof poses challenges for leaders trying to make time for both their staff and businesses⁷. Thankfully, several strategies can be used to maximize clinic efficiency, and generate more time for leaders looking to improve their businesses.

¹IRIKEFE, O. Pureheart. "Roles, Importance and Benefit of Time Management in achieving Organisational Objectives."

² "(PDF) Time as Strategic Resource in Management of Organizations." 25 Mar. 2020, https://www.researchgate.net/publication/340165460_Time_as_Strategic_Resource_in_Management_of_Organizations. Accessed 8 Apr. 2021.

³ "The 2019 survey of the veterinary profession - RCVS." <https://www.rcvs.org.uk/news-and-views/publications/the-2019-survey-of-the-veterinary-profession/>. Accessed 8 Apr. 2021.

⁴ "Finding the Balance: Uncovering Resilience in the Veterinary" <https://pubmed.ncbi.nlm.nih.gov/28206842/>. Accessed 8 Apr. 2021.

⁵ "Stress and burnout top vet concerns six months on from Covid" 29 Oct. 2020, <https://www.bva.co.uk/news-and-blog/news-article/stress-and-burnout-top-vet-concerns-six-months-on-from-covid-lockdown/>. Accessed 8 Apr. 2021.

⁶ "Success in career transitions in veterinary practice: perspectives of" 24 Aug. 2019, <https://pubmed.ncbi.nlm.nih.gov/31256013/>. Accessed 8 Apr. 2021.

⁷ "Understanding veterinary leadership in practice - CORE." <https://core.ac.uk/download/pdf/267018976.pdf>. Accessed 8 Apr. 2021.

System Reviews

The systems used in practice should be continually and periodically reviewed over time. Leaders who set aside energy to review their existing systems will by default create more space in their day by improving the efficiency of their processes.

Pull aside the management team for a frank discussion. Are there certain procedures that take time away from high-value tasks in the clinic? Perhaps completing equipment approval forms or answering emails takes too long. Can these tasks be delegated to someone else? Or can they be streamlined?

Leaders need to evaluate how they can spend less time on low-value tasks (such as answering emails, attending unnecessary meetings and undertaking administrative tasks) so they can spend more time on high-value ones. Focusing on these tasks (such as modifying onboarding processes, cultivating team cultures etc) will pay off two-fold, and therefore should be prioritized. The key is to create systems that work for leaders, rather than against them.

All Aboard!

The first couple of weeks of onboarding staff is critical. A thorough onboarding process will not only save time but will also give recruits the confidence to perform their jobs well. Deficiencies in non-technical skills are a major driver for veterinary errors, therefore proper training can improve performance in the long-term⁸.

Every practice has different processes, and teaching them to recruits is imperative. Not doing so will result in a multitude of mistakes, which will take twice as much time to fix. Frequent errors, complaints and questions will take up precious time which could be used for high-value tasks.

Expect the Unexpected

When creating plans or setting out goals, practice leaders should be conscious of possible setbacks and/or problems that may occur. Perhaps a nurse leaves unexpectedly, or the market takes an unexpected turn- whatever it is, there should be some sort of 'fallback' plan in place. If veterinary leaders have learned anything from this pandemic, it is to expect the unexpected.

⁸ "We need to talk about error: causes and types of error in veterinary" 31 Oct. 2015, <https://pubmed.ncbi.nlm.nih.gov/26489997/>. Accessed 8 Apr. 2021'.

Having succession plans, cash reserves and other emergency procedures in place will help leaders manage during times of crisis. This will not only ease anxiety, but also help save precious time. Have staff record their processes or dedicate time to look up veterinary trends to anticipate market changes. Though it is impossible to prepare for everything, planning for common occurrences (such as job changes) will ultimately save time and energy.

Make Time For Yourself

Leaders cannot hope to maximize their time and efficiency if they are exhausted. Veterinary leaders are doing some of the most valuable work on the planet, and for them to take care of their staff and clients, they must take care of themselves.

Burnout results in reduced levels of workplace effectiveness and increases cynicism and emotional exhaustion⁹. Seeing how a large proportion of veterinary leader's work is to manage others, working oneself to exhaustion only creates more inefficiency. Though self-care can seem like a waste of time, in actuality, dedicating that time to look after one's health will increase efficiency overall.

Leaders should be intentional with their self-care. Taking a walk during the day, or even practicing breathing techniques (which have been proven to drastically reduce stress¹⁰) in the clinic could be beneficial. Leaders in their free time should try and spend it wisely. Connecting and spending time with family and friends can truly be rejuvenative, improving mental health outcomes¹¹. It does not matter too much what leaders choose to do, as long as it allows them to disconnect from their work and recharge.

Takeaway

Time management is an essential skill every veterinary leader (and their staff) needs. Leaders who maximize their time, dedicating more of it to high-value tasks, will greatly benefit from this process. Leaders lacking the time to develop and/or work on their business must reevaluate their priorities and consider what is required for practice growth.

⁹ "IJERPH | Free Full-Text | Quality of Work Life and Contribution to" <https://www.mdpi.com/1660-4601/18/5/2425>. Accessed 8 Apr. 2021.

¹⁰ "How to take the perfect breath: why learning to ... - The Guardian." 26 Aug. 2020, <https://www.theguardian.com/lifeandstyle/2020/aug/26/how-to-take-the-perfect-breath-why-learning-to-breathe-properly-could-change-your-life>. Accessed 8 Apr. 2021.

¹¹ "Connection and disconnection as predictors of mental health and" 31 May. 2020, <https://internationaljournalofwellbeing.org/index.php/ijow/article/view/855>. Accessed 8 Apr. 2021.

Breaking Up is Hard to do...It's Not You, It's Me – Part I

Dave Nicol, BVMS Cert Mgmt MRCVS

CEO, VetX International

Being a 'good leader' is multidimensional and complex. Oftentimes, despite a practice owner's best intentions, chaos can erupt in the clinic, creating dysfunction and disarray. But how can leaders identify whether it's the practice itself causing all the problems- or something else?

We examine the options available for managers in terms of addressing poor performance and/or culture fit in the clinic.

The Three Main Causes of Team Strife

Generally (but not always) there are three reasons why veterinary teams struggle.

The first reason is that clinics can lack a unifying purpose. This is imperative, as whilst many vets would (likely) say their purpose at work is to help animals, this is not a sustainable driver. This is because there will always be sick pets who need help, therefore, the work is endless. Having no unifying end goal can burn out veterinarians as they have nothing to look forward to. A unifying purpose is so fundamental to work ethic that 83% of workers identify purpose as a key motivator at work¹.

The second biggest problem veterinary practices face is poor hire-for-fit. Veterinarians are in short supply nowadays and many leaders struggle to find good staff- if any at all². A bad hire can cost \$15,000 on average and cause havoc in the clinic³.

The third biggest mistake leaders make is allowing themselves to relentlessly ride the hamster wheel of leadership. The hamster wheel of leadership describes when leaders allow themselves to get caught up in the 'urgent' tasks of the day- never allocating time for less urgent, but more important business matters. This can cause stagnation.

Is It Me- or You?

Practice leaders who have problems in the clinic should ask themselves the following questions:

¹ "Putting Purpose to Work: PwC." <https://www.pwc.com/us/en/purpose-workplace-study.html>. Accessed 21 Apr. 2021.

² "UK 'needs more overseas vets and architects', say government" 29 May. 2019, <https://www.bbc.co.uk/news/uk-48443716>. Accessed 21 Apr. 2021.

³ "Performance Predicting in Hiring Process and ... - IEEE Xplore." 22 Aug. 2019, <https://ieeexplore.ieee.org/document/8809154/>. Accessed 21 Apr. 2021.

Can you (or your staff) articulate your practice's vision?
 Does your practice have a high staff turnover?
 Do you constantly feel like you are working but getting nowhere?

A practice's vision reflects the long-term goals of a clinic. Leaders or staff members who can't define their vision likely have no unifying principles to drive them forward.

Assessing a practice's staff turnover can additionally be indicative of a systematic issue. Veterinary turnover is a prolific and expensive problem. High rates of turnover correlate with stress, burnout, and dissatisfaction in the workplace⁴. Happier workers are 13% more productive than unhappy ones, therefore, practice managers or leaders struggling with this issue should look inwards to assess the cause.

Leaders who consistently feel like they are busy- but not getting anywhere are likely spending too much time focusing on clinical tasks rather than business activities.

Those who resonate with any of these questions should assess themselves in the following manner:

- First, they should reflect on the tasks they have completed that week
- Then they should write them down
- Once they have done this, they should assess how important these tasks were
- Then assess how urgent they were

Leaders who find that they are completing more urgent tasks but neglecting important ones are likely putting their workplace culture at risk. Tasks such as completing payroll, performance monitoring, training, etc are all needed for sustainable business development.

How Can Leaders Tackle This?

There are several strategies leaders can use.

Leaders should define their why, what, and how. Their why is the purpose of the practice, which is central to conceptualizing a unifying purpose. Their what is their practice mission. This is a distinct set of goals that drives performance. The how

⁴ "Strategic solutions to employee turnover in the animal health industry." <https://krex.k-state.edu/dspace/handle/2097/41387>. Accessed 21 Apr. 2021.

represents a practice's values. These values outline how the clinic functions, in terms of general practice.

When hiring, leaders should try to match their values to the people they recruit. This will (hopefully) reduce the likelihood of employing someone who doesn't fit into a practice's culture.

Having regular strategic planning meetings, operational meetings, team meetings and one on one sessions can further help ensure everyone is on the same page and maintaining the values of the practice.

Owners or managers who find themselves stepping in to do others' jobs not only prevent the growth of their employees, but deprive themselves of time. Leaders therefore should delegate and maintain boundaries to ensure that important tasks can be completed.

Giving useful feedback and recognizing good work can further help positively reinforce staff members and encourage personal development. Acknowledging personal mistakes can influence others to do likewise.

Leaders should also prioritize self care. Utilizing strategies outside work to manage stress/prevent burnout is key for the happy, healthy functioning of a practice.

Takeaway

Leaders who are struggling with dysfunctional teams should resist pointing the finger. By looking inwards and reflecting (but not blaming) themselves, leaders can identify the wider cultural drivers of poor performance and move forward in their practice.

Breaking Up is Hard to do...It's Not Me, It's You!

**Dave Nicol, BVMS Cert Mgmt MRCVS
CEO, VetX International**

Many veterinary practices suffer from poor performance. As a result practices endure chronically high staff turnover with lower profitability and higher stress levels. So what causes this issue and how can it be addressed?

1. Performance Dysfunction Defined

Performance problems typically sort into one of two categories.

1. A problem with the work itself - for example the quality, cost, size, speed may be lacking.
2. A problem with the behavior of a team member whilst doing the work.

The latter category being the issue in the vast majority of performance issues encountered. In the author's experience more than 90% of performance issues are related to behavior.

2. Why Do We Have Bad Team Members?

The most common reason for performance issues are:

1. Poor job fit.
2. Poor team fit.
3. Unclear expectations and/or training on what is expected as an output of the job.
4. Unclear expectations and/or training on how to behave.
5. The absence of an effective performance management process.
6. A lack of self awareness and/or accountability on behalf of managers and employees.

3. What Not To Do

There are many behaviors that managers/owners resort to in order to solve the issue.

1. Ignore the issue or avoid it hoping that things will improve.
2. Blame everyone else for the problem.
3. Yell at everyone like a tyrannical maniac - usually follows on from strategy one after a period of time.
4. Rant online berating your staff publicly.
5. Seek out advice from unqualified sources - on facebook - the very thing you hate clients for doing when they visit you!
6. Fire everyone
7. Sell your practice because it's too hard.

4. Effective Tactics To Resolve Issues

Instead try these things:

1. Create a performance management process. This can be done easily using the cycle below as a framework. (figure 2.)



Figure 2.

Any good performance cycle contains the above elements.

1. Written Standards

Be clear about what work is to be done and how performance will be measured.

2. Objective Data When Possible

Try to have unambiguous measures in place that can be shared frequently (preferably as close to real time as possible) so performance can be gauged by the person doing the job with as little subjective external input as possible. This leaves less room for personality clashes and subjective assessments to color opinion. In short, it's clearer and fairer.

3. Publish Data (Dashboards)

If you can get your performance measures onto a dashboard then do so, and give your team members access to that dashboard.

4. Choose Measures Carefully

Be careful of the law of unintended consequences. A good example was revealed to me by a colleague who once confided that he did not bill worker tablets for clients who just walked in as it adversely affected his average transaction fee - the principle number upon which his performance was measured. The result - he was giving low priced stock away for free!

5. Practice Feedback

Most people find feedback difficult to give and worse to receive. But for feedback to be effective it must be accurate, objective, focused on the work or behavior, not the person, timely and given in the spirit to lift the recipient up. The receiver has a role to play also however, as they must receive the feedback gratefully. Psychological safety when giving or receiving feedback is essential.

6. Begin With Values

The best place to start this process off is by defining values as they are the basis for how everyone in the practice will treat each other in the future. In other words, you will be encoding the principles for how everyone in your practice makes decisions.

If for example you value integrity, then define in three short sentences what this value actually means in practice. It's essential to do this so it's not left open to interpretation (at best) or simply being ignored (at worst).

Once you have identified each value is and defined what it means, then you are ready to share this with the team and begin the process of training and holding others (including yourself) accountable to these new behavioral standards.

7. Start Small

As with any new initiative, the larger and more complicated it is, the more likely it is to fail. So start with small steps and gradually bring clarity to your people by firming up the awareness of what is expected of each role, and what behaviors are expected of each person.

What To Do When It's Not Working Out?

Sometimes, despite our best efforts, things just don't work out. So what happens then?

How will I know when it's time?*

1. Rule Of Three - someone who consistently makes the same or similar errors despite training.

2. Rule Of One - someone who commits an egregious violation of either professional or cultural standards.

3. Good Vs Bad - how many good days do they have versus how many bad days and how can you quantify the impact fairly. Please bear in mind that if the bad days are being caused by problems such as ill physical and mental health, you may need to give more leeway to the employee. There is always room for compassion in the good leadership toolkit.

4. Is It Fair? - Are you considering dismissal on grounds that are legal and fair? If so, then proceed.

5. Are You Done? - Is this situation one that is no longer tenable for you? Has the relationship broken down to the extent that cordial and predictive relations are not possible? If so, it's time to move on.

How do I let someone go?

Follow the legal process wherever you are... most countries and many states have different levels of employee protection. Failing to follow such rules is unwise and potentially illegal an error that could cost you huge sums of money in compensation payments

That said, if the dismissal is fair and necessary, failure to act on it can also cost you a huge amount of time and money also.

The hardest part to often emotionally committing to the decision, as you do, notice all the fears that arise. Most of these are fictitious beasts of burden that will not come to pass.

So do your homework, dismiss for reasons of performance and follow the due process. Your culture and business performance (not to mention your stress) will be glad that you did.

*The advice here is general in nature and cannot cover any specific instances. Therefore you should always seek out legal advice specific to your legal jurisdiction before commencing termination of any employee.

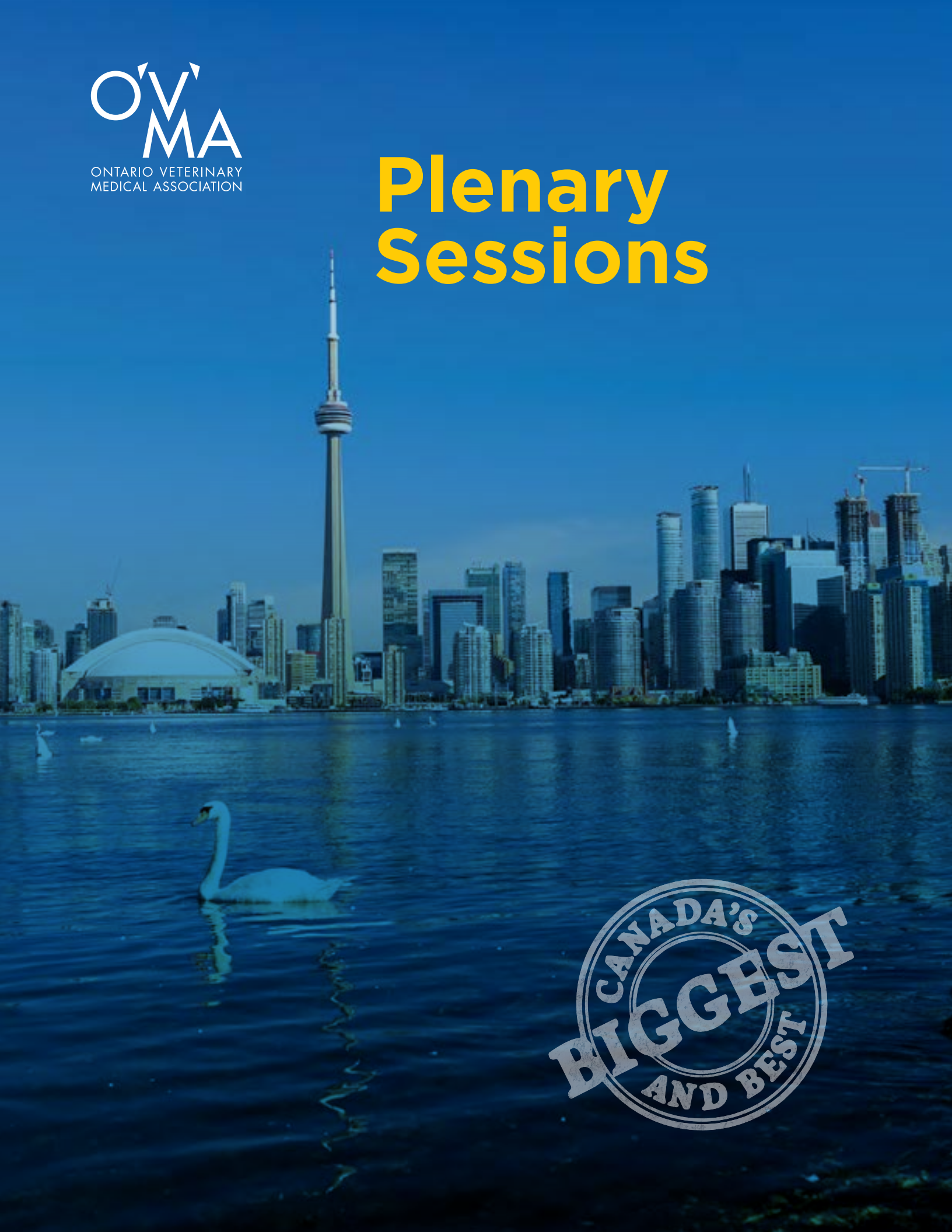
Leading others needs bold and clear action to help things go right. And to sort them out if they go wrong. An unpleasant but necessary step as a healthy culture can only thrive when we engage & empower people who help it grow, and remove those who try to harm it. The *Leadership Actions & Their Impact On Veterinary Practice Culture Study* (McInerney & Nicol 2021) published by VetX International revealed that the greatest negative impact on poor

culture was a failure to deal with toxic team behavior. Avoid this by hiring well, setting clear expectations, actively managing performance and letting go people who do not meet the required standard.



ONTARIO VETERINARY
MEDICAL ASSOCIATION

Plenary Sessions



INFECTIOUS DISEASE ROUNDUP 2022

Maureen E.C. Anderson, DVM, DVSc, PhD, Dip. ACVIM

SARS-CoV-2 in animals

Information on SARS-CoV-2 in animals (as in humans) continues to evolve, along with the virus itself. We must be vigilant for changes in the epidemiology, virulence and host range of SARS-CoV-2. Here are a few key points (we think) we know:

SARS-CoV-2 can spread from people to animals (including dogs and cats) during close contact, but the risk of animals spreading SARS-CoV-2 to people is low in most cases, particularly as it relates to household contacts. The risk may be higher in some settings such as veterinary clinics and during procedures that increase exposure to respiratory droplets or aerosols.

Although illness in cats (and less so dogs) does occur, serious illness is extremely rare. Vaccination of cats and dogs is therefore of very limited use at this time. Testing of animals for SARS-CoV-2 is also generally not recommended, except under specific circumstances where the test result may have a significant impact on management of the animal or animals / people with which it has contact, or as part of an organized research project.

Preventing transmission of SARS-CoV-2 to wildlife is very important. How the virus may spread within and between wildlife species is extremely difficult to predict and has the potential to create a wildlife reservoir and promote emergence of new variants. White-tailed deer and mink have both been shown to be very susceptible to and capable of spreading SARS-CoV-2.

- Information on SARS-CoV-2 in animals (Worms & Germs Blog)
<https://www.wormsandgermsblog.com/tags/covid-19/>
- SARS-CoV-2 in animals dashboard (Canadian Animal Health Surveillance System)
<https://cahss.ca/cahss-tools/sars-cov-2-dashboard>
- Animals and COVID-19 (Government of Canada):
<https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks/animals-covid-19.html>
- Position statement on testing of animals for SARS-CoV-2 (Council of Chief Veterinary Officers of Canada): <https://www.ccvo-cmvc.com/en/position-statements>
- Information about COVID-19, pets and other animals (US Centers for Disease Control and Prevention): <https://www.cdc.gov/healthypets/covid-19/index.html>

Update to list of notifiable hazards in Ontario

Following consultation in late 2021, an update to the appendices listing notifiable hazards in O. Reg. 277/12 (Reporting of Hazards and Findings) under the Animal Health Act, 2009, is proposed for 2022. The update is expected to include clarification of some of the pathogens and diseases already included on the lists, some adjustments to which hazards are periodically notifiable (i.e. reported annually by diagnostic laboratories in Ontario) versus immediately notifiable (by either the veterinarian or laboratory involved), and the addition of some hazards such as *Echinococcus multilocularis*, *Leishmania* spp, and SARS-CoV-2. Once enacted, the final list will be available on the Ontario.ca website (www.ontario.ca/laws/regulation/120277).

Antimicrobial stewardship resources

Antimicrobial stewardship - in all species, including humans - is an evermore important issue. While stewardship encompasses a broad range of practices, from infection control to

preventative medicine to knowing when NOT to use antimicrobials, appropriate selection and use of antimicrobials when they're needed is a critical component. To facilitate this, access to the [CVMA antimicrobial use guidelines](#) is now available at your fingertips through the [Firstline app](#). After downloading the app, choose "CVMA" as your location, then sign in with your CVMA-registered email (if you are not a CVMA member, simply contact CVMA to register your email to access the app). [Guidelines are available for dogs, cats, horses, cattle, poultry and small ruminants, and can be searched by disease condition, pathogen or drug](#). Also the OVC-CPHAZ companion animal AMU guidelines are available through the same app (use "OVC-CPHAZ" as location) and include even more information and disease conditions in dogs and cats. In 2018, the OVMA launched farmed animal antimicrobial stewardship (FAAST), an open-access website which hosts a plethora of interactive tools and practical resources for veterinarians and farm animal owners to help curb antimicrobial resistance. These include 9 species-specific learning modules (called FAAST Reviews) as well as the latest reviews focused on biosecurity practices and management of neonatal farmed animals.

- Farmed animal antimicrobial stewardship (FAAST): www.amstewardship.ca
- OAHN antimicrobial stewardship infographics (OAHN login required):
 - [If it's just a sneeze: Feline upper respiratory disease and antibiotics](#)
 - [Itchy dogs: Topical treatments & culture-critical cases](#)
 - [Treat me right: Bacterial cystitis in cats vs dogs](#)
 - [Treat me right: Canine infectious respiratory disease complex \(CIRDC\)](#)
 - [Using the best medicine and reducing antibiotic use](#) (open access)
 - [Help reduce antibiotic use in horses](#) (open access)

2 cases of rabid dogs imported from Iran (July 2021, January 2022)

Since July 2021, two cases of rabies have been confirmed in dogs in Ontario that had been recently imported from Iran through rescue organizations. The first case was detected in July 2021 in an adult dog that developed signs of an ocular issue and increased drooling that progressed over two days. The dog was euthanized within 12 days of importation. The second case was detected in January 2022 in a dog that was imported at the age of approximately 3 months in June 2021. The dog developed abnormal twitching, which progressed to fulminant neurological signs over six days, at which point the dog was euthanized. These cases each led to extensive investigations involving multiple public health units and 49 individuals received rabies post-exposure prophylaxis as a result of contact with the dogs. Both dogs had been vaccinated for rabies in Iran prior to importation with CANVAC-R, which is not a licensed rabies vaccine in Canada. In both cases, the rabies virus involved was confirmed to be a canine variant known to circulate in Iran.

Veterinarians who examine a dog, cat, or ferret recently imported into Canada should acquire and scrutinize a copy of the animal's previous vaccination record and/or health certificate and ensure the animal is currently vaccinated against rabies if it is over 3 months of age. If there is any question regarding the validity of the animal's documentation or the reliability of any previous vaccinations (in terms of product used, route of administration, age at administration or any other concerns), then the animal should be revaccinated for rabies as soon as possible, and a new vaccination certificate issued by the attending veterinarian. Under the Health Protection and Promotion Act (Reg. 567), previous vaccination using products that are not licenced for use in Canada is considered invalid in Ontario.

Remember: Vaccination prior to importation does not reliably prevent rabies in a dog that was exposed to the virus prior to vaccination and import. The typical incubation period for rabies in a dog can be up to 6 months.

Veterinarians should contact OMAFRA for assistance with rabies risk assessments, sample submission or post-exposure management, as needed. Veterinarians can submit a request for assistance online at www.omafra.gov.on.ca/rabiesrequest. Requests submitted within business hours will receive a response the same day, typically within 1-2 hours. Requests can also be submitted outside of business hours and will receive a response the next business day; interim triage guidance is provided on the webpage. If you require assistance with completing the online form due to limited internet access or due to any other accessibility issue, please contact the OMAFRA Agricultural Information Contact Centre at 1-877-424-1300 (option 1) during business hours (weekdays 8:30 AM - 4:30 PM). Animal owners who contact OMAFRA directly concerning potential rabies exposures will be advised to contact their local veterinarian.

- OMAFRA update on wildlife rabies and recent cases of imported canine rabies in Ontario (Feb-2022)
<http://www.omafra.gov.on.ca/english/food/inspection/ahw/rabies-update.htm>
- Latest Ontario rabies surveillance and control maps
<https://www.ontario.ca/page/wildlife-rabies-outbreaks-and-control-operations>
- OMAFRA Rabies website (for public and veterinarians)
www.omafra.gov.on.ca/english/food/inspection/ahw/rabies.htm
- OAHN rabies resource page for veterinarians (OAHN login required)
<https://www.oahn.ca/resources/rabies-resource-page-for-veterinarians/>
 - Rabies risk assessment flowchart
 - Veterinary guidance for domestic animal to human bites flowchart
 - Potential exposure of domestic animals to rabies: Guidance for Public Health
 - Rabies specimen handling and shipping information (including videos)

Prevalence of pathogens in dogs recently imported from Asia

A recent OAHN-funded study from the University of Guelph tested 94 dogs imported to Ontario from Asia for a number of zoonotic and canine-specific pathogens, including extended-spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae, *Dirofilaria immitis*, *Brucella canis*, canine parainfluenza, adeno- and herpes viruses. Not every dog was tested for every pathogen. Preliminary results showed 28% of dogs were positive for at least one pathogen of interest. *Dirofilaria immitis* was the most common pathogen detected (n=13) followed by ESBL-producing Enterobacteriaceae (n=9). Testing for respiratory viruses was complicated by suspected cross-reaction to intranasal vaccine given around the time of importation. A cluster of *B. canis* infections was detected in one large shipment of dogs. While the study does not provide accurate estimates of the prevalence of each of these pathogens in imported dogs from Asia due to the non-random sampling design, it does identify some of the relative risks, and emphasizes the need for education of prospective dog owners, and the need for infection control measures such as diagnostic testing and short-term isolation of imported dogs. The project summary will be posted on the [OAHN website](#).

- CVMA Veterinarian's Dog Importation Checklist (available in both English and French)
www.canadianveterinarians.net/veterinary-resources/practice-tools/canine-importation/
- OAHN canine importation, rescue and related resources
www.oahn.ca/resources/canine-importation-rescue-and-related-resources/

Lung fluke cluster, Goderich ON

Several cases of infection with the North American lung fluke, *Paragonimus kellicotti*, were reported in the Goderich ON area in late 2021. This parasite has a complex life cycle involving

snails and crayfish, and its definitive host in the wild is thought to be mink. However, dogs can be infected by eating raw crayfish, or by eating other small animals like rodents that prey on crayfish. The flukes ultimately migrate from the dog's intestinal tract to the lungs, where they form cysts in the lower airways. Fluke eggs are coughed up, swallowed and passed in the feces. People can also be infected by this parasite, but only by eating uncooked crayfish – it cannot be spread directly from a dog. Human infections in North America are rare.

Signs of infection in dogs can range from none (subclinical) to intermittent coughing or dyspnea to severe pneumonia to spontaneous pneumothorax. Diagnosis is based on detection of fluke eggs in phlegm or feces. Cysts in the lungs may also be detected on radiographs. Uncomplicated infections typically respond well to antiparasitic therapy. A veterinary infosheet on *P. kellicotti* will soon be available from [OAHN](#).

Strep zoo outbreak in a dog kennel

Streptococcus equi subsp. *zooepidemicus* (Strep zoo) is a very common opportunistic pathogen in horses, but a very uncommon cause of disease in dogs (and very rarely even people). Infections in dogs are typically sporadic, but tend to cause fairly severe and rapidly progressive pneumonia. Outbreaks have occasionally been reported in kennels or shelters, but only a few cases have previously been diagnosed in dogs in Ontario. In early October 2021, an outbreak of canine infectious respiratory disease complex (CIRDC) occurred in a group of 30 dogs in an Ontario shelter. Clinical signs in four of the dogs became severe enough that they had to be hospitalized, of which one died and one had to be euthanized. Strep zoo was confirmed in 3 of the 4 dogs. When the first dog was admitted to the ICU, the attending veterinarian at the kennel suspected something unusual and immediately instituted strict isolation and biosecurity measures to help prevent further spread. Clinical signs in the remaining dogs were much less severe and they all recovered.

In group settings like kennels or shelters, diagnostic testing of early cases of CIRDC can help guide management and treatment of the group. Strep zoo is an unusual pathogen in dogs that practitioners should keep on their radar. [This pathogen has also recently been identified as a cause of significant disease in swine](#), though the strains found in dogs and pigs do not appear to be closely related.

Pet pigs, backyard pigs, wild pigs and African Swine Fever

African Swine Fever (ASF) has been circulating widely in Europe and Asia since 2018, with an incursion into the western hemisphere in the fall of 2021 when it was detected in the Dominican Republic and Haiti. While the virus that causes ASF is not a food safety or human health risk, the disease is a looming and very serious threat to the North American swine industry. Large scale swine producers typically have strict biosecurity measures in place, but smaller backyard operators, hobbyists and pet pig owners are often less aware of the risks and how to mitigate them. Appropriate management of these animals is just as crucial to preventing the introduction of ASF into Canada, including control of food sources, visitors, and containment to prevent escapes. A number of excellent resources have been developed to provide guidance to pig owners, and to provide additional training to veterinarians who may be asked to provide medical care to these animals.

Wild pigs have played an important role in the spread of ASF, especially in Europe and Asia throughout their natural home range. In North America, wild pigs (regardless of breed or origin) are an invasive species. Wild pigs can survive remarkably well in almost any landscape, they reproduce quickly and are very intelligent, making them extremely difficult to eradicate once a population is established. They can also cause major damage to natural ecosystems,

agricultural land, and can spread diseases that are infectious to livestock and humans. In Ontario, any pig outside a fence and not under direct control of a person is considered a wild pig, and must be reported to the Ministry of Northern Development, Mines, Natural Resources and Forestry and removed from the landscape as soon as possible. While there are large populations of wild pigs already established in western Canada, no established populations have been detected in Ontario. Vigilance to detect and remove any wild pigs is critical to preventing their establishment.

- Guide to pet pig ownership (Swine Health Ontario)
<http://www.swinehealthontario.ca/Communications/pet-pig-guide>
- Small scale pig farming in Ontario (Ontario Pork)
<https://www.ontariopork.on.ca/producers/small>
- Fencing for outdoor pig production – Protect livestock and the environment (OMAFRA)
<https://files.ontario.ca/omafra-fencingpigs-en-2020-04-06.pdf>
- Dealing with escaped livestock in your community (OMAFRA)
<https://www.ontario.ca/page/dealing-escaped-livestock-your-community>
- Invasive wild pigs in Ontario and how to report sightings (NDMNR)
<https://www.ontario.ca/page/invasive-wild-pigs-ontario>

Blastomycosis cases in Ontario

In late summer 2021 there was a perceived increase in the number of blastomycosis cases referred to OVC. There was also a devastating outbreak of blastomycosis in people in Constance Lake First Nation in November; a few dogs were noted to be ill around the same time, but none of the dog cases were confirmed.

Blastomycosis is a tricky disease to monitor. It is regionally endemic in Ontario, especially around Georgian Bay, northwestern Ontario and the Ottawa region. Blastomycosis in dogs is periodically notifiable in Ontario, meaning cases are reported to OMAFRA by Ontario laboratories on an annual basis. However, veterinarians in high-risk areas may be accustomed to detecting cases based on history, clinical signs and thoracic radiographs, in which case diagnostic samples are not submitted and the cases are not reported. Cases are also reported by the location of the veterinary clinic, which is typically near where the animal lives, but not necessarily where the animal was exposed to the fungus. Most if not all of the cases detected in major urban centres are likely travel-related, particularly in dogs that spend time at cottages or hunting in high-risk areas. This highlights the importance of taking a good travel history, as some owners may not think of their regular trips to the cottage a few hours away as “travel.” Including this information on laboratory submissions is also helpful for surveillance. A map of all canine blastomycosis cases reported to OMAFRA from 2013-2020 is available in the [companion animal OAHN Fall 2021 N2K update](#) (OAHN login required).

Although the yeast form of the fungus in an infected dog is not easily spread to others, cutaneous exposure through bites or contact with discharge from draining wounds through broken skin is still a risk to veterinary staff and others. A [blastomycosis infosheet for dog owners](#) is now available from OAHN and the Worms & Germs Blog.

Additional infectious disease resources & links of interest

- OAHN antiparasitics table – UPDATE 2022
<https://www.oahn.ca/resources/anti-parasitics-table-for-cats-and-dogs/>
- OAHN online disease reporting portal (for non-notifiable diseases)
<https://www.oahn.ca/companion-animal-disease-surveillance-submission-form/>



OVMA Conference Speaker Bios



SMALL ANIMAL PROGRAM

ANNATASHA BARTEL, BSCH, BVM&S, MRCVS, DIP. ACVAA

Anesthesiologist, Head of Anesthesia and Surgery, VCA Toronto Veterinary Emergency Hospital

Dr. Annatasha Bartel is an ACVAA diplomate working in private practice in Toronto, Canada. She graduated from the University of Edinburgh in 2008 and completed her residency in anesthesia and analgesia at Cornell in 2015. Her particular interest includes the anesthesia of critical patients, locoregional anesthesia, and veterinary education. In her free time, she enjoys travelling, hiking, Scuba diving and baking. She is currently subservient to three house cats.

JEFFREY BISKUP, DVM, DACVS

Staff Surgeon, Animal Health Partners

Jeff attended veterinary school at the Ontario Veterinary College before completing a rotating internship at the University of Illinois and a 3-year surgical residency at the University of Minnesota. After completing his training, Jeff accepted a faculty position at the University of Tennessee where he worked for 5 years before heading to Oregon State University for 2 years. He has now joined the team at Animal Health Partners and is excited to be back in the land of snow and Justin Bieber! Jeff enjoys all aspects of orthopedic and soft tissue surgery with a focus on different cranial cruciate ligament repair techniques, total hip replacements and abdominal procedures.

ALICE DEFARGES, DVM, MSC, DIPLOMATE ACVIM

Associate Professor Small Animal Internal Medicine, Ontario Veterinary College, University of Guelph

Alice earned her veterinary degree from the Ecole Nationale Veterinaire d'Alfort, France. She worked in private practice for several years in France and then moved to North America to specialize. She completed an internship in small animal medicine and surgery, followed by a small animal internal medicine residency and MSc at the University of Montreal. Alice joined the Ontario Veterinary College (University of Guelph, Ontario, Canada), as an associate Professor in internal medicine in 2008. Her area of clinical and research interest are minimally invasive procedures, urology and gastroenterology. Alice published multiple papers in peer-reviewed journals regarding videocapsule endoscopy in dogs. She is considered as an expert in capsule endoscopy.

CHARLOTTE DONOHOE, RVT, VTS(ECC), CCRP

OVC Fitness and Rehabilitation, Smith Lane A.H.

Ontario Veterinary College Health Sciences Centre, University of Guelph

Charlotte is a primary care technician and rehabilitation practitioner working at OVC's Smith Lane Animal Hospital. She obtained her Bachelor of Arts from York University and her veterinary technician diploma from Seneca College. After establishing her interest in intensive and critical care medicine, Charlotte obtained her VTS(ECC) in 2004. She is the author of a text book on fluid therapy, and has co-authored several articles and book chapters. Charlotte's focus has shifted to small animal rehabilitation and she is obtained her CCRP from the University of Tennessee. She enjoys working with military and police working dogs and aspires to enhance their comfort, safety, athleticism and longevity by focusing on strength and conditioning programs for all.

CAROLINA DUQUE, DVM, MSC, DVSC, ACVIM (NEUROLOGY)

Head of Neurology Department, Mississauga Oakville Veterinary Emergency Hospital

Dr. Duque completed her training in veterinary neurology at the Ontario Veterinary College, University of Guelph. She obtained a Masters degree in veterinary neurology in 2000 and also completed a DVSc program (neurology) in 2003. Dr. Duque has fulfilled the strict guidelines set by the American College of Veterinary Internal Medicine in order to receive her board certification in neurology. In 2004, Dr. Duque joined the Veterinary Teaching Hospital of the OVC as a clinical neurologist and provided training to graduate and undergraduate students.

2022 OVMA CONFERENCE – SPEAKER BIOS

In 2006 Dr. Duque founded the neurology department at the Mississauga Oakville Veterinary Emergency Hospital and has been working in the service for the past 14 years. Dr. Duque is involved in continuing education programs locally and internationally.

TIFFANY DURZI, DVM, CVA, CCRT, CVPP, DIPLOMATE ABVP

Chief of Service, OVC Fitness and Rehabilitation Service, University of Guelph

Dr. Durzi, graduated from OVC in 2000 and began her career working at a mixed animal practice in Southern Ontario. In 2001, she moved to the Cayman Islands where she practiced small animal medicine and surgery for seven years in private practice and two years at St. Matthew's University School of Veterinary Medicine. In 2010, she returned to the Ontario Veterinary College as a clinical veterinarian at the Hill's Primary Healthcare Centre. Dr. Durzi is a Primary Care Veterinary Educator at the OVC Smith Lane Animal Hospital. Dr. Durzi is Certified Veterinary Acupuncturist (CVA), a Certified Canine Rehabilitation Therapist (CCRT) and a Certified Veterinary Pain Practitioner (CVPP). She has been the Chief of Service at the OVC Fitness and Rehabilitation Service since 2013. She became a Diplomate of the American Board of Veterinary Practitioners (ABVP) in Canine and Feline Medicine in 2021.

JACY FORD, BSC, RVT, CCRP

RVT, Ontario Veterinary College, University of Guelph

Jacy graduated from the University of Guelph in 2013 with her Bachelor of Science in Animal Biology before pursuing her Veterinary Technician Diploma at Seneca College. Jacy graduated from Seneca in 2016 and then started her RVT career at the Ontario Veterinary College in both the Surgery department and the ICU. During these years she gained a lot of valuable experience in nursing care for patients with decreased mobility, which was a major influence in her drive towards canine rehabilitation. She eventually transitioned to OVC's primary care and rehab facility in 2018, where she began her journey into rehabilitation! In 2021, Jacy obtained her Certificate as a Canine Rehabilitation Practitioner through the University of Tennessee. Jacy enjoys the hands-on approach that rehabilitation offers during patient recovery and feels rewarded by the positive affect it has on a patient's mobility, fitness, and overall quality of life. She especially loves working with patients who are geriatric or overweight and patients with neurological deficits.

KINGA GORTEL, DVM, MS, DIPLOMATE ACVD

Veterinary Dermatologist, VCA Canada Tri Lake Animal Hospital & Referral Centre

Kinga is a veterinary dermatologist who has worked as a clinician, instructor, and lecturer in Western Canada and California since becoming board certified by the American College of Veterinary Dermatology in 1999. She currently practices dermatology in the Okanagan Valley. She graduated from the Western College of Veterinary Medicine and completed an internship, dermatology residency, and Masters degree Program at the University of Illinois. In addition to clinical practice, Kinga has taught the dermatology curriculum to veterinary students at the Western College of Veterinary Medicine and the University of Calgary. She has authored articles and textbook chapters on various subjects in small animal dermatology and is particularly interested in resistant staphylococci and how they are changing practice.

Kinga is a long-standing member and past president of the Canadian Academy of Veterinary Dermatology. She has also served on the Examination Committee of the American College of Veterinary Dermatology.

LYNN GRIFFIN, DVM, MS, DACVR, DACVR(RO)

Associate Professor, Colorado State University

Dr. Lynn Griffin is an associate professor of radiology at the Colorado State University Teaching Hospital. She is double boarded in both radiation oncology and radiology and has a strong research focus on oncologic imaging, in particular PET/CT. Dr. Griffin graduated from the Ontario Veterinary College before going on to work in general practice as a mixed animal practitioner, small animal veterinarian and emergency practitioner before heading back to Colorado State University in 2010 where she completed both of her residencies then stayed on as faculty.

2022 OVMA CONFERENCE – SPEAKER BIOS

JESSICA JOHNSON, BS, DVM

Lead Veterinarian, LLC & Main Street Veterinary Dental Clinic, Grapevine TX

Dr. Jessica Johnson was raised in a small town outside of Dallas, Texas. She attended the University of Arkansas where she studied Animal Science. While there, she competed in NCAA track & field, finishing her track career with two All-American honors and a top ten finish for USA women's high jump. She retired from track & field and now enjoys competing in Ironman triathlons.

After graduating from Texas A&M's College of Veterinary Medicine in 2008, Dr. Johnson spent a decade in small animal practice: day practice, relief and emergency care. Following her passion for dentistry and oral surgery, she completed a 3-year residency with Heidi Lobprise, DVM, DAVDC, passed her written boards in 2021, and is currently preparing to sit for the practical exam. In March 2022, her original research was published in the Journal of Veterinary Dentistry on keratinizing odontogenic cysts. She particularly enjoys the problem-solving associated with jaw fractures, trauma, malocclusions, and oral medicine.

Like many veterinary graduates, she had to attain much of her dentistry experience and education after graduation. She pursued her residency while working full time in general practice and dental specialty and raising three small children. As a result, she feels compelled and uniquely qualified to teach general practitioners and has tremendous respect for the challenges GPs face in the real world and the trench(mouth)es.

CORNELIA MOSLEY, DR.MED.VET., DACVAA, CVA

Veterinary Anesthesiologist, VCA Canada 404 Veterinary Emergency and Referral Hospital

Dr. Cornelia (Conny) Mosley is a boarded anesthesiologist working at VCA Canada 404 Veterinary Emergency and Referral Hospital in Newmarket as an anesthesiologist and provides care for chronic pain patients in the Integrative Veterinary Pain Clinic. Conny graduated from the University of Leipzig in Germany and completed her residency at the University of Florida. She has held faculty positions at North Carolina State University, Oregon State University and Ontario Veterinary College.

She has strong interest in pain management, in particular, the different integrative approaches to pain relief. Conny is certified in veterinary acupuncture. In her Integrative Pain Management Service, she helps to improve the quality of life of patients experiencing chronic pain.

Dr. Mosley is also the founding director and vice-president of the Canadian Association of Veterinary Cannabinoid Medicine (www.cavcm.com) an organization that helps to understand, educate and collaborate in research in cannabinoid medicine and it's role in veterinary medicine. Through this organization, Conny has played a crucial role in the field of cannabinoid veterinary medicine in Canada.

She has extensively been lecturing nationally and internationally on multiple topics, but with a special passion when it comes to cannabinoid medicine and integrative pain management. She continues to learn more about these fascinating subjects on a daily basis.

In her spare time, Conny enjoys her two busy daughters, her even busier husband and all of their pets out in the country. Of all her pets, her large Münsterlander 'Birko' is her favorite. She enjoys a historic novel when there is time to relax.

ADESOLA ODUNAYO, DVM, MS, DACVECC

Clinical Associate Professor, University of Tennessee

Adesola Odunayo is a clinical associate professor at the University of Tennessee. She got her veterinary degree at Oklahoma State University in 2005 and completed a residency in emergency and critical care at the University of Missouri in 2010. Dr. Odunayo has a wide variety of clinical and research interests, including venous catheters, sepsis and gastrointestinal acid suppression. However, the favorite part of her job is sitting by the bedside of her patients and showering them with love and affection.

2022 OVMA CONFERENCE – SPEAKER BIOS

LISA RADOSTA, DVM, DACVB

Veterinary Behaviorist, Owner, Florida Veterinary Behavior Services

Dr. Radosta is a board-certified behaviorist and owner of Florida Veterinary Behavior Service since 2006.

She is a national and international speaker for veterinarians, their staff and lay people. She is the editor for the new edition of the Handbook of Behavior Problems of the Dog and Cat and has written chapters for Blackwell's Five Minute Veterinary Consult, Canine and Feline and Small Animal Pediatrics, and Decoding Your Cat. She is the coauthor of From Fearful to Fear Free.

Dr. Radosta has published scientific research articles on the incidence of thyroid disease in aggressive dogs, housetraining in small dogs, cat welfare and client communication, winning 2 research awards. She has written review articles for Advances in Small Animal Medicine and Surgery, Compendium, NAVC, Clinician's Brief, VetStream and AAHA News Stat. She served on the Fear Free Executive Council, the AAHA Behavior Management Task Force and was the Behavior section Editor for the Advances in Small Animal Medicine and Surgery.

Dr. Radosta has been interviewed for many publications including Cat Fancy, Dog Fancy, Palm Beach Post, NAVC Clinician's Brief, Sun Sentinel, WebMD, AAHA Trends, Real Simple, chewy.com, Oprah Magazine and AAHA News Stat. She has appeared on Lifetime television, Laurie Live, News Channel 25 (West Palm Beach, WPBF), Mitch Wilder's Amazing Pet Discoveries, Nat Geo Wild, Animal Planet, News Channel 10 (Miami, ABC) and Steve Dale's Pet Talk. She podcasts and teaches webinars for VetGirl and Dog Nerds.

MARK RISHNIW, BVSC, MS, PHD, DACVIM

Adjunct Professor (Cornell), Director of Clinical Research (VIN)

Cornell University and Veterinary Information Network

Mark graduated from Melbourne University in 1987 and went into practice in Melbourne, Australia. After 4 years in practice, he started and completed a residency in Internal Medicine at Washington State University. He then completed a residency in cardiology at UC Davis and was subsequently board certified in both specialties. After a year as registrar at Melbourne University, he joined the cardiology service at Cornell University in 1997. Three years later, he embarked on a PhD and emerged with diploma in hand 9 years later.

During this time, he joined the Veterinary Information Network (VIN), where he currently works as a consultant in cardiology and coordinates clinical research projects. He is also an adjunct professor at Cornell University, assisting with teaching and clinical research.

Mark has co-authored 200 peer-reviewed publications on a variety of topics ranging from statistical analyses of heartworm disease to delusional parasitosis. He has a particular interest in cardiac mensuration, especially of the left atrium. Mark regularly speaks at international meetings and has been an invited speaker at several meetings on cardiac issues. His hobbies include biostatistics, cycling, wood-working and house repairs. He is married and has a Labrador named Yarra.

JINELLE WEBB, DVM, DVSC, DIPLOMATE ACVIM (SAIM), ADJUNCT PROFESSOR OVC

Medical Director, Associate Internal Medicine

Dr. Jinelle Webb received her DVM in 2001 from the Ontario Veterinary College. An interest in small animal internal medicine led to the Ontario Veterinary College's DVM program in internal medicine in 2002. She completed her DVSc in 2005, and obtained board certification with the American College of Veterinary Internal Medicine that year. In 2006, Dr. Webb joined the Mississauga-Oakville Veterinary Emergency Hospital to start its' Internal Medicine service, where she remains today as Medical Director. Dr. Webb has lead the MOVEH rotating internship and Internal Medicine residency programs and is an adjunct Professor at the OVC. A published author and speaker, Dr. Webb's main research interests include investigating the use of laboratory testing and imaging modalities in the detection of occult disease; developing novel approaches to internal medicine procedures; and investigating ways to reduce the invasiveness of procedures.

FOCUS ON INFECTION

MAUREEN ANDERSON, DVM, DVSC, PHD, DACVIM

Lead Veterinarian, Animal Health & Welfare, OMAFRA

Maureen Anderson is a graduate of the Ontario Veterinary College and is ACVIM Board-certified in large animal internal medicine. Her graduate research focused on MRSA in horses and equine personnel, as well as hand hygiene and infection control measures used in small animal clinics. She is currently Lead Veterinarian, Animal Health and Welfare at the Ontario Ministry of Agriculture, Food and Rural Affairs, where she continues to work in areas bridging animal and public health, including infectious disease control, antimicrobial resistance and rabies response.

KATIE CLOW, DVM, PHD

Assistant Professor, Department of Population Medicine, OVC, University of Guelph

Dr. Katie Clow is an Assistant Professor in One Health in the Department of Population Medicine at the Ontario Veterinary College, University of Guelph. Her research focuses on the ecology and epidemiology of vectors and vector-borne zoonoses, with a specific emphasis on the blacklegged tick and Lyme disease. She also conducts research more broadly on One Health, including pedagogy and community-level applications. She holds both a Doctor of Veterinary Medicine degree (OVC, 2011) and PhD (Pathobiology, 2017). Dr. Clow has worked in private small animal practice as well as at the national and international level in One Health through internships at the Canadian Food Inspection Agency, Department of Food Safety, Zoonoses and Foodborne Disease at the World Health Organization, and the Global Disease Detection Branch of the Centers for Disease Control and Prevention. She is a member of the Canadian Lyme Disease Research Network, and regularly collaborates with public health professionals and veterinarians in private practice and industry.

MATTHEW KORNYA, DVM, ABVP (FELINE), RESIDENCY TRAINED, RESIDENT ACVIM (SAIM)

Resident ACVIM, Ontario Veterinary College

Dr. Kornya completed his DVM at the Ontario Veterinary College in 2014 and entered feline private practice at The Cat Clinic in Hamilton, where he completed an ABVP residency. He also practices emergency medicine at several hospitals. In 2020 he began a Small Animal Internal Medicine Residency at the OVC, where his research focuses on platelet function in cats. Dr. Kornya lives with his six cats and cockatiel.

KELLY ST. DENIS, MSC (IMMUNOLOGY), DVM, DABVP (FELINE PRACTICE)

Veterinarian/Educator, St. Denis Veterinary Professional Corporation

Dr. St. Denis is a practicing feline medicine specialist, board certified with the American Board of Veterinary Practitioners in the specialty of feline practice. In her early career, she trained in molecular biology and immunology, working in the field of cancer research. In 1999 she graduated from the Ontario Veterinary College, going on to own and operate the Charing Cross Cat Clinic from 2007 to 2020. Dr. St. Denis is the 2020-2021 President for the American Association of Feline Practitioners and an active volunteer in the organization, participating in many committees and task forces. Dr. St. Denis is a consultant on the Veterinary Information Network in feline medicine.

EQUINE

BILL MOYER, BS, DVM

Professor Emeritus, Large Animal Clinical Sciences, College of Veterinary Medicine, Texas A&M

Dr. Moyer graduated with his BS from Colorado State University in 1968 and his DVM in 1970. He did an Internship and Residency in Equine Surgery from 1970-1973. He built and owned a private practice in Pennsylvania from 1973 until 1980. From 1980 until 1993, he was a Professor of Equine Sports Medicine at the University of Pennsylvania, and then moved on to the College of Veterinary Medicine at Texas A&M as a Professor and Department Head of Large Animal Clinical Science until 2015.

Dr. Moyer is currently Professor Emeritus at Texas A&M and is a Past-President of AAEP. He Currently lives in central Montana and is an active member of Texas A&M Veterinary Emergency Team and Disaster Relief AAEP.

VALERIE MOORMAN, DVM, MS, PHD, DACVS-LA

Associate Clinical Professor, Large Animal Surgery and Lameness, University of Georgia, College of Veterinary Medicine

Dr. Valerie Moorman is a 2004 graduate of North Carolina State University College of Veterinary Medicine. She completed a large animal internship at Auburn University and an equine surgery residency and master's degree at Oklahoma State University. She then moved to Fort Collins, Colorado to enroll in a PhD program at the Equine Orthopedic Research Center at Colorado State University where she investigated body mounted sensors for gait analysis in lame horses. After completing her PhD in 2013, she was hired as faculty equine surgeon at Colorado State University. In 2019, she took a Clinical Associate Professor position at the University of Georgia. Research interests include gait analysis and use of rehabilitation to improve outcomes in horses.

HARRY WERNER, VMD, BSCI, PHD

Consulting Associate (now retired), Grand Prix Equine

Dr. Werner has practiced equine medicine and surgery since his 1974 graduation from the University of Pennsylvania, School of Veterinary Medicine. For 46 years, he owned Werner Equine, a general equine practice in northern Connecticut where his cases focused on lameness, prepurchase examinations, diagnostic imaging, internal medicine and welfare concerns. In 2020, Werner Equine merged with Grand Prix Equine where Dr. Werner is a consultant.

Dr. Werner has spoken nationally and internationally and published articles on Lameness, Ppurchase Examination, Equine Welfare, Veterinary Ethics, Farrier-Veterinarian Relationships and Lyme disease.

Serving the American Association of Equine Practitioners in many positions for more than 41 years, Dr. Werner was 2009 AAEP President. He presently serves as an Emeritus Member of AAEP's Welfare & Public Policy Council's Subcommittee for Wild Horses and Burros.

Dr. Werner helped to initiate the International Forum for Working Equids with BEVA President Chris House and participated in Project Samana, the Dominican Republic equitarian program. He served the World Equine Veterinary Association as a Director and Treasurer.

In 2013, Dr. Werner was elected to the International Equine Veterinarians Hall of Fame and received AAEP's Distinguished Service Award honoring him for exemplary service to the AAEP to benefit the horse and veterinary medicine. He was chosen 2015 Connecticut Veterinarian of the Year.

In 2016, the Seth and Lucy Holcombe estate established the Dr. Harry Werner Professorship in Equine Medicine at New Bolton Center, University of Pennsylvania School of Veterinary Medicine - a position dedicated to teaching, research and clinical outreach in equine welfare and well-being.

AAEP awarded Dr. Werner its 2017 Distinguished Life Member Award to recognize his outstanding contributions to AAEP throughout his career. In 2020, the American Veterinary Medical Association presented Dr. Werner with its Animal Welfare Award. This award recognizes achievement in advancing the welfare of animals via leadership, public service, education, research/product development, and/or advocacy.

PRACTICE MANAGEMENT

SUSAN BIALI HAAS, M.D.

Mental Health Clinician, OwlPod Mental Health Clinic

Dr. Susan Biali Haas is an award-winning medical doctor, internationally recognized for her expertise in mental health, stress management, burnout prevention and resilience. Formerly depressed and burned out, Dr. Biali turned her own life around by extensively studying how to overcome these debilitating conditions. In addition to her clinical practice in mental health, she coaches a broad range of clients, from military leaders and senior executives to physicians and other health professionals – to take control of their mental and physical well-being. Her popular Psychology Today blog has over 9 million views, and she has been featured in media such as the Today Show, Oprah.com, Forbes and others.

CHRIS DOHERTY, DVM

Manager of Economic Research

Chris is a 2013 graduate of OVC. After graduation, he practiced companion animal medicine before joining the OVMA, and is currently their Manager of Economic Research. He has pursued additional business and economic credentials, such as Colorado State University's Veterinary Management Institute, is concluding his training as a Chartered Business Valuator, and is currently completing a Master of Business Administration degree

BASH HALOW, CVPM, LVT

Owner, Halow Consulting

Bash is a graduate of the College of William and Mary, a certified veterinary practice manager, and a licensed veterinary technician. As a veterinary advisor and a veteran practice manager with more than 20 years of experience, Mr. Halow has helped dozens of veterinary hospitals understand how to build stronger teams and responsibly and ethically grow their businesses. He is a frequent contributor to Veterinary Economics and DVM 360 and is a member of the editorial advisory board for the FetchDVM360 veterinary conferences. He has been an invited speaker at all of the major U.S. veterinary conferences including AVMA, AAHA, NAVC, VHMA, Western, Midwest, CVC, IVECCS; state associations, and international conferences APVC, OVMA and the Alberta Veterinary Medical Association. Bash is a regular speaker at the annual VPMA Conference in Wales and addressed the Veterinary Management Association at the House of Lords, London in June 2018.

Mr. Halow is a member of the American Animal Hospital Association, the PVMA, founder and member of the New Jersey Veterinary Hospital Management Association, founder of the Big Apple Veterinary Management Association in New York City, and proud member of the Veterinary Hospital Managers Association.

Mr. Halow was the 2013 recipient of the Pennsylvania Veterinary Medical Association's President's Award for management education in the state of Pennsylvania. He resides in New York City and has a farm in Pennsylvania where he unsuccessfully wrestles vegetables, fruits, chickens and flowers from the mouths of all manners of bugs and wild things with appetites.

DAVE NICOL, BVMS CERT MGMT MRCVS

CEO, VetX International

Dr. Dave Nicol is a veterinarian with more than 20 years of experience in general practice and has held several leadership roles within practice and industry. He has written three books, most recently the best-selling, *So You're a Vet... Now What?* – a manifesto on how to survive as a veterinarian after graduation.

Dr. Dave hosts The Veterinary Career Success Show, the Veterinary Business Success Show and Blunt Dissection podcasts which combined have been played more than 275,000 times. He founded VetX to help vets connect with their career and help practice owners create fantastic practices for veterinarians to work in.

Dr. Dave speaks at conferences all over the world, to speak about his favourite topic of leadership and generally cheerleading for the veterinary profession. In 2019, he was voted VMX Practice Manager Speaker of the Year.

DARREN OSBORNE, MA

Director of Economic Research, Ontario Veterinary Medical Association

Darren Osborne is the Director of Economic Research for the Ontario VMA and Economic Consultant for the Canadian VMA, Veterinary Hospital Managers Association, several State VMAs and veterinary study groups across North America. Darren attended York University and completed his Master's Degree in Economics in 1992. When he is not crunching numbers, you can find Darren playing a guitar, running, swimming or cycling.