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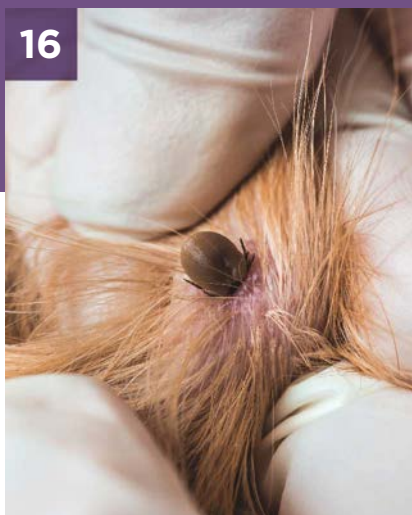


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Kara M. Burns,
MS, MEd, LVT, VTS (Nutrition),
VTS-H (Internal Medicine,
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VITAL SIGNS

EXAM ROOM

The 3 Rs of Tick-Borne Diseases

Holly Morss, LVT, Washington State University, Pullman, WA

How can your hospital or practice increase client compliance with tick preventive methods and products? The first step is ensuring every team member understands tick-borne disease so that they can convey its importance, answer client questions, and communicate preventive recommendations.

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Rachel Beck, CVT, Banfield Pet Hospital, Portland, OR

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FEATURES

CRITICAL CARE

Providing Care to Dogs with Heatstroke

Amy Newfield, CVT, VTS (ECC), BluePearl Veterinary Partners, Waltham, MA

During the dog days of summer, companion animals are at heightened risk for heatstroke. Every second counts when an animal is suffering from this condition. In order to increase the patient's chance for survival, it is imperative that you learn to recognize the signs and symptoms so that you can provide treatment quickly and effectively.

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EXTRA MILE

WHAT MOVES YOU?

ASPCA and the Arms of Angels

Pam Dickens, CVT, Animal Care Center, New Port Richey, FL

The logo of the American Society for the Prevention of Cruelty to Animals carries the tagline "we are their voice." Founded in 1866, the ASPCA depends on the dedicated volunteers who donate their time and talent to help animals. Here is the story of how one veterinary nurse chose to make a difference.

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Unique and Unusual: Exotic Animal Medicine

Sarah Kolb, BAS, RVT, VTS (Exotic Companion Animal), ISU Lloyd Veterinary Medical Center, Ames, IA

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FINAL THOUGHTS

A Global Perspective on Veterinary Nursing

Kenichiro Yagi, MS, RVT, VTS (ECC, SAIM), Park Innovation Laboratory, College of Veterinary Medicine, Cornell University



ON THE COVER

Veterinary nurses are on the front lines in the battle to ensure their patients stay healthy and safe during the summer months. Is your team prepared? Photo shutterstock.com/lbharbor



Teamwork Makes the Dream Work

The veterinary healthcare team is just that—a team. As the author, speaker, and leadership expert John C. Maxwell has said, “The truth is that teamwork is at the heart of great achievement” (johnmaxwell.com/blog/one-is-too-small-a-number).

Each member of the veterinary healthcare team plays an important role that is critical to the overall success of the team and, subsequently, to the overall wellness of the patient and success of the hospital.

Think about your hospital—does it feel like a healthy working team? Or is the feeling more in line with a work group? Individuals who are responsible for a specific portion of an overall process comprise a work group. Roles and limits are known by each individual and performed accordingly. Is this your hospital's philosophy? To me, this is not the team concept that I envision.

As members of the veterinary team we understand one another's roles and skills, and each individual skill complements other individual skills. There is a sense of shared accountability. Credentialed veterinary nurses bring knowledge and a skill set that when utilized properly complements the other members of the team. This is true of all members of the veterinary team—reception, veterinarians, veterinary assistants, practice manager, kennel assistants, etc. When we work together, it is in the best interest of our patients and we also improve ourselves individually. In addition, when each member of the team is maximizing his or her skills and knowledge, individual and team morale improves, and turnover is reduced. This is the goal we should strive for every day.

Why not make this way of working a reality? I have seen this in action and have been part of a team-oriented veterinary hospital. Teamwork divides the tasks and multiplies the success!

Those who know me know that I am a dork, and I love quotes, such as the one on this page by Mattie Stepanek. But they also know I wholeheartedly believe what I am saying—or quoting. We work in a busy, exciting, fast-paced medical environment. We chose this profession, so I believe our philosophy is to provide the best medicine to our patients. Working together as a veterinary team allows each of us to do just that every day—provide the best veterinary care for the pets that come through the door!

This was our dream when we first embarked on our careers. Let's continue to follow our dreams—together. **TVN**



Kara M. Burns,
MS, MEd, LVT, VTS (Nutrition),
VTS-H (Internal Medicine,
Dentistry)
Editor in Chief

“Unity is strength ...
when there is teamwork
and collaboration,
wonderful things can
be achieved.”

— Mattie Stepanek, author of
Journey Through Heartsongs

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Burnout, compassion fatigue, work-related stress, depression, and suicide are words that we veterinary nurses are unfortunately familiar with—caring for our patients and their families carries an emotional toll brought on by various stressors, such as financial struggles, loss of patients, unfavorable work environments, and even workplace bullying. Fostering employee wellbeing has become a focus in the workplace, and, fortunately, various organizations, including NAVTA, have dedicated resources to providing tools and support for veterinary employers and employees.

The Value of a Support Group

A support group composed of peers is one of the best resources for an individual working through emotional challenges and psychological trauma. Support groups help these individuals on a number of fronts: (1) the individual will meet peers who are struggling or have struggled with the same challenges and traumas; (2) the support-group “community” provides a safe place for the individual to express his or her feelings; and (3) the individual will receive helpful information, guidance or tools for working through the difficulty. The bottom line: the individual realizes he or she is not alone in facing these difficulties. That realization can help create self-awareness, and as the individual copes with the challenging situation or heals from the trauma, he or she can eventually become part of the support group helping someone else in need.

In 2014, Jade Velasquez, an LVT from Washington, established the Veterinary Support Staff Unleashed (VSSU) group on Facebook ([facebook.com/groups/1564029533810246](https://www.facebook.com/groups/1564029533810246)), which has close to 15,000 members today. NAVTA approached VSSU with a proposal to create a collaborative relationship as partners in providing support for NAVTA members as well.

“NAVTA has long been a proponent of advancing the field of veterinary technology and providing resources and education,” says Velasquez. “Seeing NAVTA take note of VSSU and give us an outlet in the *NAVTA Journal* was honestly one of my biggest dreams. Not only were they providing educational resources but they were allowing the community of vet med a voice regarding wellness. They publish stories of struggles, victories and self-care. NAVTA embraced our community in detailing how to speak about the educational value in just being ourselves as well as technicians and supporting one another.”

Today, that support continues. VSSU publishes articles relating to wellness in each issue of *NAVTA Journal*.



Heather Prendergast, RVT, CVPM, SHPH
Co-Chair
The Veterinary Nurse Initiative



Kenichiro Yagi, MS, RVT, VTS (ECC, SAIM)
Co-Chair
The Veterinary Nurse Initiative
NAVTA, President Elect

“Fostering employee wellbeing has become a focus in the workplace, and, fortunately, there are tools, resources, and strategies that you can employ to ensure your veterinary workplace is one that supports the emotional wellbeing of the entire team.”



The NAVTA Wellbeing Task Force

The NAVTA Wellbeing Task Force (navta.net/page/Wellbeing), formed in 2018, is headed by co-chairs Mary Berg, BS, RVT, RLATG, VTS (Dentistry) and Rebecca Rose, CVT. Its mission is to help veterinary team members create a life and career that is fulfilling, rewarding, and sustainable, and seeks to empower all veterinary team members to advocate for and strengthen one another. As its website states:

“For decades, studies have detailed that veterinarians are at risk for depression, psychological distress, and burnout. Veterinary team members show a progression from idealistic enthusiasm to a gradual loss of energy and commitment. Fatigue, frustration, and mental anguish may lead to feelings of incompetence, helplessness, and hopelessness—and can shorten a career or lead to a toxic environment within your veterinary team. The entire veterinary team is at risk. The Wellbeing Task Force will provide support to veterinary technicians/nurses and team members.”

The task force website has resources relating to physical wellbeing, mental wellbeing, professional wellbeing, and veterinary team finances and debt load.

Communication Is Key

Having a conversation is one of the best things we can do for one another when we are experiencing difficult times. When we talk to one another, listen without judgment, and are kind, we are providing critical support to a colleague in need. This is particularly true when you are concerned that a coworker is at risk for suicide or experiencing depression.

“This conversation is going to be uncomfortable and that’s okay,” writes Jamie Holms, RVT, CPT1, in a recent article in *Today’s Veterinary Nurse* (“Is Suicide Preventable?” Winter 2019 issue). Holms contends that suicide is both preventable and predictable and that we need to overcome feelings of helplessness in how to approach someone in trouble and feel empowered to make a difference.

You can start the conversation by asking if the person is doing okay and then listening without judgment and acknowledging his or her feelings if he or she expresses them. If you don’t know how to help, try to guide the individual to resources and professionals who are trained to help. The National Suicide Prevention Lifeline is a free resource (800-273-TALK or 8255).

Suicide and depression might be serious concerns you’ll encounter in the workplace, but they’re not the only ones. Burnout, compassion fatigue, and workplace stresses also plague veterinary professionals. In addition, home-related stress can impact an employee’s workplace attendance, attitude, mood, and performance. When you see a colleague in trouble, what is your response? How do you act toward him or her?

We are all likely to thrive in a “we’ve got your back” culture and environment, and we should be striving to create such an environment. Start today. Ask yourself, what am I doing as an individual each day to help create a culture of wellbeing in the workplace? **TVN**

“When we talk to one another, listen without judgment, and are kind, we are providing critical support to a colleague in need.”



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¹Data on file.



IMPORTANT SAFETY INFORMATION: NexGard is for use in dogs only. The most frequently reported adverse reactions include vomiting, pruritus, lethargy, diarrhea and lack of appetite. The safe use of NexGard in pregnant, breeding, or lactating dogs has not been evaluated. Use with caution in dogs with a history of seizures or neurologic disorders. For more information, see the full prescribing information or visit www.NexGardClinic.com.

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NexGard® (afoxolaner) Chewables

CAUTION: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Description:

NexGard® (afoxolaner) is available in four sizes of beef-flavored, soft chewables for oral administration to dogs and puppies according to their weight. Each chewable is formulated to provide a minimum afoxolaner dosage of 1.14 mg/lb (2.5 mg/kg). Afoxolaner has the chemical composition 1-Naphthalenecarboxamide, 4-[5-[3-chloro-5-(trifluoromethyl)-phenyl]-4, 5-dihydro-5-(trifluoromethyl)-3-isoxazoly]-N-[2-oxo-2-[(2,2,2-trifluoroethyl)amino]ethyl].

Indications:

NexGard kills adult fleas and is indicated for the treatment and prevention of flea infestations (*Ctenocephalides felis*), and the treatment and control of Black-legged tick (*Ixodes scapularis*), American Dog tick (*Dermacentor variabilis*), Lone Star tick (*Amblyomma americanum*), and Brown dog tick (*Rhipicephalus sanguineus*) infestations in dogs and puppies 8 weeks of age and older, weighing 4 pounds of body weight or greater, for one month. NexGard is indicated for the prevention of *Borrelia burgdorferi* infections as a direct result of killing *Ixodes scapularis* vector ticks.

Dosage and Administration:

NexGard is given orally once a month, at the minimum dosage of 1.14 mg/lb (2.5 mg/kg).

Dosing Schedule:

Body Weight	Afoxolaner Per Chewable (mg)	Chewables Administered
4.0 to 10.0 lbs.	11.3	One
10.1 to 24.0 lbs.	28.3	One
24.1 to 60.0 lbs.	68	One
60.1 to 121.0 lbs.	136	One
Over 121.0 lbs.	Administer the appropriate combination of chewables	

NexGard can be administered with or without food. Care should be taken that the dog consumes the complete dose, and treated animals should be observed for a few minutes to ensure that part of the dose is not lost or refused. If it is suspected that any of the dose has been lost or if vomiting occurs within two hours of administration, redose with another full dose. If a dose is missed, administer NexGard and resume a monthly dosing schedule.

Flea Treatment and Prevention:

Treatment with NexGard may begin at any time of the year. In areas where fleas are common year-round, monthly treatment with NexGard should continue the entire year without interruption.

To minimize the likelihood of flea reinfestation, it is important to treat all animals within a household with an approved flea control product.

Tick Treatment and Control:

Treatment with NexGard may begin at any time of the year (see **Effectiveness**).

Contraindications:

There are no known contraindications for the use of NexGard.

Warnings:

Not for use in humans. Keep this and all drugs out of the reach of children. In case of accidental ingestion, contact a physician immediately.

Precautions:

Afoxolaner is a member of the isoxazoline class. This class has been associated with neurologic adverse reactions including tremors, ataxia, and seizures. Seizures have been reported in dogs receiving isoxazoline class drugs, even in dogs without a history of seizures. Use with caution in dogs with a history of seizures or neurologic disorders (see **Adverse Reactions** and **Post-Approval Experience**).

The safe use of NexGard in breeding, pregnant or lactating dogs has not been evaluated.

Adverse Reactions:

In a well-controlled US field study, which included a total of 333 households and 615 treated dogs (415 administered afoxolaner; 200 administered active control), no serious adverse reactions were observed with NexGard.

Over the 90-day study period, all observations of potential adverse reactions were recorded. The most frequent reactions reported at an incidence of > 1% within any of the three months of observations are presented in the following table. The most frequently reported adverse reaction was vomiting. The occurrence of vomiting was generally self-limiting and of short duration and tended to decrease with subsequent doses in both groups. Five treated dogs experienced anorexia during the study, and two of those dogs experienced anorexia with the first dose but not subsequent doses.

Table 1: Dogs With Adverse Reactions.

	Treatment Group			
	Afoxolaner		Oral active control	
	N ¹	% (n=415)	N ²	% (n=200)
Vomiting (with and without blood)	17	4.1	25	12.5
Dry/Flaky Skin	13	3.1	2	1.0
Diarrhea (with and without blood)	13	3.1	7	3.5
Lethargy	7	1.7	4	2.0
Anorexia	5	1.2	9	4.5

¹Number of dogs in the afoxolaner treatment group with the identified abnormality.

²Number of dogs in the control group with the identified abnormality.

In the US field study, one dog with a history of seizures experienced a seizure on the same day after receiving the first dose and on the same day after receiving the second dose of NexGard. This dog experienced a third seizure one week after receiving the third dose. The dog remained

enrolled and completed the study. Another dog with a history of seizures had a seizure 19 days after the third dose of NexGard. The dog remained enrolled and completed the study. A third dog with a history of seizures received NexGard and experienced no seizures throughout the study.

Post-Approval Experience (July 2018):

The following adverse events are based on post-approval adverse drug experience reporting. Not all adverse events are reported to FDA/CVM. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data.

The following adverse events reported for dogs are listed in decreasing order of reporting frequency for NexGard:

Vomiting, pruritus, lethargy, diarrhea (with and without blood), anorexia, seizure, hyperactivity/restlessness, panting, erythema, ataxia, dermatitis (including rash, papules), allergic reactions (including hives, swelling), and tremors.

Contact Information:

For a copy of the Safety Data Sheet (SDS) or to report suspected adverse drug events, contact Meril at 1-888-637-4251 or www.nexgardfordogs.com.

For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at <http://www.fda.gov/AnimalVeterinary/SafetyHealth>.

Mode of Action:

Afoxolaner is a member of the isoxazoline family, shown to bind at a binding site to inhibit insect and acarine ligand-gated chloride channels, in particular those gated by the neurotransmitter gamma-aminobutyric acid (GABA), thereby blocking pre- and post-synaptic transfer of chloride ions across cell membranes. Prolonged afoxolaner-induced hyperexcitation results in uncontrolled activity of the central nervous system and death of insects and acarines. The selective toxicity of afoxolaner between insects and acarines and mammals may be inferred by the differential sensitivity of the insects and acarines' GABA receptors versus mammalian GABA receptors.

Effectiveness:

In a well-controlled laboratory study, NexGard began to kill fleas four hours after initial administration and demonstrated >99% effectiveness at eight hours. In a separate well-controlled laboratory study, NexGard demonstrated 100% effectiveness against adult fleas 24 hours post-infestation for 35 days, and was >93% effective at 12 hours post-infestation through Day 21, and on Day 35. On Day 28, NexGard was 81.1% effective 12 hours post-infestation. Dogs in both the treated and control groups that were infested with fleas on Day -1 generated flea eggs at 12- and 24-hours post-treatment (0-11 eggs and 1-17 eggs in the NexGard treated dogs, and 4-90 eggs and 0-118 eggs in the control dogs, at 12- and 24-hours, respectively). At subsequent evaluations post-infestation, fleas from dogs in the treated group were essentially unable to produce any eggs (0-1 eggs) while fleas from dogs in the control group continued to produce eggs (1-141 eggs).

In a 90-day US field study conducted in households with existing flea infestations of varying severity, the effectiveness of NexGard against fleas on the Day 30, 60 and 90 visits compared with baseline was 98.0%, 99.7%, and 99.9%, respectively.

Collectively, the data from the three studies (two laboratory and one field) demonstrate that NexGard kills fleas before they can lay eggs, thus preventing subsequent flea infestations after the start of treatment of existing flea infestations.

In well-controlled laboratory studies, NexGard demonstrated >97% effectiveness against *Dermacentor variabilis*, >94% effectiveness against *Ixodes scapularis*, and >93% effectiveness against *Rhipicephalus sanguineus*, 48 hours post-infestation for 30 days. At 72 hours post-infestation, NexGard demonstrated >97% effectiveness against *Amblyomma americanum* for 30 days. In two separate, well-controlled laboratory studies, NexGard was effective at preventing *Borrelia burgdorferi* infections after dogs were infested with *Ixodes scapularis* vector ticks 28 days post-treatment.

Animal Safety:

In a margin of safety study, NexGard was administered orally to 8 to 9-week-old Beagle puppies at 1, 3, and 5 times the maximum exposure dose (6.3 mg/kg) for three treatments every 28 days, followed by three treatments every 14 days, for a total of six treatments. Dogs in the control group were sham-dosed. There were no clinically-relevant effects related to treatment on physical examination, body weight, food consumption, clinical pathology (hematology, clinical chemistries, or coagulation tests), gross pathology, histopathology or organ weights. Vomiting occurred throughout the study, with a similar incidence in the treated and control groups, including one dog in the 5x group that vomited four hours after treatment.

In a well-controlled field study, NexGard was used concomitantly with other medications, such as vaccines, anthelmintics, antibiotics (including topicals), steroids, NSAIDs, anesthetics, and antihistamines. No adverse reactions were observed from the concomitant use of NexGard with other medications.

Storage Information:

Store at or below 30°C (86°F) with excursions permitted up to 40°C (104°F).

How Supplied:

NexGard is available in four sizes of beef-flavored soft chewables: 11.3, 28.3, 68 or 136 mg afoxolaner. Each chewable size is available in color-coded packages of 1, 3 or 6 beef-flavored chewables.

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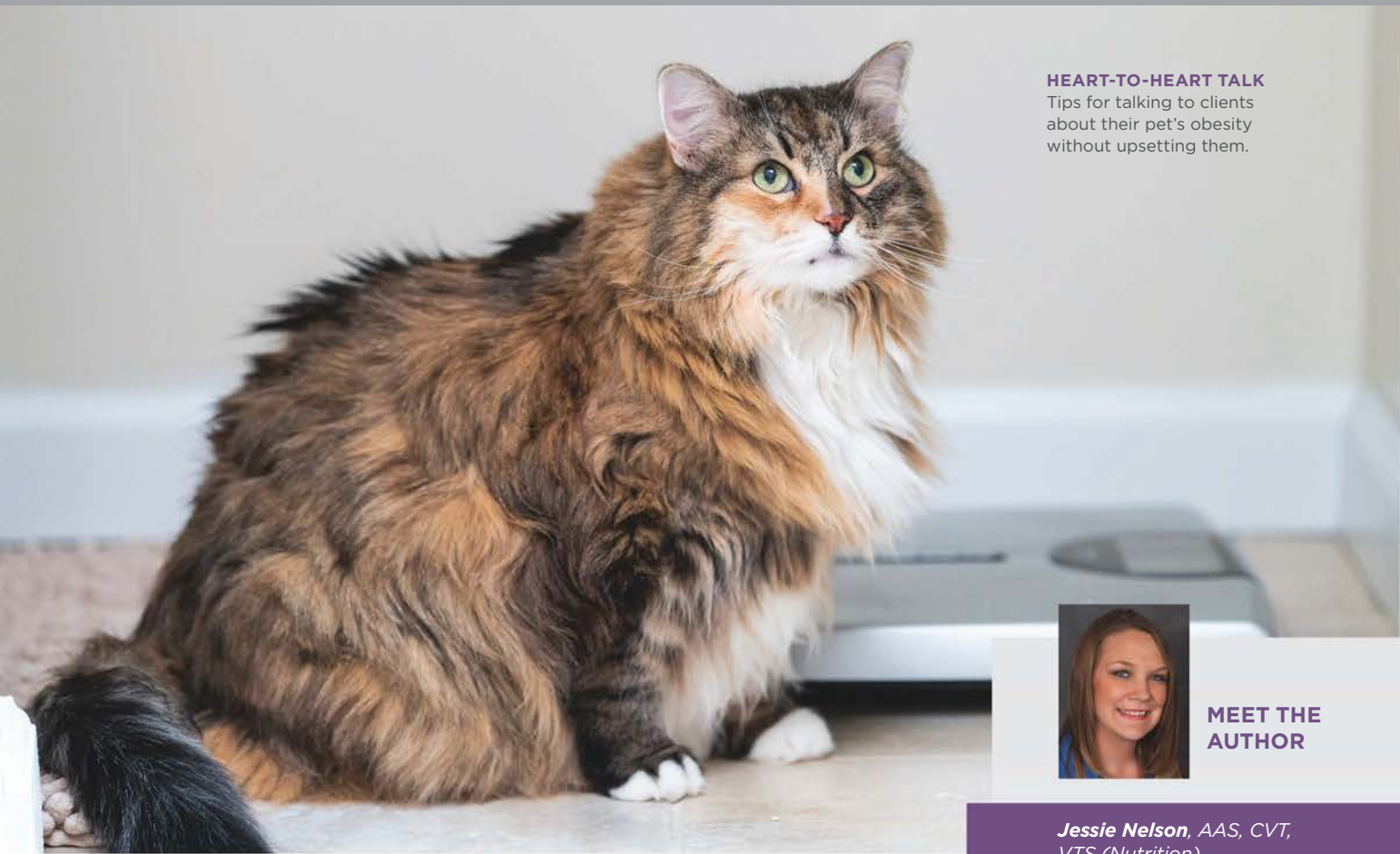
Vital Signs

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HEART-TO-HEART TALK

Tips for talking to clients about their pet's obesity without upsetting them.



MEET THE AUTHOR

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Alternative Ways to the Weight Loss Conversation

A 2017 report by the Association for Pet Obesity Prevention (APOP) found that more than 100 million dogs and cats in the United States are overweight.¹ “The number of pets with clinical obesity continues to increase,” says APOP founder Ernie Ward, DVM. “We’re continuing to see more pets diagnosed with obesity rather than overweight. Clinical obesity results in more secondary conditions such as arthritis, high blood pressure, kidney disease, and certain forms of cancer. Pets with obesity also have reduced quality of life and shorter life expectancy.”¹

Jessie graduated in 2009 from National American University with an Associate's Degree in Applied Science with an emphasis in veterinary technology. After graduation, she worked in general practice in South Dakota. In 2010, she moved to Arizona and joined Desert Veterinary Medical Specialists in 2012. She found a passion for veterinary nutrition and earned a VTS in nutrition. Jessie was the president of the student chapter of NAVTA while in college, and has continued to be an active member of NAVTA and of the American Academy of Veterinary Nutrition Technicians. In her free time she loves to be outside with her pets, riding her bicycle, reading, and swimming with her dogs in the pool.

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Despite this troubling report, veterinary professionals struggle to discuss pet obesity with a client, usually because they fear offending or upsetting him or her. Compounding this issue is that when it comes to nutrition, clients tend to take advice from just about anyone but a veterinary professional. While 57% of pet owners reported seeking nutritional advice for their animals from veterinarians, according to the APOP survey, 77% of the respondents also reported getting nutritional information from online sources, pet stores, and friends.¹ For these reasons, veterinary teams need to find alternative ways to avoid upsetting their clients and to gain their trust in communicating the best nutritional requirements for their patients.

KNOW WHAT YOU'RE TALKING ABOUT

Every veterinary team member has learned that nutrition is the fifth vital assessment and that sound nutritional recommendations for patients should be included in every veterinary appointment. The nutritional assessment is a 2-part process that begins with a screening evaluation.² Based on these findings, an extended nutritional evaluation may be required. The screening evaluation includes obtaining a history and performing a physical examination on every patient. An extended evaluation is essential when one or more nutrition-related risk factors are found or suspected based on the initial screening evaluation.³ In an ideal world, every dog and cat would be eating the exact requirements based on their life stage and the recommended requirements of the American Association of Feed Control Officials.³

START THE CONVERSATION

One of the most common—and also extremely difficult—nutritional discussions to have is the weight loss conversation. Clients may not believe their pet is overweight, let alone realize how they contributed to their animal's obesity.

It is important to get clients to realize that they play a huge part in why the animal is overweight or obese. It is also a topic that needs to be handled delicately. Discussing the results of objective tools, such as blood tests that indicate too much fat or radiology images that show “extra rolls,” can serve as a conversation starter. Explain that even a little extra weight can affect the pet's quality of life.

A landmark lifetime study of Labrador retrievers showed that overweight dogs live almost 2 years less than normal-weight dogs.⁶ Because of these health risks, the veterinary team must ensure that the client agrees that weight loss needs to take place. Take the time to discuss the risks that obese dogs and cats develop:

- Cancers of all types, diabetes mellitus, heart disease, and hypertension
- Osteoarthritis and a faster degeneration of affected joints
- Urinary bladder stones
- Anesthetic complications (due to lower heat tolerance)^{4,5}

DISCUSS, INFORM, EDUCATE

Once the veterinarian prescribes a nutritional plan, the veterinary nurse should work with the owner to implement it. Often, this includes a diet change with a goal of weight loss. Therapeutic diets aid in weight loss in a variety of ways: Higher fiber helps the patient feel full and satiated between meals; certain nutrients may also help avoid weight regain after weight loss; and some diets have nutrients that work synergistically and naturally with the pet's unique metabolism.

Inform clients about potential advantages, risks, and concerns with specific foods and treats, especially with ones they may already be feeding. It is important to educate pet owners that reducing the amount of food in the patient's normal diet is not a safe plan for weight loss because deficiencies in nutrients can occur.

Always use nonjudgmental language. Instead of asking, “Do you give Sadie treats or table scraps?” try asking, “Tell me about Sadie's favorite human foods or snacks.” Framing the question this way shows the team understands and accepts the importance of treats in the client's relationship with the pet. This is an important step in gaining a client's trust and buy-in to a weight-loss program and nutritional counseling.

Therapeutic weight-loss diets are balanced to provide both adequate nutrients and energy requirements and are less calorically dense. No matter what diet is prescribed, include your recommendations on the amount and frequency of the diet being fed and account for any snacks and/or treats. Remember to write this down for the owner and document this in the patient's medical record.



LIFESTYLE CHANGES

In addition to the nutritional plan, veterinary team members must also have a conversation about lifestyle changes. Avoid using words such as “fat,” “heavy,” or other negative terms. Remember, you are trying to create a clinic culture that presents nutritional and lifestyle changes in a compassionate and positive way. Rather than commenting, “It looks like Sadie is a couch potato,” ask, “What does Sadie like to do with you?” Guide the pet parent in understanding that weight loss is achieved by having more calories burned each day than what the animal consumes each day. Based on what activity the pet enjoys, suggest examples of how the pet owner can help the animal burn extra calories per day: an extra walk to the mailbox, for example, or longer play times.

Having animals chase the kibbles they eat will also provide great benefits in weight loss as well as mental stimulation.



Pet parents may enrich their pet’s nutritional experience by interacting with them at feeding times. Interactive food toys are wonderful in helping a pet burn extra calories. Encourage the pet owner to reward the pet with praise or extra head scratches rather than high-calorie treats. Having animals chase the kibbles they eat will also provide great benefits in weight loss as well as mental stimulation. The American Veterinary Medical Association advises that pet owners should eliminate table scraps and fattening, high-calorie treats; if food treats are given, they should be healthier ones and should be kept to a minimum. Treats should not make up more than 10% of the pet’s daily calories.⁷

IT’S ALL IN THE APPROACH

The pet parent should be involved in the decision making and help define expectations when creating the nutritional plan. An excellent place to start is to teach the client how to evaluate the body condition score and muscle condition score.^{8,9} This can be effective in helping engage clients in their pet’s care. When pet parents feel like they are involved in the decision

making, they are more likely to follow the veterinary team’s specific recommendations.

Try to uncover any issues that may limit compliance with the dietary recommendations. One of the challenges may include financial considerations. In this case, use a spreadsheet to show the daily cost of the recommended diet compared to the daily cost of the pet’s current diet, including treats and snacks. Many times, calculating the cost to feed per day shows owners that they will not be spending more in the long run.

Follow-up care and communication are key to ensuring owner compliance and to safely achieve the desired outcome. Proper weight loss can be achieved by 1% to 2% loss of body weight per week.⁹ Following up with clients helps determine whether the patient is losing weight too fast or too slow or whether there are other concerns. Within a day or two of the initial appointment, make a follow-up call. Schedule a recheck appointment 2 weeks after the initial nutritional screening. Monthly weight checks are also recommended to monitor gastrointestinal issues, changes in behavior, client acceptance, etc. These follow-up visits permit you to make adjustments to food intake as necessary.

The weight-loss conversations you have with clients may be challenging, but once you convince them that their pets will live a longer, healthier life, they’ll discover it was a conversation worth having. **TVN**

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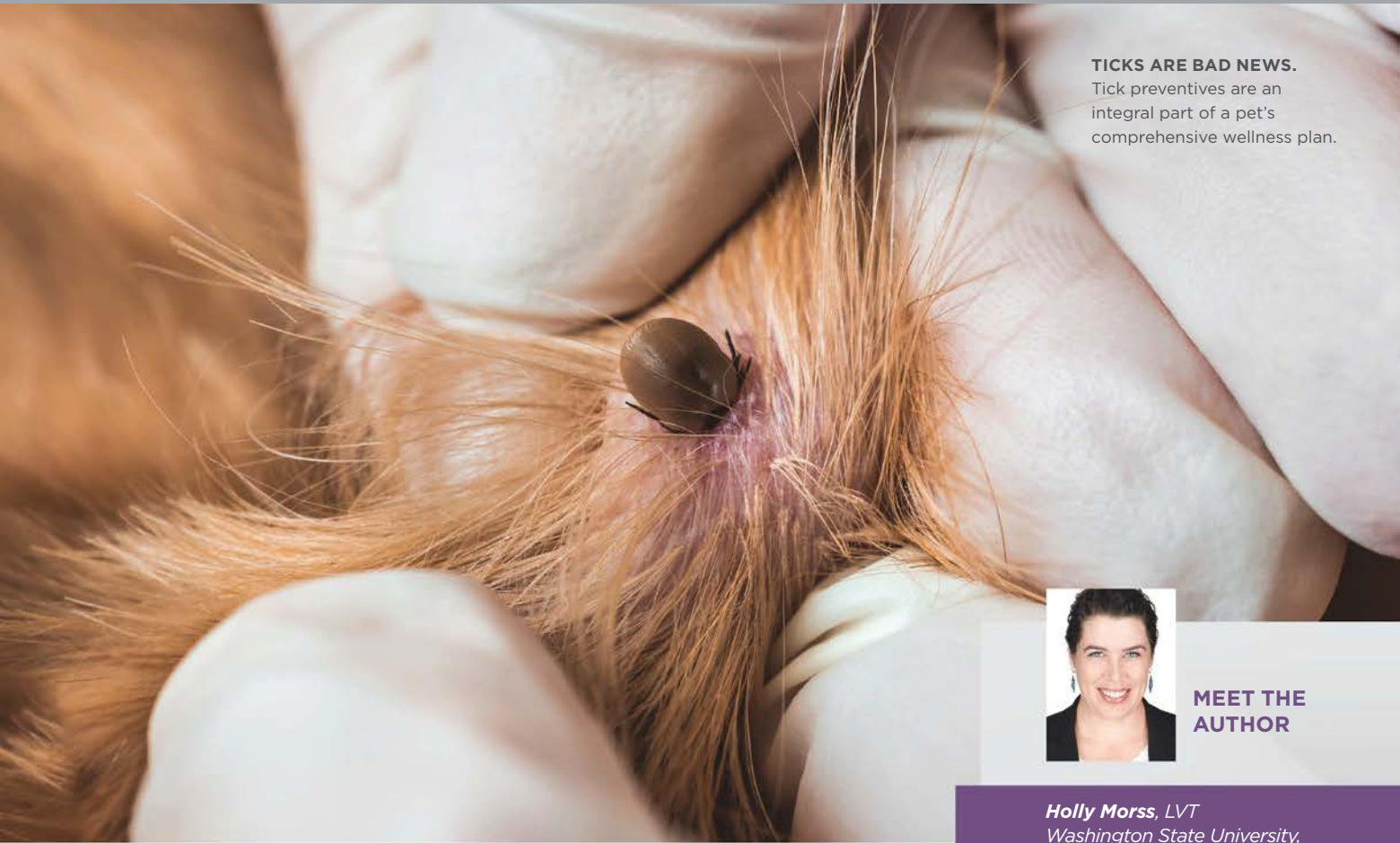
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**TICKS ARE BAD NEWS.**

Tick preventives are an integral part of a pet's comprehensive wellness plan.

**MEET THE AUTHOR**

Holly Morss, LVT
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The 3 Rs of Tick-Borne Diseases

Ticks are disgusting. The thought of them is enough to make a person's skin crawl and adds an "ick factor" that makes it easier to convince clients that parasite prevention is desirable (**FIGURE 1**). But are we relying too heavily on our innate disgust for them and failing to clearly convey the health risk that ticks pose to pets and people? How do we, the veterinary medical team, successfully educate clients on the threat of tick-borne disease and the best preventive methods?

Holly currently works in the diagnostic imaging department at Washington State University's College of Veterinary Medicine. She also enjoys working the occasional Saturday at Lewiston Veterinary Clinic. She serves on the board of the Companion Animal Parasite Council (CAPC) and is a charter member of the Boehringer Ingelheim Tech Champion Team, which provides continuing education in the United States. Holly's passion for teaching developed during her many years as an educator and administrator of veterinary technology programs in Minnesota, Utah, and Idaho. Holly spends any free time that she can find exploring the wilds of eastern Washington and the Idaho panhandle.

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[References] 1. Adequan® Canine Package Insert, Rev. 1/19.

2. Adequan® Canine (polysulfated glycosaminoglycan) NADA 141-038 FOI Summary, 1997.

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Please see the Important Safety Information on the reverse side.

3. 2016 NAVC Proceedings, Osteoarthritis in Dogs and Cats: Novel Therapeutic Advances, M Epstein, DVM, DABVP C/F, CVPP; K Kirkby-Shaw, DVM, MS, PhD, DACVS, DACVSM.



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CHECK-OFF & ECHO NOTES

Start an Effective Team to Pet Owner Conversation

If engaging in an initial discussion, start with:

Ms. White, based on watching your dog walk across the room, I think Rover is showing signs of arthritis. This is a disease that will only progress and get worse if we don't begin to look at ways to help manage the signs. Can I ask, is he becoming less interested in walking or playing? Does he struggle going up stairs?

STATE THE SOLUTION

A product you might want to consider and talk to our veterinarian about is Adequan® Canine. It's the only FDA-approved disease-modifying drug that has been shown to slow the progression of canine osteoarthritis. It works to inhibit the inflammation and damaging enzymes associated with the disease to help improve Rover's joint mobility and keep him more active.

MAKE YOUR RECOMMENDATION

Ms. White let's be sure to ask the veterinarian if he/she thinks Adequan® Canine is a good fit for Rover. Keep in mind it is a commitment on your part, a 4-week treatment of 2 injections per week, but it is a good solution to consider helping you manage canine arthritis disease.

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...so you can decide whether Adequan® Canine is a solution you'll recommend for your patients diagnosed with osteoarthritis or degenerative joint disease.

START WITH THE 3 Rs

The key to being successful in client interaction is to begin with effective team communication. Every team member, from those at the front desk to those in the boarding kennels, should understand tick-borne disease enough to convey its importance, answer client questions, and communicate the practice's preventive recommendations. It is easy to overestimate how well each person in the practice understands current protocols in preventive medicine. The responsibility of staff education falls on the clinic leadership.

Regular, all-staff meetings are an imperative part of a healthy practice. Team meetings should be more than a time for airing complaints; they should include an educational component. This component doesn't need to be lengthy or formal. Simply use the 3 Rs: (1)

Review the topic of concern, (2) discuss the current **Recommendation(s)**, and (3) form a plan to **Relay** the information. Let's use tick-borne disease as an example.































FIGURE 1. All of the ticks on this tray were removed from one dog.

REVIEW: TICK-BORNE DISEASE

TABLE 1 correlates the most frequently diagnosed diseases with their known tick vector. Distribution maps for each tick species are located at cdc.gov/ticks/geographic_distribution.html.¹ When using the maps

to determine which ticks are in your area, remember that tick distribution is dynamic and ever-changing. For example, the number of counties in the United States with established populations of *Ixodes* species has more than doubled in the past 2 decades.²

TABLE 1 Disease and Vector Correlation⁵⁻⁷

DISEASE	<i>AMBLYOMMA AMERICANUM</i>	<i>AMBLYOMMA MACULATUM</i>	<i>DERMACENTOR VARIABILIS</i>	<i>DERMACENTOR ANDERSONI</i>	<i>IXODES SCAPULARIS</i>	<i>IXODES PACIFICUS</i>	<i>RHIPICEPHALUS SANGUINEUS</i>
	LONE STAR TICK	GULF COAST TICK	AMERICAN DOG TICK	ROCKY MOUNTAIN WOOD TICK	BLACKLEGGED TICK	WESTERN BLACKLEGGED TICK	BROWN DOG TICK
Anaplasmosis							
Babesiosis							
Cytauxzoonosis							
Lyme disease							
Ehrlichiosis							
Hepatozoonosis							
Rickettsiosis							
Tick Paralysis							
Tularemia							



Not only are domestic tick populations expanding, but global mobility of humans and animals presents an opportunity for the introduction and spread of new species of ticks. For example, *Haemaphysalis longicornis*, the longhorned or Asian tick, has recently been detected in the United States. The Centers for Disease Control and Prevention reports that there is no evidence of *H. longicornis* transmitting any disease to pets or people in the United States. However, *H. longicornis* is being monitored closely because it is a carrier of multiple pathogens in other areas of the world; the unique asexual reproduction of this tick creates exponential population growth, which can equate to infestations severe enough to cause exsanguination.³

Disease review can easily turn into an endless litany of signs and symptoms. This is not an effective method of education; most listeners tune out and rarely remember the details. To engage the team, consider turning a potentially boring monologue into a fast-paced group

activity. Break into groups (or individually for small teams) and assign each a tick-borne disease. Allow 5 minutes to find answers to 5 questions that focus on information clients should know rather than getting bogged down with clinical signs and diagnostics. Keep in mind that the goal is to prepare the team to effectively communicate with clients about tick-borne disease.

1. What is the pathogen?
2. What does it infect?
3. Is it deadly?
4. Is it a human health concern?
5. What makes it unique or memorable?

When the 5 minutes are up, have each group present the findings. To aid in the retention of information, create a chart using a white board or large piece of paper, with each group filling in their findings.

TABLE 2 gives an example, as well as correct answers for this activity.

TABLE 2 Sample Completed Chart⁵⁻⁷

QUESTION	ANAPLASMA/ EHRLICHIA	RICKETTSIOSIS	LYME DISEASE	TICK PARALYSIS	BABESIOSIS	HEPATOZOONOSIS	CYTAUXZOONOSIS
What is the pathogen?	Rickettsial bacteria	Rickettsial bacteria	Spirochete bacteria	Neurotoxin in tick saliva	Intracellular parasite, hemoprotozoan	Intracellular parasite, hepatozoon	Intracellular parasite, hemoprotozoan
What does it infect?	Platelets, granulocytes, or monocytes depending on species	Epithelial cells of end-arterioles	Any organ or system in the body	Motor nerves	Erythrocytes	Hepatocytes	Erythrocytes
Is it deadly?	Not typically lethal, often subclinical	Yes, can cause cardiovascular collapse or oliguric renal failure	Not typically deadly, can cause acute progressive renal failure	Yes, can cause respiratory failure 1-2 days after onset of symptoms	Yes, following peracute shock, hypoxia, and hypertension	Yes, often fatal	Yes, very lethal
Is it a human health concern?	Yes, some species are zoonotic	Yes, people contract rickettsial infections too	Yes, Lyme disease is a well-known concern for people	Yes, people can suffer tick paralysis	Yes, people can also get babesiosis from a tick bite	No	No
What makes it unique or memorable?	Even subclinical cases should be treated because of zoonotic potential	Rocky Mountain spotted fever is the most recognizable rickettsiosis	Shifting limb lameness is a unique symptom that can become a chronic condition	There is no correlation between the toxicity and the tick number, size or duration of attachment	<i>Babesia</i> makes erythrocytes stick together, clogging capillaries	Causes periosteal proliferation throughout the body	Mortality rate is >50%

RECOMMENDATIONS

A review of the practice's recommended tick prevention products should also be discussed during the meeting. Each member of the team should be knowledgeable enough about the products offered by the practice to answer any client questions about the dose, administration, efficacy, and potential side effects.

The Companion Animal Parasite Council (CAPC) is a nonprofit organization that collects and analyzes data on the prevalence of tick-borne diseases as well as the prevalence of other parasites and diseases in the United States and Canada. Dr. Craig Prior, immediate past president of CAPC, says that the major ticks seen in the United States have 3 different hosts in their life cycles. The hosts vary depending on tick species and life stages but may encompass any mammal, bird, amphibian, and even reptile. (Adult females lay anywhere from 2000 to 8000 eggs—and some lay even more than that). According to Dr. Prior, ticks may live over 4 years and they spend over 3 years in the environment (not on a host). “If the temperature is over 43 degrees F, ticks are active, even if there’s 2 feet of snow on the ground,” says Dr. Prior. “Snow actually acts as an insulator for them and the ticks stay below the top level of snow until the temperature is 43 degrees or above and the ticks then start questing.” The dynamic changes in tick populations and distribution and the increased incidence of tick-borne diseases have led to the following recommendations, provided by CAPC (capcvet.org):⁴

- All dogs (and cats) should be treated year-round and throughout their life with tick control products to limit infestations on the pet, reduce the number of ticks in the environment around the home, and prevent establishment of brown dog tick populations in the home.
- Recognize that home infestations with brown dog ticks (*Rhipicephalus sanguineus*), once established, may take several months to bring under control and that, in addition to consistently treating pets with tick control product, the services of a licensed exterminator are necessary to eliminate the infestation from buildings.
- Because ticks transmit a wide variety of disease agents to pets and people and are active throughout the year, tick control must be practiced consistently to protect the health of the pet and to prevent untreated pets from bringing ticks—which may then infest people—into the home.
- Stay current on tick population shifts and new threats from ticks that develop over time. Tick



FIGURE 2. A clear tick jar is a must-have for every practice. Keep it in a location visible to clients and add a conversation-starting note nearby.

distributions are dynamic and ever changing, and practice protocols often need to evolve to meet the growing threat ticks pose to pet health.

RELAYING THE MESSAGE

Following the review of tick-borne diseases and discussion of recommendations, it's time to create a plan for relaying this message to clients. Rather than relying on a scripted scenario, brainstorming with the entire team will help to create a plan that is best tailored to your specific practice culture and clientele. These sessions can produce creative new ideas as well as boost morale. When team members' voices are heard, they feel valued; when everyone is working toward the same goal, the team is strengthened. With that in mind, here are a couple ideas to get things started.

Pique the client's interest. The “ick factor” has already been proposed as an easy hook, so just take it to the next level. Your practice should already have a clear tick jar (**FIGURE 2**) in a location that is visible to clients; if you don't have one, make one! A brief note near the jar is a simple conversation starter: “Ticks are disgusting, but did you know they can transmit harmful diseases to you and your pet?” This simple note will plant a bug in the client's mind (pun intended) so that when a team member broaches the subject it seems even more relevant.

Personalize the message. Local tick-borne disease prevalence maps, down to the county level, can be located on the CAPC website. Practices can subscribe to CAPC's free social media tool, which generates monthly, automated posts with local information. This

Tick distributions are dynamic and ever changing, and practice protocols often need to evolve to meet the growing threat ticks pose to pet health.



tool helps convey to clients the risks of tick-borne disease in their own backyards.

Provide a clear recommendation for each patient.

There is limited amount of time for client interactions, so be concise and confident. The client expects members of the veterinary medical team to be experts and to advise on the best methods for keeping their beloved pet(s) healthy.

Tick-borne disease is an often underemphasized but core part of companion animal health. It is up to the

entire veterinary team to broach this important topic with our clients and to help them understand why tick preventives are an integral part of a pet's comprehensive wellness plan.

The first step toward this goal is team communication and education—get on it! **TVN**

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COME TOGETHER?

The National Veterinary Professionals Union began taking shape in 2017. Not everyone agrees it is a good thing.

Veterinary Professionals Explore Forming a Union

For more than a decade, veterinary technician Morgan VanFleet watched with growing concern as she and her colleagues struggled to make a living in the job they loved. Low wages, meager benefits, and high employee turnover left many support staff feeling burned out, unappreciated, and unable to make ends meet, yet practice owners routinely refused to acknowledge their concerns or take steps to improve work conditions.



MEET THE AUTHOR

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The answer, VanFleet concluded, was a union that would work on their behalf. In February 2017, VanFleet, who had worked as a technician in Washington and Oregon, established the National Veterinary Professionals Union (NVPU) in an effort to draw attention to the plight of overworked, underpaid veterinary staff. “It really struck a nerve,” said VanFleet, who recently left veterinary medicine to work as an RN and is no longer associated with NVPU. “People got excited about it very quickly. Dozens of people told me that they always wanted something like this but never knew where to start.”

The establishment of the NVPU was big news among veterinary employees and practice owners. But could such an organization really enact change?

In August 2017, employees at VCA San Francisco Veterinary Specialists began talking among themselves about unionizing, said veterinary assistant Katy Bradley, who was among the first to broach the idea. Bradley came from a union family—her grandfather had been a member of the International Longshore and Warehouse Union (ILWU), so she called him for advice. A month later, the ILWU reached out to Bradley to gauge how serious she and her coworkers were about forming a union. If they truly wanted to unionize, ILWU reps told her, they would be happy to assist.

“We started discussing a union because we felt we weren’t being heard,” Bradley said. “There were multiple issues going on at the hospital, along with what we felt was a lack of accountability. The response from management was always, ‘Put it in an email and we’ll see what we can do.’ We felt a union would give us a voice.”

In April 2018, a vote to unionize was held at VCA San Francisco Veterinary Specialists, with two-thirds of eligible employees voting in favor. A month later, Blue Pearl North Seattle, similarly guided by the ILWU, approved a union by a vote of 14-1. Eligible employees at VCA Northwest Veterinary Specialists of Clackamas, Oregon, voted to unionize in September 2018, and Columbia River Veterinary Specialists of Vancouver, Washington, followed suit in October.

According to Patty Zehna, secretary/treasurer of NVPU, the union represents the employees of Blue Pearl North Seattle, which began collective bargaining in December, while the ILWU represents the employees of VCA San Francisco Veterinary Specialists, Northwest

Veterinary Specialists of Clackamas, and Columbia River Veterinary Specialists of Vancouver. “The hope is that both sides can bargain in good faith, negotiating for better wages and benefits, and safer working conditions,” Zehna said.

Zehna believes unionization will help achieve a number of important goals for office support staff, including:

- Empowering them to band together and collectively bargain for change in their workplace
- Establishing realistic staff-to-patient ratios to ensure both staff and patient safety
- Advocating for patients and the provision of gold-standard care
- Negotiating for benefits to ensure staff health and well-being
- Negotiating for and enforcing payment of a living wage for veterinary support staff



“We are empowering veterinary employees to take control of their working conditions, their rights in the workplace, and their professional advancement.”

This is a particularly important issue because a survey by the National Association of Veterinary Technicians in America found that full-time technicians reported an average salary between \$15 and \$20 per hour. “Well-paid veterinary technicians are only slightly above the poverty line once income taxes are considered,” the survey authors said.

“We are empowering veterinary employees to take control of their working conditions, their rights in the workplace, and their professional advancement,” Zehna explained. “Change and challenge to the status quo is always scary. We hear from many practice owners who are excited for this change. However, corporate ownership has been very difficult from the onset of these efforts, and continues to push back through a variety of channels.”

The initial push for unionization understandably made many practice owners wary. “Our position is that we

**THE COST OF BUSINESS.**

Corporate owners say that the cost of worker demands will result in an increase in fees, reduction in staff, and other measures.

would rather have the dialogue directly with our employees than have a third party like a union, which may have competing interests to our employees, intermediate that dialogue,” said Doug Drew, president, U.S. Animal Hospitals, VCA. “We have committed to bargaining in good faith with the ILWU as it concerns VCA San Francisco Veterinary Specialists.”

Many questions remain regarding the effects of unionization on individual practices. Corporate owners have expressed concern that the cost of worker demands will result in an increase in fees, reduction in staff, and other measures.

“Speaking in general terms, if the cost of operating a hospital increases it would be natural for the hospital to raise prices to cover any increase in operational costs,” observed Drew. “Or it might be necessary for the hospital to reduce the number of team members, as has happened in other industries where wages went up faster than expected because of increased minimum wages. Animal hospitals typically do not have high margins after capital expenditures and taxes are taken into account, so it would be natural for owners of hospitals to try to at least offset additional costs that are incurred.”

VCA San Francisco Veterinary Specialists has yet to see a fee increase, noted Bradley. “VCA has annual increases they apply to various services, such as consult fees,” she said, “but there have been no increases to services in relation to the union.”

Practice owners also express concern that a union will adversely affect office dynamics and patient care, especially if some employees do not support the effort. “How will [a union] affect the mood and morale within what is typically a small business environment?” asked Mark Cushing, JD, CEO and founder of the Arizona-based Animal Policy Group.

NVPU has turned to social media to inform veterinary support staff about the growing union initiative, and how to proceed if they are interested in trying to unionize their hospital. “The NVPU has a very active Facebook group, which is open to all non-management veterinary staff,” Zehna said. “We also have a website—natvpu.org—and contacts receive a prompt response to questions or concerns. We receive inquiries on an almost daily basis from veterinary support staff around the country wondering how to become involved.” **TVN**

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¹ Grosenbaugh DA, De Luca K, Durand P-Y et al. Characterization of recombinant OspA in two different *Borrelia* vaccines with respect to immunological response and its relationship to functional parameters. *BMC Veterinary Research*. 2018;14:312. <https://doi.org/10.1186/s12917-018-1625-7>. Accessed November 7, 2018.

² Rice Conlon JA, Mather TN, Tanner P. Efficacy of a nonadjuvanted outer surface protein A, recombinant vaccine in dogs after challenge by ticks naturally infected with *Borrelia burgdorferi*. *Vet Ther*. 2000;1(2):98-107.



CONVERSATION STARTER

Osteoarthritis and obesity are inextricably linked. Here are tools and insight for better management of these patients.



MEET THE AUTHOR

Rachel Beck, CVT
Banfield Pet Hospital
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From the Field shares insights from **Banfield Pet Hospital** veterinary team members. Drawing from the nationwide practice's extensive research, as well as findings from its electronic veterinary medical records database and more than 8 million annual pet visits, this column is intended to explore topics and spark conversations relevant to veterinary practices that ultimately help create a better world for pets.

Improve Outcomes in Arthritic Pets

In 2017, Banfield Pet Hospital and the North American Veterinary Community (NAVC) partnered to release the first annual *Veterinary Emerging Topics (VET)[®] Report*. Our 2017 and 2018 reports focused on antimicrobial usage patterns among veterinarians treating common canine and feline infections, respectively. For the 2019 report, we shifted gears to examine management of osteoarthritis (OA) in overweight pets.

Rachel Beck is a certified veterinary technician and credentialed project manager on the Veterinary Affairs team at Banfield Pet Hospital. She currently leads a team of project managers who specialize in implementation. Having been in the veterinary field for over 16 years, she has served roles both in hospitals and at Banfield's central office. She is passionate about engaging the whole veterinary team in proactive health and wellness as well as about career pathing for paraprofessionals in the industry. She resides in Portland, Oregon, with her significant other and 1 cat.

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Efforts in the veterinary and pet care industry to address the overweight pet epidemic have thus far proven unsuccessful, with Banfield's 2017 *State of Pet Health Report* finding 1 in 3 pets in the U.S. is overweight or obese—and witnessing a 169% increase in overweight cats and a 158% increase in overweight dogs over the past 10 years.

As veterinary professionals know all too well, these pets are at higher risk of developing comorbidities like OA.¹ Given the close relationship between excess weight and OA,² we believe a focus on this condition and the importance of weight management in the treatment process is important to evaluate. There exists an opportunity to evolve how we have conversations about excess weight in pets—and to improve the outcomes of treating OA by reinforcing the importance of weight loss in these pets.

As part of the report, patient medical records from both canine and feline OA cases were reviewed. In addition, an online survey of veterinarians was conducted to better understand the practices in the diagnosis and management of newly diagnosed OA pets, as well as perceived barriers to providing recommended care. The Banfield study also looked at diagnostic and therapeutic practices in general veterinary practice. While guidelines and therapeutics exist, we found that following and incorporating these into the management of OA in a general veterinary practice is challenging for both the veterinary team and the pet owner.

Managing OA, particularly in pets with excess weight, is not new to the veterinary profession; however, we found several opportunities exist to improve the care these affected pets receive. Quality medical management of OA requires a multi-faceted diagnostic and treatment plan—a combination of diagnostic testing, multi-modal pain management, and weight management all needs to be considered to most effectively improve patient outcomes.

Opportunity #1

Dispense pain medications for OA pets! Almost half of the pets diagnosed with OA did not receive pain medications at the time of diagnosis. Identifying barriers to treatment—for example, cost or the owner not recognizing their pet is in pain—and finding solutions to reduce them can improve a pet's comfort, increase mobility, and demonstrate the value of therapeutic management to the pet owner.

Opportunity #2

Tools for early identification or recognition. Client education materials, activity monitors, and validated quality of life (QoL) or chronic pain index instruments may facilitate client understanding of normal vs. abnormal for an older dog—and encourage initiation and continuation of the management plan.



Almost half of the pets diagnosed with OA did not receive pain medications at the time of diagnosis.

Opportunity #3

Incorporate a nutritional component. Nutritional management is an important component of the multi-modal approach to managing OA patients. Recent surveys indicate that pet owners want their veterinarian to provide diet or other nutritional recommendations for their pets.^{3,4}

Opportunity #4

Weight management. Helping pet owners get their pets to a healthier or ideal weight is an integral component in management of these pets. Research has found that, in obese dogs, losing as little as 6.1% of their weight can lead to improvement in the clinical signs of OA.^{5,6} Veterinary technicians gathering a clear diet history at each visit, including treats, is an important part of weight management. Consider utilizing veterinary technician appointments to check on progress.

Opportunity #5

Patient management as a team effort. Every pet you encounter provides an opportunity to notice changes its owner might not notice—or consider normal—in their aging pet.

With the above opportunities in mind, an inward assessment of how a hospital team manages OA pets and how they can modify their approaches has the potential to improve the quality of veterinary care offered to their owners. A tool adapted from a human



At The Core: Quality of Care

Quality care in veterinary medicine can be achieved, in part, by utilizing methods and tools adapted from human healthcare. These tools can be used to assess interventions and changes to achieve desired results.

The Five Domains of Quality

can be used to guide decision-making and drive quality in a veterinary practice.

Understanding the Domains of Quality and Applying Them to Care Delivery



SAFE: Having the right culture, systems and equipment in place to create a safe environment for associates, clients and pets, thus avoiding harm.

Application: Perform full physical examination, as well as CBC and blood chemistry blood chemistry as appropriate before starting on long-term pain medications and at regular intervals, to monitor for changes in health status and to adjust treatment plan accordingly.



EFFECTIVE: Providing the care that meets quality standards of our profession.

Application: Stay abreast of guidelines and new medications to properly diagnose and treat these cases of OA.



PET- AND CLIENT-CENTERED: Building relationships to become a trusted partner to our clients, and identifying the unique, individual needs of each pet to provide appropriate care.

Application: Engage clients in their pet's health by utilizing tools that enable them to recognize their pet is osteoarthritic and/or overweight earlier and develop a management plan tailored for their pet and home environment.



TIMELY: Seeing pets when they need to be seen to help keep them healthy, prevent future disease and treat current disease.

Application: Ensure that all hospital team members are capable of meeting the needs of pets and clients, from scheduling pets when they need to be seen to providing diagnostics and treatment to follow-up conversations to assess adequacy of management plan.



EFFICIENT: Managing use of resources to minimize waste and maximize the value of care provided.

Application: Involve other hospital team members in joining the conversation with owners about their pet's condition and management. This may allow follow-up questions or consultations (e.g., weigh-ins) to not necessarily be dependent on the availability of the veterinarian but may be handled by other trained team members (e.g., licensed or registered veterinary technicians).

FIGURE 1. The Five Domains of Quality promote safe, effective, patient-centered, timely, and efficient care. CBC = complete blood count.



Veterinary technicians gathering a clear diet history at each visit, including treats, is an important part of weight management. Consider utilizing veterinary technician appointments to check on progress.



healthcare quality model,⁷ the Five Domains of Quality, can also be applied by veterinary hospital teams to enhance the quality of care, assess interventions, and improve patient outcomes (**FIGURE 1**). **TVN**

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HEART OF THE MATTER

When assessing a patient with a congenital heart defect, it can be useful to determine which type of load on the heart has been altered and which chamber is affected.

CONTINUING EDUCATION

CARDIOLOGY

A Look at Unusual Congenital Heart Defects in Dogs and Cats



MEET THE AUTHOR

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Congenital heart defects (CHDs) are well-recognized causes of morbidity and mortality in veterinary medicine (**BOX 1**). Yet, in comparison to all other illnesses, they account for a very small percentage of morbidity, with a 1999 reported incidence in dogs of 0.46% to 0.85%.³ A search of the Veterinary Medical Database (maintained by a consortium of veterinary medicine colleges) for any diagnosis of CHD in all dogs entered between 1965 and 2003 yielded a calculated incidence of 0.9%, while a 2015 report put the incidence of CHDs at 0.13% in mixed-breed dogs and 0.14% in mixed-breed cats.¹ The lower percentage for dogs in this report is thought to be due to the lack of purebred dogs in the study group, not a true decrease in the incidence of CHDs. This article explores the rarest CHDs, which present an opportunity to better understand cardiac physiology.

PHYSIOLOGY REVIEW

Blood pressure is the product of cardiac output and systemic vascular resistance (**FIGURE 1**). Systemic vascular resistance is controlled by the arterioles via vasodilation or constriction, while cardiac output is the product of the stroke volume and heart rate. The stroke volume is determined by 3 influences: preload, afterload, and contractility. Very simply, *preload* can be thought of as the volume ready to fill the ventricle, whereas *afterload* represents the force (pressure) the ventricle must exert to move blood forward. *Contractility* is usually thought of as the ability of the

**BOX 1****Congenital Heart Defects in Dogs and Cats**

- Pulmonic stenosis^a
- Patent ductus arteriosus^a
- Subaortic stenosis^a
- Ventricular septal defect^a
- Tricuspid valve dysplasia^b
- Mitral valve dysplasia^b
- Cor triatriatum dexter (dogs)^b
- Cor triatriatum sinister (cats)^b
- Tetralogy of Fallot^b

^aFrom most to least common.^{1,2}

^bFrom most to least common, based on a 2019 search of the National Institutes of Health PubMed database for congenital heart defects in dogs and cats.

myocardium to perform its work. Therefore, preload is a *volume* load, and afterload is a *pressure* load.

When assessing a patient with a CHD, it can be useful to determine which load on the heart has been altered and which chamber is affected. For example, pulmonic stenosis (PS) restricts blood flow out of the right ventricle (RV), which increases the pressure load (afterload) on the RV, resulting in hypertrophy. This increased pressure in the RV, right atrium (RA), and caudal venous system can lead to signs of right-sided congestive heart failure (CHF), such as ascites, organomegaly, anorexia, cachexia, and dyspnea. Left-sided CHF includes failure of the left atrium (LA) and left ventricle (LV) and leads to pulmonary edema.

Any CHD can, therefore, be assessed by starting with the fundamental physiology and working backward to predict the outcome. To aid in this assessment, knowledge of the normal pressure of each heart chamber is helpful (**TABLE 1**). Blood always flows from an area of high pressure to one of low pressure and takes the path of least resistance.

Patients can have more than one form of CHD.² The author has examined a dog with tetralogy of Fallot (TOF) and patent ductus arteriosus (PDA). These combinations sometimes present a mechanism for compensation that allows the patient to live relatively normally as a modern pet. One consequence of TOF is reduced pulmonary perfusion or a mismatch in ventilation-perfusion equity. In the patient mentioned above, the PDA allowed extra blood to shunt to the lungs, thereby maintaining the ventilation-perfusion equity closer to normal.

ATRIOVENTRICULAR VALVE DYSPLASIA

Valve dysplasia is abnormal development of the heart valves. Common examples are PS and subaortic stenosis. Tricuspid valve dysplasia (TVD), mitral valve dysplasia, and cor triatriatum dexter and sinister are, respectively, less common.

Tricuspid Valve Dysplasia

TVD is a malformation of the tricuspid valve (TV); the effect may be inconsequential or cause serious morbidity. Labrador retrievers are overrepresented for this disease.

A dysplastic TV may have fused and immobile leaflets with a stenotic orifice or elongated leaflets that are

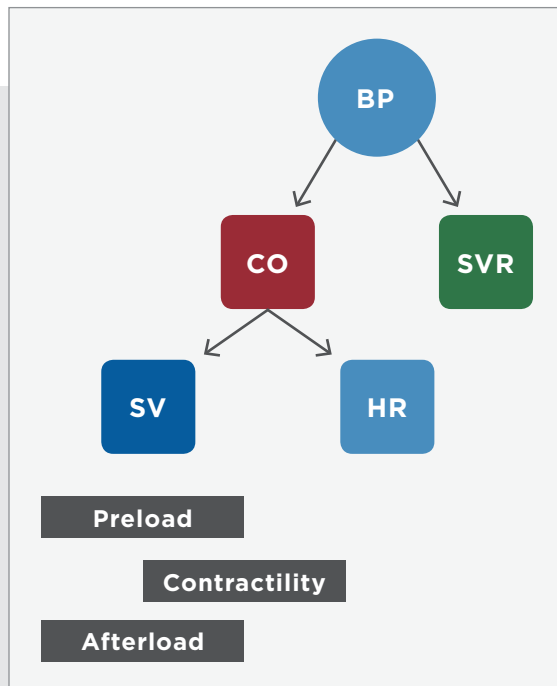


FIGURE 1. Relationship of blood pressure (BP), cardiac output (CO), systemic vascular resistance (SVR), stroke volume (SV), heart rate (HR), preload, afterload, and contractility. If preload and contractility increase, SV increases. If afterload is significantly increased, SV is reduced. An increase in any one determinant (SV, HR, or SVR) within physiologic limits will result in an increase in blood pressure. For example, if a positive inotrope is administered, the contractility will increase. As a result, SV increases, which increases CO, and, in turn, BP is increased.

TABLE 1 Normal Intracardiac Pressures

	SYSTOLE (MM HG)	DIASTOLE (MM HG)
Right atrium	4–6	0–4
Right ventricle	15–30	5–15
Pulmonary artery	15–30	5–15
Pulmonary wedge	6–12	4–8
Left atrium	5–12	<8
Left ventricle	95–150	<10
Aorta	95–150	70–100

incompetent. TV displacement into the RV is known as Ebstein's anomaly. TVD may cause regurgitation and/or stenosis, thereby increasing volume and pressure on the RA and leading to right-sided CHF.

Clinical Signs and Physical Examination Findings

TVD is typically diagnosed in young adult or middle-aged patients; some cats may develop CHF as kittens. Presenting complaints include exercise intolerance, lethargy, syncope, and abdominal distention.

On physical examination, a murmur may or may not be present. If present, it is typically loudest on the right hemithorax, is holosystolic with variable intensity, and may have a crescendo quality. Jugular distention occurs with significantly elevated RA pressure, and jugular pulses occur with significant tricuspid regurgitation. A hepatojugular reflux test can be performed by gently lifting the cranial abdomen while observing the jugular veins, displacing some blood toward the RA and the cranial vena cava. A wave of jugular distention noted

after the abdominal lift is a positive result indicating elevated RA pressure.

Diagnostic Tests

Radiography, echocardiography, and electrocardiography (ECG) are used to diagnose TVD if an arrhythmia is present during the physical examination. Thoracic radiographs reveal an enlarged cardiac silhouette in the RA and RV region. The heart may appear somewhat globoid if RA enlargement is severe. The caudal vena cava will be enlarged. The ventrodorsal radiograph often shows a characteristic “reverse D” appearance over the right heart chambers. Enlargement of the RA and RV may be extreme. Ascites can often be noted in the cranial abdomen on the thoracic radiograph.

ECG generally shows a normal sinus rhythm or sinus tachycardia unless disease progression is advanced, when arrhythmias such as atrial fibrillation or ventricular premature complexes may be present. The mean electrical axis (MEA) deviates to the right, and the QRS complex may be “splintered” due to a ventricular conduction system defect (**FIGURE 2**).

Typical findings on an echocardiogram include a dilated RA, which may be several times the normal size (**FIGURE 3**). The TV can be visualized for movement. Tethering and poorly mobile leaflets are common. Redundant chordae tendineae may be seen. Dilation of the RV is also common. The LA and LV are often normal in size or slightly diminished depending on RV output. Doppler echocardiography can be used to visualize regurgitation, measure high-velocity flow related to stenosis, and estimate pulmonary artery (PA) pressure by measuring tricuspid regurgitation velocity. Patent foramen ovale (PFO) may be noted by Doppler imaging and confirmed with a contrast echocardiogram.

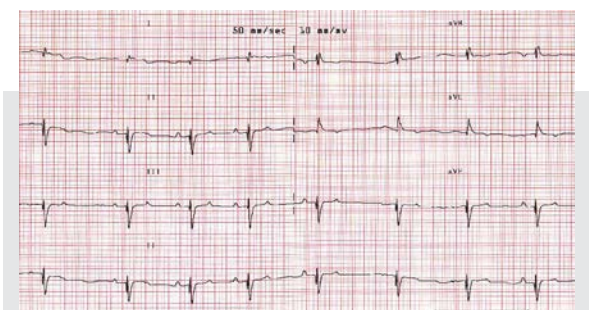


FIGURE 2. Electrocardiogram from a dog with TVD. The heart rate is 120 beats per minute. The rhythm is sinus arrhythmia, with an MEA of approximately -105° on the hexaxial system. The QRS complex is more isoelectric, with nearly equal distribution of the Q and the R waves, creating a “splintering” effect. This is characteristic of ventricular conduction defects common with TVD.

Cor triatriatum is the term for a heart that develops with 3 atria or an abnormal membrane across 1 atrium, restricting flow into the heart.



Management

Management is primarily control of signs of right-sided CHF. Diuretics, angiotensin-converting enzyme inhibitors, inodilators, and spironolactone are the mainstays of therapy. If the valve is stenotic, balloon valvuloplasty has been successful in palliative therapy; however, clinical signs may return owing to increased tricuspid regurgitation.⁴ Surgical replacement or repair of the TV may be done via cardiopulmonary bypass.⁵

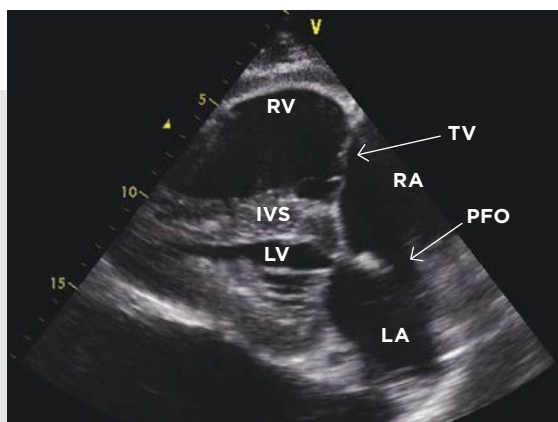


FIGURE 3. Long-axis echocardiographic image of a canine heart with TVD. The patient's cranial aspect is on the right side; caudal is on the left. Depth in centimeters is along the left edge of the image. Notable features include a dilated RV and RA. Typically, the LV and LA are the most prominent chambers. The RV free wall, seen directly above the RV label, is hypertrophied; it is typically one-third the thickness of the LV wall. The TV is flattened straight across the annulus, rather than being a triangle shape pointed toward the RV apex. The LV and LA appear to be diminished in size. The mitral valve and chordae tendineae can be seen below and rightward of the LV label. The echo-free space between the RA and the LA could be a PFO, an atrial septal defect, or an echocardiographic artifact. Color Doppler imaging would help identify this finding. An air contrast echocardiogram could be used to determine any right to left shunting. The intraventricular septum is labeled IVS.

Mitral Valve Dysplasia

Mitral valve dysplasia is very rare. It is very similar to tricuspid regurgitation. The valve may be stenotic, incompetent, or both. Stenosis is less prevalent than insufficient valves, which demonstrate a wide range of deformities.

Clinical Signs and Physical Examination Findings

These patients present with signs of left-sided CHF, including dyspnea, tachypnea, weakness, lethargy, exercise intolerance, and possibly syncope. During physical examination, cyanosis, weak femoral pulses, pulmonary crackles, coughing (in dogs), and thoracic fluid lines (in cats) may be appreciated. Both systolic and/or diastolic murmurs may be heard.

Diagnostic Tests

Radiographs show an enlarged cardiac silhouette in the caudal heart over the LA and dilation of the pulmonary veins. Infiltrates consistent with pulmonary edema may be present, indicating left-sided CHF. Some dilation of the pulmonary arteries may be noted secondary to increased LA pressure leading to pulmonary hypertension. Arrhythmias are not uncommon, especially atrial fibrillation. A left MEA shift is common. Echocardiography will show a dilated LA, LV, and pulmonary veins. Systolic dysfunction may

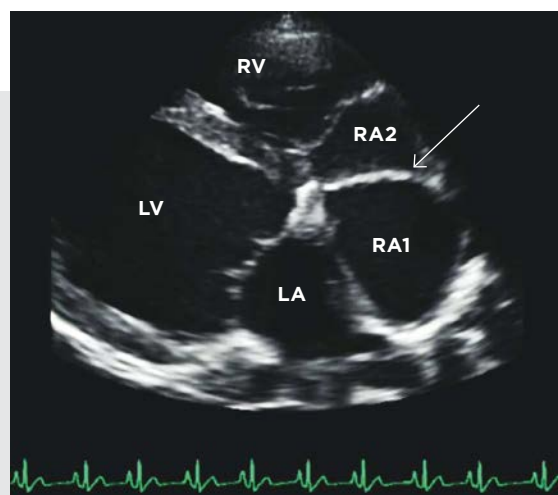


FIGURE 4. Long-axis echocardiographic image of a dog heart with cor triatriatum dexter. The patient's cranial aspect is on the right side; caudal is on the left. The arrow points to the abnormal septum separating the right atrium number 1 (RA1) and right atrium number 2 (RA2). The tricuspid valve is just above the RA2.

Right: Courtesy Durham, HE. *Cardiology for Veterinary Technicians and Nurses*, Wiley-Blackwell, 2017.
Opposite Right: Courtesy Durham, HE. *Cardiology for Veterinary Technicians and Nurses*, Wiley-Blackwell, 2017.

result from volume overload caused by mitral regurgitation.

Management

Therapy is directed at control of left-sided CHF with conventional medical therapy. Valve replacement is the only surgical option.

Cor Triatriatum

Cor triatriatum is the term for a heart that develops with 3 atria or an abnormal membrane across 1 atrium, restricting flow into the heart. Cor triatriatum dexter is the term used when the RA is affected and the abnormal septum obstructs venous return from the vena cava (**FIGURES 4 AND 5**). Increased pressure caused by the obstruction leads to ascites and signs of right-sided CHF.

Cor triatriatum dexter has been reported in dogs, but not in cats. Presentation for diagnosis is related to the degree of obstruction, with mild obstructions remaining undiagnosed for years. The condition can be palliated with balloon dilation of the abnormal membrane or managed with medical therapy if not severe.⁶

Cor triatriatum sinister, or supravulvar stenosis, refers to abnormal septal formation across the LA or creation of a second LA. This condition, along with

supravulvar mitral stenosis, has only been reported in cats (**FIGURE 6**).^{7,8} This condition leads to left-heart CHF due to pressure overload of the pulmonary veins. In the case of cor triatriatum sinister, standard cardiac catheterization is difficult because anatomic features prevent passage of a catheter from the arterial circulation retrograde to the LA. A hybrid open-heart surgery and balloon dilation procedure has been reported with some success.⁹ Most clients elect medical management of CHF based on cost.

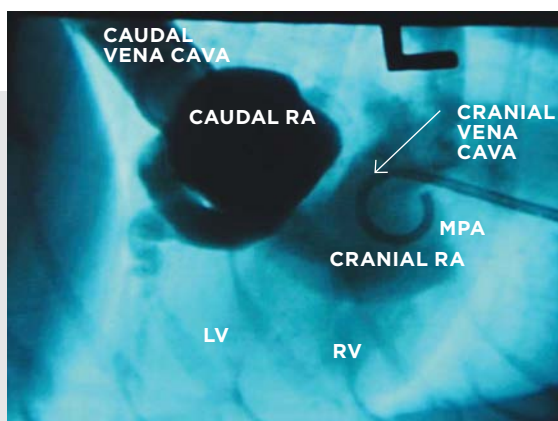


FIGURE 5. Right lateral projection of fluoroscopic contrast angiogram. The radiographic marker at the top right is 1 cm across the bottom. One 6-French (~2 mm) pigtail catheter is in the caudal vena cava just behind the caudal RA; a second is in the cranial RA. A radiographic contrast solution has been injected into each catheter. Marked pooling of contrast can be seen in the caudal RA, while reasonable dilution in the cranial RA indicates more movement of blood. The main pulmonary artery is labeled MPA.

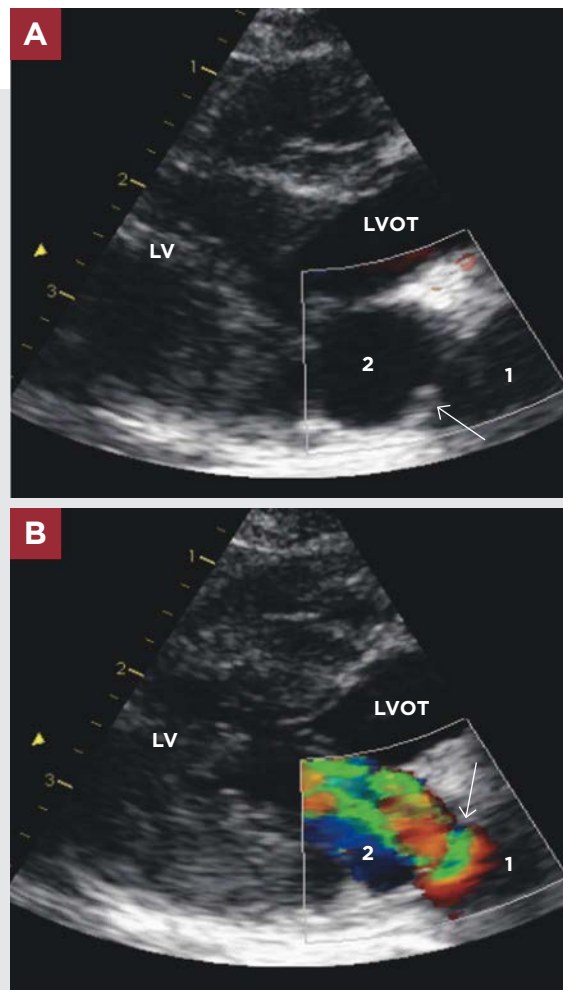


FIGURE 6. Dual long-axis echocardiographic/Doppler echocardiography images of a kitten with cor triatriatum sinister. The patient's cranial aspect is on the right side; caudal is on the left. Depth in centimeters is along the left edge of the image. The arrows in each image indicate the location of the abnormal septum. The color Doppler image (**B**) shows high-velocity turbulent blood flow moving from left atrium 1 (**1**) into left atrium 2 (**2**). This flow is returning to the LA from the lungs through the pulmonary veins. It is typically low pressure and low velocity; however, the obstruction is creating excess pressure on the pulmonary veins. The left ventricular outflow tract is labeled LVOT.



R-to-L PDAs have been reported in dogs and rarely in cats. They usually go undiagnosed for the early years of life. At presentation, these patients show signs of exercise intolerance, lethargy, syncope, shortness of breath, and potentially sudden death.



CYANOTIC CONDITIONS

Congenital cardiac defects that cause abnormal mixing of deoxygenated and oxygenated blood are collectively identified as cyanotic conditions or “right-to-left” (R-to-L) shunts. The “right” side includes the RA, RV, and PA, while the “left” refers to the systemic circulation, including the LA, LV, and aorta. These conditions, including TOF, “reversed” PDA, and R-to-L shunting septal defects, can lead to hypoxemia and resultant polycythemia.

A significant cause of R-to-L shunting is Eisenmenger’s physiology, which describes a situation in which pulmonary arterial hypertension is greater than that of the systemic circulation. In these cases, an existing left-to-right (L-to-R) shunt, as seen with a typical ventricular septal defect (VSD) or PDA, can “reverse” so that blood is shunted right to left. When this occurs in human medicine, a heart-lung transplant is necessary.

Reversed Patent Ductus Arteriosus

The term reversed PDA is used to describe a PDA that shunts blood from the PA to the aorta, adding deoxygenated blood to the systemic circulation of the caudal body. Conventional theories of the pathogenesis center on the patient having a congenital PDA; chronic high-volume flow in the pulmonary arterial tree is thought to induce a loss of compliance, leading to increased resistance in the PA and a change in the shunt to right to left. It is also theorized that in some cases, the PDA does not reverse, but never actually changes from fetal circulation at all because the

pulmonary vascular resistance does not fall with the expansion of the lungs. The term for the latter scenario is persistent fetal flow, rather than reversed PDA.

Regardless of the pathogenesis, the result is an R-to-L PDA that shunts deoxygenated blood from the PA into the descending aorta. The brachiocephalic trunk and left subclavian arteries exit the aorta upstream of the PDA and are unaffected by the shunt. Therefore, the partial pressure of arterial oxygen (PaO_2) is reduced only in the caudal portion of the patient, except under stress. The measured PaO_2 is inversely proportional to the volume of the shunt through the PDA; the greater the shunt volume, the lower the PaO_2 . The decreased PaO_2 , in turn, stimulates the renal system to release erythropoietin, leading to polycythemia. Unless another comorbidity exists, the patient will eventually succumb to chronic hypoxia and polycythemia.

Clinical Signs and Physical Examination Findings

R-to-L PDAs have been reported in dogs and rarely in cats. They usually go undiagnosed for the early years of life. At presentation, these patients show signs of exercise intolerance, lethargy, syncope, shortness of breath, and potentially sudden death. Murmurs are not typically appreciated with R-to-L shunting PDA. This is partly due to the decreased pressure gradient between the PA and aorta created by pulmonary hypertension and the hyperviscosity of the blood induced by polycythemia. In some cases, a loud S2 sound may be appreciated related to the crisp closing of the pulmonic valve due to pulmonary hypertension. A jugular pulse can occur with significant tricuspid regurgitation. A positive hepatojugular reflux test indicates elevated RA pressure.

Generalized cyanosis may be present during exercise or excitement. The classic physical examination finding is differential cyanosis, in which the cranial mucous membranes are pink but the caudal tissues are cyanotic. Hindlimb weakness is also a common sign in patients with R-to-L shunting PDA.

Diagnostic Tests

Diagnostic tests include radiography, complete blood count, serum chemistry, and echocardiography. Radiographically, evidence of RA and RV enlargement and overcirculation of the pulmonary arteries with a prominent pulmonary trunk are seen. Some tortuosity

of the pulmonary arteries may be appreciated. A prominent bulge is also seen in the descending aorta at the level of the PDA. Signs of left-sided CHF are uncommon. The ECG generally indicates RV enlargement patterns with right MEA shifts. Arrhythmias are variable.

Echocardiography is typically diagnostic, revealing RV hypertrophy and dilation, RA dilation, and dilation of the pulmonary trunk. The use of Doppler

echocardiography may allow visualization of the shunt flow in the distal PA. Spectral Doppler echocardiography of any tricuspid regurgitation can yield the estimated pulmonary arterial pressure, which is used for prognosis and response to therapy information. Definitive diagnosis is achieved by performing contrast echocardiography over the abdominal aorta (**BOX 2 AND FIGURE 7**). As the saline is injected into the vein, it travels to the RA, RV, and PA. A portion of the air bubble contrast will pass through the PDA and descend to the abdominal aorta. Cardiac catheterization is not commonly performed but can be used to measure pulmonary pressure. Arterial blood gas of the femoral artery will indicate the severity of the drop in PaO_2 .

Management

Medical management is the best approach. Surgical closure of the PDA in the presence of pulmonary hypertension typically leads to death from RV pressure overload, often at the time of surgery. However, surgery has been successfully performed in certain situations in both dogs and cats.¹⁰⁻¹² The priority of therapy is control of erythrocytosis and hyperviscosity.

Phlebotomy can be helpful in resolving clinical signs associated with hyperviscosity, such as hindlimb weakness and shortness of breath.¹³ The target packed cell volume (PCV) in these patients is 62%. To achieve

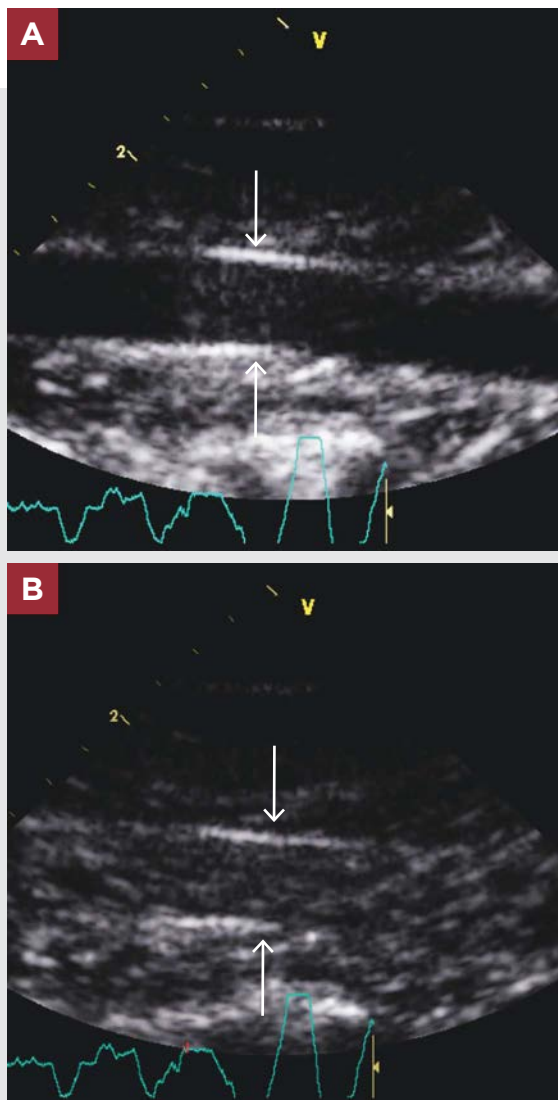


FIGURE 7. Abdominal ultrasound images of the abdominal aorta beneath the urinary bladder from a dog with R-to-L shunting PDA. **(A)** Aorta before an air-contrast study. There is some image artifact directly between the arrows due to the hyperreflective aorta walls. **(B)** The entire aorta is filled with highly reflective microbubbles. This finding is only possible with R-to-L shunting PDA as the contrast passes through the pulmonary artery and into the descending aorta.

BOX 2

Contrast Echocardiography: A Unique Diagnostic Test

Diagnosis of R-to-L shunts is often aided by contrast echocardiography. The technique involves injecting an ultrasound contrast medium into the patient's venous system and following the path of blood by echocardiography. Commercial preparations are available but are often cost prohibitive in veterinary medicine. In veterinary medicine, the same effect is commonly achieved with an agitated solution of saline and air. Dextrose or a flash of the patient's blood in the solution aids in keeping the microscopic air bubbles in suspension. After aggressive agitation, the visible air is expressed from the solution. The solution is then injected into a vein, typically via an IV catheter. The section of the anatomy where the R-to-L shunt is believed to exist is imaged by ultrasound simultaneously. The microbubbles create a bright contrast to the ultrasound waves, and shunts can be positively diagnosed (**FIGURE 7**).



Treatment of TOF involves corrective surgery and is commonly done with great success in human medicine; Olympic snowboarder Shaun White is a notable example.



this PCV, approximately 10% of the patient's blood volume is initially removed. No replacement fluids are given. After several hours of cage rest, an additional 5% to 18% of the blood volume is removed based on the initial PCV.¹³

Administration of the chemotherapy agent hydroxyurea has been successfully used to retard the production of blood components.¹⁴ Complete blood counts and platelet counts are initially monitored biweekly, then periodically to maintain a PCV of approximately 60%. Dosage and administration are customized to minimize the side effects of vomiting, anorexia, alopecia, pruritus, and potential bone marrow hypoplasia.

Other therapies such as vasodilators are of little effect due to their predominantly systemic effects. Sildenafil is a notable exception, as it works by increasing pulmonary arterial vasodilation more than systemic. Sildenafil has anecdotally been described as improving clinical signs. With phlebotomy or hydroxyurea therapy, patients may do well for some years, but the long-term prognosis is poor.

Tetralogy of Fallot

Tetralogy of Fallot is named for Dr. Étienne-Louis Arthur Fallot, who first linked the condition to cyanotic babies, although it had been previously described in the medical literature.^{15,16} Affected neonates have a heart with 4 defects, hence the term *tetralogy*. The defects are (1) obstruction of the right ventricular outflow tract (RVOT); (2) a large VSD, which (3) allows the aorta to shift toward the RV (dextrorotation); and (4) RV hypertrophy. This CHD is not actually 4 problems in one patient, as commonly believed.

Pathophysiology

In the embryo, the heart begins as a hollow organ that divides into 4 chambers by the intersection of 3 septa: the spiral, which creates the great vessels and is most superior; the conotruncal, which separates the upper portions of the ventricles, contributes to the semilunar valves, and is centrally located; and the muscular, which separates the lower muscular portion of the ventricles. TOF results when the conal septum forms shifted anterior, superior, and rightward and incompletely fuses with the muscular septum.

If the development of the septum is correctly placed, even if a large VSD is present, the flow may be physiologically balanced. In this situation, the patient may exhibit few signs at rest. The most malignant version shows complete pulmonary atresia, and all blood flow to the lungs is achieved by either the ductus arteriosus before it closes or another systemic-pulmonary shunt. In human medicine, these children are identified in utero and surgical repair is planned accordingly. In veterinary medicine, these patients often die suddenly hours to days after birth.

Clinical Signs and Physical Examination Findings

The condition is reported in both cats and dogs. Keeshonds are predisposed. Patients often show a failure to thrive in the early weeks of life and usually present for lethargy, exercise intolerance, syncope, or shortness of breath. During the physical examination, cyanosis may be apparent if the PaO_2 is sufficiently low. Some patients with TOF only show cyanosis during exercise. A murmur may or may not be present. As with R-to-L PDA, hyperviscosity may retard the development of turbulence of a murmur. If a murmur is present, it is generally systolic, located over the left heart base, and of variable loudness related to the PS. Murmurs at the right heart base are either radiation of the PS murmur or flow across the VSD. Under stress, patients may gasp and have pulmonary crackles, which are not related to pulmonary edema, but their genesis is not understood.

Diagnosis typically centers on radiography and echocardiography. An ECG typically shows a right MEA axis shift in sinus rhythm, but MEA may be normal. If the disease is advanced, atrial fibrillation or other arrhythmias may be noted. Ventricular arrhythmias may be present if hypoxemia is severe. Radiographs demonstrate undercirculation of the lungs,

diminished LA size, and normal cardiac size, with possible rounding of the RV. The main PA is small and no poststenotic dilation occurs as with lone PS. The echocardiogram will allow visualization of the VSD, evidence of RV hypertrophy, and malformed RVOT (FIGURE 8). The LA and LV size will be related to the amount of pulmonary circulation through the RVOT. If the RVOT is very narrow, the LA and LV will be diminished. A Doppler study shows turbulent flow exiting the RVOT and flow across the VSD into the aorta. A contrast echocardiogram can be used to verify R-to-L shunting.

Management

Treatment of TOF involves corrective surgery and is commonly done with great success in human medicine; Olympic snowboarder Shaun White is a notable example. Surgical repair is achieved by closing the VSD and opening the RVOT via cardiopulmonary bypass. Palliative surgery using the Blalock-Taussig procedure, which uses the subclavian artery to create a systemic to PA shunt, has been performed in dogs and cats.^{17,18}

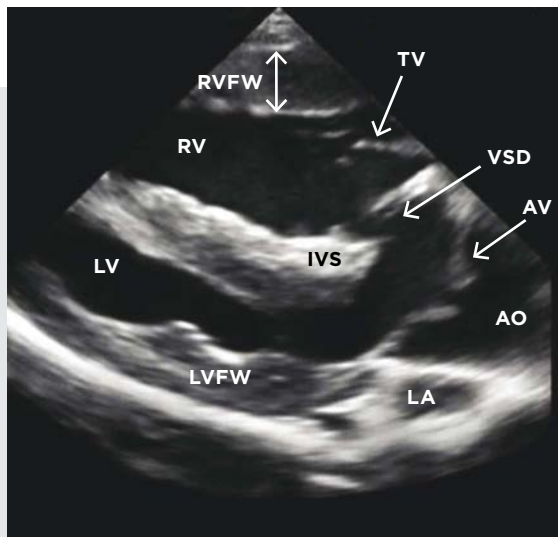


FIGURE 8. Long-axis echocardiographic image of a bovine heart with tetralogy of Fallot. The patient's cranial aspect is on the right side; caudal is on the left. This is an early systolic frame; the AV is just opening, and the TV is just closing. The RV free wall (RVFW) is hypertrophied as indicated by the double arrow; it should be one-third the thickness of the LV free wall (LVFW). The RV is dilated compared with the LV, which should always be larger than the RV. A VSD can be seen beneath the TV and leading into the AO. The AO appears large compared to the rest of the heart and may represent dilation from increased flow. The intraventricular septum is labeled IVS.

Medical management is used with any intervention. The same approach as with R-to-L PDA of phlebotomy or control RBC production are the priorities. The long-term outcome is directly related to the amount of pulmonary blood flow and ranges from failure to thrive (pulmonary atresia with compensating shunt) to exercise intolerance (mild to moderate RVOT flow). CHF is uncommon; rather, most patients without corrective surgery succumb to chronic hypoxia, chronic hyperviscosity, cardiac arrhythmias, and sudden death.

TVN

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CONTINUING EDUCATION

A Look at Unusual Congenital Heart Defects in Dogs and Cats

LEARNING OBJECTIVES

After reading this article, the well-versed veterinary nurse will be able to describe how a right-to-left shunt causes hypoxemia and which right-to-left shunts might be identified in the clinic. The reader should also be able to define several uncommon but important congenital heart defects. The astute nurse will explain the physiology of the 2 groups of defects presented.

TOPIC OVERVIEW

This article is an overview of 6 uncommon congenital heart defects and the associated physiology changes of the cardiovascular system. Summaries of the clinical presentations and management are included.

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1. The overall incidence of all congenital heart disease in dogs is approximately:
 - a. <1%
 - b. 5%
 - c. 7%
 - d. 10%
2. Which of the following influences stroke volume?
 - a. Heart rate
 - b. P_{aO_2}
 - c. Cardiac output
 - d. Preload
3. Eisenmenger's physiology describes which of the following?
 - a. The decrease of heart rate after closure of a patent ductus arteriosus (PDA).
 - b. The genetic defect responsible for reversed PDA and tetralogy of Fallot.
 - c. The decrease in stroke volume associated with a ventricular premature complex and the sudden increase afterward.
 - d. The increase in pulmonary arterial pressure that causes blood to shunt from right to left with reversed PDA.
4. Tricuspid valve dysplasia is most common in which of the following breeds?
 - a. Golden retriever
 - b. Labrador retriever
 - c. Boxer
 - d. Greyhound
5. Which of the following is a physical examination finding for a right-to-left shunting patent ductus arteriosus?
 - a. Pale mucous membranes
 - b. Left basilar grade 5/6 continuous murmur
 - c. Differential cyanosis
 - d. Hyperkinetic pulses
6. Which of the following chambers is affected in a patient with cor triatriatum dexter?
 - a. Left atrium
 - b. Right atrium
 - c. Left ventricle
 - d. Right ventricle
7. Pulmonic stenosis and a large ventricular septal defect are noted in a patient during echocardiography. The ultrasonographer says the aorta is almost hanging in space, and the right ventricle is gigantic. Which defect is most likely?
 - a. Mitral valve dysplasia
 - b. Eisenmenger's syndrome
 - c. Cor triatriatum sinister
 - d. Tetralogy of Fallot
8. Which finding is common in patients with tetralogy of Fallot or a right-to-left shunting patent ductus arteriosus?
 - a. Polycythemia
 - b. Anemia
 - c. Leukocytosis
 - d. Thrombocytopenia
9. Tetralogy of Fallot may be palliated with which of the following procedures?
 - a. Jackson-Henderson technique
 - b. Simple surgical ligation
 - c. Blalock-Taussig technique
 - d. There are no palliative procedures, and a heart transplant must be done.
10. A right-to-left shunting defect of any kind can cause cyanosis directly related to which of the following?
 - a. Increased partial pressure of arterial carbon dioxide
 - b. Decreased partial pressure of arterial carbon dioxide
 - c. Increased partial pressure of arterial oxygen
 - d. Decreased partial pressure of arterial oxygen



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RUFFLED FEATHERS

Feather-plucking is a behavioral problem among Moluccan, or salmon-crested, cockatoos.



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CASE REPORT: WOUND MANAGEMENT

Long-Term Nursing Care of a Self-Mutilating Moluccan Cockatoo

**MEET THE AUTHOR**

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Jodi Berls worked in another field for 25 years before heeding the call to veterinary medicine. Fascinated with birds and their welfare, she enrolled in Houston Community College's Veterinary Paramedics Program in 2011. She achieved state-level certification as a Certified Veterinary Assistant (CVA) in 2013, then earned her Associate of Applied Science (AAS), veterinary technology, degree from Cedar Valley College, in Lancaster, Texas, and her license in 2016. Her passion for avian and exotic companion animals continues to grow, and she is particularly interested in maximizing the healing power of the hospital environment.

Hospitalized veterinary patients usually leave the clinic after a few hours or days. When they do not, however, long-term hospitalization can pose particular challenges, especially for sensitive exotic species. Add to this challenge an avian patient who hates being restrained, and you have the case of Chula, a self-mutilating cockatoo. Chula's case demonstrates how constant monitoring, effective communication within the care team, low-stress handling, and in-hospital enrichment contribute to a favorable outcome.

Chula had been engaging in feather destructive behavior, which in captive psittacine birds is a complicated and often frustrating problem that can lead to self-mutilation. It is the most common behavior problem for which birds are presented to veterinary clinics.¹ Pet birds may pluck or chew feathers in specific areas or over most of the body, damaging feathers and/or skin. Damage may extend deep into the tissues beneath the skin. Feather destructive behavior is not considered a specific disease or diagnosis but rather the outward indication of an underlying disorder.² Numerous etiologies have been identified or proposed and include a variety of infectious and noninfectious conditions, psychological causes, and trauma.³ Self-trauma is most commonly reported in large cockatoos and African grey parrots. A complete discussion of feather destructive behavior and self-mutilation is beyond the scope of this report, but **BOX 1** lists some predisposing factors.

**BOX 1****Causes of Feather Destructive Behavior and Self-Mutilation in Birds**

Feather destructive behavior, which can lead to self-mutilation, is a multifactorial condition with a large number of possible medical, behavioral, and environmental causes. Predisposing factors include⁴:

- Medical
 - Hormonal influences
 - Atherosclerosis
 - Dermatitis
 - Ectoparasites
 - Allergies
 - Bacterial or fungal infection
 - Toxin or irritant exposure
 - Trauma
 - Nutritional deficiency
 - Neoplasia
- Environmental
 - Lack of physical activity
 - Lack of mental stimulation
 - Presence of a companion (avian or human)
 - Absence of a companion (avian or human)
 - Stress
 - Sleep deprivation
- Behavioral
 - Attention-seeking behaviors
 - Abnormal repetitive behavior
 - Poor socialization at an early age
 - Sexual frustration

THE CASE

Chula is a 25-year-old female Moluccan cockatoo. On May 4, 2018, she was brought to our clinic with a severe self-inflicted wound in the left inguinal region, extending distal to the stifle, and a smaller wound in the cranial thoracic region. She did not leave the hospital until almost 3 months later.

History

Chula had been surrendered to a local sanctuary in July 2015, where she remained until her adoption in 2018. Shortly after moving to her new home, she began engaging in feather destructive behavior, which eventually graduated to self-mutilation. At that point,

she was returned to the sanctuary, fitted with an acrylic restraint collar, and taken for medical care to the veterinary clinic that serves the sanctuary. Sanctuary staff believe the self-mutilation behavior was triggered by an unsuccessful effort to match her with a compatible male cockatoo for breeding purposes.

Initial Assessment

Except for the wounds and a large number of missing and tattered feathers on the breast, under both wings, and on the inguinal region of both legs, Chula appeared generally healthy. She was bright, alert, and in good body condition (weight 778 g). The left inguinal wound was 7 cm long, 2 cm deep, and involved severe damage to the skin and some of the underlying muscle of the medial thigh, extending distal to the stifle. The smaller wound had been opened at the cranial point of the sternum. Feathers had been removed and the skin was abraded in the right inguinal region. The wounds were not actively bleeding at the time of presentation. We assumed that the wounds were painful, although the only sign of discomfort was Chula's initial reluctance to step up onto a hand or perch.

Treatment Plan and Hospitalization

Because of financial constraints, Chula's treatment plan was based on patient history and physical examination. A diagnostic workup of complete blood count, blood chemistries, fecal examination, and radiographs was not performed.

For most cases of feather destructive behavior, the recommended treatment involves a physical barrier (e.g., collar or vest) to prevent further tissue damage, long-term antimicrobial therapy for secondary infection, pain control, and psychotropic drugs when warranted. In addition to medical treatment, these patients often require management of any underlying disorder(s) and modification of their husbandry and environment to provide an improved diet, stress reduction, and adequate sleep.⁵

Our first priorities were to clean the wounds, address infection, and manage pain. We cleaned the inguinal wound by using hydrotherapy and flushing it with warm, dilute chlorhexidine (2% diluted to 1:40) q72h, after which time we packed Manuka honey and 1% silver sulfadiazine cream into both wounds. Prescribed medications were antibiotics (enrofloxacin, 20 mg PO q24h), pain medication (meloxicam, 0.75 mg PO



q12h), and medication for treatment of presumed behavioral abnormality (fluoxetine, 0.72 mg PO q24h).

We attempted to bandage the wounds, but movement and the presence of feathers made both wounds difficult to cover (**FIGURE 1**). In addition, we were concerned that the bandages could increase damage at and near the wounds. When after a few days it became clear that bandages would not remain in place, we discontinued bandaging.

Surgery to close the wound was intentionally postponed until after the wound had closed on its own as much as possible, because of the risk for dehiscence in such a highly mobile area. However, intensive nursing care resulted in the wound closing without surgery (**FIGURE 2**). On June 26, surgery was canceled, antibiotics and hydrotherapy were discontinued, and cold laser therapy q72h was added (3 min at 1.0 watts/sec on the manufacturer's preset for contaminated wounds; we used a Class IV veterinary therapy laser, which offers reduced treatment time and greater penetration).

Sanctuary staff believe the self-mutilation behavior was triggered by an unsuccessful effort to match her with a compatible male cockatoo for breeding purposes.



CASE MANAGEMENT

Long-term nursing care is always a team effort because no one person is on duty at all times. Communication among care team members becomes essential, and the team must be committed to ensuring that small, subtle signs of a problem are addressed before they become more serious. In addition, members of the nursing team sometimes must be creative and improvise solutions to various problems that may arise.

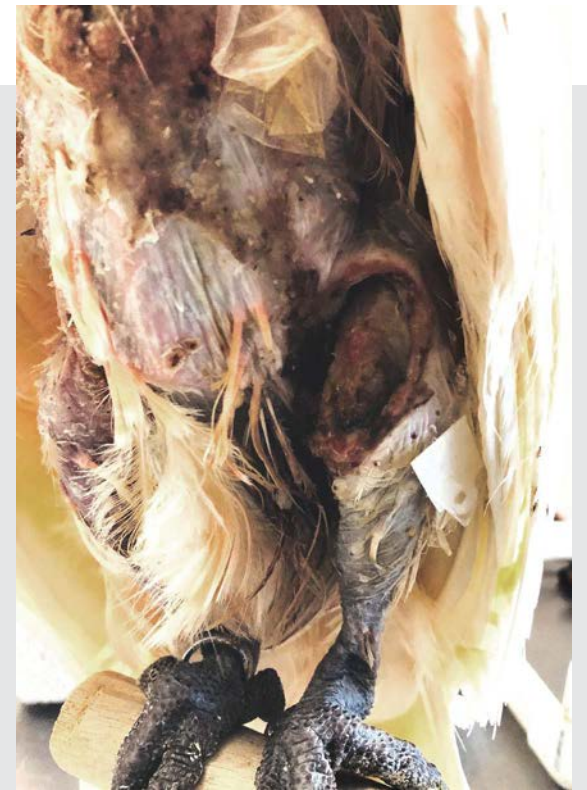


FIGURE 1. Bandaging was discontinued because of the presence of feathers and the highly mobile location of the wound. A few remaining pieces of bandage material can be seen.

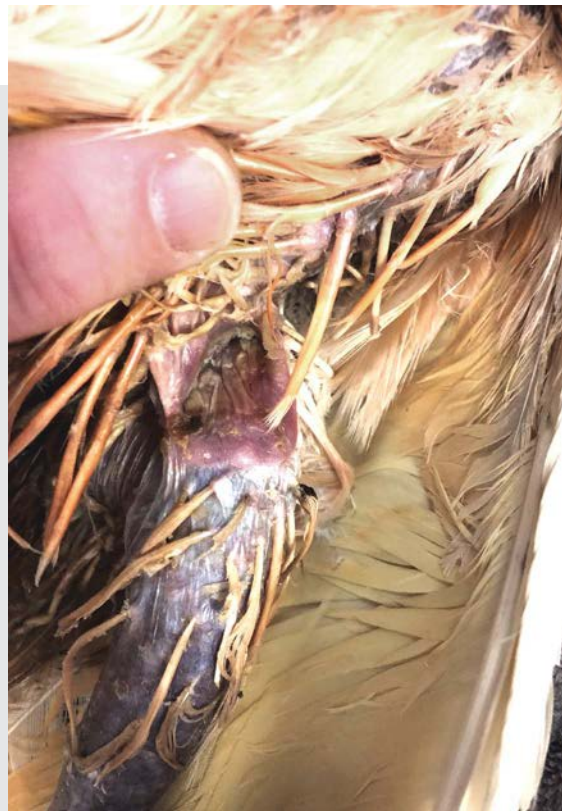


FIGURE 2. Surgery planned to close the patient's inguinal wound was canceled when it became clear that the wound had healed.



Exotic species, such as Chula, are highly susceptible to stresses related to unfamiliar environments, people, and animals.



Constant Monitoring and Communication

In the first few days of Chula's hospitalization, the care team noticed occasional tiny flecks of fresh blood near the edges of the inguinal wound. No one saw Chula chewing at the wound, but she had been observed bending over in an effort to reach it. In addition, the restraint collar had rubbed at the thoracic wound, gradually enlarging it to about 4 cm. To prevent further damage, we attached a 10-inch diameter plastic shield to the ring collar (**FIGURE 3**).



FIGURE 3. A plastic shield attached to an acrylic restraint collar was used to prevent further damage to the wounds.

Although the collar and shield effectively prevented Chula from further self-mutilation, we became concerned that they might also interfere with her ability to reach her food. We therefore experimented with ways to increase the height of her food bowls to make food easier to reach and carefully monitored her weight. We discussed the possibility of decreasing the diameter of the restraint shield, but doing so became unnecessary when Chula learned to manipulate her body to get the shield out of her way. She gained approximately 50 g during her hospital stay.

Consistency of care throughout Chula's hospitalization was achieved by the twice daily recording of her weight, appetite, mentation, elimination, and receipt of medications. In addition, members of the team frequently left each other notes detailing problems and solutions.

Low-Stress Handling and Treatment

Exotic species, such as Chula, are highly susceptible to stresses related to unfamiliar environments, people, and animals. They can react violently to unpleasant procedures and tend to find restraint difficult to tolerate.



FIGURE 4. Hydrotherapy performed while the patient stands on a perch without restraint. A focus on minimal handling and low-stress treatment methods was used to excellent effect.

Right: Courtesy of Sarah Plasencia.



Chula is a friendly, well-socialized bird, but she screamed and thrashed when being restrained for her twice-daily medication and once-daily hydrotherapy sessions. Concern grew that the stress would compromise her recovery, particularly because stress seemed to have been a predisposing factor in her self-mutilation. The team began injecting her medications into pieces of fruit (tangerine segments, grapes) and small chunks of bread. She ate the medicated items with enthusiasm, thereby avoiding the need for restraint. She would stand freely, without restraint, on a hand or a perch while the inguinal wound was flushed and ointments were applied (**FIGURE 4**). Finding ways to get the patient to cooperate made daily treatments easier for everyone, especially the patient.

Enrichment

Birds are extremely intelligent and sensitive. They can quickly become bored and stressed when kept in a small cage for a long time. Members of the care team visited Chula several times a day and provided a variety of chew toys to entertain her, including wood chunks, cardboard cores from paper towel rolls, compressed paper rings (“birdie bagels”), and yucca “bird kabobs.” Her own adaptation—chewing the towels that lined her cage—prompted us to change her cage lining to newspaper. When the newspaper left smudges of ink on her feathers, she was bathed and the newspaper was switched to plain (unprinted) newsprint.

OUTCOME AND CONCLUSION

On July 25, 2018, Chula returned to the sanctuary. As of late October 2018, she had not resumed any self-mutilation behaviors. Her mobility was unaffected by the injury—she was walking and climbing normally. Her plastic restraint collar and shield were replaced by a sock around her upper body, which allows freedom of movement while providing a distraction from feather destruction (i.e., she chews the sock instead of her feathers) (**FIGURE 5**). Her feathers have not fully recovered, but feather quality will probably improve after her next molt, except for some areas where feather follicles have been damaged, in which case the feathers will not regrow.

Because most hospitalized veterinary patients leave the clinic after a few hours or days, it is a special experience to develop a long, intimate relationship with a patient. Similar techniques can be applied to enhance the



FIGURE 5. After discharge from the hospital, a sock around the neck gave the patient a safe object to chew on while allowing complete freedom of movement.

outcomes of short-term patients. And although this case involved an avian patient, the techniques used to enhance Chula’s hospitalization can be applied to patients of other species. **TVN**

The team began injecting her medications into pieces of fruit (tangerine segments, grapes) and small chunks of bread. She ate the medicated items with enthusiasm, thereby avoiding the need for restraint.



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KEEP COOL

Every second counts with a patient suffering heatstroke. Intensive nursing care must be provided to increase the patient's chance for survival.





CRITICAL CARE

Providing Care to Dogs with Heatstroke



MEET THE AUTHOR

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Amy is employed by BluePearl Veterinary Partners as a Training Project Manager. After working in general practice, she found her passion in emergency medicine and in 2003 became a Veterinary Technician Specialist in Emergency and Critical Care. She has held several board positions in the Academy of Veterinary Emergency & Critical Care Technicians & Nurses, including president. Amy has published numerous articles, is an international speaker, has received numerous awards (including 2 Speaker of the Year awards), and is highly involved in her community. She and her wonderful furry kids live in Massachusetts, where you can find her eating chocolate, running in the woods, competing her dogs in agility, and scuba diving in the ocean.

Thermoregulation is the ability to maintain body temperature within certain boundaries, even when the surrounding temperature is very different. This ability is a major aspect of homeostasis. Companion animals may experience large changes in environmental temperature, and although their bodies may initially be able to regulate the temperature to within normal range, at some point they may not be able to keep up with the demand. When this happens, and if the core body temperature reaches 41.1°C (106°F) or above, the animal is said to have heatstroke.

Most commonly (although not the only cause), the increasing outside temperatures of summer can result in heatstroke in companion animals. As a veterinary nurse or assistant, you are likely to be the first person to deal with the client and the heatstroke patient and to perform the diagnostic testing, treatment, and nursing care for these critical patients. This article describes the physiology of normal thermoregulation; the pathophysiology of heatstroke; and how to recognize, treat, and care for the heatstroke patient.

THERMOREGULATION

Body temperature is regulated almost entirely by a nervous system feedback mechanism that responds to the temperature-regulating center in the hypothalamus, where there are 3 times as many heat-sensitive as cold-sensitive neurons, which function as temperature sensors.¹ The signals sent by these sensors cause the



body to lose or increase body heat. When heat loss is needed, the body can respond with vasodilation, sweating, panting, and decreased chemical thermogenesis.¹

Heat loss occurs by 4 main mechanisms: convection, conduction, radiation, and evaporation.

- Convection is the process of losing heat through movement of air or water across the skin.
- Conduction is the process of losing heat through physical contact with another object or body.
- Radiation is the process of heat transfer from one object to another, without physical contact.
- Evaporation is the process of losing heat through conversion of water to gas.

In animals, most heat loss occurs from convection (cooler air moving over the body) and conduction (lying directly on a colder surface).¹ Less commonly, animals also lose heat through radiation and evaporation (panting and sweating).

HYPERTHERMIA

An animal becomes hyperthermic when physiologic thermoregulation is no longer adequate. Causes include disease or changes in environmental temperature. Hyperthermia is considered to be a body temperature above normal (39.2°C /102.5°F). There are 2 categories of hyperthermia: pyrogenic and nonpyrogenic.²

Pyrogenic hyperthermia is caused by inflammation or infection, in which the body responds to a new temperature set point, ultimately producing a fever. Some fevers are beneficial and help the immune system and inflammatory response act appropriately so the body can heal. Unless the temperature rises above 41.1°C/106°F, hyperthermia in these patients should not be reduced.² Treatment of the illness or injury will decrease the temperature most of the times in these cases.

Nonpyrogenic hyperthermia is caused by damage to the hypothalamus (e.g., by a tumor) or an alteration to the temperature-regulating center itself.² When the damaged hypothalamus no longer triggers heat-disseminating mechanisms, body temperature rises. Temperatures above 41.1°C /106°F (heatstroke) can lead to neurologic and organ dysfunction, and temperatures of 43°C /109.4°F or above can lead to brain cell death.^{3,4}

TYPES OF HYPERTHERMIA

Heat Stress

Heat stress is associated with increased thirst, hyperthermia, and panting.² The patient is still mentally aware and generally is ambulatory.

Heat Exhaustion

Heat exhaustion is a more severe form of heat stress and is usually associated with markedly increased thirst, generalized weakness, and heavy panting.² These patients may or may not be ambulatory or may collapse. They are mentally aware but too tired to react.

Heatstroke

Heatstroke is more serious than heat exhaustion. Problems that occur when temperatures exceed 41.1°C/106°F include dysfunction of the central nervous, gastrointestinal, cardiovascular, hepatobiliary, renal, hematologic, and muscular systems.⁴ Although there is no set point at which each of these systems will fail, higher temperatures and longer durations of heat exposure will lead to more system dysfunctions and risk of death. Some animals will have elevated liver and kidney enzymes at the time of presentation.² The consequences of heatstroke, however, vary among individuals. For example, at a core temperature of 43°C/109°F, some dogs may suffer organ dysfunction while others may experience life-threatening hematologic and renal disorders.

Heatstroke can be further subdivided into 2 types: exertional and nonexertional.⁵

Exertional heatstroke occurs when a dog or cat is playing, running, or walking in an environment that is too hot for their body condition. Tolerance for any exertion in high temperatures is much lower for animals of certain breeds (e.g., brachycephalic breeds), those that are obese, and those with certain medical conditions (e.g., laryngeal paralysis or heart disease). The nares of brachycephalic dogs are stenotic rather than open and round, resulting in the need for more force to suck in the same amount of air than is needed by dogs of other breeds.⁵ In addition, the trachea of brachycephalic breeds is often one-third the diameter of the trachea of nonbrachycephalic dogs of similar weight, further restricting air flow and ventilation.⁵ A hot and humid environment may cause the upper



airway of brachycephalic dogs to swell, thereby partially or completely closing the airway.

Nonexertional heatstroke is caused by the animal's inability to dissipate heat because of decreased airflow (closed car) or lack of shade and/or water. Generally, if pets are provided shade, water, and an adequate amount of circulating air, they will be able to thermoregulate appropriately.

SIGNS AND SYMPTOMS OF HEATSTROKE

Heatstroke signs and symptoms include incessant or noisy panting, collapse, inability to walk (e.g., staggering), altered mentation, and/or gastrointestinal (GI) signs (e.g., vomiting/diarrhea). These signs result from changes to the nervous, GI, cardiac, renal, and hepatic systems.

Neurologic

As temperature increases, the brain swells (i.e., cerebral edema)^{2,4} and may bleed in localized areas.⁴ Neurologic signs include seizures, nystagmus, anisocoria, or coma.

Gastrointestinal

During heatstroke, GI dysfunction results from ischemia and poor GI perfusion.⁴ Some mildly hyperthermic animals may experience GI signs (e.g., hematochezia, melena, vomiting, hematemesis, and GI mucosa sloughing).

Cardiac

Initially during heatstroke, blood vessels dilate and cardiac output increases.¹ Cardiac failure can result from increased demands placed on the heart by increased metabolic requirements and redistribution of blood flow, which lead to bodywide hypoxia.⁶ Lack of oxygen delivery to the myocardium can lead to ventricular arrhythmias, which can lead to cardiac failure.⁷

Renal and Hepatic

One of the most life-threatening heatstroke symptoms is thermal injury to the renal system.⁴ Renal failure is initially caused by decreased cardiac output and renal vasoconstriction,¹ which results in decreased renal perfusion and tubular necrosis.¹ Dehydration can also exacerbate renal failure. Liver and muscle damage result



WHY HEAT IS DANGEROUS FOR BRACHYCEPHALIC BREEDS

Factors that predispose animals to heatstroke include obesity, genetics, heart disease, humidity, water immersion, not being acclimated to a warm climate, and being a brachycephalic breed (such as pugs, Boston terriers, and English bulldogs). Unlike humans, who sweat when they're hot, dogs use their respiratory system to pant and get rid of heat. Flat-faced breeds are at a huge disadvantage because their airway abnormalities and bone structure of their faces make their airways like a tight maze; with each breath, they have to work much harder than non-brachycephalic dogs to get air to reach the lungs. Summer months are a particularly dangerous time for these popular breeds.

from hypoxia.¹ Excessive heat can also injure hepatocytes, leading to worsening liver failure.¹ Even if a patient recovers from heatstroke, the animal may have permanent renal and liver damage requiring lifelong treatment.

OTHER COMPLICATIONS

Disseminated intravascular coagulation (DIC) is a pathologic process in which the blood starts to coagulate throughout the whole body, depleting the body of platelets and coagulation factors, increasing the risk for bleeding.⁸ DIC is generally triggered by a major disruption in the intravascular system, as occurs with heatstroke. Petechiae, ecchymosis, excessive bleeding, or multiple organ failure may be noted.⁸ DIC in a heatstroke patient increases the risk for death.

Systemic inflammatory response syndrome (SIRS)

is an inflammatory response of the entire body and can result in death. The cytokines produced during an inflammatory response mediate and control the SIRS response. SIRS can occur from hyperthermia alone if there is an inciting incident,



such as sepsis. Heatstroke patients experiencing SIRS are also at risk for organ failure.

Multiple organ dysfunction syndrome (MODS) is altered function of 2 or more organ systems. Organ dysfunction can result from heatstroke or a disease process causing hyperthermia. If MODS occurs in conjunction with SIRS, the prognosis becomes very poor.⁹ A higher number of involved organs decreases survival chances.⁹

Rhabdomyolysis is the rapid breakdown of injured muscle fibers. In patients with heatstroke, muscle necrosis¹ is followed by release of muscle fiber contents (e.g., myoglobin) into the bloodstream, where they eventually block the structures of the kidneys, causing acute tubular necrosis or kidney failure. Patients with heatstroke may exhibit myoglobinuria.

DIC, SIRS, and MODS are all intertwined in patients experiencing heatstroke. A combination of more than one of these complications increases the risk for death.

TREATMENT FOR HEATSTROKE

The initial stabilization goal should be to lower the dog's body temperature to prevent further injury, restore tissue perfusion, and minimize further neurologic injury.^{2,3} Subsequent treatment involves oxygen supplementation, fluid therapy, and treatment of complications.

Cooling the Patient

If clients phone to report signs of heatstroke in their dog, they should be instructed to pour cool (not cold) water over the dog and immediately bring it to the closest veterinary hospital. Instruct them to not

submerge the dog and to keep the dog's nose and mouth above water at all times.

After the dog is in the hospital, the goal of cooling is to reduce body temperature slowly in a way that stresses the body the least. A sudden drop in body temperature will cause further complications (e.g., iatrogenic hypothermia¹). Avoid ice and cold water baths because they can cause peripheral vasoconstriction, which forces blood back to the organs.¹ The body feels cold and, in response, will try to warm itself up. Even if cooling methods are applied carefully and slowly, cerebral swelling may be present. Cerebral edema may lead to dysfunction of the temperature-regulating center in the hypothalamus, and the patient may not be able to thermoregulate in either direction.¹ If the temperature is dropped too quickly, the impaired temperature-regulating center may prevent the animal from being able to re-warm itself. Regardless of how careful the veterinary team is, if the hypothalamus is damaged, the patient may not be able to thermoregulate.

Ineffective methods for peripheral cooling have included pouring rubbing alcohol on the footpads and leaving a wet towel on the patient. If a wet towel is left on a patient it will quickly heat up and not allow for heat to escape from the patient. The best and most effective method to decreasing body temperature is pouring cool water over the body. When pouring water, place the patient on a cool metal table.³ A wet sink with a grate is best because water can constantly drain off the patient. If the water pools under the patient, it will very quickly heat up to the body's temperature.

Constant cool water is best. A grated wet sink table also allows for ventilation under the patient, as opposed to a smooth metal table, which can heat up quickly from the patient. However, if a wet sink table is not available, a solid metal table is preferable over a laminated table. Fans can be used to circulate cool air or room-temperature air around the patient. During cooling, the patient's temperature should be monitored continuously or, if that is not possible, taken every 5 minutes until the desired stopping point (39.4°C /103°F) is obtained.³ Cooling beyond 39.4°C /103°F can lead to iatrogenic hypothermia, which increases risk for death.³ The cooling process should take 30 to 60 minutes.³

Other ineffective methods that have been tried include cold water gastric lavage, cold water peritoneal lavage, and cold intravenous fluids. However, these methods have no real reported advantage over noninvasive, peripheral cooling.²

The best and most effective method to decreasing body temperature is pouring cool water over the body. When pouring water, place the patient on a cool metal table.³





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Oxygen Supplementation

Most heatstroke patients experience some level of ischemia, hypoxia, and/or dyspnea, and therefore benefit from supplemental oxygen, especially brachycephalic dogs. It is not uncommon for dogs of these breeds to require intubation or emergency tracheostomy because their airway has swollen shut from excessive panting. The most effective ways to administer oxygen are through a face mask (removing the diaphragm to allow for panting) or an oxygen hood.¹⁰ Flow-by oxygen is generally ineffective, and oxygen cages should be avoided during the initial emergency because you cannot work on your patient and the patient needs adequate circulating air to cool.¹⁰

Flow-by oxygen is generally ineffective, and oxygen cages should be avoided during the initial emergency because you cannot work on your patient and the patient needs adequate circulating air to cool.¹⁰



Fluid Therapy

An intravenous catheter should be placed so that fluids can be given to help support cardiac output; however, fluids should be used judiciously to avoid fluid overload.³ Large volumes may worsen cerebral and/or pulmonary edemas. Blood should be collected at the time of catheter placement to determine baseline values, which should include packed cell volume, total solids, glucose, electrolytes, venous blood gas, and lactate to assist in guiding fluid therapy.^{2,3} Mortality rates are higher among patients that are hypoglycemic during the initial stages of heatstroke.³ Throughout the fluid resuscitation process, the patient's temperature, heart rate, and blood pressure should be monitored.¹¹

Other Treatment

Ideally, an ECG should be run to check for any arrhythmias secondary to the heatstroke.¹¹ Plasma transfusions should be considered for patients suspected

of having DIC.¹¹ Albumin can be administered to hypoalbuminemic patients.¹¹

Contraindications

Use of corticosteroids and nonsteroidal anti-inflammatory drugs is usually contraindicated because of their tendency to decrease gastrointestinal integrity.¹¹ Heatstroke patients are typically at risk for gastrointestinal ulceration and ischemic injury, which can be worsened by administration of these drugs.

NURSING CARE

Heatstroke patients require constant and intensive nursing care. Monitor these patients for trends; even if a patient seems to be stabilizing, notify the veterinarian of any changes in vital parameters.

If the patient is recumbent, lubricate the eyes, moisten the mucous membranes, turn the patient, keep them dry and free of bed sores, and perform passive range of motion exercises.¹¹ For patients unable to rise, a urinary catheter can help keep them clean and dry.

Because glucose, electrolyte, and acid-base abnormalities are common, check blood values frequently.¹¹ Ideally, unless DIC is present, a central line should be placed to preserve veins and can be used to administer parental nutrition if needed later.

Blood pressure of heatstroke patients must be monitored closely, directly or indirectly. Direct (invasive) arterial pressure monitoring is standard¹¹ and requires an arterial catheter, which can also be used to obtain arterial blood gas samples. Indirect methods provide less accurate readings, but they are more readily available and noninvasive (e.g., oscillometric devices or Doppler ultrasound flow detectors). If mean arterial pressure falls below 60 mm Hg, the kidneys and other organs are not appropriately perfused, putting them at risk for failure.¹¹ The goal is normalization of blood pressure (i.e., mean arterial pressure of 80 to 120 mm Hg or systolic pressure of 110 to 160 mm Hg).¹¹

Patients should be monitored for GI signs; all vomiting and diarrhea should be noted. GI protectants, antiemetics, and antidiarrheals should be considered for any heatstroke patient.

Even for patients without a urinary catheter, veterinary nurses should monitor urine output¹¹ by using



nonabsorbent litter for cats or direct catch for dogs. Decreased urine production might indicate kidney failure. Look for signs of icterus by monitoring the color of the gums, sclera, ear pinnae, and underbelly. Throughout the pet's hospitalization, blood values should be constantly monitored and treatment tailored accordingly. Veterinary nurses should monitor for signs of DIC, such as increased bleeding times, petechiae, or ecchymosis. Clients should be informed that heatstroke patients are at risk for DIC and organ failure up to 5 to 7 days after experiencing the heatstroke.³

Because heatstroke patients are at risk for cardiac arrhythmias, running a continuous or periodic ECG should be considered. Auscultation of the heart every 2 to 4 hours will help identify heatstroke-related cardiac issues early.

Veterinary nurses and assistants should pay close attention to their patient's mental state. Central nervous system abnormalities can result from cerebral swelling. Watch for nystagmus, anisocoria, miotic pupils, or blindness. Seizures are rare.

For patients in very critical condition, having one veterinary nurse or assistant assigned to the patient may help detect subtle changes. The nursing care may be so intense that it requires one veterinary nurse to be with the patient throughout its care.

CONCLUSION

As a veterinary professional, you will probably encounter a patient who is experiencing heatstroke. You will need to communicate effectively and quickly to the client. Understanding the needs of your patient will enable you to provide the best nursing care possible. Because every second counts with these patients, treatment must be administered quickly and intensive nursing care must be provided to increase the patient's chance for survival. **TVN**

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REHABILITATION

Myofascial Trigger Points in Veterinary Patients

**MEET THE AUTHOR**

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Lis received her bachelor's degree from Ithaca College and earned her license in veterinary technology shortly after joining the Veterinary Medical Center of CNY's team. She developed the physical rehabilitation service at the Veterinary Medical Center of CNY and, in 2010, initiated the center's pain management service. Lis has lectured at professional veterinary conferences nationally and routinely contributes to newspaper articles, journal submissions, and book chapters regarding physical rehabilitation and pain management. She has received special training in Canine Myofascial Trigger Point Therapy through Myopain Seminars and has a special interest in myofascial issues and muscle dysfunction.

The concepts of myofascial trigger points (MTrPs) and myofascial pain syndrome (MPS) were first introduced by Dr. Janet Travell more than 65 years ago.¹ These syndromes have yet to be recognized in mainstream veterinary and human medicine as initial diagnostic criteria; however, understanding them can help in recognizing signs of pain in veterinary patients.

Credentialed veterinary nurses are often able to create a bond with their patients by building trust through the use of appropriate behavioral assessments/low-stress handling skills.² The nursing staff (especially in a rehabilitation setting) have more time in the examination room than the veterinarian and see patients on a recurring basis. This gives veterinary nurses an excellent opportunity to see patients without the influence of the “white coat” effect.

Observation of a patient's movement and preferred postures with an understanding of abnormal movement and compensation patterns provides the first clues for identifying myofascial trigger point zones or regions in companion animals. The history obtained from pet owners is not always conclusive or consistent with the presenting complaint; therefore, by watching a patient's movement patterns, veterinary nurses may be better able to determine and identify underlying MTrPs and MPS.

Appropriate therapy to reduce activation of MTrPs may help veterinary patients regain normal range of motion;

**BOX 1****Observing Patient Motions and Postures for Signs of Pain****Head Position During Movement**

Is it ...

- symmetric when turning to both sides?
- lower than normal?
- tilted slightly to one side?

Sitting

Are the hips and hindlimbs ...

- square?
- lazy (off to the side)?

Standing

Is the patient ...

- shifting additional weight forward to the front limbs?
- keeping the base of support neutral?
- keeping limbs widened or in a stagger stance posture?
- offloading weight from a joint or multiple joints or limbs?
- leaning away from a specific side/region?

maintain appropriate posture, balance, and correct use of limbs (independent ambulation); and experience better, more sound sleep due to increased comfort while in the resting position.

UNDERSTANDING MYOFASCIAL TRIGGER POINTS, MYOFASCIAL PAIN SYNDROME, AND FASCIA

Myofascial Trigger Points

An MTrP is defined as a hyperirritable spot or “knot” located in a taut band of a muscle, capable of producing referred pain and a local twitch response (LTR) with direct palpation or dry needling.³⁻⁵ An LTR is a spinal cord reflex and cannot be controlled; it is thought to be transmitted by central and local pathways.⁶ It is a rapid contraction of the taut band within the muscle belly and is evident when the MTrP is stimulated.⁷

In dogs and cats, the taut band is identified in the muscle belly by palpating perpendicular to the affected muscle fibers. Once the taut band is indicated, the practitioner palpates along the taut band to locate the nodule, or “knot.” An MTrP is a discrete area that feels like an intensely contracted structural unit within the muscle, or sarcomere, while adjacent muscle groups may feel supple. An MTrP is not to be confused with a muscle spasm or contracture (increased neuromuscular tone of the entire muscle due to a nerve-initiated contraction).⁷

MTrPs typically form after muscle injury or repetitive overuse of muscles. It has been proposed that sustained low-level contractions cause a decrease in perfusion, hypoxia, and ischemia and that cellular responses occur due to stimulation of activating chemical substances, which affect neuropeptides. Specific neuropeptides, including calcitonin gene-related peptide and substance P, may facilitate an increased release of regulatory compounds, resulting in excessive acetylcholine (ACh). It is hypothesized that the excessive ACh release, sarcomere shortening, and inappropriate changes in receptor activity lead to development of a taut band and subsequent MTrPs.⁷

Persistent muscle fiber contraction can also be an adaptive response caused by low-level muscle contractions, unaccustomed eccentric contractions (e.g., lowering the weight in a biceps curl), muscle overload from shifting cranially due to hip or stifle pain, or slight postural adjustments.

For example, a dog with a digital amputation may shift weight to other body regions to compensate, which promotes changes in other muscle groups. This



FIGURE 1. Poodle in sphinx position. The examiner will lure the dog forward to watch reaction/fasciculations along the paraspinal muscles and to assess length of stretch before making adjustments or repositioning.



overload forces cellular deregulation of ions causing chronic cellular changes in specific parts of the muscles.

MTrPs can be located within the belly, origin, or insertion of a muscle and are known to cause decreased changes in range of motion, muscle weakness, and postural imbalance as the patient develops gait pattern changes in order to function without pain.

Myofascial Pain Syndrome

MPS is associated with a type of pain within skeletal muscle and its fascia; people describe it as deep, dull, aching pain. It is diffuse and not easy to localize because MPS is a referred type of pain within the musculoskeletal and fascial system. Veterinary patients may display subtle alterations in gait function due to primary muscle fatigue and muscle weakness.⁸ They may also posture with an arched or hunched back, move stiffly in all limbs, prefer a lowered head position, and have an unidentifiable source of pain.

Fascia

The definition of fascia as it relates to MTrPs is difficult as there is no consensus yet among researchers. Fascia supports, penetrates, and is distributed within body systems. It is found in bone and meningeal tissue and covers organs and skeletal muscles, creating many independent layers.⁹ When injured through trauma, inflammation, or stress, it can become tense and firm, altering its ability to perform its physiologic function. An observable example of fascial restriction is as follows: a patient that is stretching forward for a food lure while sitting in a sphinx position shows a ripple or twitch in the back (paraspinal muscles), then retracts back to neutral and shifts forward by rising or crawling instead of stretching further. The stretch induces discomfort, so the patient chooses to move its entire body forward and compensate to avoid pain (**FIGURE 1**).

Discovering Myofascial Trigger Points

During a rehabilitation evaluation, it is common for



FIGURE 2. Pointer in sit position. **(A)** Note the difficulty this patient has performing a square sit. The stifles are adducted toward the body and tarsal joints are abducted away. Weight is being transferred to the forelimbs. This dog was treated 16 weeks earlier with bone marrow aspirate stem cell concentrate and platelet-rich plasma post-surgery for fragmented medial coronoid process with no other orthopedic abnormalities. **(B)** Poor sit position with roached back; patient is unable to sit with the ischium touching the ground. Clinically, this dog had a tight piriformis muscle, and multiple MTrPs were present along the paraspinal muscles.

**BOX 2****Perpetuating Factors for Myofascial Trigger Points⁸**

- Mechanical stressors
 - Muscle overload
 - Osteoarthritis
 - Repetitive motions
 - Orthopedic disease
 - Soft tissue injury
 - Neuropathy
- Chronic infections/infestations
- Nutritional deficiency or inadequacy (e.g., anemia, inappropriate supplementation)
- Physical and emotional stress (tense/tight muscles/posture)

practitioners to evaluate the patient's posture and movement before physical palpation. When asking for a simple command such as "sit," attention is paid to a few key responses, posture, and behavior in performing the task (**BOX 1** and **FIGURE 2**). When findings are abnormal, such as in compensatory movements during the stand-to-sit posture, an important consideration is the history of the patient back to the earliest time their handler or owner can remember. "Did they always sit off to the side? Did they ever sit with straight posture?" MTrPs create a posture imbalance or shift due to pain and are perpetuated by mechanical stressors, including underlying disease processes (**BOX 2**).



FIGURE 3. Flat palpation technique over the quadratus lumborum. The examiner is palpating by applying finger pressure across the muscle fibers.

Although history and observation are important factors during an evaluation, palpation skill and technique are considered to be the most important tools in identifying MTrPs. Understanding how a "normal" muscle feels and knowing the anatomy of muscles, including their origins, insertions and actions, are critical in discovering and treating the cause of muscle dysfunction.

Hands-on Examination and Palpation Techniques

Due to the lack of objective measurements and diagnostic tools, identifying MTrPs by palpation remains the standard way of confirming their presence so that a diagnosis can be made by a veterinarian. Advances in imaging, such as diagnostic ultrasonography in the hands of a seasoned practitioner or magnetic resonance imaging,¹⁰ are being examined as potential aids in detecting and studying MTrPs, but they are not regularly used clinically. The hands-on assessment approach consists of 3 basic palpation techniques, 2 of which are typically used in veterinary patients.¹¹

During palpation, the patient should be as relaxed as possible to individualize the taut bands; a laterally recumbent position is preferred. Standing patients are much more difficult to relax if muscles are engaging during palpation and activation of sensitive spots.

If palpation techniques are performed in front of an owner or handler, it is important to discuss the possible pain response, or "jump sign," exhibited by the patient when an MTrP is found. Patients may flinch, yelp,



FIGURE 4. Pincer palpation technique over quadriceps muscle group. The examiner is grasping the muscle between the thumb and fingers and rolling the muscle until a taut band(s) is/are detected.



cry out, or try to bite, depending on the location and intensity of pain. This reaction is a normal response to pain induced from palpation and can be assuaged by providing treat rewards to the patient; maintaining soft yet confident praise; or applying petting and massaging through the process to decrease patient anxiety or stress.

Flat Palpation

This technique is best used to identify MTrPs in flat muscles or muscle groups, such as the latissimus dorsi, serratus ventralis, infraspinatus, iliopsoas, and supraspinatus muscles. The examiner applies pressure with the pointer and index finger across the muscle fibers while simultaneously compressing the muscle against the underlying structure, such as a bone or bones, to identify the taut band (**FIGURE 3**).

Pincer Palpation

This technique is best used on specific muscles such as the sartorius, quadriceps, triceps, and gastrocnemius. The examiner grasps the muscle belly between their thumb and finger and rolls the muscle between their fingertips down along the muscle belly until a taut band or bands are detected and a firm nodule within the band is palpated (**FIGURE 4**).

THERAPY

There are invasive and noninvasive therapies for the treatment of MTrPs. Invasive therapy with the use of acupuncture needles or injections is considered the most effective way of decreasing and preventing recurrence in activation of MTrPs. Veterinary technicians and nurses are not permitted to perform needling techniques; therefore, the therapies discussed below are noninvasive techniques that involve manual modalities and laser therapy (**TABLE 1**).

Manual MTrP Release

Human massage therapy often describes relieving muscle “knots” by applying pressure. This is known as ischemic compression. One study has suggested that using this type of technique in myofascial therapy may be effective in reducing symptoms of human patients with chronic shoulder pain.¹² In ischemic compression, the index and middle fingers are held over the MTrP for 30, 60, or 90 seconds with increased pressure after the initial 20 seconds.

To relieve muscle spasms, static stretch can be applied while performing manual MTrP release. A strain and counterstrain theory, previously known as positional release technique (PRT), was developed in 1981. This technique resets the muscle spindle, allowing the spasm

TABLE 1 Noninvasive Therapies for Myofascial Trigger Points

TECHNIQUE	DESCRIPTION
Ischemic compression	Palpate over MTrP and press for 30 seconds, increasing pressure after initial 20 seconds Release pressure for interval of 15–20 seconds, then repeat for 30–90 seconds until reduction of jump sign or local twitch response is noted
Static stretch	Apply stretch to muscle for 15–20 seconds, relax and apply ischemic compression
Positional release technique	Apply ischemic compression over the MTrP and shorten the muscle (opposite of stretch); hold for 90 seconds
Low-level laser therapy	Use directly over MTrP with target energy amount 4 J/cm ² ; can work along muscle band/spasm for relief
Therapeutic ultrasound	Modality used to relieve spasms; not effective as standalone therapy for MTrP release (sample protocol: 5 minutes pulsed 20%, 1 MHz)
Transcutaneous electrical nerve stimulation	Modality has been used in humans for MPS; not effective as standalone therapy for MTrP (sample protocol: 100 Hz, 250 msec stimulation followed by 100 Hz, 50 msec)
Extracorporeal shock wave therapy	Modality used in human MPS and MTrPs (sample protocol: 800–1000 energy level; 0.25 mJ/mm ² , frequency of 4–6 Hz; 1–2 treatments per week for total of 3–7 treatments)



to relax, by moving the joint and muscle away from the motion restriction.¹¹

Low-Level Laser Therapy

Low-level laser therapy (LLLT) uses class IIIa and IIIb lasers, which provide a power output of less than half of a watt (500 mW). The laser applicator can be held directly over the MTrP region at a target energy delivery of 4 J/cm², with the dose range between 1.5 and 5 J/cm².¹¹

A comparison study of dry needling and laser therapy in the masseter muscle found similar outcomes, with a statistical significance of reduction of MTrPs with laser therapy at a dose of 4 J/cm² or dry needling with 2% lidocaine injection over the MTrPs.¹³ Patients were evaluated after a total of 4 sessions at intervals ranging between 48 and 72 hours; however, the number of treatments needed to deactivate MTrPs varies from patient to patient depending on whether the issue is chronic or acute.

Another comparison study concluded that LLLT was more effective than dry needling; however, it stated that more studies with appropriate LLLT use and experienced practitioners are needed to prove greater efficacy. This study mentioned that LLLT may be effective at 2 to 5 treatments per week. It also suggested using more frequent treatments with higher energy for acute cases (e.g., 24 J/cm² 5 times a week) and less frequent treatments with lower energy over more sessions for chronic cases (e.g., 4 J/cm², 2 times a week for 30 sessions).¹⁴

Therapeutic Exercise

Although exercise techniques may not deactivate MTrPs on their own, exercise is helpful in activating appropriate muscles, improving posture, and decreasing compensatory issues that may be perpetuating and precipitating factors of MTrPs. To help condition muscles for postural control, owners can be taught a simple “stack stance” to help their pet stand square and evenly balanced with its head in neutral position without weight shifting for a certain period of time. Gait reeducation is also helpful and can be facilitated by the use of land or underwater treadmills, obstacle courses, and curbs. It is critical during gait reeducation for the patient to demonstrate normal gait patterns such as walking or trotting and not ambling or pacing, which are common compensatory strategies.

Adjunctive Therapy

Other modalities used in veterinary medicine, including therapeutic ultrasound, electrical muscle stimulation, and extracorporeal shock wave therapy (ESWT), may aid in reducing pain and discomfort before release of MTrPs; however, they are not typically used as standalone treatment options. A few studies have demonstrated reduction of MPS with ESWT in humans, but veterinary studies will need to be completed to provide further guidance for practitioners.

CONCLUSION

A veterinary nurse’s goal is to teach clients tools to promote reduction in MTrP activation in their pets, thereby relieving pain and providing better outcomes and successful, long-lasting treatments. More in-depth articles, book chapters, videos, and coursework on MTrPs in companion animals are available for readers who want to learn more about MTrPs and MPS. **TVN**

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Extra Mile

CAREER CHALLENGES — Unique and Unusual: Exotic Animal Medicine — **68**

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HOLD STILL. Providing medical care for exotic companion animals presents unique challenges for veterinary nurses, including how to properly restrain and handle them.



MEET THE AUTHOR

Sarah Kolb, BAS, RVT, VTS
(Exotic Companion Animals)
ISU Lloyd Veterinary Medical Center, Ames, IA

Unique and Unusual: Exotic Animal Medicine

Exotic animals, such as small mammals, birds, reptiles, amphibians, and fish, have become common pets in American households. According to the National Pet Owners Survey, 62 million exotic companion animals resided in US households in 2016, a 25% increase since 2011.^{1,2} The surge in ownership of exotic animals has certainly contributed to an increase in owners seeking veterinary care for their pets. Veterinarians and veterinary nurses are finding themselves faced with providing medical care for nontraditional pets, presenting unique challenges for all involved.

Sarah earned a Bachelor of Applied Science in Veterinary Nursing from St. Petersburg College and the Veterinary Technician Specialty (Exotic Companion Animals). She currently works at ISU Lloyd Veterinary Medical Center in Ames, Iowa. She is a member of the National Association of Veterinary Technicians in America and International Association of Animal Behavior Consultants. Sarah has written numerous articles and lectured extensively on exotic animal topics. She has fostered birds for the Des Moines Animal Rescue League since 2014. Her interests include avian anatomy, physiology, behavior and enrichment; wildlife rehabilitation; and anesthesia.

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HANDLE WITH CARE

Veterinary appointments for exotic pets are quite different than dog and cat appointments. Though owner awareness of the importance of annual health exams of exotic animals is increasing, the majority of exotic appointments continue to present as emergency illnesses or traumatic injuries, requiring specialized handling and longer appointment times. Except for ferrets, exotic animals are prey species. In order to survive, exotic animals living in the wild hide signs of illness from predators. This defense mechanism is called the masking phenomenon. When an exotic animal begins to show signs of illness, it is physically unable to mask its symptoms any longer, meaning it is in a fragile state of health, which presents challenges for veterinary professionals. For example, a pet parrot with a respiratory emergency needs to be handled with extreme care. The additional stress due to handling and restraint can cause a bird in respiratory distress to die.

Illness is not the only reason specialized handling and restraint may be required for exotic pets. For example, the veterinary nurse must take care in handling a rabbit to ensure that it is unable to gain leverage off a surface if it were to kick its back legs. Rabbits are at great risk for spinal fractures caused by mishandling or a sudden frightened kick with its hind legs. This is because the bones of rabbits are delicate in comparison with their muscle mass. Hedgehogs may require anesthesia to be able to uncurl their body for examination. An owl that will use its talons in defense cannot be restrained in the same way or manner as a parrot that will use its beak in defense. Mice can be captured by the base of their tail; however, if a gecko is captured by its tail, the tail is likely to fall off. Veterinary nurses must be familiar with handling techniques for various species to prevent injury in either the animal or the handler.

Exotic animal veterinary appointments also differ from dog and cat appointments in the amount of husbandry and nutrition information that must be discussed. Veterinary nurses play an integral role in educating owners about how to provide the best possible environment, enrichment, and nutrition for their exotic pets. It has been reported that over 90% of exotic pet illness is related to poor husbandry or nutrition.³ A tremendous amount of misinformation can be found on the internet and in pet stores, leading owners astray on how to best care for their exotic pets. As exotic medicine evolves, recommendations made for husbandry and nutrition are also changing. For example, 40 years ago, feeding seed diets to pet parrots

was the recommendation for providing the best nutrition. Now veterinary professionals are diagnosing birds fed seed diets with hypovitaminosis A related to chronic poor nutrition. The feeding recommendation for birds has changed to pelleted diets, which provide better nutrition than seed diets.

A veterinary nurse may be presented with hundreds, or even thousands, of different exotic species, each with its own unique characteristics. For example, the Reptile Database reports 10,793 reptiles in existence as of July 2018.⁴ Medical care, husbandry, nutrition, and even anatomy and physiology can differ drastically among 10,793 reptile species. It is impossible to be an expert on such a vast number of species! Rather, veterinary professionals extrapolate information from known

STRICTLY FOR THE BIRDS. As exotic medicine evolves, recommendations made for husbandry and nutrition are also changing. For example, feeding seed diets to pet parrots—which are beloved for their beauty and intelligence—was once the recommended diet. Today, seed diets have been linked to poor nutrition and hypovitaminosis A in birds. The feeding recommendation for birds has changed to pelleted diets, which provide better nutrition than seed diets.





reptile species to apply to unfamiliar species. Networking among veterinary professionals is important to improve our collective knowledge of exotic animal medicine. By sharing what we see and learn, medical care provided to exotic animals will continue to advance.

THE ETHICAL CONSIDERATIONS

As a veterinary nurse working with exotic animals, you may also be faced with ethical issues related to keeping these animals as pets. You should ensure the owner has properly researched and prepared for keeping an exotic animal as a pet. Has he or she made provisions for the ideal housing and diet as well as medical care? For example, has the owner properly mimicked a reptile's natural habitat with the use of UVA/UVB bulbs, heating elements, and humidifiers? There are also the ethical questions you will face as a veterinary team, such as whether you'll clip the wing feathers of pet parrots to prevent them from flying. These are just two examples of the concerns that impact the welfare and wellbeing of these animals.

An increasing number of veterinary practices are providing medical care for nontraditional pets. All it takes is one exotic pet in need of medical care to walk, slither, or fly through the door of a veterinary clinic and a team of veterinary professionals willing to learn new things. For me, that one exotic pet was a white rat named Bertie. Bertie presented with a mammary mass that had grown so large, she was unable to use her rear legs. Bertie was diagnosed with a mammary fibroadenoma, becoming the first rat to undergo a mass removal surgery in that veterinary clinic. I was hooked.

Working with exotics can be an amazing learning experience. The variety in species, the continued learning, and witnessing the human-animal bond exist between humans and species that are not a cat or dog is fascinating and exciting! **TVN**

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**GUARDIAN ANGELS**

Veterinary nurse volunteers can make a difference in the lives of abused animals.

**MEET THE AUTHOR**

Pam Dickens, CVT
*Animal Care Center
New Port Richey, Florida*

ASPCA and the Arms of Angels

Your television is tuned-in to one of your favorite shows when a familiar commercial appears on the screen. The iconic music of Sarah McLachlan begins to play in the background as you watch haunting images of puppies and kittens caged in horrendous conditions. It's heartbreaking to imagine how terrified these animals must be, and you wonder how this can be happening in 2019. First, you are sad, and maybe even cry. Then, you become mad and wonder what can be done to change this and help these animals. One of the answers to this question is very simple—you can volunteer!

Pam Dickens, CVT, graduated from Saint Petersburg College in 1982. She worked in private specialty practice (ophthalmology) from 1980 to 2001 and worked in small animal private practice from 2001 to present. In 1999, she became a Nutrition Consultant with Nestle Purina Petcare. Dickens is a Florida State Animal Response Coalition (FLSARC) member, a Florida Association of Credentialed Veterinary Technicians (FACVT) member, a NAVTA member, and an ASPCA FIR Team Responder. She also volunteers with the Animal Balance, HSI, HSUS and Operation Catnip HGHVSN campaigns. Pam enjoys participating in pet therapy volunteering, and her hobbies include ultra running and photography.



As veterinary nurses, we dedicate our lives to helping animals of all shapes and sizes because we are animal welfare warriors and are naturally drawn to want to help. Our veterinary skills also make us uniquely qualified to assist with situations like the ones we see in those heartbreaking commercials, and we are very fortunate to have so many opportunities to work and volunteer in such a variety of arenas in our field. You may think that you don't possibly have the time, but you're probably already doing a lot of volunteering as part of your everyday life. Most of us take home bottle babies and foster countless puppies, kittens, squirrels, and more.

My career as a CVT started in 1982 after I graduated from St. Petersburg College. I worked in private specialty practice (ophthalmology) and currently work in general practice and with Nestle Purina Petcare. I have been able to take the skills I have learned over the course of my career and use them to help other veterinary professionals and patients as a volunteer.

My volunteer career started in 1989, when I helped develop a pet therapy program at a local hospital. I caution everyone that pet therapy is instantly addicting, but in the best possible way. My pet therapy work continues today with weekly visits at two hospitals with two of my dogs. This led to volunteering with spay/neuter groups doing High-Quality, High-Volume Spay/Neuter Surgery campaigns all over the world with Animal Balance, Humane Society International, and Spayathon for Puerto Rico with the Humane Society of the United States and soon working in Chernobyl with the Clean Futures Fund. I also volunteer locally with the Florida State Animal Response Coalition and Operation Catnip at the University of Florida.

The ASPCA Field Investigations and Response team also has opportunities for individuals interested in the field of animal rescue. You may think that it is heartbreaking, but once you are involved in the care and treatment of these souls, you are completely invested in seeing them succeed. By volunteering, you can get a feel for what it's all about. If you work in private practice, volunteering will give you a glimpse into the life of shelter medicine. We are uniquely qualified to help in these cases because it's our life! It's what we do every day at clinics all around the country.

There are a large variety of cases you may be asked to respond to, such as hoarding, puppy mills, dogfighting, cockfighting, or assistance in disaster response. These



If you work in private practice, volunteering will give you a glimpse into the life of shelter medicine. We are uniquely qualified to help in these cases because it's our life!

cases all have one thing in common—they need veterinary nurses. As you can imagine, these needs can arise quickly. You may be asked to help set up a temporary shelter by assembling crates and cages, setting up medical areas for forensics exams, or setting up quarantine areas. You may also be asked to go on scene and assist with the removal and transport of these animals to a temporary shelter. Whatever area you are assigned, it's all integral to the care and treatment of these animals. Every job is equally important.

Once animals are in the shelter, there are teams to transition each one into a new life and set them up for success, which results in astounding quality of care. Along with the medical team, there is a behavior team who works closely to ensure each individual animal is treated and enriched as needed. In addition, daily care teams are the critical eyes and ears for these animals and report any concerns. The temporary shelters also include playgroup and exercise coordinators, logistics teams, and even human medical and mental health professionals. Everyone works together for the common goal of seeing these animals move on to new, loving homes.

I have gained so much knowledge from each and every case. One common theme I have seen time and time again is that nurses are a wealth of knowledge and they are awesome at sharing that knowledge. I've learned more about *Babesia* treatment than I ever knew before thanks to volunteering with other veterinary nurses. Together, all of us can create an environment to help these animals gain a better life—one they all deserve.

Volunteer, and it will be the best decision you ever make. To learn more about becoming an ASPCA responder, visit aspca.org/animal-rescue/rescue-work-and-field-deployments. **TVN**

**UNIVERSAL LOVE**

Compassionate, skilled veterinary nurses play a vital role on the veterinary team as patient advocates.

**MEET THE AUTHOR**

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A Global Perspective on Veterinary Nursing

All around the world, members of the veterinary nurse profession are increasingly connected by shared concerns, challenges, and successes. There are also some differences, particularly in credentialing. Generally, however, there is one shared goal—elevating the profession—that unites those who are passionate about their work. Many veterinary nurses and organizations across the globe seek to work collaboratively in standardizing credentialing and addressing the challenges facing veterinary nurses.

Ken has spent nearly 20 years in practice. He obtained his VTS certification in emergency and critical care, as well as small animal internal medicine, and earned his master's degree in Veterinary Science. He served as ICU Manager and Blood Bank Manager at Adobe Animal Hospital until 2018, and is now Program Director for the RECOVER CPR Initiative and simulation lab manager of the Park Veterinary Innovation Laboratory at Cornell University. He co-chairs the Veterinary Nurse Initiative and serves as a board member of the Veterinary Emergency and Critical Care Society, the Academy of Veterinary Emergency and Critical Care Technicians, and the Veterinary Innovation Council.

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INTERNATIONAL VETERINARY NURSES AND TECHNICIAN ASSOCIATION

Founded in 1991, the International Veterinary Nurses and Technician Association (IVNTA) aims to increase global cooperation among national veterinary technician and nurse organizations. The IVNTA has largely focused on gathering information regarding the state of the profession and created opportunities in sharing this information so progress can be better made in each respective country.

CURRENT STATE OF THE PROFESSION

When asked about the current state of the profession from a global perspective, Virginia Thomas, secretary general to the IVNTA, commented that “veterinary nurses and technicians are now in a phase of maturation and professionalization as countries worldwide are instigating compulsory or voluntary registration of the profession as national associations gain more credibility and authority.” The permanent member countries of IVNTA are Australia, Canada, Ireland, New Zealand, the United Kingdom, and the United States; affiliate member countries include Japan, Malta, Nepal, Norway, Pakistan, Spain, and Turkey.

In the numerous countries where the veterinary nursing and technology role within veterinary medicine has been defined or developed, qualifications involve obtaining a diploma or degree by following and completing an educational curriculum. In addition, veterinary nurses or technicians in some states and countries must pass a standardized examination to obtain certification or licensure. Credentialing of veterinary nurses can be described by 3 different categories:

- 1. No credentialing**—the state, province, or country has no regulatory oversight
- 2. Voluntary credentialing**—private organizations have created voluntary credentials that are not required to practice
- 3. Compulsory credentialing**—a governmental agency requires credentials to be obtained in order to practice as a veterinary nurse or technician

Of IVNTA member countries, the United Kingdom and Ireland are countries that have standardized national compulsory credentialing in order to obtain the title Registered Veterinary Nurse, though other countries are working toward establishing standardized credentials.



UNITED WE STAND The IVNTA meeting in 2019 was hosted at the VNCA Annual Conference in Australia. From left to right: Helen Power (VNCA, Australia), Luanne Corles (NZVNA, New Zealand), Carolyn Cartwright (RVTTTC, Canada), Virginia Thomas (IVNTA), Ken Yagi (NAVTA, United States).

CHALLENGES IN THE PROFESSION

An international panel at the 2017 Ireland Veterinary Nurses Association Conference, which addressed the profession from different perspectives around the world, discussed the challenges facing the profession: low wages, high attrition, shortage of experienced staff (including shortage of credentialed staff in countries where this is not a legal requirement), underutilization, lack of opportunity for specialization, and barriers to legal recognition of veterinary nurses and technicians. These challenges are consistent with the findings of the demographics survey conducted by the National Association of Veterinary Technicians in America (NAVTA) in 2016.

Despite the challenges faced by the profession around the world, progress is being made.

“The overall state of the VN profession is that we are in some ways behind human nursing (if you’re going to make that comparison), but in many ways, we are making faster leaps and bounds to catch up to them,” says Nimisha Patel, student council advisor to the British Veterinary Nursing Association. “A lot of people in the public still do not recognize who we are and what we do for animals, and so a lot more public awareness campaigning is needed. This is usually achieved through our Vet Nurse Awareness Month, but also throughout the year through client education and public education.”

INITIATIVES AROUND THE WORLD

Various efforts are being made by national associations

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Information for Cat Owners: Adverse reactions can occur with use of SEMINTRA. The most common adverse reactions reported during the field studies included vomiting, diarrhea, lethargy, weight loss, anemia, and dehydration.

Contraindications: Do not use in cats with a hypersensitivity to telmisartan.

Human Warnings: Not for human use. Keep out of reach of children.

SEMINTRA is an angiotensin II antagonist/angiotensin receptor blocker (ARB). Pregnant women should avoid contact with SEMINTRA because substances that act on the renin-angiotensin-aldosterone system (RAAS) such as angiotensin receptor blockers (ARBs) can cause fetal and neonatal morbidity and death during pregnancy in humans.

Precautions: SEMINTRA can cause mild anemia or non-regenerative anemia. Cats should be monitored for anemia when initiating treatment with SEMINTRA.

SEMINTRA may cause inappetence and weight loss in some cats. Cats should be monitored for weight loss when initiating treatment with SEMINTRA. Use with caution in cats with a history of vomiting, inappetence, or weight loss.

SEMINTRA has not been evaluated in cats with systolic blood pressure >200 mmHg.

The safe use of SEMINTRA in cats with hepatic disease has not been evaluated. SEMINTRA is metabolized by the liver.

The safe use of SEMINTRA has not been evaluated in cats less than 9 months of age, or in cats that are pregnant, lactating, or intended for breeding. **See Human Warnings.**

The safe use with other anti-hypertensive medications has not been evaluated.

Adverse Reactions: The safety of SEMINTRA was evaluated in a 28-day field study in 192 cats. Adverse reactions that occurred include vomiting 46 (24.0%), diarrhea 18 (9.4%), lethargy 13 (6.8%), weight loss 13 (6.8%), decreased appetite/inappetence 13 (6.8%), non-regenerative anemia 11 (5.7%), dehydration 10 (5.2%), retinal lesions (target organ damage) 4 (2.1%).

The long-term safety of SEMINTRA was evaluated in an open-label, 5-month field effectiveness and safety study in 107 cats that received at least one dose of SEMINTRA. Adverse reactions that occurred in this study are weight loss 37 (34.6%), vomiting 32 (29.9%), dehydration 18 (16.8%), non-regenerative anemia 17 (15.8%), anorexia 14 (13.1%), diarrhea 12 (11.2%), lethargy 12 (11.2%), decreased appetite/inappetence 11 (10.3%), heart murmur 10 (9.3%), death, euthanasia, found dead 9 (8.4%), cough 8 (7.5%), and retinal lesions (target organ damage) 6 (5.6%).

Nine cats died or were euthanized during the study. Three cats had progressive chronic kidney disease that may have been affected by telmisartan treatment, concurrent disease, or inadequate control of hypertension. The other six cats died of causes unrelated to treatment (e.g. neoplasia).

To report suspected adverse drug events, for technical assistance, or to obtain a copy of the Safety Data Sheet (SDS), contact Boehringer Ingelheim Vetmedica, Inc. at 1-866-638-2226. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or at <http://www.fda.gov/AnimalVeterinary/SafetyHealth>.

Effectiveness: Effectiveness was demonstrated in a 28-day multi-center, controlled, randomized and masked field study in client-owned cats with hypertension, and in an open-label 5-month field study.

28-Day Field Study

In a 28-day study, 288 cats with hypertension (systolic blood pressure [SBP] 160-200 mmHg) were enrolled in the study and randomized to treatment with SEMINTRA (telmisartan oral solution) (n=192) or vehicle control (n=96). The study population included cats with hypertension associated with chronic kidney disease or controlled hyperthyroidism, or idiopathic hypertension. The per protocol population for effectiveness was 141 SEMINTRA treated cats and 79 control cats. SEMINTRA was administered orally at 1.5 mg/kg twice daily for 14 days, then 2 mg/kg once daily until study end; the vehicle control was administered at a mL/kg volume equivalent to SEMINTRA. The two primary variables for effectiveness were comparison of the SEMINTRA and control group mean SBP (mSBP) from baseline to Day 14, and a decrease in mSBP >20 mmHg in the SEMINTRA group from baseline to Day 28. Cats with SBP >180 mmHg at Days 14 or 28 were rescued and removed from the study. There was a statistically significant difference between the mSBP for the SEMINTRA group compared to the control group at Day 14 (p=0.0005). At Day 14 the SEMINTRA group mSBP decreased by 23.2 mmHg, and the control group mSBP decreased by 7.3 mmHg. At Day 28, the SEMINTRA group mSBP decreased 23.9 mmHg compared to baseline.

5-Month Field Study

One hundred-seventy cats from the SEMINTRA group that had successfully completed the 28-day study were enrolled in a 5-month open-label study. At the beginning of the 5-month study most cats were administered SEMINTRA at 2 mg/kg once daily. Cats that experienced hypotension (defined as SBP <120 mmHg) at 2 mg/kg once daily could have the SEMINTRA dose reduced to 1 mg/kg once daily. Cats that experienced hypotension at 1 mg/kg once daily could have the SEMINTRA dose reduced again to 0.5 mg/kg once daily. Cats were evaluated for SBP, target organ damage (TOD; primarily assessed by retinal photographs), clinical pathology and adverse reactions. SBP was measured on Days 28, 56, 98, 140 and 182 and retinal photographs and clinical pathology were collected on Days 28, 98 and 182. Seventy-three (68.2%) cats completed the study (Day 182), 8 cats were removed for hypertension (SBP >180 mmHg), 2 cats were removed for hypotension, 10 cats were removed by the owner or for owner non-compliance, 8 cats were removed for new or worsening TOD, and 6 cats were removed for adverse reactions unrelated to TOD. Twenty-six cats had dose reductions to 1 mg/kg once daily to manage hypotension. Of these 26 cats, 10 had an additional dose reduction to 0.5 mg/kg once daily.

NADA 141-501, Approved by FDA

Manufactured for:

Boehringer Ingelheim Vetmedica, Inc.
St. Joseph, MO 64506, U.S.A.

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Reference: Package Insert 449201-00 Revised 03/2018

09/2018



FINAL THOUGHTS

to help resolve and overcome professional challenges.

In Australia, the Australian Veterinary Nurses and Technicians Registration Scheme has been developed by the Veterinary Nurses Council of Australia (VNCA). It raises the minimum standards and brings consistency to education, improves standards of practice, brings professional recognition, provides better animal health and welfare, safeguards public health, and better aligns with international standards.

The Registered Veterinary Technologists and Technicians of Canada, in addition to strengthening the Registered Veterinary Technician profession through advocacy, has established the National RVT Career Ladder Task Force to “develop a national document identifying a broad pathway for long-term RVT career progression specifically identifying skills, experience, and personal contribution”.

In the UK, the VN Futures project is a joint initiative between the Royal College of Veterinary Surgeons and the British Veterinary Nursing Association that aims to take charge of the profession's future. It has set 6 goals: create a sustainable workforce, develop structured and rewarding career paths, support wellbeing, take a proactive role in one's health, maximize the nurses' potential, and define a clarified and bolstered role for the veterinary nurse.

In the US, NAVTA launched the National Credential Initiative in 2015, which was renamed the Veterinary Nurse Initiative (VNI) in May of 2017. The goals of the VNI include standardizing credential requirements, defining scope of practice, and establishing title protection under the title “Registered Veterinary Nurse.”

THE GREAT PROFESSION

Regardless of the country we reside in and the paths that are being taken to combat challenges, there is one commonality: The profession of veterinary nursing and technology is considered a career and way of life in which compassionate, educated, skillful individuals play a vital role in the veterinary team to provide nursing care and serve as patient advocates to lead an animal to healing. With groups of professional associations coming together to share ideas and resources through connections such as the IVNTA, there will only be success in our future. **TVN**

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- 💧 Easy-to-use syringe allows for accurate dosing and flexible dosing²
- 💧 Safe for long-term administration, with once-daily dosing after 14 days¹



IMPORTANT SAFETY INFORMATION

SEMINTRA is an angiotensin II antagonist/angiotensin receptor blocker (ARB). Pregnant women should avoid contact with SEMINTRA because it can cause fetal and neonatal morbidity and death during pregnancy in humans. Pregnant women should avoid contact with SEMINTRA because other similar drugs have been found to harm the unborn baby during pregnancy. **Precautions:** SEMINTRA can cause mild anemia or non-regenerative anemia. Cats should be monitored for anemia when initiating treatment. Cats should be monitored for weight loss when initiating treatment with SEMINTRA. Use with caution in cats with a history of vomiting, inappetence, or weight loss. The safe use of SEMINTRA in cats with hepatic disease has not been evaluated. SEMINTRA is metabolized by the liver. SEMINTRA has not been evaluated in cats with systolic blood pressure > 200 mmHg. The safe use of SEMINTRA has not been evaluated in cats less than 9 months of age, or in cats that are pregnant, lactating, or intended for breeding. The safe use with other anti-hypertensive medications has not been evaluated. For more information, please see full prescribing information.

References: 1. Semintra® (telmisartan oral solution) Prescribing Information. Boehringer Ingelheim Vetmedica, Inc. 2018.
2. Zimmering T. Ease of use of Semintra® and its effects on quality of life—update on cat owner feedback ("EASY Programme") [abstract]. In: Proceedings from the 21st Federation of European Companion Animal Veterinary Associations (FECAVA); October 15–17, 2015; Barcelona, Spain. Poster.

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