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Marijuana Intoxication Case
Copper Hepatopathy in a Dog

ECTOPARASITES IN RABBITS

Volume 17 Number 4
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Claro® is indicated for the treatment of otitis externa in dogs associated with susceptible strains of yeast (Malassezia pachydermatis) and bacteria (Staphylococcus pseudintermedius).

**CAUTION:** Federal (U.S.A.) law restricts this drug to use by or on the order of a licensed veterinarian. **CONTRAINDICATIONS:** Do not use in dogs with known tympanic membrane perforation. **CLARO®** is contraindicated in dogs with known or suspected hypersensitivity to florfenicol, terbinafine hydrochloride, or mometasone furoate.

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See page 2 for product information summary.
Providing small animal practitioners and their teams with practical, relevant information on the latest topics in veterinary medicine
CLARO® should be administered by veterinary personnel.

**DOSAGE AND ADMINISTRATION:**

1. Clean and dry the external ear canal before administering the product.
2. Verify the tympanic membrane is intact prior to administration.
3. Remove single dose dropperette from the package.
4. While holding the dropperette in an upright position, remove the cap from the dropperette.
5. Turn the cap over and push the other end of the cap onto the tip of the dropperette.
6. Twist the cap to break the seal and then remove cap from the dropperette.
7. Screw the applicator nozzle onto the dropperette.
8. Insert the tapered tip of the dropperette into the affected external ear canal and squeeze to instill the entire contents (1 mL) into the affected ear.
9. Gently massage the base of the ear to allow distribution throughout the ear canal.
10. Repeat with other ear as prescribed.

Cleaning the ear after dosing may affect product effectiveness.

**CONTRAINdications:**

- Do not use in dogs with known tympanic membrane perforation (see PRECAUTIONS).
- CLARO® is contraindicated in dogs with known or suspected hypersensitivity to florfenicol, terbinafine hydrochloride, or mometasone furoate.

**WARNings:**

- Human Warnings: Not for use in humans. Keep this and all other drugs out of reach of children. In case of accidental ingestion by humans, contact a physician immediately.
- In case of accidental skin contact, wash skin thoroughly with water. Avoid contact with eyes. Humans with known hypersensitivity to florfenicol, terbinafine hydrochloride, or mometasone furoate should not handle this product.

**PRECAUTIONs:**

- Do not administer orally.
- The use of CLARO® in dogs with perforated tympanic membranes has not been evaluated. The integrity of the tympanic membrane should be confirmed before administering the product. Reevalua the dog if hearing loss or signs of vestibular dysfunction are observed during treatment. Use of topical antiinflammatory drugs has been associated with diminished suppression and unpredictable performance in eight dogs (see ANIMAL SAFETY).

- Use with caution in dogs with impaired hepatic function (see ANIMAL SAFETY).
- The use of CLARO® in dogs with perforated tympanic membranes has not been evaluated. The integrity of the tympanic membrane should be confirmed before administering the product. Reevalua the dog if hearing loss or signs of vestibular dysfunction are observed during treatment. Use of topical antiinflammatory drugs has been associated with diminished suppression and unpredictable performance in eight dogs (see ANIMAL SAFETY).

- Use with caution in dogs with impaired hepatic function (see ANIMAL SAFETY).

**ADVERSE REACTIONS:**

- In a well-controlled, double-masked field study, CLARO® was evaluated against a combination of three active substances: florfenicol, terbinafine hydrochloride, and mometasone furoate.

- Florfenicol is a bacteriostatic antibiotic which acts by inhibiting protein synthesis. Terbinafine is an antifungal agent which selectively inhibits the early synthesis of ergosterol. Mometasone furoate is a glucocorticoid with anti-inflammatory activity.

**MICROBIOLOGY:**

- The compatibility and additive effect of each of the components in CLARO® solution was demonstrated in a component effectiveness and noninterference study. As is typical of study organisms collected from clinical cases of otitis externa in dogs, involvement in the clinical effectiveness study determined that florfenicol and terbinafine hydrochloride inhibit the growth of bacteria and yeast commonly associated with otitis externa in dogs. No consistent synergies or antagonistic effect of the two antimicrobials was demonstrated. The addition of mometasone furoate to the combination did not impair antimicrobial activity to any clinically significant extent.

- In a well-controlled, double-masked field study, CLARO® was evaluated against a vehicle control in 221 dogs with otitis externa. One hundred and forty-six dogs were treated with CLARO® and 75 dogs were treated with the vehicle control. All dogs were evaluated for safety. Treatment (1 mL) was administered on Day 0 to the affected ear(s). Prior to treatment, the ear(s) was cleaned with saline. The dogs were evaluated on Days 7, 14, and 30. Blood work and urinalysis were obtained at Cap 0 pre-treatment and Day 30. The study was based on clinical improvement at Day 30. Of the 185 dogs included in the effectiveness evaluation, 72.5% of dogs administered CLARO® solution were successfully treated, compared to 11.5% of the vehicle-control group (p<0.0001).

- ANIMAL SAFETY:

- In a target animal safety study, CLARO® was administered orally to 12-week-old Beagle puppies of dosing groups of 10X, 15X, and 30X the recommended dose once every 7 weeks for a total duration of 29 weeks (15 times the treatment duration). No clinically relevant treatment-related findings were noted in hearing, body weight, organ weights, blood or food consumption. CLARO® administration was associated with post-treatment increases in total protein, plasma inorganic phosphorus, and potassium.

- CLARO® is available in cartons of two, ten, or twenty dropperettes.

- CLARO® Otic Solution is a fixed combination of three active substances: florfenicol (antibacterial), terbinafine (antifungal), and mometasone furoate (steroidal anti-inflammatory).

- Florfenicol is a bacteriostatic antibiotic which acts by inhibiting protein synthesis. Terbinafine is an antifungal agent which selectively inhibits the early synthesis of ergosterol. Mometasone furoate is a glucocorticoid with anti-inflammatory activity.

- The compatibility and additive effect of each of the components in CLARO® solution was demonstrated in a component effectiveness and noninterference study. As is typical of study organisms collected from clinical cases of otitis externa in dogs, involvement in the clinical effectiveness study determined that florfenicol and terbinafine hydrochloride inhibit the growth of bacteria and yeast commonly associated with otitis externa in dogs. No consistent synergies or antagonistic effect of the two antimicrobials was demonstrated. The addition of mometasone furoate to the combination did not impair antimicrobial activity to any clinically significant extent.

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JULIEN GUILLAUMIN, DVM, DACVECC, DECVECC, is an associate professor of emergency medicine and critical care at The Ohio State University. He earned his DVM from National Veterinary School of Nantes in Nantes, France, and completed a small animal rotating internship at National Veterinary School of Alfort in Maisons-Alfort, France. Dr. Guillaumin completed a residency at University of California, Davis, and serves on the American College of Veterinary Emergency Critical Care residency training committee and the European College of Veterinary Emergency and Critical Care education committee. His clinical interests are hemostasis, blood banking and blood products, immune-mediated hemolytic anemia, thrombosis, and systemic inflammatory response syndrome, sepsis, and multiple organ dysfunction syndrome.

CASE IN POINT PAGE 34

DEBORAH E. LINDER, DVM, MS, DACVN, is a veterinary nutritionist at Cummings School of Veterinary Medicine at Tufts University, where she earned her DVM. She is also the codirector of the Tufts Institute for Human–Animal Interaction. She has spoken at national and international conferences and has authored articles for numerous publications. Dr. Linder’s clinical interests include obesity management, effective pet owner education, and human–animal interaction. Her research focuses on safe and effective weight-loss strategies for pets, as well as the effects of obesity on pet and human well-being.

CONSULT THE EXPERT PAGE 27

MEGAN STADLER, DVM, is an assistant professor of emergency medicine and critical care at The Ohio State University, where she earned her DVM. Dr. Stadler is a member of the European Veterinary Emergency and Critical Care Society, the Veterinary Emergency and Critical Care Society, the American College of Veterinary Radiology, and the International Veterinary Radiology Association. Her clinical interests include diagnostic imaging, toxicities, and polytrauma.

CASE IN POINT PAGE 34

J. SCOTT WEESE, DVM, DVSc, DACVIM, is the editor in chief of Clinician's Brief. He is also the chief of infection control at Ontario Veterinary College in Ontario, Canada, and a veterinary internist and microbiologist. Dr. Weese’s research interests are infectious and zoonotic disease, particularly of companion animals, as well as infection control, staphylococcal infections, Costridium difficile infection, and antimicrobial therapy. He holds a Canada Research Chair in zoonotic disease.

CASE IN POINT PAGE 56
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Let’s face it, pilling cats isn’t for everyone.

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† A single treatment is effective and a second treatment should not be necessary. If reinfection with worms occurs, Profender® can be applied after 30 days.

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Ectoparasites in Rabbits
David Eshar, DVM, DABVP (ECM), DECZM (SM & ZHM)

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WE ASKED …

What is the strangest thing you have found in your pocket after a shift?

“We had a clinician who liked to secretly put dog testicles in veterinary nurses’ pockets.”—Emily C

“Is it weird that the number of times I have found poop in my pocket makes me consider it not strange enough for this question? I did find poop in my wallet at the bank after a shift once. Luckily, I was in line and not at the teller.”—Justin D

“A kidney! I was in an anatomy laboratory, and someone played a joke on me by putting a dog kidney in my coat pocket.”—Mary N

“An owner’s phone number—put there without me knowing!”—Anita N

“A pen. Seriously, they disappear like nobody’s business.”—Cheralyn A

What is one thing you would change about your current job?

“Sending medical records straight from my brain to the computer, with no typing involved.”—Kelly R

“Every animal would have health insurance, and there would be no budget restrictions.”—Cath R

“Compassion fatigue would not exist.”—Susan E

“Actually leaving on time every day!”—Erin M

What is the most satisfying moment of your day?

“Removing a tooth without breaking any roots.”—Erin C

“Converting a skeptical owner by finding a single flea on a cat with a naked butt.”—Ali J

“When a blocked cat pees!”—Melissa A

“Getting the pet that has not eaten in 5 days to take a teeny tiny nibble.”—Carolynn H

“When I find the person who stole my favorite pen and steal it back from them.”—Alyssa W

A TELTTALE SIGN OF A ROUGH DAY …

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YOUR PATIENT PULLS HER HAIR BACK INTO A HIGH PONY.
THE ONLY CHOICE YOU NEED TO MAKE.

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Managing cutaneous adverse food reactions is already complex, and an overweight pet presents an additional challenge. Making a decision about what diet to feed patients with both cutaneous adverse food reactions and an overweight body condition can be difficult.

Now you can manage both conditions at the same time with the new Multifunction Satiety + Hydrolyzed Protein formula from Royal Canin, the first and only hydrolyzed protein product in the market formulated for weight loss, and the latest addition to our Multifunction hydrolyzed protein diet line.

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Heartgard Plus (ivermectin/pyrantel) is recommended for dogs 6 weeks of age and older.

For dogs over 100 lb use the appropriate combination of these chewables.

Dosage:
Heartgard Plus should be administered orally at monthly intervals at the recommended minimum dose levels of 6 mcg of ivermectin per kilogram (2.7 mg/kg) and 5 mg of pyrantel (as pamoate salt) per kg (2.7 mg/lb) of body weight. The recommended dosing schedule for prevention of canine heartworm disease and for the treatment and control of ascarids and hookworms is as follows:

<table>
<thead>
<tr>
<th>Dog Weight</th>
<th>Chewables Per Month</th>
<th>Ivermectin Content</th>
<th>Pyrantel Content</th>
<th>Color Coding of Foil Backing and Carton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25 lb</td>
<td>1</td>
<td>69 mcg</td>
<td>57 mg</td>
<td>Blue</td>
</tr>
<tr>
<td>26 to 50 lb</td>
<td>1</td>
<td>138 mcg</td>
<td>114 mg</td>
<td>Green</td>
</tr>
<tr>
<td>51 to 100 lb</td>
<td>2</td>
<td>272 mcg</td>
<td>227 mg</td>
<td>Brown</td>
</tr>
</tbody>
</table>

Heartgard Plus is recommended for dogs 6 weeks of age and older. For dogs over 100 lb use the appropriate combination of these chewables.

Administration:
Remove only one chewable at a time from the foil-backed blister card. Return the card with the remaining chewables to its box to protect the product from light. Because most dogs eat Heartgard Plus palatable, the product can be offered to the dog by hand. Alternatively, it may be added intact to a small amount of dog food.

Chewables should be administered in a manner that encourages the dog to chew, rather than to swallow without chewing. Chewables may be broken into pieces and fed to dogs that normally swallow treats whole.

Care should be taken that the dog consumes the complete dose. Chewed animals should be observed for a few minutes after administration to ensure that part of the dose is not lost or rejected. If it is suspected that any of the dose has been lost, re-feeding is recommended.

Heartgard Plus should be given at monthly intervals during the period of the year when mosquitos (vectors), potentially carrying infective heartworm larvae, are active. The initial dose must be given within a month (30 days) after the dog’s first exposure to mosquitos. The final dose must be given within a month (30 days) after the dog’s last exposure to mosquitos.

When replacing another heartworm preventive product in a heartworm disease preventive program, the first dose of Heartgard Plus must be given within a month (30 days) of the last dose of the former medication.

If the interval between doses exceeds a month (30 days), the efficacy of ivermectin can be reduced. Therefore, for optimal performance, the chewable must be given once a month on or about the same day of the month. If treatment is delayed, whether by a few days or many, immediate treatment with Heartgard Plus and resumption of the recommended dosing regimen will minimize the opportunity for the development of adult heartworms.

Monthly treatment with Heartgard Plus also provides effective treatment and control of ascarids (T. canis, T. leonina) and hookworms (A. caninum, U. stenocephala, A. braziliense). Clients should be advised of measures to be taken to prevent reinfection with intestinal parasites.

Efficacy:
Heartgard Plus Chewables, given orally using the recommended dose and regimen, are effective against the tissue larval stage of O. circumcincta for a month (30 days) after infection and, as a result, prevent the development of the adult stage. Heartgard Plus Chewables are also effective against canine ascarids (T. canis, T. leonina) and hookworms (A. caninum, U. stenocephala, A. braziliense).

Acceptability:
In acceptability and field trials, Heartgard Plus was shown to be an acceptable oral dosage form that was consumed at first offering by the majority of dogs.

Precautions:
All dogs should be tested for existing heartworm infection before starting treatment with Heartgard Plus which is not effective against adult O. circuncincta. Infected dogs must be treated to remove adult heartworms and microfilariae before initiating a program with Heartgard Plus.

While some microfilariae may be killed by the ivermectin in Heartgard Plus at the recommended dose level, Heartgard Plus is not effective for microfilariae clearance. A mild hypersensitivity-type reaction, presumably due to dead or dying microfilariae and particularly involving a transient diarrhea, has been observed in clinical trials with ivermectin alone after treatment of some dogs that have circulating microfilariae.

Keep this and all drugs out of the reach of children. In case of ingestion by humans, clients should be advised to contact a physician immediately. Physicians may contact a Poison Control Center for advice concerning cases of ingestion by humans.

Store between 68°F - 77°F (20°C - 25°C). Excursions between 59°F - 86°F (15°C - 30°C) are permitted. Protect product from light.

Adverse Reactions:
In clinical field trials with Heartgard Plus, vomiting or diarrhea within 24 hours of dosing was rarely observed (0.1% of administered doses). The following adverse reactions have been reported following the use of Heartgard: Depression/lethargy, vomiting, anorexia, diarrhea, myasthenia, ataxia, staggering, convulsions, and hyperesthesia.

Safety:
Heartgard Plus has been shown to be bioequivalent to Heartgard, with respect to the bioavailability of ivermectin. The dose regimens of Heartgard Plus and Heartgard are the same with regard to ivermectin (6 mcg/kg). Studies with ivermectin indicate that certain dogs of the Collie breed are more sensitive to the effects of ivermectin alone after treatment of some dogs that have circulating microfilariae.

Keep this and all drugs out of the reach of children. In case of ingestion by humans, clients should be advised to contact a physician immediately. Physicians may contact a Poison Control Center for advice concerning cases of ingestion by humans.

Store between 68°F - 77°F (20°C - 25°C). Excursions between 59°F - 86°F (15°C - 30°C) are permitted. Protect product from light.

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At elevated doses, sensitive dogs showed adverse reactions which included mydriasis, depression, ataxia, tremors, diarrhea, vomiting, anorexia, recumbency, excitability, stupor, coma and death. Heartgard Plus demonstrated no signs of toxicity at 10 times the recommended dose (60 mcg/kg) in sensitive Collies. Results of these trials and bioequivalence studies, support the safety of Heartgard products in dogs, including Collies, when used as recommended.

Heartgard Plus has shown a wide margin of safety at the recommended dose level in dogs, including pregnant or breeding bitches, stud dogs and puppies aged 6 or more weeks. In clinical trials, many commonly used flea collars, dips, shampoos, anthelminthics, antibiotics, vaccines and steroid preparations have been administered with Heartgard Plus in a heartworm disease prevention program.

In one trial, where some pups had parvovirus, there was a marginal reduction in efficacy against intestinal nematodes, possibly due to a change in intestinal transit time.

How Supplied:
Heartgard Plus is available in three dosage strengths (See Dosage section) for dogs of different weights.

Chewables include articles, videos, or webinars on a particular topic, from cardiology to client communication.
THE PROTECTION DOGS COME RUNNING FOR.

The only Real-Beef Chewable isn’t just the #1 choice of dogs,1 owners,2 and veterinarians3 - it’s the one dogs look forward to. HEARTGARD Plus:

✓ Protects dogs from heartworm disease and treats and controls 3 species of hookworms and two species of roundworms
✓ Is approved for puppies as young as 6 weeks of age
✓ Over 30 years of trusted prevention

IMPORTANT SAFETY INFORMATION: HEARTGARD® Plus (ivermectin/pyrantel) is well tolerated. All dogs should be tested for heartworm infection before starting a preventive program. Following the use of HEARTGARD Plus, digestive and neurological side effects have rarely been reported. For more information, please see full prescribing information or visit www.HEARTGARD.com. See page 10 for product information summary.
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ECTOPARASITES IN RABBITS

David Eshar, DVM, DABVP (ECM), DECZM (SM & ZHM)
Kansas State University
Dermatologic diseases are among the most common clinical presentations in rabbits (Oryctolagus cuniculus). Most dermatoses in rabbits occur secondary to parasitic infestation.
Many clinical presentations in rabbits result from suboptimal husbandry (eg, environment, diet); therefore, a thorough review of patient husbandry is critical for successful diagnosis and treatment of dermatoses and/or parasitic infestation. The owner should be questioned about the patient’s caging system, substrate, bedding, and diet and whether the patient is indoor, outdoor, or both. More targeted questions pertaining to skin disease (eg, duration of any past diseases, treatment, whether other animals in the household are also showing dermatologic signs) can also be beneficial. Once identified, any husbandry deficiencies should be corrected and the environment treated (eg, cage cleaned, bedding removed, other animals in the household evaluated) to control the parasitic infestation and prevent recurrence.

Clinical Signs
Rabbits infested with ectoparasites can show a variety of clinical signs, most commonly pruritus, scaling or crusting, hair loss, erythema, excoriations, erosions, alopecia, and/or nodules. Pruritus is the most common clinical sign associated with ectoparasites in rabbits; thus, recognition of pruritus in patients, in other animals in contact with the patient, or in the owner is crucial.

Diagnosis
A detailed dermatologic examination is necessary in all rabbits presented with skin disease suspected to be secondary to parasitic infestation. Because rabbits are prone to being fractious, safe restraint is required to obtain quality diagnostic skin samples, and anesthesia or sedation may be indicated in some patients.

Several useful dermatologic diagnostic tests, including impression smears, are available for rabbits. Direct slide impressions are often used in patients with moist, exudative, or crusted lesions. A moistened swab can also be used to collect cytologic samples, which can then be rolled onto a slide. Brushed hair and debris can be useful for detection of superficial ectoparasites (eg, certain mites, lice) and their eggs. Skin scrapings, both superficial (ie, collection of oiled debris) and deep (ie, down to dermal capillary bleeding), can also be useful in the detection of ectoparasites and their eggs. Because rabbits have thin skin, a dulled scalpel blade or a scraping spatula should be used to perform skin scrapings. Bacterial culture and susceptibility testing can be useful for samples collected from any exudative, crusted, nodular, or cystic lesion. A trichogram can be used...
to evaluate for ectoparasites and dermatophytosis (eg, fungal hyphae, ectothrix) and for broken or fractured hair ends that would help determine whether hair loss is traumatic. Acetate tape impressions are preferred for drier lesions and can be useful in the detection of superficial ectoparasites and their eggs, particularly *Cheyletiella* spp. Other common diagnostic tests include fungal culture, Wood’s lamp, skin biopsies for histopathology, and clinical pathology testing, including CBC and serum chemistry profile, as some skin lesions may be reflective of systemic disease.

**Discussion**

Skin disease in rabbits can be caused by infestation of several different types of parasites, including, fleas, lice, ticks, and mites.

**Fleas**

Pet rabbits may commonly acquire *Ctenocephalides* spp if in the same household as a carrier dog or cat. Various flea species, including the rabbit flea (*Spilopsyllus cuniculi*), the common Eastern rabbit flea (*Cediopsylla simplex*), the giant Eastern rabbit flea (*Odontopsyllus multispinosus*), and the sticktight flea (*Echidnophaga gallinacea*), may be found on pet rabbits that are housed outside or that have been exposed to wild rabbits. *S cuniculi* infestations are common in rabbit colonies. The life cycle of this flea is influenced by the hormonal cycle of the host, with sudden proliferation seen in pregnant does and young rabbits. In endemic areas, *S cuniculi* is a vector for myxomatosis. Flea-infested rabbits often are housed outside or that have been exposed to wild rabbits. *S cuniculi* infestations are common in rabbit colonies. The life cycle of this flea is influenced by the hormonal cycle of the host, with sudden proliferation seen in pregnant does and young rabbits. In endemic areas, *S cuniculi* is a vector for myxomatosis. Flea-infested rabbits often are clinically normal, have pruritus, or display a poor coat. Diagnosis is made via flea removal and microscopic identification.

**Lice**

Infestations by *Haemodipsus ventricosus*, a sucking louse, are common in wild lagomorphs but rare in pet rabbits (*Figure 3*). Pruritus, erythema, papules, alopecia, and, rarely, anemia may be present in infested rabbits. Lice may also act as a vector for tularemia (*Francisella tularensis*). Diagnosis is made via microscopic visualization of the lice and eggs (ie, nits).

**Ticks**

Many species of ticks feed on rabbits (*Figure 4*). The most common in North America to feed on rabbits is the continental rabbit tick (*Haemaphysalis leporispalustris*). Rabbits can serve as hosts for each stage of the continental rabbit tick’s life cycle, although the tick must leave the rabbit after feeding to develop and molt between each stage.
Tick infestation can cause anemia, and ticks also serve as vectors for myxomatosis, papillomavirus, and tularemia. Ticks should be physically removed from rabbits.2,4,6 Because of the potential presence of zoonotic pathogens (eg, *Rickettsia rickettsii*, *Francisella tularensis*), it is crucial that clinicians ensure proper tick removal with forceps or a tick-removal instrument.

Mites
The nonburrowing ear mite *Psoroptes cuniculi* is one of the most common causes of dermatologic disease and a frequent cause of otitis externa in rabbits.6 Typical clinical signs include pruritic otitis with thick crusts on the ear pinna.2,6 Neurologic signs may be exhibited in patients with purulent otitis media and/or tympanum perforation. Other skin involvement may be seen on the face, neck, and/or external genitalia. Mites can be observed through microscopic examination of crusts or skin scrapings.2,4,6

Sarcoptic acariasis from the burrowing mite *Sarcoptes scabiei* var *cuniculi* can also occur in pet rabbits4 and results in a highly pruritic, hyperkeratotic dermatosis that often initially affects the skin around the face, feet, and external genitalia (*Figure 5*).6 This zoonotic ectoparasite can cause an intense papular pruritus often on the limbs and torso of affected humans. Mites can be observed through microscopic examination of superficial and deep skin scrapings.3,4

*Cheyletiella parasitovorax*, the rabbit fur mite, is a nonburrowing mite that can sometimes be visible to the naked eye as “walking dandruff.” Some rabbits can be subclinical carriers, but patients with heavy infestations may have mild crusting and scaling along the dorsum, variable pruritus, and partial alopecia (*Figure 6*).2,4,6 This zoonotic mite can cause pruritic papular dermatitis in humans and can also be transferred to other animals in the household.3,7 The mites can be observed on microscopic examination of superficial skin scrapings or cellophane tape samples (*Figure 7*).2
Leporacarus gibbus is a nonburrowing fur-clasping mite that is usually nonpathogenic but may cause alopecia and scaling. This zoonotic ectoparasite can cause dermatosis with papular urticaria in humans. Mites can be seen on microscopic examination of skin scrapings, trichogram, or acetate tape impression.

Demodicosis (Demodex cuniculi) in rabbits is often subclinical, and rabbits with dermal lesions (eg, pruritus, crusting) are often affected by other systemic illnesses. Diagnosis is made via microscopic examination of deep skin scrapings and trichogram.

Infestation by the mite Ornithonyssus bacoti is common in small rodents and laboratory rabbit colonies but is rarely observed in pet rabbits. Infested rabbits show intense pruritus, generalized alopecia, crusts, and secondary dermatitis. Heavy infestation may lead to severe anemia. Diagnosis is made through microscopic examination of skin scrapings, trichogram, or acetate tape impression.

Other mites such as Psorobia lagomorphae and Notoedres cati var cuniculi are rarely observed in rabbits but, when present, can cause pruritic dermatosis.

### TABLE

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Ectoparasite Treating Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doramectin</td>
<td>0.2-0.3 mg/kg SC once 0.2 mg/kg PO once</td>
<td>Psoroptes spp mites</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L gibbus and Psoroptes spp mites</td>
</tr>
<tr>
<td>Eprinomectin</td>
<td>0.2-0.3 mg/kg SC once or 0.5 mg/kg every 2 to 3 weeks based on response to treatment</td>
<td>Psoroptes spp mites</td>
</tr>
<tr>
<td>Fipronil</td>
<td>Contraindicated; can cause CNS signs and death in rabbits</td>
<td></td>
</tr>
<tr>
<td>Fluralaner</td>
<td>20 mg/kg PO once</td>
<td>Psoroptes spp mites</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>10-16 mg/kg topically once or weekly as needed</td>
<td>Adult fleas</td>
</tr>
<tr>
<td>Imidacloprid + moxidectin</td>
<td>Imidacloprid (10 mg/kg) + moxidectin (1 mg/kg topically) every 4 weeks for 3 treatments</td>
<td>Psoroptes spp mites</td>
</tr>
<tr>
<td>Imidacloprid + permethrin</td>
<td>11-16 mg/kg topically once</td>
<td>L gibbus</td>
</tr>
<tr>
<td>Ivermectin</td>
<td>0.2-0.4 mg/kg SC every 10 to 14 days for 3 treatments</td>
<td>Adult mites, lice, ticks</td>
</tr>
<tr>
<td>Lufenuron</td>
<td>30 mg/kg PO every 30 days</td>
<td>Flea larva</td>
</tr>
<tr>
<td>Moxidectin</td>
<td>0.2-0.3 mg/kg SC every 10 to 14 days for 3 treatments 0.2 mg/kg PO every 10 days for 2 treatments</td>
<td>Adult mites Psoroptes spp mites</td>
</tr>
<tr>
<td>Selamectin</td>
<td>12 mg/kg topically once 20 mg/kg topically once a week 8-14 mg/kg topically every 30 days for 2 treatments 6-18 mg/kg topically once</td>
<td>Cheyletiella spp Fleas Sarcoptes spp mites Psoroptes spp mites</td>
</tr>
</tbody>
</table>
Treatment
Most cases of antiparasitic treatment in rabbits have reportedly involved use of products that were not originally labeled for use in rabbits, and most chosen treatment options are based on clinical experience or few available clinical trials. Practical antiparasitic treatment options derived from extra-label reports and the author’s experience are detailed in the Table, previous page.

Follow-Up & Monitoring
Weekly monitoring of rabbits infested with ectoparasites is indicated, as many ectoparasitic conditions in rabbits have a profound effect on the animal’s quality of life, can become complicated, and, although rare, can pose a zoonotic concern. In addition to monitoring the progression of the patient’s presenting clinical signs and efficacy of treatment, clinicians should inquire about potential environmental treatments, other animals in the household, and any other concerns raised by the owner.

References

POLL
Which of the following ectoparasites do you see most often in your rabbit patients?
A. Fleas
B. Lice
C. Ticks
D. Mites
E. I have never seen ectoparasite infestations in my rabbit patients.
F. I do not see rabbit patients.

Scan the QR code to submit your answer and see the other responses! The poll is located at the bottom of the article.

Using QR codes from your mobile device is easy and quick!
Simply focus your phone’s camera on the QR code as if taking a picture (but don’t click!). A notification banner will pop up at the top of your screen; tap the banner to view the linked content.

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*BRAVECTO kills fleas and prevents flea infestations for 12 weeks. BRAVECTO Chew and BRAVECTO Topical Solution for Dogs kill ticks (black-legged tick, American dog tick, and brown dog tick) for 12 weeks and also kill lone star ticks for 8 weeks. BRAVECTO Topical Solution for Cats kills ticks (black-legged tick) for 12 weeks and American dog ticks for 8 weeks.

IMPORTANT SAFETY INFORMATION: BRAVECTO has not been shown to be effective for 12-weeks’ duration in puppies or kittens less than 6 months of age. BRAVECTO Chew: The most common adverse reactions recorded in clinical trials were vomiting, decreased appetite, diarrhea, lethargy, polydipsia, and flatulence. BRAVECTO is not effective against lone star ticks beyond 8 weeks of dosing. BRAVECTO Topical Solution for Dogs: The most common adverse reactions recorded in clinical trials were vomiting, decreased appetite, diarrhea, lethargy, polydipsia, and flatulence. BRAVECTO is not effective against lone star ticks beyond 8 weeks of dosing. For topical use only. Avoid oral ingestion. Use caution in dogs with a history of seizures. Seizures have been reported in dogs receiving fluralaner, even in dogs without a history of seizures. BRAVECTO Topical Solution for Cats: The most common adverse reactions recorded in clinical trials were vomiting, itching, diarrhea, hair loss, decreased appetite, lethargy, and scabs/ulcerated lesions. BRAVECTO is not effective against American dog ticks beyond 8 weeks of dosing. For topical use only. Avoid oral ingestion. The safety of BRAVECTO has not been established in breeding, pregnant and lactating cats. Use with caution in cats with a history of neurologic abnormalities. Neurologic abnormalities have been reported in cats receiving BRAVECTO, even in cats without a history of neurologic abnormalities. See full Prescribing Information on page 22.

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Hypoalbuminemia

Julie Allen, BVMS, MS, MRCVS, DACVIM (SAIM), DACVP
Cornell University

Following are differential diagnoses, listed in order of likelihood, for patients presented with hypoalbuminemia.

- Increased loss
  - Protein-losing nephropathy (eg, glomerulonephritis, Lyme nephritis)
  - Protein-losing enteropathy (eg, inflammatory bowel disease, lymphangiectasia)
  - Hemorrhage
  - Severe exudative dermatitis (eg, large burns or wounds, snakebites)
- Decreased production
  - Acute phase reaction (albumin is a negative acute phase protein)
  - Liver dysfunction/failure
  - Secondary to hyperglobulinemia (ie, albumin is downregulated due to increased oncotic pressure from increased globulins)
  - Starvation (ie, chronic, severe malnutrition)
- Excessive fluids (dilutional effect)
- Hypoadrenocorticism
- Sequestration (eg, secondary to loss in protein-rich effusions), third-spacing
- Hemophagocytic histiocytic sarcoma
- Increased catabolism (poorly characterized)

References


**BRAVECTO®**
(Furalaner topical solution) for Dogs

**BRIEF SUMMARY (For full Prescribing Information, see package insert)**

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

**Indications:** Bravecto kills adult fleas and is indicated for the treatment and prevention of flea infestations (Ctenocephalides felis) and the treatment and control of tick infestations (Ixodes scapularis (black-legged tick), Dermacentor variabilis (American dog tick), and Amblyomma americanum (brown dog tick)) for 12 weeks in dogs, and puppies 6 months of age and older, and weighing 4.4 pounds or greater.

Bravecto is also indicated for the treatment and control of *Ammospermis tenera* (bone star tick) infestations for 6 weeks in dogs, and puppies 6 months of age and older, and weighing 4.4 pounds or greater.

**Contraindications:**

There are no known contraindications for the use of the product.

**Warnings:**

Not for human use. Keep this and all other drugs out of the reach of children. Do not contact or allow children to contact the application site until dry. Keep the product in the original packaging until use, in order to prevent children from getting direct access to the product. Do not eat, drink or smoke while handling the product. Wash hands thoroughly with soap and water immediately after use of the product.

**Precautions:**

Bravecto has not been shown to be effective for 12-weeks duration in puppies less than 6 months of age. Bravecto is not effective against *Ammospermis tenera* ticks beyond 8 weeks after dosing.

**Adverse Reactions:**

In a well-controlled 11.5 field study, which included 234 dogs (224 dogs were administered Bravecto every 11.5 weeks and 70 dogs were administered an active control every 4 weeks) and were provided with a tick collar, there were no serious adverse reactions. All potential adverse reactions were recorded in dogs treated with Bravecto over a 12-day period and in dogs treated with the active control over an 84-day period. The most frequently reported adverse reaction in dogs in the Bravecto and active control groups was vomiting.

**Contraindications:**

There are no known contraindications for the use of the product.

**Warnings:**

Not for human use. Keep this and all other drugs out of the reach of children. Do not contact or allow children to contact the application site until dry. Keep the product in the original packaging until use, in order to prevent children from getting direct access to the product. Do not eat, drink or smoke while handling the product. Avoid contact with skin and eyes. If contact with eyes occurs, flush eyes slowly and gently with water. Wash hands and contacted skin thoroughly with soap and water immediately after use of the product.

**Precautions:**

For topical use only. Avoid oral ingestion. Use with caution in dogs with a history of seizures. Seizures have been reported in dogs receiving furalaner, even in dogs without a history of seizures. Bravecto has not been shown to be effective for 12-weeks duration in puppies less than 6 months of age. Bravecto is not effective against *Ammospermis tenera* ticks beyond 8 weeks after dosing.

**Adverse Reactions:**

In a well-controlled U.S. field study, which included a total of 165 households and 321 treated dogs (221 with furalaner and 100 with a topical active control), there were no serious adverse reactions.

**Percentage of Dogs with Adverse Reactions in the Field Study**

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>Bravecto Group: Percent of Dogs with AR During the 105-Day Study (n=224 dogs)</th>
<th>Active Control Group: Percent of Dogs with AR During the 84-Day Study (n=100 dogs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vomiting</td>
<td>6.1%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>4.7%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Lethargy</td>
<td>2.7%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Decreased appetite</td>
<td>1.4%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Lesions</td>
<td>1.6%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

In the field study, two dogs treated with Bravecto with no prior history of seizures each experienced a seizure. One dog had two seizures; a day apart about 18 days after its first dose. The dog was started on antiepileptic medication and had no additional seizures during the study. A second dog had a seizure 76 days after its first dose and 3 days after starting furalaner for separation anxiety. The furalaner was discontinued and no additional seizures during the study. One dog treated with Bravecto was observed by the owner to be ataxic balance for about 30 minutes five days after its first dose and had no similar observations on the second dose. The second dog had no additional seizures had a seizure the day after the second dose of the active control.

In two well-controlled laboratory dose confirmation studies, one dog developed seizures one hour after dosing Bravecto and Bravecto caused ataxia in one dog. In the first study, two cats treated with furalaner topical solution experienced ataxia. One cat became ataxic and had a right head tilt 31 days after the first dose. The cat improved within one week of starting antibiotics. The ataxia and right head tilt, along with recent urination, occurred 82 days after administration of the first dose. The cat recovered with antibiotics and was continued on a furalaner topical solution 30 days after the first dose, with no further abnormalities during the study. A second cat became ataxic 15 days after recovering from the first dose and recovered the next day. The cat was treated with furalaner topical solution 82 days after administration of the first dose, with no further abnormalities during the study.

In a European field study, two cats from the same household experienced tremors, ataxia and anesthesia within one day of administration. The signs resolved in both cats within 48-72 hours.

**Human Warnings:**

Not for human use. Keep away from heat, sparks, open flame or other sources of ignition.

**Precautions:**

For topical use only. Avoid oral ingestion. Use with caution in cats with a history of neurologic abnormalities. Neurologic abnormalities have been reported in cats receiving Bravecto. Even in cats without a history of neurologic abnormalities, Bravecto has not been shown to be effective for 12-weeks duration in kittens less than 6 months of age. Bravecto is not effective against *Dermacentor variabilis* ticks beyond 8 weeks after dosing. The safety of Bravecto has not been established in breeding, pregnant and lactating cats.

**Contraindications:**

There are no known contraindications for the use of the product.
Everything You Wanted to Know About Macaws

Macaws are grouped into large and small (ie, mini) macaws. Large macaws measure 80 to 100 cm in length and weigh approximately 800 to 1000 g. Mini macaws are typically 30 to 40 cm in length and weigh approximately 200 to 450 g. Because macaws have been successfully bred in captivity, those with many color mutations have been bred by aviculturists. Most macaws live to be 50 to 70 years of age. They require a significant amount of interaction and can forge strong and lasting bonds with their caretakers. Good socialization and consistent, positive interactions are important to forging these bonds, as are toys and enrichment devices. Behavior problems can include screaming, biting, and feather-destructive behavior; however, medical problems should be ruled out before making a diagnosis of feather-destructive behavior. Diets of captive macaws should be based on complete feeds (eg, pellets). Towel-training from a young age and sedatives (eg, midazolam ± butorphanol intranasally) can help reduce the stress of veterinary handling on macaws.

Most macaws demonstrate a stress leukogram on CBC results, likely a result of handling; this should be differentiated from an infectious leukogram (eg, presence of immature cells, toxic changes). Radiographically, the cardiac vessels of macaws are visible, and their livers are small as compared with other species. Asthma and respiratory hypersensitivity are relatively common in macaws as compared with other species; patients are often presented with wheezing and dyspnea. In chronic patients, polycythemia may also be present. Administration of intramuscular diphenhydramine can help in acute patients, and meloxicam, bronchodilators, and air filters can aid in management. Macaws are prone to proventricular dilatation disease caused by an avian bornavirus that causes neuritis affecting the GI tract and, sometimes, the CNS. Treatment focuses on reduction of inflammation with NSAIDs; a vaccine may be available in the future. Oral doxycycline can cause regurgitation and inappetence, so long-acting injectable doxycycline should be used in warranted cases (eg, psittacosis).—Morrisey JK
**Wasting Away: Managing Weight Loss in Chronic Kidney Disease**

Chronic kidney disease in dogs and cats is frequently accompanied by significant weight loss, which may increase morbidity and/or mortality. Prevention and early detection of such weight loss is a key part of patient care.

Development of sarcopenia (ie, normal loss of lean body mass that occurs with age) is thought to be multifactorial. Cachexia (ie, loss of lean body mass associated with disease) occurs in both acute and chronic disease states when amino acids from muscle rather than fat are used as the body’s primary fuel source. Cachexia has harmful effects on strength, immune function, and wound healing. In humans, cachexia is primarily defined based on percentage of body weight loss over time; however, this is an insensitive measure of weight loss.

Patients with chronic kidney disease may have concurrent sarcopenia and/or cachexia. Because measuring only total weight loss may cause muscle loss to be underestimated until it becomes advanced, other means of identification of sarcopenia and cachexia are necessary. Nutritional assessments should be performed for every patient at every visit and should include body weight, BCS, muscle condition score (MCS), and dietary history. MCS assessment includes palpation of the thoracic and lumbar vertebrae, head, scapula, and pelvic bones. BCS and MCS are not directly related, as obese patients can have cachexia and thin patients can have a normal MCS; thus, palpation is important.

Hyporexia (ie, reduced food intake) and dysrexia (ie, altered dietary patterns) are often factors in an owner’s decision to euthanize. Using targeted treatments to address sarcopenia and cachexia can help improve food intake and quality of life. Such treatments may include dietary modification, assisted feeding or alternate feeding strategies, and pharmacologic intervention (eg, myostatin antagonists, ghrelin agonists). Extensive research into prevention, treatment, and diagnosis of sarcopenia and cachexia is ongoing.—**Freeman LM**

**Feline Parasites**

A recent study has suggested that heartworm disease in cats is greatly underreported. Two groups of cats presented for wellness examinations (indoor-only \( n = 93 \); primarily indoor with limited outdoor access \( n = 17 \)) were tested for heartworm antigen, antibody, and heat-treated antigen. None of the cats exhibited signs of respiratory or cardiovascular disease.

Of the indoor-only cats, 9.7% tested positive on at least one heartworm test; 23.5% of indoor-outdoor cats tested positive. There were several clinical implications from these data. Heartworm antigen testing in cats appears insensitive; thus, testing of cats should be performed using preferably both antibody and antigen testing. In areas with a year-round mosquito season, indoor-only cats are sufficiently exposed to mosquitoes to warrant use of year-round heartworm preventive. Further, any cat with respiratory or cardiovascular clinical signs should be tested for heartworm disease, regardless of indoor/outdoor status, and heartworm preventive should be added to a cat’s prevention control if the currently used parasite preventive does not include protection against heartworms.

Clinical signs of heartworm disease in cats are not 100% specific and may or may not be present. Two-view thoracic radiography is critical to diagnosis; if findings are consistent with heartworm disease (eg, dilated, tortuous, and/or blunted pulmonary arteries), blood tests may be used to confirm diagnosis.

A separate, additional study of 116 cats has suggested that gross and microscopic fecal examinations for identifying roundworms, hookworms, and tapeworms in cats are lacking in sensitivity and, subsequently, intestinal helminth infections are likely underdiagnosed. Thus, use of broad-spectrum parasite control in cats would be advantageous.—**Norsworthy GD**

**Any cat with respiratory or cardiovascular clinical signs should be tested for heartworm disease, regardless of indoor/outdoor status.**
The following hypothetical case demonstrates proper assessment of moderate constipation in a cat and how to determine management options.

**Assess the Animal**
Lily, a 9-year-old spayed domestic shorthair cat, weighs 5.4 kg and has a BCS of 3.5/5 and normal muscle mass. She is the only pet in the household, lives strictly indoors, and gets limited exercise. She has a history of being slightly overweight, poor grooming, and periodic constipation. She has been receiving a hyperosmotic laxative for the past 3 months.

Over the past 3 days, Lily has not made any attempts to defecate, despite spending prolonged periods of time in the litter box. The small amount of feces she produces is hard and dry.

Findings on abdominal palpation and radiographs are consistent with a mildly distended colon with firm feces. With Lily anesthetized, fecal material is removed via enema and gentle manual expression. A tentative diagnosis of chronic constipation is made.

**Assess the Food & Feeding Method**
Lily has been eating a therapeutic weight management dry food (125 kcal ME twice daily) for several years, along with 2 teaspoons (10 kcal ME) of a highly-digestible gastrointestinal canned food, which she receives each day with the laxative. The dry food has an increased fiber content (1.8 g/100 kcal crude fiber) from predominantly insoluble fiber sources (ie, cellulose, oat fiber). One water bowl is available to her at all times.

---

**Therapeutic Food Comparison**

<table>
<thead>
<tr>
<th></th>
<th>Old food (dry)</th>
<th>New food (dry)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kcal ME/cup</strong></td>
<td>321</td>
<td>361</td>
</tr>
<tr>
<td>(8 oz measure)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>16.6</td>
<td>8.8</td>
</tr>
<tr>
<td>(g/100 kcal ME)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fat</strong></td>
<td>2.5</td>
<td>4.5</td>
</tr>
<tr>
<td>(g/100 kcal ME)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crude fiber</strong></td>
<td>1.8</td>
<td>1.1</td>
</tr>
<tr>
<td>(g/100 kcal ME)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Carbohydrate</strong></td>
<td>6.5</td>
<td>8.3</td>
</tr>
<tr>
<td>(g/100 kcal ME)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fiber sources</strong></td>
<td>Cellulose,</td>
<td>Ground pecan</td>
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<tr>
<td></td>
<td>oat fiber</td>
<td>shells, beet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pulp, flaxseed,</td>
</tr>
<tr>
<td></td>
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<td>citrus pulp,</td>
</tr>
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<td></td>
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<td>pumpkin, pressed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cranberries,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>fructooligosaccha-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ride, psyllium</td>
</tr>
</tbody>
</table>

---

*Iveta Becvarova, DVM, MS, DACVN
Director, Global Academic & Professional Affairs
Hill’s Pet Nutrition, Inc

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Cluster Seizures

Cluster seizures are defined as 2 or more seizures occurring in a 24-hour period, whereas status epilepticus is defined as continuous seizure activity lasting more than 5 minutes. Repetitive seizures induce cerebral alterations on a cellular level, including depletion of inhibitory mechanisms and up-regulation of excitatory mechanisms, which, over time, may lead to resistance to first-line treatments. Status epilepticus may result in profound acidosis, hyperthermia, and other changes that constitute a medical emergency.

The most critical therapeutic goal in these patients is to stop the seizures. The initial drug of choice is typically diazepam, but drug selection depends on the suspected underlying cause. Diazepam may be administered intravenously, intranasally, or rectally. Pentobarbital or propofol should be selected when diazepam fails. General anesthesia can be induced by intravenous bolus, then maintained by constant-rate infusion. Although intermittent boluses may be used for pentobarbital, constant-rate infusion may be more effective. Parenteral levetiracetam may be useful, but reports on its efficacy are limited. Because status epilepticus can have profound multisystemic effects, affected systems must be monitored and supported as necessary.

Brain function must also be protected from the potential consequences of cerebral edema, increased intracranial pressure, and neuronal necrosis. This protection may include use of oxygen therapy and treatment with mannitol and furosemide. Elevating the head and neck approximately 30° from the horizontal and avoiding jugular compression may help prevent increases in intracranial pressure. Ongoing seizure activity should be monitored visually, and cessation of seizure activity should be confirmed, if possible, with the aid of electroencephalography.

Cluster seizures can be managed at home with diazepam, with the goals of preventing further seizures, decreasing the number and severity of subsequent seizures, and avoiding the need for emergency visits. Diazepam is typically administered rectally; however, in dogs, this route undergoes a substantial first-pass effect. Intranasal administration of diazepam, and possibly other benzodiazepines, may be more effective.—Mariani CL

Ongoing seizure activity should be monitored visually.

Common Orthopedic Errors to Avoid

Although the diagnosis and treatment of orthopedic conditions in dogs and cats are often successfully accomplished by the general practitioner, there are some common errors to avoid, such as:

- Misuse of pins and wires for fracture repair. Mechanical, biologic, and systemic factors are key factors to consider with the fracture patient scoring system; pins and wires should only be used in patients that score high in each category. Following this scoring system, pins and wires are generally used in skeletally immature animals with great capacity to heal and with a stable fracture configuration. In the author’s practice, most cases in which pins and wires are used alone involve feline and canine nonarticular Salter-Harris fractures.
- Poor-quality radiography. Suitable standards for performing radiography should be adopted. Chemical restraint is often important to ensure proper positioning.
- Improper coaptation. Goals for coaptation should be defined prior to placing bandages and splints. For example, in fractures, the joint above and below the fracture must be immobilized, which limits this type of repair to fractures below the elbow or stifle.
- Incorrectly attributing lameness to hip dysplasia in a dog simply because dysplasia is identified on radiography. Hip dysplasia is typically subclinical; cranial cruciate ligament rupture is the more likely cause of lameness.
- Misdiagnosing inflammatory arthropathies, which can have serious consequences. It is imperative to obtain synovial fluid for analysis in patients with unexplained joint effusion or pain, history of shifting leg lameness, fever of unknown origin, and/or severe pain localized to a single joint.—Kim SE
When treating four-legged patients, make each moment matter.

—

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Make today the day.™
Physical Activity Programs for Cats

Deborah E. Linder, DVM, MS, DACVN
Cummings School of Veterinary Medicine at Tufts University

Exercise can be an integral part of a weight loss program, serve as both mental and environmental enrichment, and function as a preventive measure for indoor cats prone to obesity and/or obesity-associated diseases. Although increasing physical activity can help with weight loss, unless there is significant activity that burns calories, physical activity in cats may be more useful in the management of behavior problems or conditions linked to stress (eg, feline lower urinary tract disease). For example, a cat that overgrooms or begs for food may be distracted from such behaviors by physical activity and/or mental enrichment.

With the exception of walking, information on various forms of exercise in dogs and cats is largely undocumented; this leaves cat owners without clear guidance on how to provide and encourage healthy activity for their cat unless it is leash-trained. The benefits of physical activity in cats are difficult to quantify due to lack of research, but any increase in physical activity is likely beneficial. Thus, the development of an individualized physical activity program can be a helpful addition to primary nutritional management of weight loss and/or provide a means for reducing attention-seeking and/or destructive behaviors.

Patient Assessment
Before incorporating exercise into a cat’s routine, the patient should first be assessed to confirm eligibility for a physical activity program. Then, obtaining patient history, followed by determining patient motivations and the owner’s readiness to commit, can help ensure selection of activities and development of a physical activity program tailored to the individual patient.

Patient Eligibility
Patient eligibility for a physical activity program should be determined by obtaining patient BCS and muscle condition score (see Suggested Reading, page 31) and assessing the patient for any comorbidities that would restrict exercise (eg, asthma; orthopedic conditions requiring cage rest, exercise restriction, or restriction of certain activities). Cats suspected of such comorbidities...
may need to gradually work up to physical activity or should not engage in a program until a full diagnostic investigation can be performed to rule out comorbid conditions and/or determine activity restrictions, if necessary. A complete diagnostic investigation is also recommended in patients with moderate-to-severe muscle wasting or with a BCS of 8-9/9. Moderate-to-severe muscle wasting may be indicative of a comorbid condition and should be addressed prior to implementation of a weight loss plan or physical activity program. In these patients, physical activity does not have to be restricted, but active weight loss should not occur until any medical conditions have been stabilized, as weight loss in patients with disease may induce more muscle loss than fat loss.

Patient History
After patient eligibility for a physical activity program is confirmed, a detailed dietary history, including current and previous activity level, should be obtained (Example History Form; see Suggested Reading, page 31).¹ Such information can help assess the household environment and determine what level of activity can be recommended. For example, an indoor-only cat may require scheduled activity throughout the day.

Patient Motivations
The owner should be interviewed to determine the patient’s motivations and incentives (eg, food-motivated [eg, willing to follow a piece of kibble down a hallway] vs hunting-motivated [eg, prefers chasing a laser light or electronic mouse]). Recommendations for a physical activity program should always be tailored to each cat’s specific motivations to ensure the cat enjoys its activities (see specific suggestions for various motivations in Activity Selection & Implementation). Providing activity recommendations tailored to the individual cat can also provide a bonding experience for the cat and the owner.

Owner Commitment
The owner’s level of interest in the program and commitment to change should be evaluated (see Suggested Reading, page 31).² For cats that live in a household with multiple humans, each individual should be interviewed to gauge his or her interest and level of commitment, as this can help tailor the plan to an achievable level for the household; if this is not possible, having all members individually fill out a dietary history form that includes questions regarding personal readiness to commit would also help identify household dynamics. Owners with low readiness to commit should be given only a few simple activities to try, and frequent check-ins with the owner should be held to evaluate continued interest and adherence to the program, whereas owners with high readiness to commit could be given multiple activities to try. Creating a calendar with clear goals for each activity can also be beneficial.

EXAMPLE HISTORY FORM
Is the cat primarily:
☐ Indoor  ☐ Outdoor  ☐ Both
☐ Other (eg, access to large indoor locations such as sunrooms)
Are there other pets in the household?
☐ Yes  ☐ No
If yes, please provide species and number: _______
Please describe the cat’s activity level:
☐ Low  ☐ Moderate  ☐ High
Please describe the cat’s current physical activity (eg, chases a toy for 5 minutes twice per week):
_____________________________________________
_____________________________________________
_____________________________________________
Does the cat have a condition that requires exercise restriction (eg, coughing, joint pain, recent surgery, respiratory disease, heart disease)?
_____________________________________________
_____________________________________________
_____________________________________________
Activity Selection & Implementation
The physical activity chosen should be part of an individualized weight management plan; patient motivations should be considered, and expectations, schedule, potential challenges, and any patient or owner limitations should be discussed with the owner. For example, owners of previously sedentary cats should be encouraged to gradually increase their cat’s activity, starting with creative, low-intensity activities (eg, walking around the house, searching for food items) for 5 to 10 minutes per day. Cats with higher BCS scores should be more cautiously worked up to the activity goals set for them, as arthritis and/or joint issues are more prevalent in this population and may require exercise restriction or modification (eg, shorter duration, lower intensity).

For cats with exercise limitations (eg, those with orthopedic disease), veterinary physical rehabilitation services that can help improve strength and mobility while limiting the risk for further injury are available. For cats that require specialized care or those that should not engage in a rigorous physical activity program, consulting a certified veterinary physical therapy specialist should be considered, as such specialists will be able to recommend and facilitate physical activity for cats with physical impairments through various methods (eg, standard treadmills, underwater treadmills, guided swimming; Figure 1). Increasing numbers of studies have shown the potential benefit of physical and aquatic therapy as part of a weight management program for dogs, and such therapies should not be ruled out in cats.

Food-motivated cats can be given puzzle toys that allow access to treats or meals after the cat has activated the toy through physical activity. The food items the patient enjoys and that motivate the patient to move should be ascertained. Cats do not have sweet receptors and are therefore more likely to prefer textured foods and meat tastes. In the author’s experience, vegetables that are semisoft (eg, zucchini) or moist and crunchy (eg, sweet red peppers) may also be appetizing to cats.

**Figure 1** A cat on an individualized physical therapy plan that includes underwater treadmill work to provide resistance without putting undue stress on joints. Photo courtesy of University of Tennessee College of Veterinary Medicine

**Figure 2** A cat on a leash walk as part of its individualized physical activity program

### RELATED ARTICLES
Visit cliniciansbrief.com for the following related articles:

- Obesity in Cats [cliniciansbrief.com/article/obesity-cats](https://cliniciansbrief.com/article/obesity-cats)
Commercial treats vary in calories, so owners should be instructed to read treat labels before selecting a commercial treat; the chosen treat should not exceed 1 kcal per piece. High-calorie foods such as cheese or fatty meats (eg, ground beef) should be avoided. For cats fed only canned food, owners can open a can of food and encourage and entice the cat to follow them around the house. Kibble can also be used as a treat if the cat is fed dry food; for these cats and those that like to eat throughout the day, particularly those in single-pet households, spreading kibble throughout the house can be an excellent way to encourage activity associated with mealtimes. Owners should be advised not to use too many high-calorie treats or foods to encourage exercise, as an activity that burns 10 calories but requires 100 calories in treats will defeat the purpose of the exercise.

For cats that are motivated by hunting, electronic toys (eg, mice, laser/pen lights) can be used to encourage physical activity. However, some cats may quickly become bored of such toys; in such situations, a treat or kibble can be tossed to the cat when it catches the light or toy mouse.

More active and adventurous cats can be taught to walk on a leash through positive reinforcement (eg, given a treat for letting the harness be put on) and gradually work up to going outside with the harness on (Figure 2, previous page). Of note, many natural tendencies of cats (eg, “hunting” kibble, chasing toys) include physical activity that can be incorporated into the program. In addition, modifying the household environment to encourage more natural behaviors (eg, placing food bowls on shelves or providing large kitty condos to encourage jumping) may incite motivation for more physical activity.8,9

Several resources for encouraging activity in cats are available. See Suggested Reading for specific recommendations, some of which have handouts that can be given to owners to test which activity their cat prefers and works for their household environment.8

Follow-Up & Troubleshooting
After the physical activity program has been tailored to the patient and implemented, continued owner interest and adherence to the program should be evaluated through regular follow-up. Troubleshooting activities (see Suggested Reading), and various parts of the weight loss or obesity prevention plan, every 2 weeks should be considered.

Conclusion
Owners should be educated that, although increased physical activity may help reduce begging behaviors and maintain lean tissue, there is no substitute for monitoring caloric intake. Increasing physical activity in dogs has been shown to allow for ingestion of slightly more calories while still maintaining weight loss goals; however, calorie restriction and monitoring are still considered mainstays of obesity prevention and treatment.10 Although outside the scope of this article, it is important to note that nutritional management is of critical importance in feline weight loss and weight management (see Related Articles, previous page). Cats in particular tend to
require significant calorie restriction to achieve an ideal BCS. An appropriate veterinary therapeutic weight loss diet is often necessary to reduce caloric intake without reducing nutrients essential to cats. An individualized physical activity program can be a successful plan to accompany primary nutritional management of weight loss in cats. ■

References


Suggested Reading


An activity that burns 10 calories but requires 100 calories in treats will defeat the purpose of the exercise. ■
Moxidectin is a potent, broad-spectrum parasiticide of the macrocyclic lactone drug class, the only class currently utilized for the prevention of dirofilariasis. Older drugs in this class include ivermectin and milbemycin oxime.

With biological activity that provides significant immediate and residual antiparasitic activity,1 moxidectin is a potent macrocyclic lactone (ML) preventive against Dirofilaria immitis.2

Three routes of administration have been approved by the FDA for moxidectin use in dogs:
- oral tablet*
- injection
- transdermal

Transdermal moxidectin allows the safe delivery of 2.5 mg/kg which is then broadly distributed into tissues and fat. This allows for both backward and forward protection against D. immitis and the treatment and control of internal parasites with monthly application. Repeated monthly, transdermal administration results in high and sustained levels.3,4

### Comparison of Moxidectin Delivery Routes

<table>
<thead>
<tr>
<th>Administration</th>
<th>Brand</th>
<th>mg/kg moxidectin</th>
<th>Dosing</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Tablet</td>
<td>ProHeart® Tablets* (moxidectin)</td>
<td>0.003</td>
<td>Monthly by pet owner</td>
<td>• Prevents heartworm</td>
</tr>
<tr>
<td>Injection</td>
<td>ProHeart® 6 (moxidectin)</td>
<td>0.17</td>
<td>Biannually by veterinarian</td>
<td>• Prevents heartworm • Treats hookworms present at the time of injection</td>
</tr>
<tr>
<td>Transdermal</td>
<td>Coraxis™ (moxidectin)</td>
<td>2.5</td>
<td>Monthly by pet owner</td>
<td>• Prevents heartworm • Treats and controls hookworms, roundworms and whipworms</td>
</tr>
</tbody>
</table>

*Not currently marketed in the U.S.

5Data on file, Bayer, Shawnee Mission, KS.
8Coraxis™ is not approved for the treatment of adult D. immitis.

CAUTION: Federal (U.S.A.) law restricts Coraxis® to use by or on the order of a licensed veterinarian. WARNING: DO NOT ADMINISTER THIS PRODUCT ORALLY. For the first 30 minutes after application ensure that dogs cannot lick the product from application sites on themselves or other treated animals. Children should not come in contact with the application site for two (2) hours after application. (See Contraindications, Warnings, Human Warnings and Adverse Reactions for more information.) CONTRAINDICATIONS: Do not use this product on cats.

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**Get the skinny on transdermal moxidectin:**

Leveraging the full potential of moxidectin

Transdermal moxidectin (2.5 mg/kg):
- Provides 30 days of active, forward heartworm prevention by continuously killing incoming larvae
- Delivers monthly treatment and control of roundworms, hookworms and whipworms - Including immature stages of hookworms and roundworms
- Minimizes limitations associated with other routes of administration - Needle-free – ideal for even reactive animals - Not feed-dependent – no missed doses due to difficulty of giving pills - Easily given at home – may aid in compliance

**Key Takeaways**

**Backward protection:**
- Kills heartworm larvae that have established infection in the last 30 days

**Forward protection:**
- Kills incoming heartworm larvae for the next 30 days, preventing establishment of new infection

With coverage of the most common internal parasites of concern in canine health, Coraxis™ fits perfectly into a comprehensive nematode plan without the need or cost of additional nematode control products such as pyrantel pamoate or fenbendazole.

**Transdermal delivery is ideal for the delivery of high amounts of lipophilic drugs like moxidectin.**

---

**Comparison of  Moxidectin Delivery Routes**

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5Data on file, Bayer, Shawnee Mission, KS.
8Coraxis™ is not approved for the treatment of adult D. immitis.
Thirty days in, heartworms are still out.

Coraxis™ (moxidectin) Topical Solution for Dogs is transdermal moxidectin that achieves and sustains high serum levels and keeps killing susceptible stages of heartworms for 30 days. Administered monthly, Coraxis™ also treats and controls hookworms, roundworms and whipworms to work hard for your clinic and your patients.

Add the power of 30-day heartworm protection to your portfolio. Visit coraxis.com or contact your Bayer sales representative today.

Coraxis™ is not approved for the treatment of adult D. immitis.

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

WARNING: DO NOT ADMINISTER THIS PRODUCT ORALLY. For the first 30 minutes after application ensure that dogs cannot lick the product from application sites on themselves or other treated animals. Children should not come in contact with the application sites for two (2) hours after application. (See Contraindications, Warnings, Human Warnings, and Adverse Reactions, for more information.)

CONTRAINDICATIONS: Do not use this product on cats.

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See page 31 for product information summary.
Marijuana Intoxication in a Pit Bull

Megan Stadler, DVM
Julien Guillaumin, DVM, DACVECC, DECVECC
The Ohio State University

Stevie, a 3-year-old, 50.8-lb (23.1-kg), neutered male pit bull, was presented for an emergency examination approximately 3 hours after the owner noticed an acute onset of lethargic behavior.

The owner reported that Stevie had behaved normally the previous night. He was the only dog in the household and had access to a garage and fenced yard. There was no history of tick bites or travel. Stevie had been neutered at 8 months of age with no complications and had no major medical or surgical history. He was up-to-date on flea, tick, and heartworm preventives and received no other medications.

Physical Examination
Physical examination revealed a rectal temperature of 98°F (36.7°C), heart rate of 60 bpm, and respiratory rate of 24 breaths per minute. Stevie was mildly (ie, 6%) dehydrated and dribbled urine while walking. During the neurologic examination, Stevie fell asleep during periods of inactivity but had times of hyper-responsiveness to mild-to-moderate stimulation. Marked proprioceptive ataxia with bilateral mydriasis and sluggishly pupillary light reflexes were noted. The rest of the physical examination was unremarkable.

Diagnosis
CBC and serum chemistry profile were normal. Blood pressure measured by Doppler method was 118 mm Hg. An over-the-counter (OTC) urine drug screen test was performed and was positive for tetrahydrocannabinol (THC; see Urine Drug Screen Tests). The owner affirmed that Stevie had the potential for recent (ie, <4 hours) marijuana exposure.

Dogs that have ingested or inhaled THC can exhibit neurologic and GI signs, seizures, recumbency, and stupor that should correlate to the estimated dose ingested (see Take-Home Messages, page 36). The pharmacokinetics of marijuana in dogs is similar to that in humans.
(ie, rapid oral absorption and slow metabolization). Clinical signs in dogs typically appear within 1 to 3 hours and can last up to 36 to 48 hours after exposure.1

**DIAGNOSIS:**
TETRAHYDROCANNABINOL INTOXICATION

**Treatment & Long-Term Management**
Because of the possible recent exposure to THC, emesis was induced (see **Treatment at a Glance**) with apomorphine (0.03 mg/kg IM). Inducing emesis can remove toxins, but there are risks for aspiration pneumonia due to decreased mentation, and emesis is not indicated in every case of THC intoxication. Stevie was determined by the clinician to be sufficiently alert with an intact gag reflex to allow induction of emesis. He produced 2 bouts of vomiting that contained what appeared to be plantlike material (species was not identified). Following emesis, an antiemetic (ie, maropitant [1 mg/kg SC]) was administered, and Stevie was started on the following supportive care treatments:

- Activated charcoal with sorbitol (1-2 g/kg PO); repeat doses were not given.
- Balanced electrolyte solution at a maintenance rate (58 mL/hr IV), plus correction of 6% dehydration over 24 hours (58 mL/hr IV) for a total of 116 mL/hr over 24 hours
  - Maintenance rate (mL/day) = 132 × (body weightkg0.75)
  - Dehydration3 = body weightkg × % dehydration (as a decimal) = fluid deficit in liters
- Orders were given for diazepam (0.5 mg/kg IV) to be administered as needed to control agitation, tremors, and/or seizures; however, this medication was not administered, as it was not needed.

Intralipid emulsion (ILE) therapy was considered but deemed unnecessary. Anecdotal evidence and experimental studies using intravenous lipid emulsion to treat highly lipid-soluble toxicities have been reported in human and veterinary medicine.3 The mechanism of action of ILE therapy remains largely theorized and unknown. Dosing recommendations include an initial bolus of 20% lipid emulsion (1.5 mL/kg), followed by a constant-rate infusion (0.05-0.25 mL/kg/min; not to exceed 10 mL/kg) over 30 minutes.3

Stevie’s vitals returned to normal after several hours of supportive care and monitoring, during which time mentation slowly improved. He was discharged 24 hours after admission with no further medication.

**URINE DRUG SCREEN TESTS**
The accuracy of OTC urine drug screen tests has not been validated in dogs. The main psychoactive substance in marijuana, Δ-9-THC, is metabolized in the liver and excreted primarily through feces, with approximately 20% excreted through urine.5 Urine metabolites excreted by dogs appear larger and more fragile than those excreted by humans, which may be a variable as to why OTC drug screen tests fail to detect the metabolites. In humans, the approximate time for detection of THC in OTC urine drug screen tests ranges from 4 hours to 3 days, with a minimum detection limit of 50 ng/mL.7 The THC detection window remains controversial in humans due to a variety of factors (eg, acute vs chronic use) and has not been determined in dogs.8

**TREATMENT AT A GLANCE**

- If recent ingestion is known, early decontamination (eg, induction of emesis, administration of activated charcoal) should be performed if the patient is stable.1,5,6
- Treatment is mostly based on supportive care for clinical signs (eg, intravenous fluid support, thermoregulation).1,5,6,9
- Intravenous lipid emulsion therapy has been reported in severe cases, as THC is a highly lipid-soluble compound.3
Patients with nonsevere marijuana intoxication may improve slowly over the course of a few hours, in which case some owners may elect to take their pet home. Recommendations for hospitalization can be made for patients that are severely affected or dehydrated or if owners prefer that their pet recover while under professional medical supervision.

**Prognosis & Outcome**
The prognosis for marijuana intoxication is generally good with treatment. Fatalities are rare but have been documented. ILE therapy has been successfully described in patients that have ingested high concentrations of THC and in patients presented with severe clinical signs.

**TAKE-HOME MESSAGES**
- THC intoxication is caused by inhalation of the smoke or ingestion of any portion of the plant, products laced with marijuana, or products made with concentrated THC oil.
- Neurologic and GI signs (eg, CNS depression, ataxia, vomiting, tremors, acute onset of urinary incontinence) are the most commonly reported clinical signs of marijuana intoxication in dogs.
- THC is lipid-soluble and undergoes enterohepatic recirculation.
- The minimum lethal THC dose in dogs is >3 g/kg; however, the ingestion dose is rarely known.
- Recovery is dose-dependent and may take 24 to 72 hours.
- OTC urine drug screen tests have not been validated in dogs, and false-negative results are common.

**ILE** = intralipid emulsion  
**OTC** = over-the-counter  
**THC** = tetrahydrocannabinol

**POLL**
For those located in states where recreational marijuana use has been legalized, have you seen an increase in marijuana intoxication cases since legalization?

A. Yes  
B. No  
C. I have suspected cases of marijuana intoxication but have not confirmed them.  
D. I have never seen a case of marijuana intoxication.  
E. I am not located in a state where recreational marijuana use has been legalized.

Scan the QR code to submit your answer and see the other responses! The poll is located at the bottom of the article.

**References**
Managing the Effects of Stress on the Immune System

What is the connection between environmental stress and outbreak of upper respiratory infections in cats?
In their natural state, cats are both predator and prey — opportunistic feeders that are always wary of potential threats around them. This state of being both hunters and hunted is not limited to outdoor cats; indoor, domesticated cats are also vulnerable to everyday stressors such as the presence of other pets, household guests, owner absences and even small children in the household. And for cats that live in shelters or other confined group settings with other cats, this environmental stress is magnified.

As we know, stress — especially chronic stress — can negatively affect the immune system. In cats, one sequela of stress is the recrudescence of latent viruses that may cause clinical signs of upper respiratory infection.

You have conducted several studies using probiotics in cats. What did you hope to learn?
Evidence suggests that some probiotics may have potential benefits for the modulation of the immune system. We know that certain probiotics can beneficially influence innate and acquired immunity systemically and the *E. faecium* strain SF68 (equivalent to Purina® Pro Plan® Veterinary Diets FortiFlora® Feline Probiotic Supplement) has been shown to have positive clinical effects in cats.

What can you share about your study on the effects of *E. faecium* SF68 on cats with feline herpesvirus type-1 (FHV-1)?
At Colorado State University, we conducted a placebo-controlled pilot study in cats to determine if the immune modulating effects of SF68 could provide clinical benefit. Twelve cats with chronic FHV-1 infection were fed either SF68 or a placebo. They were monitored for clinical signs of the disease, monitored for FHV-1 shedding and evaluated for FHV-1 specific humoral and cell-mediated immune responses, as well as for fecal microbiome stability. After an equilibration period, mild stress was induced over time by changing the housing of the cats from cages to group housing multiple times over a five-month period.

Fecal microbial diversity was maintained throughout the study in cats supplemented with *Enterococcus faecium* SF68 but decreased in cats fed the placebo. Additionally, while results varied from cat to cat, those fed SF68 had significantly fewer episodes of conjunctivitis than the placebo group during the supplementation period. This suggests that administration of the probiotic may decrease the incidence of conjunctivitis in cats with previously diagnosed chronic FHV-1 infection.

How can veterinarians apply these findings in everyday practice?
Most cats are exposed to viruses that may cause upper respiratory infections during their lifetime. By modifying the environments in which cats live to better suit their needs, proactively managing stress and utilizing tools such as probiotics, we may reduce the frequency of clinical signs associated with upper respiratory infections.

---

Michael R. Lappin, DVM, PhD, DACVIM
Kenneth W. Smith
Professor in Small Animal Clinical Veterinary Medicine
College of Veterinary Medicine and Biomedical Sciences
Colorado State University

What were the study findings?
Fecal microbial diversity was maintained throughout the study in cats supplemented with SF68 but decreased in cats fed the placebo.

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Most cats are exposed to viruses that may cause upper respiratory infections during their lifetime. By modifying the environments in which cats live to better suit their needs, proactively managing stress and utilizing tools such as probiotics, we may reduce the frequency of clinical signs associated with upper respiratory infections.
Coach the Immune System to Play Offense

Have you ever considered the similarities between a probiotic and a winning sports team? Think about it. Regular practice helps team members play better and respond quickly to challenging situations that arise during a game. A probiotic that supports the immune system works in much the same way. By helping to promote beneficial bacteria in the digestive system, probiotics can help the immune system respond quickly to environmental and pathogenic challenges.

Supporting the immune system

More than 65 percent of the immune cells in the body are located in the gut, which make it the largest immune organ. IgA is the major class of immunoglobulin secreted by B lymphocytes at the intestinal mucosa. It has several ways of countering bacterial infection: blocking bacterial adhesion at the mucosal surface, agglutinating the bacteria for easier elimination, neutralizing bacterial toxins and disturbing bacterial growth.

Probiotics can exert different effects on the immune system, depending on the specific strain. Purina research showed that healthy puppies fed Enterococcus faecium SF68 — the probiotic found in Purina® Pro Plan® Veterinary Diets FortiFlora® Probiotic Supplements — had a statistically significant increase in canine distemper virus-specific IgG and IgA at 31 and 44 weeks after vaccination when compared to the puppies in the control group.1

Helping minimize diarrhea

Knowing that young pets can be prone to diarrhea and loose stools because their immune and digestive systems are still developing, Purina conducted studies with both puppies and kittens to evaluate the effects of probiotic administration.

- Puppies. We fed puppies from approximately 3 weeks to 1 year of age either a control diet or the same diet supplemented with E. faecium SF68. Puppies fed E. faecium SF68 had increased fecal bifidobacteria and lactobacilli and firmer feces compared to puppies fed the control food.2

- Kittens. We conducted a long-term kitten growth study where E. faecium SF68 was fed from weaning to 1 year of age, during this time, an outbreak of diarrhea occurred. While 60 percent of the kittens fed the control food supplemented with a placebo developed diarrhea severe enough to require treatment, less than 10 percent of the kittens fed the same diet and supplemented with the probiotic required treatment.3

E. faecium SF68 can also be fed prophylactically to pets who may soon experience a stressful situation (for example, pets going to a boarding kennel or living in a shelter).4

Easy for clients to administer and palatable for pets, FortiFlora can be just the probiotic supplement to get pets off to a healthy start — and help them stay at the top of their game.

“By helping to promote beneficial bacteria in the digestive system, probiotics can help the immune system respond quickly to environmental and pathogenic challenges.”

E. faecium SF68 promotes immune function in healthy puppies6

E. faecium SF68 helps minimize diarrhea outbreaks in kittens6

Proactive Approach to Probiotic Therapy Pays Off for Patients

Whether patients are young or old, dogs or cats, I have found a number of different short- and long-term applications for Purina® Pro Plan® Veterinary Diets FortiFlora® Probiotic Supplement in my practice. I firmly believe in taking a proactive approach to managing patients whose health is at risk because of compromised immune function.

Boarding animals. I recommend that any dog or cat boarding at our facility be supplemented with FortiFlora. It’s especially beneficial for anxious animals that are prone to stress-induced colitis. Since we began making probiotic therapy a routine recommendation, we’ve seen an improvement in the number of cases of dogs with diarrhea in our boarding population. And because high-strung pets tend to be poor eaters while boarding, adding the supplement may help stimulate their appetites.

Patients on antibiotic therapy. As veterinarians, we’re all familiar with antibiotic-induced diarrhea, which results from disruption of the normal gut microflora. Whether an animal has undergone surgery or has an injury or infection, any patient in our practice who sent home on antibiotics is also sent home with probiotics.

Puppies and kittens. I like to see young animals get off to a healthy start. I recommend that my breeder clients feed weaning puppies a grain of moistened kibble supplemented with FortiFlora while they are making the transition to solid food. Because maternal antibodies begin to wane at weaning, I believe this additional immunonutrition is important for puppies, while the palatability of the supplement helps make them eager to eat. My goal is to see healthy puppies when they come in for vaccinations at 6 or 7 weeks of age. Young kittens can also benefit from probiotic therapy. Upper respiratory disease is common in kittens, and FortiFlora may help stimulate appetites affected by congestion and discomfort.

When discussing probiotic therapy with clients, I explain the importance of healthy microflora in the gut and its relationship to the immune system and their pets’ overall health. I also like to share the results of studies on immune system health and its effect on stress- and antibiotic-induced diarrhea. Clients often tell me they have had similar conversations with their own doctors. The relationship between the gut and immune health is something many of them understand.

Key Takeaways

- While various stressors can reactivate common respiratory viruses in cats, the E. faecium SF68 probiotic strain may decrease the frequency of conjunctivitis in cats with previously diagnosed chronic FHV-1 infection.7

- Puppies fed a control diet supplemented with E. faecium SF68 had increased fecal bifidobacteria and fecal lactobacilli and firmer feces than puppies fed the control food alone.6 Kittens fed a control diet supplemented with E. faecium SF68 were significantly less likely to require treatment for diarrhea than kittens fed the control food alone.8

- Patients whose immunity is compromised due to age, stress or antibiotic use may all benefit from probiotic administration.

![Image](https://via.placeholder.com/150)

Seth Bynum, DVM
Lewiston Veterinary Caring for Pets

Gail Czarnecki-Maulden, PhD
Senior Research Nutritionist
Nestlé Purina PetCare


Key Takeaways

- While various stressors can reactivate common respiratory viruses in cats, the *E. faecium* SF68 probiotic strain may decrease the frequency of conjunctivitis in cats with previously diagnosed chronic FHV-1 infection.
- Puppies fed a control diet supplemented with *E. faecium* SF68 had increased fecal bifidobacteria and lactobacilli and firmer feces than puppies fed the control food alone. Kittens fed a control diet supplemented with *E. faecium* SF68 were significantly less likely to require treatment for diarrhea than kittens fed the control food alone.
- Patients whose immunity is compromised due to age, stress or antibiotic use may all benefit from probiotic administration.

Coach the Immune System to Play Offense

Gail Czarnecki-Maulden, PhD
Senior Research Nutritionist Nestlé Purina PetCare

Have you ever considered the similarities between a probiotic and a winning sports team? Think about it. Regular practice helps team members play better and respond quickly to challenging situations that arise during a game. A probiotic that supports the immune system works in much the same way: By helping to promote beneficial bacteria in the digestive system, probiotics can help the immune system respond quickly to environmental and pathogenic challenges.

Supporting the immune system

More than 65 percent of the immune cells in the body are located in the gut, which make it the largest immune organ. IgA is the major class of immunoglobulin secreted by B lymphocytes at the intestinal mucosa. It has several ways of counteracting bacterial infection: blocking bacterial adhesion at the mucosal surface, agglutinating the bacteria for easier elimination, neutralizing bacterial toxins and disturbing bacterial growth. Probiotics can exert different effects on the immune system, depending on the specific strain. Purina research showed that healthy puppies fed Enterococcus faecium SF68—the probiotic found in Purina® Pro Plan® Veterinary Diets FortiFlora® Probiotic Supplements—had a statistically significant increase in canine distemper virus-specific IgG and IgA at 31 and 44 weeks after vaccination when compared to the puppies in the control group.

Helping minimize diarrhea

Knowing that young pets can be prone to diarrhea and loose stools because their immune and digestive systems are still developing, Purina conducted studies with both puppies and kittens to evaluate the effects of probiotic administration.

- **Puppies.** We fed puppies from approximately 3 weeks to 1 year of age either a control diet or the same diet supplemented with *E. faecium* SF68. Puppies fed *E. faecium* SF68 had increased fecal bifidobacteria and lactobacilli and firmer faces compared to puppies fed the control food.

- ** Kittens.** We conducted a long-term kitten growth study where *E. faecium* SF68 was fed from weaning to 1 year of age; during this time, an outbreak of diarrhea occurred. While 60 percent of the kittens fed the control food supplemented with a placebo developed diarrhea severe enough to require treatment, less than 10 percent of the kittens fed the same diet and supplemented with the probiotic required treatment.

"By helping to promote beneficial bacteria in the digestive system, probiotics can help the immune system respond quickly to environmental and pathogenic challenges."

Proactive Approach to Probiotic Therapy Pays Off for Patients

Whether patients are young or old, dogs or cats, I have found a number of different short- and long-term applications for Purina® Pro Plan® Veterinary Diets FortiFlora® Probiotic Supplement in my practice. I firmly believe in taking a proactive approach to managing patients whose health is at risk because of compromised immune function.

**Boarding animals.** I recommend that any dog or cat boarding at our facility be supplemented with FortiFlora. It’s especially beneficial for anxious animals that are prone to stress-induced colitis. Since we began making probiotic therapy a routine recommendation, we’ve seen an improvement in the number of cases of dogs with diarrhea in our boarding population. And because high-strung pets tend to be poor eaters while boarding, adding the supplement may help stimulate their appetites.

**Patients on antibiotic therapy.** As veterinarians, we’re all familiar with antibiotic-induced diarrhea, which results from disruption of the normal gut microflora. Whether an animal has undergone surgery or has an injury or infection, any patient in our practice who sent home on antibiotics is also sent home with probiotics.

**Puppies and kittens.** I like to see young animals get off to a healthy start. I recommend that my breeder clients feed weaning puppies a gruel of moistened kibble supplemented with FortiFlora while they are making the transition to solid food. Because maternal antibodies begin to wane at weaning, I believe this additional immune support can be important for puppies, while the palatability of the supplement helps make them eager to eat. My goal is to see healthy puppies when they come in for vaccinations at 6 or 7 weeks of age. Young kittens can also benefit from probiotic therapy. Upper respiratory disease is common in kittens, and FortiFlora may help stimulate appetites affected by congestion and discomfort.

When discussing probiotic therapy with clients, I explain the importance of healthy microflora in the gut and its relationship to the immune system and their pets’ overall health. I also like to share the results of studies on immune system health and its effect on stress- and antibiotic-induced diarrhea. Clients often tell me they have had similar conversations with their own doctors. The relationship between the gut and immune health is something many of them understand.
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Designed to bridge the gap between research pages and daily practice protocol, the following pearls offer tips and techniques to grow the general practitioner’s clinical excellence.

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Electronic Collar Use in France

Karen Lynn C. Sueda, DVM, DACVB
VCA West Los Angeles Animal Hospital
Los Angeles, California

In the Literature

Electronic collars (ECs) use electronic stimulation (ie, shock) at various intensities to deter undesirable behavior in dogs. When the collar is activated, an electric current is delivered to the skin on the ventral surface of the dog’s neck through 2 metal electrodes. Three types of ECs are commercially available: bark-activated collars (BACs), collars used in conjunction with an electronic boundary fence, and remote-controlled collars (RCCs).

Because EC training involves application of an aversive stimulus, studies have examined its effect on canine welfare. Behavioral indicators of stress (eg, pinned ears, lip licking, appearing tense, yawning, yelping) were more prevalent in dogs trained with ECs as compared with those that were not, although cortisol levels were similar. Additional studies have found positive-reinforcement training to be equally or more effective than punishment-based training and to have a lower risk for adverse effects.

Several European countries have banned and/or restricted the sale or use of ECs; France, however, does not have such restrictions. To investigate EC use in France, information was gathered from 1251 dog owners via an online questionnaire. Twenty-six percent of respondents (n = 330) had used an EC, with 14.2% having used an RCC, 11.9% a BAC, and 4.5% an electronic boundary fence collar. Weight (>88.2 lb [>40 kg]), intact status, and adoption for reasons other than companionship (eg, hunting, security) were significantly associated with greater EC use. Most (63%) dogs that wore an EC were younger than 2 years.
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Dr. Anthony Caiafa
BVSc BDSc MACVSc (SA Surgery and Veterinary Dentistry)
ECs were primarily used to address behavior or training-related problems. More than half of the respondents tried only one or no other training option prior to purchasing an EC. Most (75%) respondents purchased their EC online or at a pet or gardening store and obtained information on its use on their own (37.2%), from a friend (23.9%), or online (21.5%). Only 28.2% received professional advice on its use from a veterinarian or trainer.

Efficacy varied with the type of EC used. Owners using RCCs reported the highest success, with 51% stating that the problem behavior resolved without the dog having to wear the collar. Only 25.5% of BAC users reported resolution of barking; 35.9% reported the problem worsened or was unchanged. Depending on the type of collar used, a portion of owners reported that their dog appeared sad or stressed while wearing the collar. Nearly 7% reported their dog was burned by the collar, which occurred most commonly with BACs. Despite this, 42.8% considered that an EC could better solve undesirable behavior issues than any other training method.

The survey determined that, although EC use among French dog owners was high, there was great variability with regard to efficacy and effects on physical and behavioral welfare depending on the type of collar used. The authors advocated for regulation of EC use in Europe and that these factors be taken into account when determining EC policy.

A portion of owners reported that their dog appeared sad or stressed while wearing the collar.

... TO YOUR PATIENTS

Key pearls to put into practice:

1. Because owners may not seek behavior advice from their veterinarian, clinicians should proactively inquire about the pet’s behavior at each appointment (eg, “Does your pet engage in behaviors you do not like?”, “Has your pet’s behavior changed since you were last here?”).

2. Owners may use ECs or other punishment-based training techniques without understanding the potential adverse effects. Handouts (see Suggested Reading) can be provided to inform owners of the potential psychological and physical harm to their pet.

3. Owners should be encouraged to use positive reinforcement-based training, as it appears to be equally effective and less likely to adversely affect the pet’s welfare as compared with punishment-based training.

References


Suggested Reading

Butorphanol vs Buprenorphine as an Adjunct Intramuscular Sedative in Cats

Kate Cummings, DVM, DACVAA
Emily Wheeler, DVM
Cummings School of Veterinary Medicine at Tufts University

In the Literature

FROM THE PAGE ...
Intramuscular sedation can help facilitate intravenous catheter placement. Insufficient sedation may not only preclude intravenous catheterization but can also increase patient stress, particularly in patients resistant to restraint, and adverse effects with sedation (eg, cardiovascular disturbances, respiratory depression, GI effects, excitement) may also be seen.

Opioids are often used as adjuncts to other sedatives for an enhanced calming effect with fewer cardiovascular consequences. Opioids exert effects at 3 different receptor types (ie, µ, κ, Δ) located throughout the body, including, but not limited to, the brain, spinal cord, GI tract, and chemoreceptor trigger zone. Consequently, opioids are associated with a variety of effects (eg, analgesia, sedation, dysphoria, nausea, decreased GI motility), which vary by drug and recipient species. Buprenorphine is considered to be a partial µ agonist, whereas butorphanol is classified as a µ antagonist and κ agonist. Buprenorphine has been shown to produce superior analgesic effects as compared with butorphanol and is associated with fewer GI side effects than are full µ agonists, although nausea and vomiting may still occur. In contrast, butorphanol has been found to have antiemetic properties in certain species. Opioids and α2-adrenergic agonists have synergistic effects when used in combination in cats.

This prospective study investigated differences in sedation achieved with intramuscular dexmedetomidine (10 µg/kg) combined with butorphanol (0.4 mg/kg) as compared with intramuscular dexmedetomidine (10 µg/kg) combined with buprenorphine (20 µg/kg) for intravenous catheter placement. Forty healthy adult cats being sedated for minimally invasive procedures were included. An earlier study comparing these protocols in dogs found superior sedation with butorphanol, and the addition of butorphanol has previously been shown to provide superior sedation in cats when compared with dexmedetomidine alone.

Cats were scored on their sedation, and an attempt was made to place an intravenous catheter, with additional sedation with alfaxonale administered as necessary. Undesirable effects were also recorded. Although only a small number of cats in both groups required additional sedation with alfaxonale, those that received butorphanol had significantly higher sedation scores than those that received buprenorphine. In addition, a significantly greater number of cats vomited after receiving buprenorphine. It was concluded that butorphanol in combination with dexmedetomidine provides superior sedation with fewer adverse effects as compared with buprenorphine.
... TO YOUR PATIENTS
Key pearls to put into practice:

1. Intramuscular sedation with butorphanol in combination with dexmedetomidine is likely to provide superior sedation in cats than buprenorphine and dexmedetomidine.

2. Butorphanol is less likely than is buprenorphine to contribute to emesis when used in combination with dexmedetomidine for intramuscular sedation.

3. In cats for which buprenorphine is a more desirable choice of opioid (e.g., painful patients or those undergoing invasive procedures), administration of an antiemetic 45 to 60 minutes prior to intramuscular sedation may be considered.

References

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J1459p – Pole / Cage mount - allows for quick and easy mounting on IV pole or cage bar.
Permanent Tracheostomy for Laryngeal Collapse

Kelley M. Thieman Mankin, DVM, MS, DACVS (Small Animal)  
Texas A&M University

In the Literature

FROM THE PAGE …

Brachycephalic airway obstructive syndrome encompasses many primary defects, including stenotic nares and nasopharyngeal turbinates, hypoplastic trachea, and elongated soft palate, which may be a primary or secondary condition. These anatomic abnormalities result in increased resistance to airflow and an increased intraluminal pressure gradient during respiration. Increased airway resistance can lead to secondary manifestation of brachycephalic airway obstructive syndrome, including laryngeal collapse.

Laryngeal collapse occurs when the larynx cartilages lose structural rigidity. It is staged in severity from I to III. Stage I laryngeal collapse consists of eversion of the laryngeal ventricle (saccule). In stage II, the cuneiform process of the arytenoid cartilage is medially displaced. In stage III, the cornicate processes are collapsed, resulting in loss of the dorsal arch of the rima glottidis and subsequent airway obstruction. Treatment of laryngeal collapse is based on severity. Stage III collapse is corrected through a salvage procedure and is treated with cricoarytenoid and thyroarytenoid caudolateralization or permanent tracheostomy.

The authors of this study reported outcomes of 15 dogs with stage III laryngeal collapse treated with permanent tracheostomy. Major complications were reported in 12 (80%) of the dogs, 8 (53%) of which died or were euthanized. Of the remaining 7 dogs, 6 died of unrelated causes, and one dog was alive at the end of the study. Although these numbers may seem poor, it is important to recognize that 47% of the dogs either died of an unrelated cause or remained alive after undergoing permanent tracheostomy as a salvage procedure due to severe respiratory signs.

The reported median survival time was 100 days. Early mortality was common; 6 dogs died within 20 days postoperatively. Median survival time of dogs dying from causes related to surgery was 15 days, whereas median survival time of dogs that died of unrelated causes was 1982 days. Four (27%) dogs underwent revision surgery; these dogs survived long-term or died of unrelated causes.
… TO YOUR PATIENTS
Key pearls to put into practice:

1. Permanent tracheostomy as a salvage procedure should be considered in brachycephalic dogs with severe clinical signs associated with laryngeal collapse that have failed to respond to treatment with arytenoid lateralization and/or surgery of the soft palate, nares, and saccules.

2. Complications following permanent tracheostomy can be expected. Fatal complications are most likely to occur in the first month postoperation. Dogs that survive the first 16 weeks postoperation are likely to survive long-term or die of unrelated causes.

3. Stoma management is demanding for owners to perform, mainly because of the frequency of cleaning. In the present study, when a revision surgery was recommended due to stenosis, dehiscence, or obstruction by skin folds, dogs of owners who elected for revision survived long-term or died of unrelated causes; thus, owner education and owner commitment are critical for procedure success.

References

Suggested Reading
Contamination with *Toxocara* spp from Dog Walking

Nancy Vincent-Johnson, DVM, MS, DACVIM (SAIM), DACVPM
*Fort Belvoir Veterinary Center*
*Fort Belvoir, Virginia*

Ova of *T cati* prevailed both in occurrence and abundance, making up 83% of the ova recovered.

**In the Literature**

**FROM THE PAGE …**
Visceral larva migrans and ocular larva migrans can cause serious zoonotic diseases resulting from ingestion of animal roundworm ova, particularly *Toxocara canis* and *T cati*. Infected dogs and cats pass roundworm ova into the environment through deposition of feces. These hardy ova persist in the soil long after fecal matter has broken down. Children are at increased risk due to closer contact with soil or sand during play, potential for geophagia (ie, eating soil), and decreased awareness regarding hygiene as compared with adults. Other possible routes of transmission include contact with contaminated inanimate objects or ingestion of infected paratenic hosts.

In this study, researchers rinsed dog paws and soles of dog owners’ shoes after dogs and their owners completed daily walking routines to identify and quantify the number of parasitic ova picked up during the walks. These numbers were compared with findings of samples from shoes of humans who do not own dogs. No parasite eggs were found in the samples of those who do not own dogs, possibly because these humans tend to walk on pedestrian paths and less-contaminated areas. Of samples from dog paws, 19.4% were positive for *Toxocara* spp ova; 11.4% of dog owner shoes were also positive. Egg counts in samples ranged from 1 to 8. Fecal flotation testing was negative in all 8 dogs studied, suggesting that ova were picked up from the environment. Ova of *T cati* prevailed both in occurrence and abundance, making up 83% of the ova recovered.
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¹Hill’s data on file. Clinical study on microbiome changes in cats.
To Your Patients

Key pearls to put into practice:

1. Eggs of *Toxocara* spp and other parasites can be carried into homes by the paws of dogs and the shoes of their owners. Thus, owners should be advised to wipe their dog’s paws before allowing them indoors to decrease the potential for contamination.

2. The risk for contamination of homes with parasitic ova can be further reduced by removing shoes at the door and storing them on a separate washable mat. Soles should also be scrubbed and rinsed after dog walking and trips to the dog park.

3. Owners should be advised to avoid walking pets in heavily contaminated areas when possible and to pick up their pet’s feces immediately after deposition. Frequent testing and deworming, particularly of puppies and kittens, can help decrease environmental contamination from *Toxocara* spp and other intestinal parasites. Adult pets should receive broad-spectrum parasite control year-round.

4. Owners should be discouraged from allowing pets to roam, hunt, or scavenge.

Reference


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Research Note: Transmucosal Corn Syrup & Blood Glucose Concentrations in Kittens

Although early-age gonadectomy has become more common, concern still exists regarding risk for hypoglycemia in very young animals that lack liver glycogen stores. This study evaluated the effect of postoperative transmucosal application of corn syrup, a common practice, on blood glucose concentrations in kittens. Seventy-five kittens between 8 and 16 weeks of age were randomly assigned to a treatment or control group. Corn syrup application was not found to result in significant blood glucose elevations as compared with controls, and no kitten in the study was demonstrated to be hypoglycemic. These findings suggest that routine dextrose supplementation in these patients is unwarranted and that truly hypoglycemic kittens may require an alternate route of administration to significantly increase blood glucose concentration.

Source

Lyme Consensus Statement

J. Scott Weese, DVM, DVSc, DACVIM*
Ontario Veterinary College
Ontario, Canada

In the Literature

FROM THE PAGE …

The ACVIM recently published its consensus statement on Lyme disease. Although the goal of a consensus statement is to develop evidence-based consensus recommendations, this is challenging to do with Lyme disease, as data are often lacking, incomplete, or conflicting. As a result, this consensus statement has many unresolved issues, although there was agreement on some important areas relevant to practice in Lyme-endemic regions.

It was agreed that screening is indicated for all dogs in areas where Lyme disease is present. However, the presence of antibodies against Borrelia burgdorferi is indicative of exposure to the bacterium and not necessarily that it causes—or will ever cause—disease. Treatment (ie, doxycycline [10 mg/kg PO q24h for 4 weeks]) is indicated in seropositive dogs with arthritis not attributable to another cause. Similarly, seropositive dogs with protein-losing nephropathy (PLN) should also be treated.

Although testing all dogs in endemic areas and treating dogs with clinical Lyme disease was clearly supported, there was less agreement on the approach to clinically normal seropositive dogs. Screening of seropositive dogs for proteinuria is recommended; however, in the absence of clinical signs of Lyme disease or PLN, the majority of panelists did not recommend treatment of seropositive dogs, which has been one of the most controversial aspects of Lyme disease management in dogs.

Tick preventive use is the cornerstone of Lyme disease prevention, and it was agreed that dogs in endemic areas should receive year-round tick control, preferably with a product that prevents attachment of ticks and/or kills ticks early in the feeding process. There was no consensus regarding the indication for vaccination.

… TO YOUR PATIENTS
Key pearls to put into practice:

1. Tick prevention is key for the prevention of Lyme disease and other tick-borne diseases. A product that prevents tick attachment or kills ticks within a short period of time after attachment should be administered to dogs at risk for exposure.

2. Annual serologic testing is recommended for dogs that live in or travel to endemic areas. Owners should be educated about why testing is being done and that positive results do not necessarily mean that treatment is indicated. Identification of a seropositive dog should be taken as an opportunity to emphasize the importance of tick prevention.

3. There is no evidence that quantitative antibody testing provides additional useful information in clinically normal dogs, as the magnitude of the antibody response has not been correlated with disease risk.

4. Lyme nephropathy should be considered in dogs that are seropositive with PLN. Antimicrobial treatment is indicated unless another cause for PLN has been identified.

RELATED ARTICLE
See related article, Borrelia Burgdorferi Seropositivity in a Clinically Normal Dog, on page 56.

*Dr. Weese is also editor in chief of Clinician’s Brief.
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For additional safety information, see brief summary of prescribing information on page 52.


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Research Note: Eastern Equine Encephalitis Virus

Eastern equine encephalitis virus (EEEV) is highly pathogenic, mosquito-borne, and capable of causing disease and mortality in birds, humans, and other mammals. This study described 3 cases of EEEV in puppies in Michigan and New York in 2011. The puppies all had a history of acute fever and diarrhea. One died in its kennel overnight, and the other 2 developed seizures and were euthanized.

Two puppies tested negative for West Nile virus and canine distemper virus; one of these puppies also tested negative for toxoplasmosis. All 3 study puppies tested negative for rabies. Histologic examination revealed necrotizing meningoencephalitis with positive immunohistochemical labeling for EEEV antigen. Diagnosis was confirmed through PCR or plaque reduction neutralization testing. These cases occurred in late summer in areas with high mosquito activity. EEEV should be considered as a differential diagnosis in puppies with neurologic signs, particularly if more common differentials (e.g., rabies, canine distemper, toxoplasmosis) have been ruled out.

Source
Scratching of Inappropriate Objects by Cats

Leslie Sinn, DVM, DACVB
Behavior Solutions
Leesburg, Virginia

In the Literature

FROM THE PAGE …
Scratching of inappropriate objects is a frequent complaint of cat owners, with an incidence as high as 83.9% reported in this study of 116 cats. Destruction of property is a common reason given for relinquishment (12.4%) and is the most common reason a cat is presented for declawing (69%-78%).1,2 It is paramount that clinicians understand normal feline scratching behavior and best practices for modifying that behavior to protect animal welfare, maintain the human–animal bond, and prevent inappropriate interventions and unnecessary surgeries.3

Most study cats demonstrated a preference for inappropriately scratching furniture (81.5%) and carpet (64.1%) and, particularly, items oriented vertical to the ground. This is important to consider when looking at scratching prevention. The survey revealed that cats were more likely to use scratching posts positioned vertically as compared with scratching pads. A preference for substrate was not identified in this study, although a separate, previously published survey found sisal rope and carpeting to be preferred by cats.4

A number of punishment-based methods were used by owners to prevent cats from scratching inappropriate items and included yelling, clapping, spraying water or air, shaking a rattle can, throwing things at the cat, and spanking the cat. None of these methods were found to be effective. Owners who attempted to teach their cats to scratch a designated item by placing the cat near the scratch post/pad actually caused their cats to be less likely to scratch the designated item as compared with owners who did not use this method. Although this study did not identify any method that may help increase the incidence of appropriate scratching, the aforementioned previous survey found that owners who rewarded their cat for appropriate scratching saw an increase in their cat using the preferred scratch post.4

… TO YOUR PATIENTS
Key pearls to put into practice:

1. A vertical scratching post covered in sisal rope or carpet should be provided to cats to help prevent inappropriate scratching.

2. Owners should be educated that punishment is ineffective in eliminating inappropriate scratching and that carrying a cat to its scratching post will make it less likely to use it.

3. Owners should be educated that positive reinforcement (eg, rewarding a cat for scratching appropriately with verbal praise, food, or playtime) is the approach most likely to provide the desired results.

References
Research Note:  
**Social Media Use & Mental Health & Well-Being**

**Marie Holowaychuk, DVM, DACVECC**  
*Critical Care Vet Consulting*  
*Calgary, Canada*

The impact of social media use on mental health and well-being is controversial. Suggested benefits include the ability to maintain long-distance connections, foster networks with others who share similar interests and circumstances, and facilitate face-to-face meetings. Proposed downsides include users experiencing comparisons, envy, isolation, and disconnection.1

Responses to a recent survey suggest that social media use among veterinarians can be detrimental. Survey responses collected from more than 3500 randomly selected veterinarians show that spending more than an hour per day on social media sites is negatively associated with mental health and well-being.2 However, there are ways social media users can avoid the potential negative consequences of screen time.

Research investigating the association between social media use and anxiety or depression has garnered conflicting results, suggesting that the type of activity and engagement on social media can affect mental health outcomes. A recent study of social media use among more than 700 adults that compared active use (eg, messaging a friend, commenting in a group) with passive use (eg, scrolling and liking posts) showed that active social media use was associated with a 15% decrease in depressive symptoms as compared with a 33% increase in depressive symptoms among passive social media users.3

Some have chosen to give up social media use altogether to reduce possible negative effects. A study that compared participants who took a break from Facebook with those who continued using Facebook showed that taking a break improved life satisfaction and positive emotions.4 The effects of taking a break from Facebook were greater among those who were previously heavy Facebook users and those who previously used Facebook passively.

The following practices can foster active social media engagement:
- Sharing posts that are meaningful (eg, personal stories) to encourage comments and engagement from others
- Sending messages to friends and loved ones to maintain distant connections
- Searching for local events to attend in person and make new connections
- Finding and joining closed groups where engagement can occur in a meaningful way (eg, a Facebook group for veterinary professionals who are also mothers)
- Limiting use to no more than an hour per day using time-management apps

Whenever possible, social media should be used actively or its use should be limited.

**References**

Service Dogs & Psychosocial Health
Purdue University College of Veterinary Medicine (vet.purdue.edu) has presented study findings suggesting that service dogs may have measurable effects on the psychosocial health of individuals with physical disabilities and/or chronic conditions. The study, funded by Elanco Animal Health (elanco.com), used standardized measures to examine the relationship between the human–animal bond and psychosocial outcomes among humans with service dogs, as a goal of the study was to apply science in quantifying the effects that these dogs can have on their handlers’ well-being. To reach this goal, researchers recruited 154 individuals to participate in a cross-sectional survey, including 97 individuals placed with a mobility or medical service dog and 57 on the waitlist to receive one. The results showed that, as compared with those on a waitlist to be matched with a service dog, individuals with a service dog exhibited significantly better psychosocial health, including higher levels of social and emotional functioning. Participants were recruited from the database of Canine Assistants (canineassistants.org), a provider of mobility and medical service dogs for a variety of physical conditions and disabilities. For more information, visit canineassistants.org.—Press Release 1/2019

IDEXX Announces SediVue Dx Urine Sediment Analyzer Update
IDEXX Laboratories (idexx.com) has announced an update to its SediVue Dx Urine Sediment Analyzer with its Neural Network 4.0 software release. The update includes 2 new parameters that aid in assessing liver function and blood disorders in critical care situations. These additional parameters can help clinicians understand when a patient might have a liver or blood disease that requires immediate intervention. The update will be implemented across all SediVue Dx analyzer customers by the end of March.—Press Release 1/2019

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CASE IN POINT

BORRELIA BURGDORFERI SEROPOSITIVITY IN A CLINICALLY NORMAL DOG

J. Scott Weese, DVM, DVSc, DACVIM*
Ontario Veterinary College
Ontario, Canada

*Dr. Weese is also editor in chief of Clinician’s Brief.
Merlin, a 6-year-old neutered male Labrador retriever, was presented for his annual wellness visit. Merlin lived in an area where ticks were increasingly common and where *Borrelia burgdorferi* had been identified in local ticks as part of public health surveillance activities. Merlin was not receiving a tick preventive, and the owners had found a few engorged ticks of unknown species on him in the past year.
TABLE 1

URINALYSIS RESULTS
(Source: Free Catch)

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Yellow</td>
</tr>
<tr>
<td>Clarity</td>
<td>Slightly cloudy</td>
</tr>
<tr>
<td>Volume submitted</td>
<td>38 mL</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.042</td>
</tr>
<tr>
<td>pH</td>
<td>6.0</td>
</tr>
<tr>
<td>Urine Dipstick Test</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>Negative</td>
</tr>
<tr>
<td>Glucose</td>
<td>Negative</td>
</tr>
<tr>
<td>Ketones</td>
<td>Negative</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>Negative</td>
</tr>
<tr>
<td>Blood</td>
<td>Negative</td>
</tr>
<tr>
<td>Urine Sediment (400× Magnification)</td>
<td></td>
</tr>
<tr>
<td>Leukocytes</td>
<td>1-3/field</td>
</tr>
<tr>
<td>RBCs</td>
<td>None observed</td>
</tr>
<tr>
<td>Squamous epithelial cells</td>
<td>0-2/field</td>
</tr>
</tbody>
</table>

**Physical Examination**

Merlin was bright, alert, and clinically normal. He was afebrile, and physical examination was unremarkable. His gait was normal, and no joint pain or effusion was noted on palpation.

**Diagnostics**

*B burgdorferi* seropositivity was identified as part of multiplex testing for heartworm disease. Although *B burgdorferi* seropositivity was an incidental finding in this patient, the positive result required consideration because of the potential for clinically inapparent disease. Merlin had been evaluated yearly for *B burgdorferi* antibodies, so the result was consistent with exposure during the past year. Because the owners did not report any signs consistent with Lyme disease (eg, shifting leg lameness) and physical examination was unremarkable, the main clinical consideration was Lyme nephritis, an uncommon but serious condition. A free-catch urine sample was collected to assess for potential Lyme nephritis. Routine urinalysis was unremarkable (*Table 1*), and urine protein:creatinine ratio was 0.1 (reference range, <0.5).

No further testing directed at Lyme disease was performed. Although a commercial quantitative assay for C6 antibody levels is available, C6 levels are not predictive of disease.1

**DIAGNOSIS: B BURGDORFERI SEROPOSITIVITY**

**Treatment & Discussion**

Identification of seropositive but clinically normal dogs is common in areas where *B burgdorferi* is endemic. Although doxycycline is clearly indicated in animals with clinical evidence of Lyme disease, there is controversy about the need for treatment of clinically normal dogs (*Table 2*). The recent ACVIM consensus statement on Lyme disease did not have a consensus approach to management of seropositive, clinically normal, nonproteinuric dogs.1 Most panelists did not recommend treatment because of concerns about overuse of antibiotics, lack of evidence that treatment reduces illness, lack of
evidence that treatment can clear the bacterium from all tissues, and the fact that reinfection is common in endemic areas. There was consensus that subclinical Lyme-seropositive dogs should be regularly (eg, 2-3 times per year) re-evaluated for proteinuria, regardless of whether antibiotics are used.

Prognosis & Outcome
Merlin’s prognosis was excellent. His seropositive result indicated exposure to a tick weeks or months before the wellness visit. Because signs of disease were not present, it was unlikely that disease related to that exposure would develop. Seropositivity is common in endemic areas, yet disease is anecdotally fairly rare, meaning most exposed dogs mount an immune response and therefore become seropositive but do not develop disease.

Lyme nephritis is of concern because of the severity of disease; however, it is rarely reported, and the pathogenesis of disease and factors that predispose to disease are unknown.² *B burgdorferi* is rarely found in the kidneys of dogs with Lyme nephritis, and disease manifests as an immune complex glomerulonephritis.³,⁴ As such, immune-mediated disease—rather than active infection—is the apparent etiology, raising questions about whether an infection to treat is still present by the time Lyme nephritis is identified or whether disease occurs during a postinfectious state. Although there is no universal approach to seropositive but clinically

| Table 2
<table>
<thead>
<tr>
<th>POINT–COUNTERPOINT FOR TREATMENT OF SEROPOSITIVE DOGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Point</strong></td>
</tr>
<tr>
<td>Lyme disease might be present but subtle and not obvious.</td>
</tr>
<tr>
<td>Lyme nephritis might develop.</td>
</tr>
<tr>
<td>Lyme nephritis is a potentially life-threatening condition.</td>
</tr>
<tr>
<td>Treatment is unlikely to hurt.</td>
</tr>
<tr>
<td>Treatment might help reduce establishment of <em>B burgdorferi</em> in protected sites (eg, collagen in the skin).</td>
</tr>
</tbody>
</table>

TREATMENT AT A GLANCE
- If proteinuria is identified, treatment with doxycycline is warranted; however, other causes of proteinuria should be considered.
- Antimicrobial treatment of clinically normal, seropositive dogs without proteinuria is likely not warranted.
normal animals, treatment of seropositivity in the absence of proteinuria is likely not warranted. The owners submitted urine samples from Merlin twice over the next year, and proteinuria was not identified. Merlin was clinically normal at his next annual wellness visit. His owners had been diligent with tick prophylaxis and had not observed any ticks on him since the previous visit. At his latest wellness examination, antibodies against *B. burgdorferi* were identified but were likely residual levels from his prior exposure. Twice-yearly rechecks were recommended to assess for proteinuria.

**References**


**TAKE-HOME MESSAGES**

- Although *B. burgdorferi* seropositivity should not be dismissed, its presence does not mean Lyme disease is present or is likely to occur.
- Seropositivity should be taken as an indication that tick prophylaxis is needed or that compliance with prophylaxis has been poor.
- Newly seropositive dogs that are clinically normal are unlikely to develop Lyme disease, but periodic evaluation for proteinuria is warranted.

**LOOK FOR THESE ARTICLES IN FUTURE ISSUES**

- Top 5 Cytologic Findings in Enlarged Lymph Nodes
- Diet-Associated Dilated Cardiomyopathy Case
- Neutropenia: A Differentials List
- Tips to Successful Management of Otitis Externa
- Diagnosis & Management of Corneal Ulceration

**RELATED ARTICLE**

See related article, Lyme Consensus Statement, on page 50.
World Small Animal Veterinary Association (WSAVA), the foremost platform for veterinarians, is joining forces with the Canadian Veterinary Medical Association (CVMA), for a highly anticipated Congress, that will take place in Toronto, Canada, between 16-19 July 2019.

WSAVA/CVMA 2019 will not only provide you with an incredible social experience, but also enhance your knowledge and clinical practice in the veterinary field. This is your unique opportunity to network with a wide range of professionals from all over the globe.

You really don’t want to miss this…

See you there!
WSAVA/CVMA 2019 Congress
16-19 July 2019
Toronto, Canada
A 5-year-old neutered male Labrador retriever is presented for evaluation of decreased appetite, lethargy, and intermittent vomiting. The patient has a 3-year history of seizures occurring every 6 months; however, the frequency of his seizures has recently increased, with 3 seizures occurring in the past 2 months. An investigation into the cause of the seizures has not been performed. The patient also has bilateral hip osteoarthritis. Serum chemistry profile reveals increased liver enzymes (ALP, 437 U/L; reference range, 10-130 U/L and ALT, 885 U/L; reference range, 10-120 U/L), mild hyperbilirubinemia (1.8 mg/dL; reference range, <0.3 mg/dL), and hypoalbuminemia (2.2 g/dL; reference range, 2.6-4.0 g/dL). Abdominal ultrasonography reveals a coarse echotexture in the liver but no other abnormalities. Prothrombin time and activated partial thromboplastin time were both within the control ranges.

A liver biopsy shows chronic hepatitis with moderate lymphoplasmacytic and neutrophilic infiltrates, as well as moderate bridging fibrosis. There is increased staining for copper, and liver copper concentration is 2143 ppm on a dry-matter basis (normal, <400 ppm; toxic, >1500 ppm). Aerobic and anaerobic cultures reveal no growth.
Which of the following drugs would be appropriate for this patient?

Based on the information provided, how would you grade the following drugs and why?

<table>
<thead>
<tr>
<th>Drug</th>
<th>RED</th>
<th>YELLOW</th>
<th>GREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisone</td>
<td>RED</td>
<td>YELLOW</td>
<td>GREEN</td>
</tr>
<tr>
<td>Cyclosporine</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-penicillamine</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc sulfate</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maropitant</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium bromide</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levetiracetam</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metronidazole</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carprofen</td>
<td>RED</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RED = do not use  YELLOW = proceed with caution  GREEN = safe

TURN THE PAGE TO COMPARE YOUR RESULTS
Did you answer?

The following represents the best responses based on drug metabolism, pharmacokinetics, species, diagnostic differentials, clinical and laboratory data, and other pertinent findings.

**Prednisone**

Prednisone is indicated to manage the inflammatory component to this patient’s liver disease. Considering the breed predisposition to copper hepatopathy and the concentration of copper in this patient’s liver, copper hepatopathy is likely to be the primary cause for the liver disease; special stains of the liver for copper could help further confirm this. The copper accumulation is centrilobular (zone 3) in the primary (ie, breed-related) form and periportal in the secondary (ie, cholestatic) form. Management of the secondary inflammation is indicated to reduce ongoing liver injury.

Well known side effects of prednisone include polyuria, polydipsia, and weight gain. Other side effects, such as hepatomegaly and increased ALP, may confound the assessment of clinical improvement. Although ALP may increase further, a decrease in total bilirubin and ALT should be expected with successful treatment.

**Cyclosporine**

Cyclosporine inhibits T-cell function and has been used in dogs with various inflammatory and immune-mediated diseases, including atopic dermatitis, inflammatory bowel disease, and immune-mediated hemolytic anemia. Anecdotally, cyclosporine may also be a useful anti-inflammatory agent for the management of inflammatory liver disease. However, in the absence of more extensive studies, routine use of cyclosporine cannot yet be recommended. In addition, cyclosporine is largely metabolized by the liver, and this patient’s liver function is suspected to be reduced based on the presence of hypoalbuminemia and hyperbilirubinemia. Ideal blood concentrations of cyclosporine are not known in dogs, and the effects of liver disease on drug metabolism may make this patient’s response unpredictable. GI signs are the most common side effect of cyclosporine, and this patient already has a reduced appetite. Despite these caveats, cyclosporine would be a reasonable choice if the patient does not tolerate prednisone or if prednisone is ineffective as a sole anti-inflammatory drug. Potential adverse effects of cyclosporine include gingival hyperplasia and opportunistic infections.

**D-penicillamine**

D-penicillamine is a metal chelating agent. Each molecule of D-penicillamine binds one copper atom, and the complex is excreted in the urine. D-penicillamine would be the drug of choice for managing primary copper hepatopathy in this patient. D-penicillamine must be given on an empty stomach; otherwise, bioavailability is poor.

The most common side effects are vomiting and inappetence. Concurrent administration of an antiemetic may help manage these signs. Treatment with D-penicillamine may be needed for 6 to 9 months to clear accumulated copper from the liver. Although response to treatment and duration of treatment should be assessed based on repeat liver biopsy and copper quantification, this is often not feasible.
Zinc sulfate

Zinc supplementation with zinc acetate, gluconate, or sulfate can be a useful adjunctive treatment in dogs with primary copper hepatopathy or with chronic liver disease and secondary copper accumulation. Because they are both divalent cations, zinc and copper compete for absorption, and zinc administration will reduce copper absorption. However, supplements should not be used concurrently with D-penicillamine, as D-penicillamine will also chelate zinc and its efficacy will be reduced. In addition, there may be no additional benefit of zinc supplementation in dogs that are fed a low-copper diet.

Maropitant

Maropitant may be useful for controlling this patient’s vomiting associated with the primary liver disease or with D-penicillamine treatment. Although maropitant is an effective antiemetic, this patient may also be experiencing nausea; it is not clear whether maropitant can effectively control nausea. Maropitant is metabolized by the liver and excreted in the bile; thus, caution should be taken in dogs with liver dysfunction. This drug has a wide therapeutic index, with doses 3 times the highest label dose of 8 mg/kg being well tolerated in dogs, and significant adverse events are unlikely.

Phenobarbital

Because the frequency of this patient’s seizures is reported to have recently increased, anticonvulsant treatment may be indicated. Phenobarbital would not be an appropriate choice in this patient because it is primarily metabolized in the liver, and drug concentrations are likely to be higher in a patient with a pre-existing liver dysfunction. Phenobarbital may cause hepatotoxicity; this risk appears to be increased with higher serum phenobarbital concentrations.

Potassium bromide

Potassium bromide would be a safe anticonvulsant to use in this patient. Bromide does not need to be metabolized by the liver and is eliminated in the urine. Prior to initiation of treatment with potassium bromide, blood ammonia levels should be measured to rule out seizures secondary to hepatic encephalopathy. However, the long-standing nature of this patient’s seizures is more suggestive of pre-existing idiopathic epilepsy, with incidental progression of seizures concurrent with the diagnosis of copper hepatopathy.

The most significant disadvantage of potassium bromide is its prolonged half-life (≈2 weeks). Because 5 half-lives may be required to achieve steady state drug concentrations, there may be a lag in achieving seizure control. Administering loading doses may achieve steady state drug concentrations sooner but could increase the risk for sedation, which would be undesirable in this patient.
Levetiracetam

Levetiracetam would be safe to use to control this patient’s seizures. It is not hepatically metabolized, has no significant potential for hepatotoxicity, and is excreted primarily in the urine, making it a potentially useful drug in patients with seizures and concurrent liver disease. However, studies confirming levetiracetam’s efficacy as monotherapy for the control of seizures in dogs are lacking. Another potential use of levetiracetam in this patient would be as an add-on therapy in combination with potassium bromide to assist with seizure control while serum blood bromide concentrations reach therapeutic levels.

Metronidazole

Although metronidazole is not contraindicated in this patient, there are no indications for its administration. Bacterial culture results from the liver were negative, and metronidazole is a narrow-spectrum antibiotic with no significant activity against aerobic bacteria. Although it is often suggested that metronidazole has anti-inflammatory effects in the GI tract, it has been proposed that these effects may be mediated through modification of GI microbiota. Because the liver lacks a significant commensal bacterial population, the anti-inflammatory effects of metronidazole are likely to be less in the liver. As noted above, it is unlikely this patient’s seizures are due to hepatic encephalopathy. However, if elevated blood ammonia levels were documented, metronidazole could be used with lactulose to help manage hyperammonemia and hepatic encephalopathy.

Carprofen

Carprofen is contraindicated for management of this patient’s osteoarthritis. NSAIDs are largely metabolized by the liver and have narrow therapeutic margins and therefore should be avoided in patients with liver dysfunction. In addition, carprofen has been associated with idiosyncratic hepatotoxicity. One study of carprofen-induced hepatotoxicity included a preponderance of Labrador retrievers, although this finding may be a reflection of the breed’s predisposition to osteoarthritis and other forms of liver disease. Patients with significant liver dysfunction are also at higher risk for NSAID-induced GI ulceration, as portal hypertension—which cannot be excluded in this patient—is an independent risk factor for gastric ulceration. Concurrent administration of NSAIDs with glucocorticoids is contraindicated.

References

THE PLATFORM YOU’VE NEEDED SINCE VETERINARY SCHOOL

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Elongated soft palate resection with a Flexible Fiber CO₂ Laser

By William E. Schultz, DVM

Congenital obstructive upper airway disease is common in the brachycephalic breeds. Symptoms include noisy and/or labored breathing during sleep and wakefulness, snoring, lowered exercise tolerance and increased heat sensitivity. Excessive weight is an aggravating factor. Dogs with the syndrome may suffer from one or a combination of abnormalities, including stenotic nares, enlarged tonsils, elongated soft palate, everted laryngeal sacculae and hypoplastic trachea. In this issue, we will only address the resection of the elongated soft palate.

The procedure can be performed with a scalpel, electrocautery or a CO₂ laser. Conventional scalpel surgery requires suturing the soft palate and leaving suture material in a sensitive area. Removal with electrosurgery may cause a large band of necrosis and severe tissue edema. In my practice, a CO₂ laser is always utilized for this procedure. CO₂ laser surgery produces an incision with no tissue friction (cutting and vaporization are done in a non-contact manner, with a highly focused beam of light) and the level of hemostasis that allows for excellent visualization of the surgical site and precise incision (due to the high vaporization of the soft palate, efficient hemostasis afforded by the CO₂ laser is especially beneficial). The damage to healthy adjacent tissue is very small.1 Numerous human studies have shown that when compared to a scalpel blade, CO₂ laser surgery results in decreased postoperative pain and discomfort, and improved healing with reduced wound contraction and scarring.2-4

Preoperative Preparation

Patient is premedicated with torbutrol and maintained on an initial propofol bolus, with propofol only as needed. An endotracheal tube and gas anesthesia are nearby during the procedure in the event that intubation and forced oxygen are needed. Intubation during the surgery may be necessary in extremely compromised cases (the endotracheal tube, however, decreases the size of the surgical field). In intubated patients, the endotracheal tube should be protected from inadvertent lasing with saline-soaked gauze. Cardiac and oxygen monitoring are performed for the entire procedure. Marcarene or other local anesthetic is used topically before the surgery. The level of anesthesia is constantly monitored and maintained at a light level (patient may occasionally swallow).

The CO₂ laser (Aesculight®, Bothell, WA) is set to 15 W in the continuous-wave mode. A handpiece, equipped with a metal backstop, is used with a 0.4-mm focal spot size ceramic tip (Figure 1). The backstop prevents inadvertent damage to the tissue behind the soft palate when the laser beam passes through the target tissue. Alternately, a saline-soaked gauze sponge can serve as a backstop (only if intubation is used).

Procedure

The patient is placed in sternal recumbency with the maxilla suspended by gauze. A determination is made as to how much tissue to excise. An experienced surgeon can make a visual estimation of the amount of tissue to remove, but for less experienced surgeons, marking the planned incision is strongly recommended. If intubation is used in the procedure, marking is done when the patient is extubated.

The initial marking incision is made at the level of the caudal aspect of the tonsillar crypt, which is also at the level of the dorsal aspect of the epiglottis. For marking, the laser is used in the pulsed mode.

After the amount of redundant tissue is determined, the patient may be re-intubated. The pendulous portion of the soft palate is held with soft-tissue thumb forceps and retracted rostrally (Figure 2). Gentle traction is applied to the soft palate during the procedure to facilitate cutting. The incision is made along the initial markings with several passes, minimizing the amount of smoke inhaled. Smoke evacuation is used and held at the edge of the mouth to prevent negative air pressure in the throat. The incision is deepened until the redundant part of the soft palate is completely removed (Figures 3A-C).

The oxygen monitor is important during this phase. If the oxygen saturation drops into the low 90s, the procedure is halted until the saturation returns to the mid to high 90s. The use of a local anesthetic sprayed on the surface of the soft palate allows for a lighter stage of anesthesia during the procedure.

With a CO₂ laser, bleeding is unlikely; if bleeding occurs, it may be controlled by defocusing the laser—increasing the tip-to-tissue distance—and spot-lasing the area of the bleeder.

Recovery is usually uneventful, and quiet breathing is noted immediately on waking.

Postoperative Instructions

Immediately following the resection of the soft palate, the patient may be intubated or masked with oxygen until awake. Patient is sent home on low dose prednisone (to reduce the possibility of inflammation) and a broad-spectrum antibiotic for one week postoperatively. Only limited exercise is allowed and walking in a harness for the first five days following the surgery is recommended.
A pre-op view of the soft palate extending into the laryngeal opening with Aesculight laser handpiece with a metal backstop visible.

The elongated soft palate is retracted rostrally with forceps to facilitate laser incision.

The incision is checked for proper removal; additional tissue may be removed if needed.

Immediately post-op, no sutures are placed. Note the lack of bleeding.

REFERENCES:

WATCH CO₂ LASER SURGERY VIDEOS:
www.Aesculight.com/video/

About Dr. Schultz:
Dr. William E. Schultz graduated from Michigan State University in 1973, went into private practice and opened his companion animal practice in the fall of 1974. Dr. Schultz has been a board member on the Symbiotics Reproductive Advisory Panel, The Society for Theriogenology and The Theriogenology Foundation. He has held speaking engagements at several veterinary conferences, veterinary associations and national specialties because of a special interest in canine reproduction. Dr. Schultz is also interested in soft tissue and orthopedic surgery. He has over 20 years of experience with laser surgery. Dr. Schultz uses a 40-watt flexible hollow waveguide CO₂ laser.
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-Naphthalene-carboxamide, 4-(3-chloro-5-( trifluoromethyl)-phenyl)-4, 5-dihydro-5-(trifluoromethyl)-3-isoxazolyl-N(2-oxo-2-(2,2,2-trifluoromethyl)amino)ethyli

Indications:
NexGard kills adult fleas and is indicated for the treatment and prevention of flea infestations (Chenopetalus 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 leaches/ scolpidies vectors tick.

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:

<table>
<thead>
<tr>
<th>Body Weight</th>
<th>Afoxolaner Per Chewable (mg)</th>
<th>Chewables Administered</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 to 10.0 lbs.</td>
<td>11.3</td>
<td>One</td>
</tr>
<tr>
<td>10.1 to 24.0 lbs.</td>
<td>28.3</td>
<td>One</td>
</tr>
<tr>
<td>24.1 to 60.0 lbs.</td>
<td>88</td>
<td>Two</td>
</tr>
<tr>
<td>60.1 to 121.0 lbs.</td>
<td>136</td>
<td>One</td>
</tr>
<tr>
<td>Over 121.0 lbs.</td>
<td>Administer the appropriate combination of chewables</td>
<td></td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>Treatment Group</th>
<th>Afoxolaner Oral active control</th>
</tr>
</thead>
<tbody>
<tr>
<td>N°</td>
<td>% (n=415)</td>
</tr>
<tr>
<td>Vomiting (with and without blood)</td>
<td>17</td>
</tr>
<tr>
<td>Dry/Faity Skin</td>
<td>13</td>
</tr>
<tr>
<td>Diarrhea (with and without blood)</td>
<td>13</td>
</tr>
<tr>
<td>Lethargy</td>
<td>7</td>
</tr>
<tr>
<td>Anorexia</td>
<td>5</td>
</tr>
</tbody>
</table>

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/CDV. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data.

<table>
<thead>
<tr>
<th>Contact Information:</th>
</tr>
</thead>
</table>

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

For additional information about adverse drug experience reporting for animals, 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 was administered up to 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.

In a well-controlled 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%, 94.7%, 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 (8.3 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 pathlogy (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, antibio (including topical), steroids, NSAIDS, anesthetics, and antibiostatics. 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: 113, 283.8, 68 and 136 mg afoxolaner. Each chewable size is available in color-coded packages of 1, 3 or 6 beef-flavored chewables.

NADA 141-406, Approved by FDA
Marketed by: Frontline Vet Labs™, a Division of Merial, Inc.
Duluth, GA 30096-4640 USA
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1. **CONSULT THE EXPERT PAGE 12**
Which of the following is the most common clinical sign associated with ectoparasite infestation in rabbits?
A. Alopecia  
B. Scaling  
C. Pruritus  
D. Erythema

2. **CONSULT THE EXPERT PAGE 27**
Which of the following should be assessed when determining a feline patient’s eligibility for a physical activity program?
A. BCS  
B. Muscle condition score  
C. Presence of comorbidities  
D. All of the above

3. **CASE IN POINT PAGE 34**
Recovery from tetrahydrocannabinol intoxication in dogs may take up to _______ days.
A. 3  
B. 5  
C. 7  
D. 10

4. **CASE IN POINT PAGE 56**
Although the recent ACVIM consensus statement on Lyme disease did not have a consensus approach to management of seropositive, clinically normal, nonproteinuric dogs, there was a consensus that _______.
A. Treatment reduces illness.  
B. Treatment will clear the bacterium from all infected tissue.  
C. Regular re-evaluation for proteinuria should be performed.  
D. Tick prophylaxis is no longer necessary, as reinfection is uncommon.

**Answer Key:** 1: C 2: D 3: A 4: C
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* Among veterinary brands in the US. Survey conducted among small animal veterinarians in the United States who recommended oral joint health supplements.
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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1Data on file.

Powerful protection can also be gentle:
✓ Safe for puppies as young as 8 weeks of age weighing 4 lbs or more
✓ Over 140 million doses of afoxolaner have been prescribed¹
✓ And it’s the only flea and tick control product indicated for the prevention of Borrelia burgdorferi infections as a direct result of killing Ixodes scapularis vector ticks

Peace of mind.

Prescribe

NexGard® Chewables
What one little chew can do

See page 70 for product information summary.