January 2020

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PROGRESSIVE FACIAL LESION IN A CAT

IN THIS ISSUE

Volume 18 Number 1

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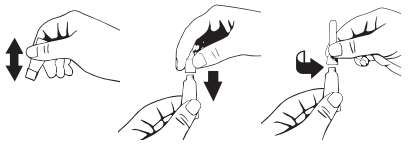
CAUTION: Federal (U.S.A.) law restricts this drug to use by or on the order of a licensed veterinarian.

DESCRIPTION:
CLARO® contains 16.6 mg/mL florfenicol, 14.8 mg/mL terbinafine (equivalent to 16.6 mg/mL terbinafine hydrochloride) and 2.2 mg/mL mometasone furoate. Inactive ingredients include purified water, propylene carbonate, propylene glycol, ethyl alcohol, and polyethylene glycol.

INDICATIONS:
CLARO® is indicated for the treatment of otitis externa in dogs associated with susceptible strains of yeast (*Malassezia pachydermatis*) and bacteria (*Staphylococcus pseudintermedius*).

DOSAGE AND ADMINISTRATION:
Shake before use.
CLARO® should be administered by veterinary personnel.
Administer one dose (1 dropperette) per affected ear. The duration of effect should last 30 days.

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 of the solution.
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 drugs out of reach of children. In case of accidental ingestion by humans, contact a physician immediately. In case of accidental skin contact, wash area 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. Reevaluate the dog if hearing loss or signs of vestibular dysfunction are observed during treatment. Use of topical otic corticosteroids has been associated with adrenocortical suppression and iatrogenic hyperadrenocorticism in dogs (see **ANIMAL SAFETY**).
Use with caution in dogs with impaired hepatic function (see **ANIMAL SAFETY**).
The safe use of CLARO® in dogs used for breeding purposes, during pregnancy, or in lactating bitches has not been evaluated.

ADVERSE REACTIONS:
In a field study conducted in the United States (see **EFFECTIVENESS**), there were no directly attributable adverse reactions in 146 dogs administered CLARO®.
To report suspected adverse drug events and/or obtain a copy of the Safety Data Sheet (SDS) or for technical assistance, contact Bayer HealthCare at 1-800-422-9874.
For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at http://www.fda.gov/AnimalVeterinary/SafetyHealth.

PHARMACOLOGY:
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 which selectively inhibits the early synthesis of ergosterol. Mometasone furoate is a glucocorticosteroid 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 non-interference study. An *in vitro* study of organisms collected from clinical cases of otitis externa in dogs enrolled 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 synergistic 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 field study (see **EFFECTIVENESS**), at least 10 isolates from successfully treated cases were obtained for *S. pseudintermedius* and *M. pachydermatis*.

EFFECTIVENESS:
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 once on Day 0 to the affected ear(s). Prior to treatment, the ear(s) was cleaned with saline. The dogs were evaluated on Days 0, 7, 14, and 30. Blood work and urinalysis were obtained on Day 0 pre-treatment and Day 30 at study completion. Four clinical signs associated with otitis externa were evaluated: erythema, exudate, swelling, and ulceration. Success was based on clinical improvement at Day 30. Of the 183 dogs included in the effectiveness evaluation, 72.5% of dogs administered CLARO® solution were successfully treated, compared to 11.1% of the dogs in the vehicle-control group (p=0.0001).

ANIMAL SAFETY:
In a target animal safety study, CLARO® was administered aurally to 12-week-old Beagle puppies (4 dogs/sex/group) at 0X, 1X, 3X, and 5X the recommended dose once every 2 weeks for a total dosing period of 28 days (3 times the treatment duration). No clinically relevant treatment-related findings were noted in hearing tests, body weight, weight gain, or food consumption. CLARO® administration was associated with post-treatment ear wetness or clear aural exudate, increased absolute neutrophil count, decreased absolute lymphocyte and eosinophil counts, suppression of the adrenal cortical response to ACTH-stimulation, decreased adrenal weight and atrophy of the adrenal cortex, increased liver weight with hepatocellular enlargement/cytoplasmic change, and decreased thymus weight. Other potentially treatment-related effects included mild changes to AST, total protein, inorganic phosphorus, creatinine, and calcium.

STORAGE INFORMATION:
Store between 20°C – 25°C (68°F – 77°F), excursions are permitted 15°C – 30°C (59°F – 86°F).

HOW SUPPLIED:
CLARO® solution is supplied in a single-use dropperette in a blister. Each dropperette contains one 1 mL dose.
CLARO® is available in cartons of two, ten, or twenty dropperettes.

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(See Contraindications, Warnings, Human Warnings, and Adverse Reactions, for more information.)
CONTRAINDICATIONS: Do not use this product on cats.

BAYER

See page 2 for product information summary.

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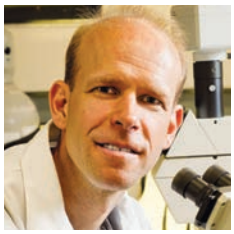

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DIFFERENTIAL DIAGNOSIS PAGE 29

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CASE ROUTES PAGE 17

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CASE IN POINT PAGE 11

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CASE IN POINT PAGE 11

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CONSULT THE EXPERT PAGE 30

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CASE ROUTES PAGE 17

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CASE IN POINT PAGE 63

DIFFERENTIAL DIAGNOSIS PAGE 69

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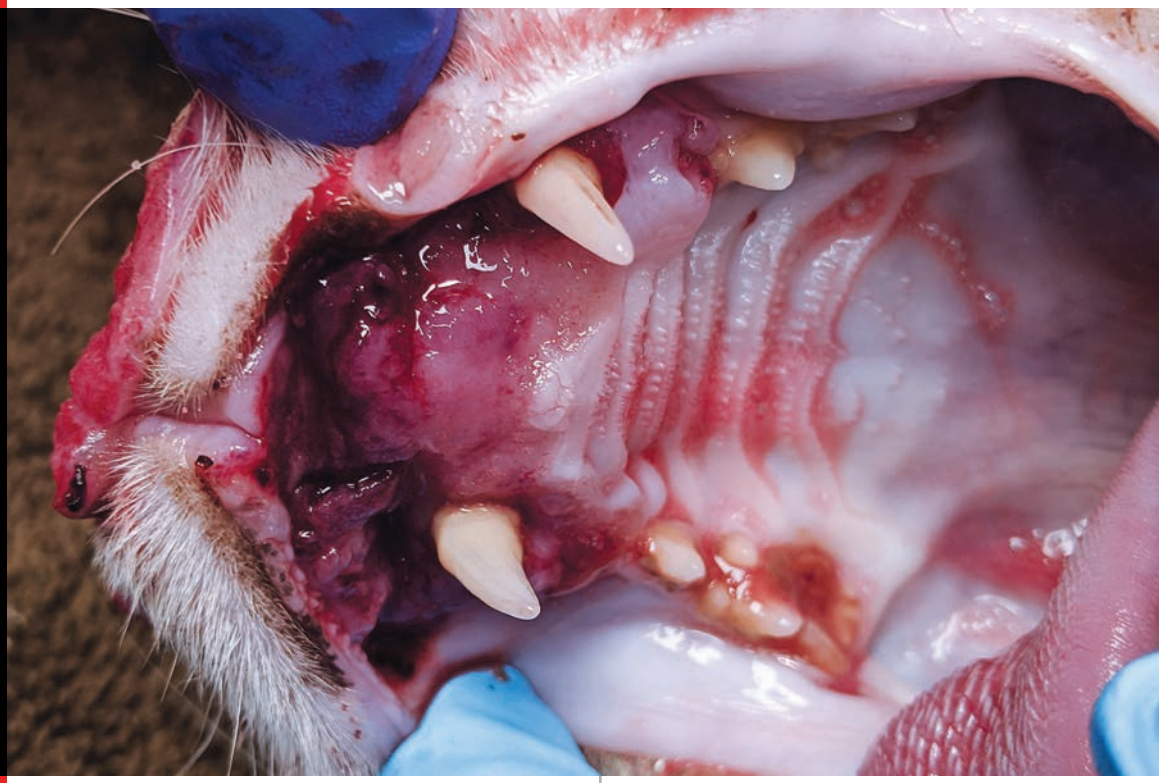
See page 3 for product information summary.

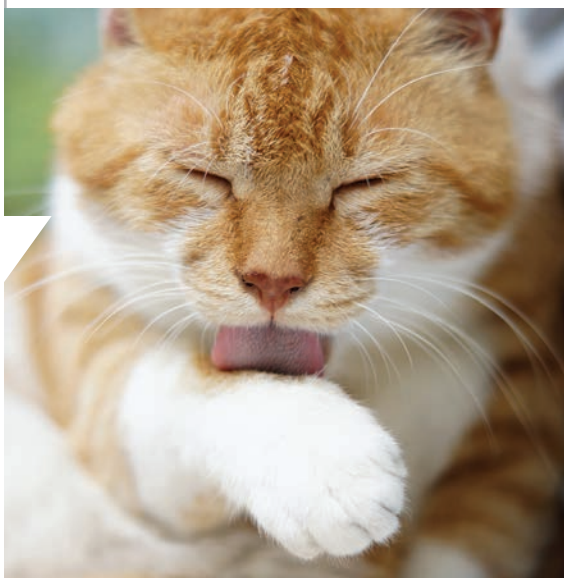
IN THIS ISSUE

ON THE COVER

CASE IN POINT
Progressive Facial Lesion in a Community Cat
Sarah Steen, DVM
Lisa M. Pohlman, DVM, MS, DACVP

PG 11





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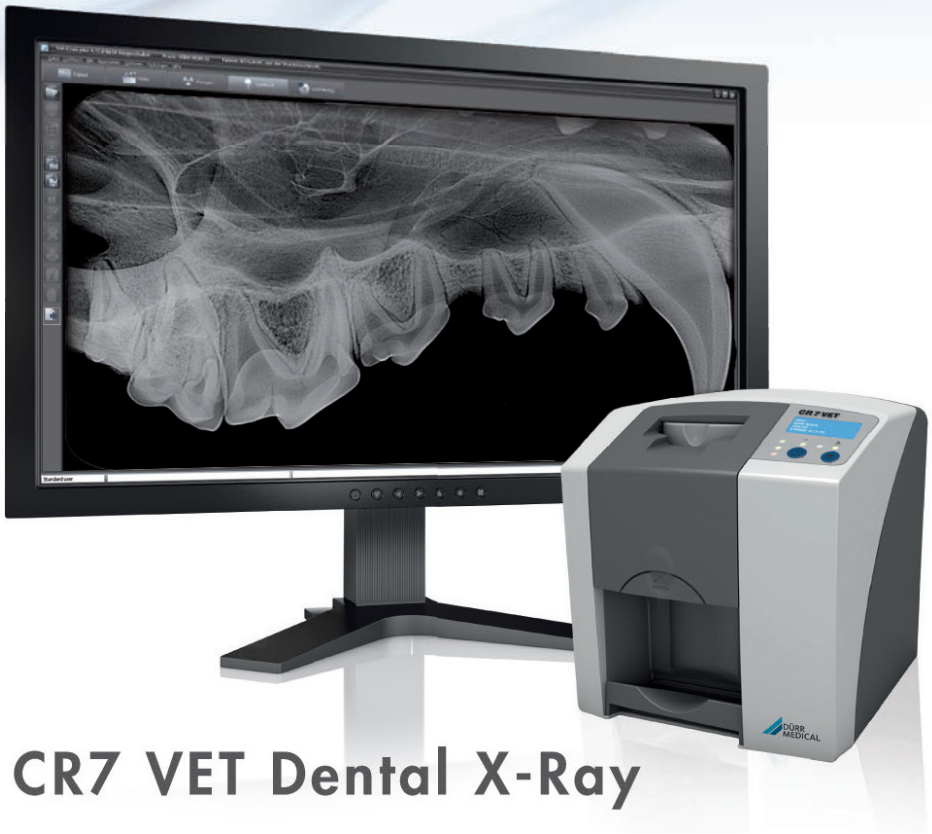

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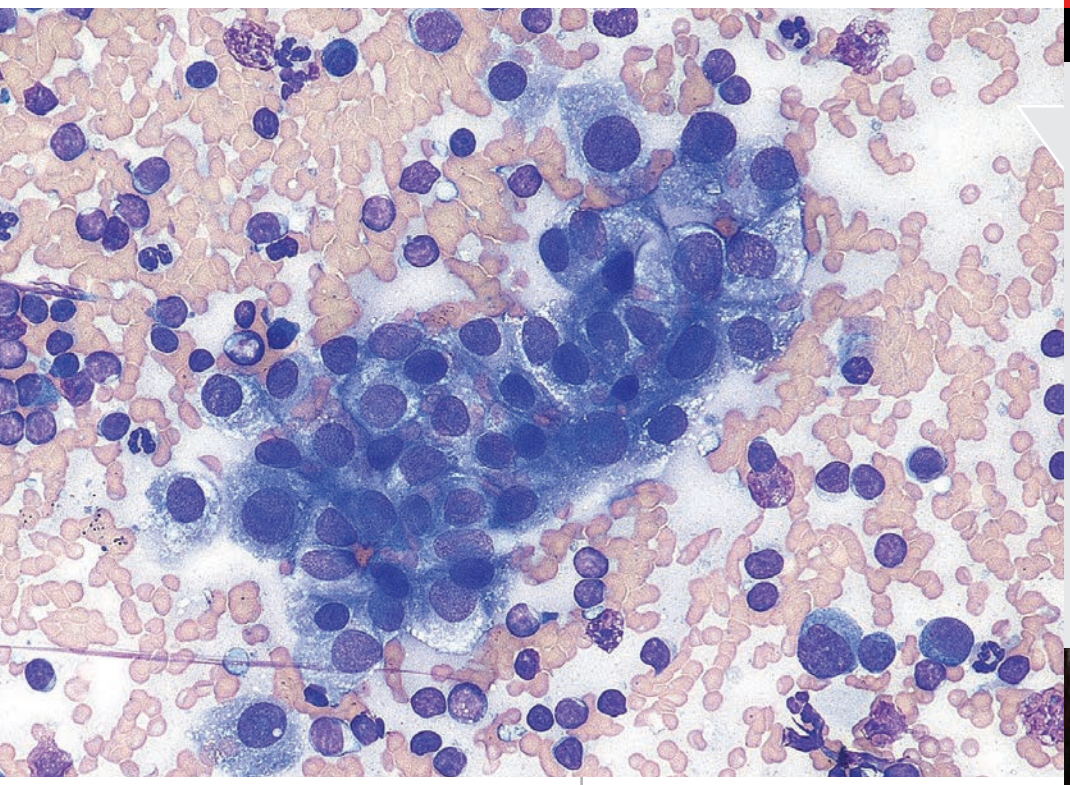

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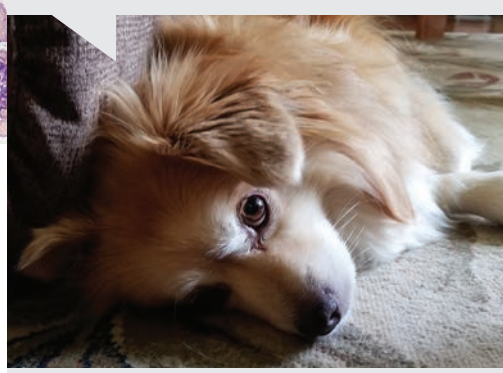
M. Katherine Tolbert, DVM, PhD, DACVIM (SAIM)
brief.vet/gastroprotectant-use



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At what age do you recommend puppies start group socialization classes?

"8 weeks, which should be after puppies receive their first vaccinations. Once healthy puppies have started their vaccinations and are dewormed, they should start socialization classes to prevent behavior problems. Waiting until all vaccinations are given loses the optimum window of socialization."—*Beth C*

"9 weeks; 1 week after their first vaccinations."—*Ericka W*

"8 weeks, as long as the group of puppies has been dewormed and vaccinated. Poor socialization in dogs is a difficult problem, and the socialization period is short and early."—*Tracy C*

"9 weeks, once they have been in their new home for a minimum of 10 days."—*Maggi B*

"8 weeks."—*Lucy G*

What are your criteria for administering an antibiotic injection to a patient undergoing dental cleaning?

"I personally never do it. Sometimes I will send home oral clindamycin if osteomyelitis is documented on radiographs."—*Savannah H*

"I do not give antibiotics if the procedure is just scaling and polishing; however, I do give them if any extractions are performed."—*Martina S*

"Never. It is not needed unless there is risk for bacterial endocarditis due to valvular disease."—*Ben B*

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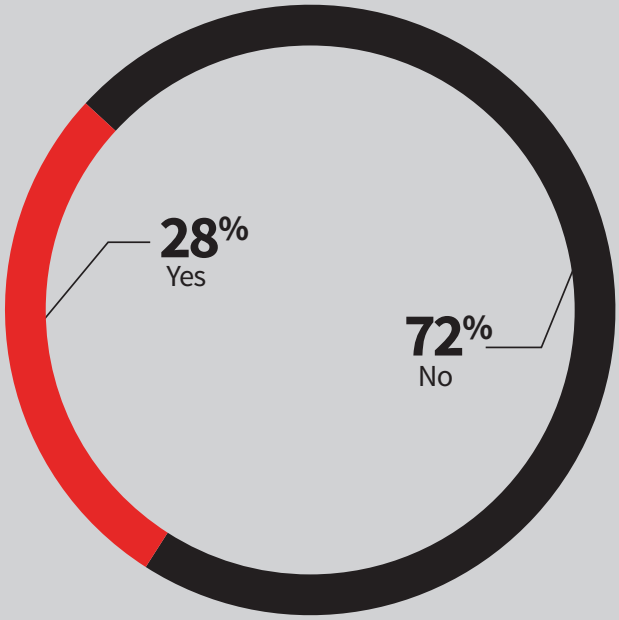

Have you ever diagnosed gastric dilatation-volvulus in a small-breed dog?

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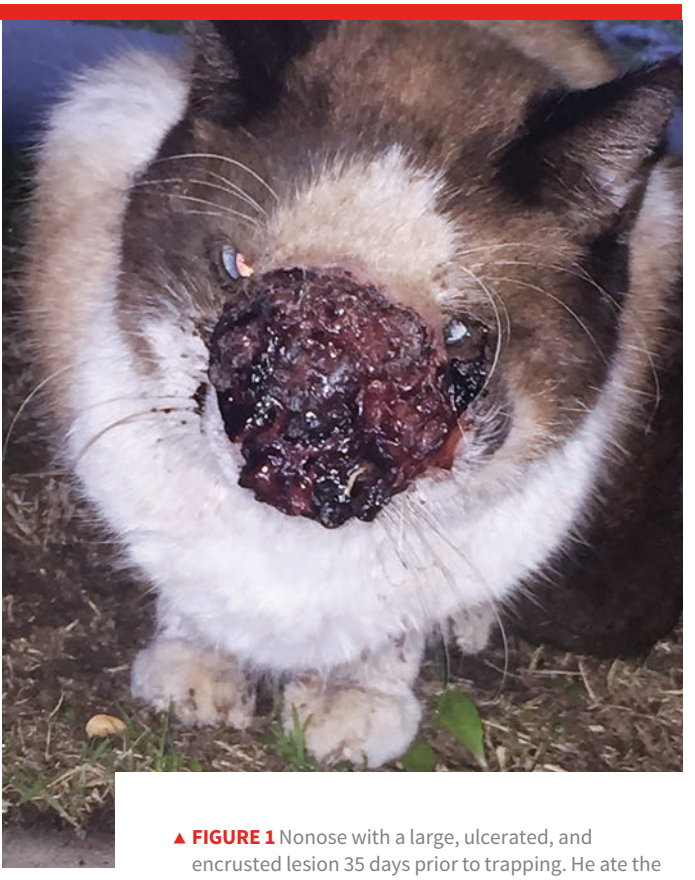
Progressive Facial Lesion in a Community Cat

Sarah Steen, DVM
Critters Without Litters
Bakersfield, California

Lisa M. Pohlman, DVM, MS, DACVP
Kansas State University



▲ **FIGURE 1** Nonose with a large, ulcerated, and encrusted lesion 35 days prior to trapping. He ate the provided food but would not enter the trap for food at the time this photograph was taken. *Photo courtesy of Frankie Cowan*

Nonose, an intact male community cat in Bakersfield, California, estimated to be 3 to 5 years of age, had a slowly progressive facial lesion and audible respiratory noise of ≈1 year's duration, based on reports by his community caretakers. The facial lesion was described as alternating between a visibly encrusted (***Figure 1***) or an open bleeding wound (***Figure 2***, next page). According to local community members, Nonose had been in the area for years; he had no known owner, and multiple caretakers provided him food but were never able to handle him. Nonose was trapped and transported to a local clinic to assess the nature and extent of his disease.

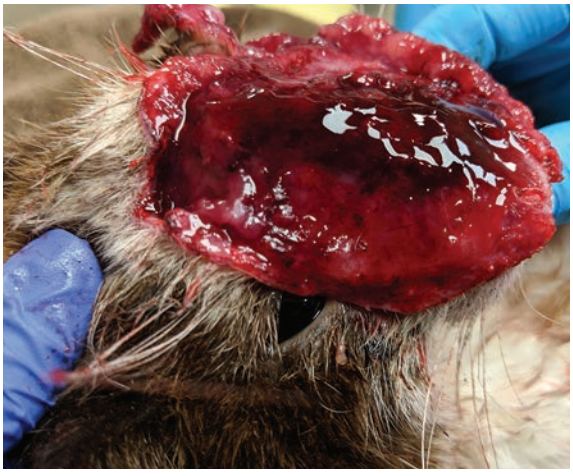
Physical Examination

On visual examination, Nonose was bright and alert, with severe respiratory stertor and subjectively increased inspiratory effort. No open-mouth breathing was noted during transport or at the clinic. He had a large lesion extending from the medial canthi across the forehead to just dorsal to the margin of the upper lips. Within these margins, no normal haired skin, nasal planum, or nares could be identified. He appeared to be visual, and mentation was deemed appropriate.

Diagnosis

Nonose was anesthetized for further examination. The surface of the lesion was characterized by a glistening, serosanguinous, gelatinous material (***Figure 3***, next page), which, when wiped with gauze, revealed exposed bone or cartilage. The full-thickness lesion extended into the mouth and through the upper left lip, creating a hole into the oral cavity (***Figure 2***, next page). The proliferative

▲ **FIGURE 2** Nonose on arrival to the clinic immediately after being trapped. A hole extending into the oral cavity (***arrow***) is visible.



▲ **FIGURE 3** Close view of the gross lesion (forehead left, mouth right). The lesion is obstructing vision of the right eye.

nature of the lesion likely obstructed vision directly in front of the patient. Nasal passages were located after debridement but were composed of exposed nasal bone/cartilage rather than planum. All upper incisors were absent, and the gingiva surrounding all remaining teeth and the hard palate appeared affected with diffuse erythema and small amounts of the gelatinous material (***Figure 4***).

Due to the severity of facial tissue destruction, poor prognosis, and feral nature of the cat, euthanasia was elected. A blood sample was obtained prior to euthanasia for point-of-care FeLV/FIV testing, which was performed immediately after euthanasia and was negative. Multiple impression smears of affected tissue were obtained for cytologic examination (***Figure 5***).

Smears were composed of abundant round to oval-shaped, blue to pink yeast structures 3 to 12 µm in diameter. A thick, clear capsule surrounded the structures, resulting in organisms ≈5 to 20 µm in diameter. Narrow-based budding of the organisms was observed. Among the organisms were large, often vacuolated macrophages that occasionally contained one or more of the yeast structures (***Figure 5***).

DIAGNOSIS:
CRYPTOCOCCOSIS

Discussion

Cryptococcal infections are seen worldwide in various species and, in the United States, are most common in California and the Pacific Northwest.[1] Basidiospores are usually found in soil or avian fecal material; infection often occurs through inhalation but can occur via direct contact of basidiospores in open wounds.[1-3] Incubation can range from a few months to years.[2]

Although assays to determine species were not performed in this patient, most cats in California that have cryptococcosis are infected by *Cryptococcus gattii* VGIII, with relatively fewer infections

being due to *C gattii* VGII.[1] *C neoformans* var *grubii* is the most common cause of cryptococcosis in dogs and humans; in the United States, cats are rarely infected with this species.[1]

In cats, cryptococcosis is generally chronic and often presents as mucosal lesions in the nasal cavity, regardless of the primary site of entry/infection of the basidiospores.[1-3] The glistening, serosanguinous gelatinous nature of the mass observed in this patient is a characteristic feature of cryptococcosis and a reflection of the presence of the polysaccharide capsule.[1,2] Meningoencephalitis, cerebral granulomas, chorioretinitis, optic neuritis, uveitis, and other lesions may also be observed.[2,3]

Pathogenesis of disease and success of treatment are dependent on the type and extent of infection, host immunity, and strain of *Cryptococcus* spp involved.[1-3] Fungal culture is recommended, as a long course of therapy is required to resolve infection, and antifungal resistance is common.[1-3] Antifungals commonly selected for feline therapy include fluconazole (10 mg/kg PO every 12 hours) and itraconazole (5-10 mg/kg PO every 24 hours).

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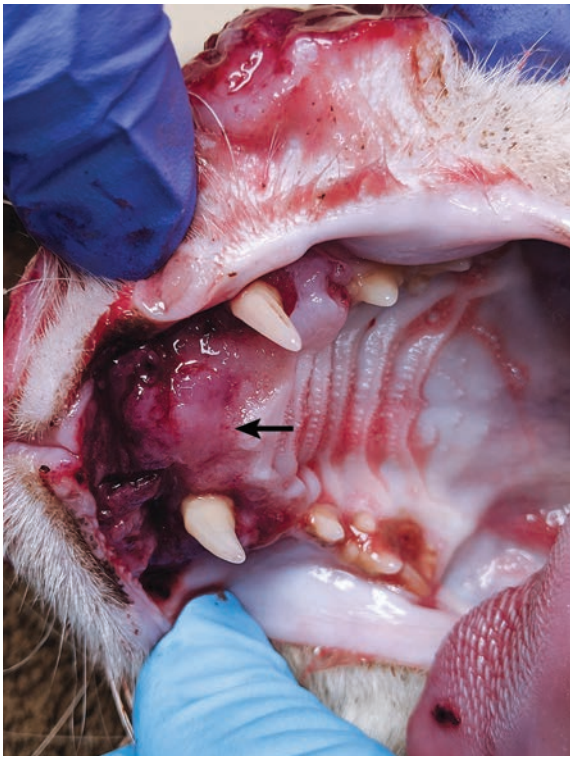
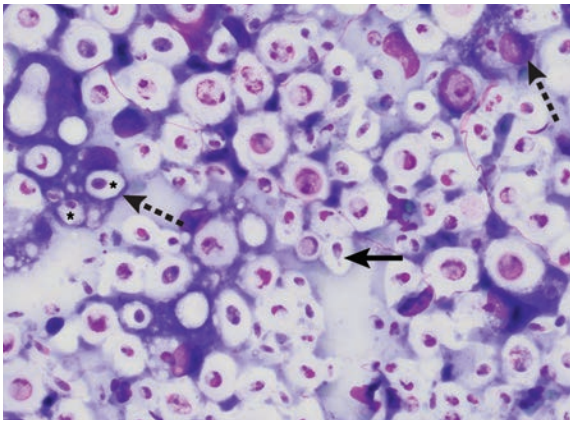


▲ **FIGURE 4** Image of the oral cavity. The lesion extends into the mouth. The absence of all upper incisors can be noted, and the rostral hard palate is affected (***arrow***).

TREATMENT AT A GLANCE

- Culture and susceptibility testing is recommended prior to initiating treatment and can help guide selection of appropriate antifungal therapy and provide prognostic information.[2]
- Azoles are the treatment of choice, with fluconazole and itraconazole most commonly used in cats.[3]
- Surgical excision and/or debulking may help decrease the required duration of antifungal therapy and increase the chance for infection resolution, although lesion location may hinder the ability of these to be performed.[2]
- Treatment should be continued until clinical signs are no longer present and fungal antigen titers are 0.[1,3]
- Antifungal therapy duration ranges from 2 to 18 months, with an average duration of 4 to 6 months.[1,2]



▲ **FIGURE 5** Impression smear of the nasal lesion. Narrow-based budding of the yeast organisms can be seen (***solid arrow***). Macrophages (***dashed arrows***) that occasionally contained one or more of the yeast structures (***asterisks***) are present.

Fluconazole is the initial antifungal agent of choice due to its good tissue penetration in the brain, eyes, and urinary tract and its relatively low cost. If the patient fails to respond to fluconazole therapy, as is often seen with *C gattii* infections, itraconazole may help achieve remission; however, multimodal therapy, including amphotericin B and 5-flucytosine, may be required in severe disseminated cases. Serial laboratory monitoring of liver enzymes is recommended, as liver toxicity is possible with azole therapy (see ***Treatment at a Glance***, previous page).[1-3]

Once cryptococcosis is diagnosed, a discussion should be held with the owner regarding the cost of long-term medication and laboratory monitoring, the importance of owner and patient compliance for long-term oral therapy, and the potential for disease recurrence, particularly if compliance is poor. A committed owner and a compliant patient are essential for a successful outcome.

Treatment success can be gauged by reduction in both clinical signs and serum antigen titers (at least one dilution per month of treatment); treatment should be continued until the antigen titer is 0.[1-3] Continued antigen titer monitoring after resolution of disease at 3- to 6-month intervals is recommended, as early detection of relapse can lead to shorter duration of repeat treatment (see ***Take-Home Messages***).[2]

TAKE-HOME MESSAGES

- In the clinical setting, cytology is often used to make an initial diagnosis of cryptococcosis.[1-3]
- Although cryptococcosis in humans is more common in immunocompromised patients, FeLV/FIV status in cats does not appear to play a role in susceptibility to *Cryptococcus* spp. However, coinfection with FIV/FeLV may impact response to therapy and patient prognosis.[1-3]
- Cryptococcosis can develop after inhalation of basidiospores from the environment[2,3]; infected patients are considered noncontagious.
- Young adult cats appear to be at increased risk for infection, with the median age of infected cats being 6 years[1]; cats of all ages may be affected.
- Treatment can be successful, but owner and patient compliance, as well as duration of therapy and resulting financial requirements, may inhibit success.[1]
- With appropriate treatment, nasal and cutaneous diseases may have a good prognosis. If CNS or ocular disease is present, treatment is generally less effective.[4]

References

1. Sykes JE, Malik R. Cryptococcosis. In: Sykes JE, ed. *Canine and Feline Infectious Diseases*. St. Louis, MO: Elsevier Saunders; 2014:599-611.
2. Sykes JE, Malik R. Cryptococcosis. In: Greene CE, ed. *Infectious Diseases of the Dog and Cat*. 4th ed. St. Louis, MO: Elsevier Saunders; 2012:621-634.
3. Pohlman LM, Chengappa MM. Yeasts – cryptococcus, *Malassezia*, and *Candida*. In: McVey DS, Kennedy M, Chengappa MM, eds. *Veterinary Microbiology*. 3rd ed. Ames, IA: Wiley-Blackwell; 2013:313-317.
4. Lappin MR. Polysystemic mycotic infections. In: Nelson RW, Couto CG, eds. *Small Animal Internal Medicine*. 4th ed. St. Louis, MO: Mosby Elsevier; 2009:1354-1356.

2x THE DURATION OF MONTHLY PRODUCTS

Reduce her anxiety with protection that lasts twice as long.

Longer-lasting, broad-spectrum parasite protection can mean less stress on felines and better compliance.[1-3] Recommend BRAVECTO® PLUS (fluralaner and moxidectin topical solution) for Cats with **2x the duration of REVOLUTION® PLUS (selamectin and sarolaner topical solution) for Cats.**

fleas ticks heartworm roundworms hookworms

For information, visit BravoVets.com/Plus.

1 Lavan RP et al. *Parasites & Vectors*. 2017;10:284.
2 Lavan RP et al. *Parasites & Vectors*. 2018;11:581.
3 Brakke Consulting. *The US Flea Control and Heartworm Markets*. 2018:6-7.

IMPORTANT SAFETY INFORMATION: The most commonly reported adverse reactions include vomiting, hair loss, itching, diarrhea, lethargy, dry skin, elevated ALT, and hypersalivation. BRAVECTO PLUS has not been shown to be effective for 2 months duration in kittens less than 6 months of age. For topical use only. Avoid oral ingestion. The safety of BRAVECTO PLUS has not been established in breeding, pregnant and lactating cats. Fluralaner is a member of the isoxazoline class. This class has been associated with neurologic adverse reactions including tremors, ataxia, and seizures. Neurologic adverse reactions have been reported in cats receiving isoxazoline class drugs, even in cats without a history of neurologic disorders. Use with caution in cats with a history of neurologic disorders. Use with caution in cats that are heartworm positive. The effectiveness of BRAVECTO PLUS to prevent heartworm disease after bathing or water immersion has not been evaluated.

See page 16 for product information summary.

BRAVECTO® PLUS

(fluralaner and moxidectin topical solution) for Cats

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

Description:
Each tube is formulated to provide a minimum dose of 18.2 mg/lb (40 mg/kg) fluralaner and 0.9 mg/lb (2 mg/kg) moxidectin. Each milliliter contains 280 mg of fluralaner and 14 mg of moxidectin.

The chemical name of fluralaner is (±)-4-[5-(3,5-dichlorophenyl)-5-(trifluoromethyl)- 4,5-dihydroisoxazol-3-yl]-2-methyl-N-[2-oxo-2-(2,2,2- trifluoroethylamino)ethyl]benzamide. The chemical name of moxidectin is (2aE,4E,5'R, 6R,6'S,8E,11R,13S,15S,17aR, 20R,20aR,20bS)-6'-[(E)-1,3-Dimethyl-1-butenyl]-5',6,6',7,10,11, 14,15,17a,20,20a,20b-dodecahydro-20,20b-dihydroxy-5',6,8,19-tetramethylspiro[11,15-methano-2H,13H,17H-furo[4,3,2-pq][2,6] benzodioxacyclooctadecin-13,2'-[2H]pyran]-4',17(3'H)-dione 4'-(E)-(O-methyloxime). Inactive ingredients: dimethylacetamide, glycofurol, diethyltoluamide, acetone, butylhydroxytoluene

Indications:
Bravecto Plus is indicated for the prevention of heartworm disease caused by *Dirofilaria immitis* and for the treatment of infections with intestinal roundworm (*Toxocara cati*; 4th stage larvae, immature adults and adults) and hookworm (*Ancylostoma tubaeforme*; 4th stage larvae, immature adults and adults). Bravecto Plus 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) and *Dermacentor variabilis* (American dog tick)] for 2 months in cats and kittens 6 months of age and older and weighing 2.6 lb or greater.

Dosage and Administration:
Bravecto Plus should be administered topically as a single dose every 2 months according to the **Dosage Schedule** below to provide a minimum dose of 18.2 mg/lb (40 mg/kg) fluralaner and 0.9 mg/lb (2 mg/kg) moxidectin.

For prevention of heartworm disease, Bravecto Plus should be administered at 2-month intervals. Bravecto Plus may be administered year-round without interruption or at a minimum should be administered at 2-month intervals beginning at the cat's first seasonal exposure to mosquitoes and continuing until the cat's last seasonal exposure to mosquitoes. If a dose is missed and a 2-month interval between doses is exceeded, administer Bravecto Plus immediately and resume the dosing every 2 months.

When replacing a monthly heartworm preventative product, the first dose of Bravecto Plus should be given within one month of the last dose of the former medication.

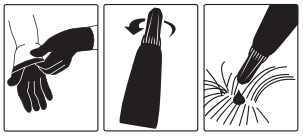
Dosing Schedule:

Body Weight Ranges (lb)	Fluralaner content (mg/tube)	Moxidectin content (mg/tube)	Tubes Administered
2.6 – 6.2	112.5	5.6	One
>6.2 – 13.8	250	12.5	One
>13.8 – 27.5*	500	25	One

* Cats over 27.5 lb should be administered the appropriate combination of tubes.

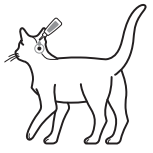
A veterinarian or veterinary technician should demonstrate or instruct the pet owner regarding the appropriate technique for applying Bravecto Plus topically to cats prior to first use.

Step 1: Immediately before use, open the pouch and remove the tube. Put on gloves. Hold the tube at the crimped end with the cap in an upright position (tip up). The cap should be rotated clockwise or counter clockwise one full turn. The cap is designed to stay on the tube for dosing and should not be removed. The tube is open and ready for application when a breaking of the seal is felt.



Step 2: The cat should be standing or lying with its back horizontal during application. Part the fur at the administration site. Place the tube tip vertically against the skin at the base of the skull of the cat.

Step 3: Squeeze the tube and gently apply the entire contents of Bravecto Plus directly to the skin at the base of the skull of the cat. Avoid applying an excessive amount of solution that could cause some of the solution to run and drip off of the cat. If a second spot is needed to avoid run off, then apply the second spot slightly behind the first spot.



Greasy, oily, or wet appearance may occur at the application site in some cats.

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

WARNINGS:

Human Warnings:
Not for human use. Keep this and all drugs out of the reach of children.

Do not contact or allow children to contact the application site until 2 hours post application.

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, then flush eyes slowly and gently with water. **If wearing contact lenses, eyes should be rinsed first, then remove contact lenses and continue rinsing, then seek medical advice immediately. Wash hands and contacted skin thoroughly with soap and water immediately after use of the product. If the product accidentally contacts skin and a sticky residue persists after washing, rubbing alcohol (70% isopropyl alcohol) can be applied to the area to remove the residue.**

The product is highly flammable. Keep away from heat, sparks, open flame or other sources of ignition.

Precautions:
For topical use only. Avoid oral ingestion (see **Animal Safety**).

Fluralaner, one of the ingredients in Bravecto Plus, is a member of the isoxazoline class. This class has been associated with neurologic adverse reactions including tremors, ataxia, and seizures. Neurologic adverse reactions have been reported in cats receiving isoxazoline class drugs, even in cats without a history of neurologic disorders. Use with caution in cats with a history of neurologic disorders.

Use with caution in cats that are heartworm positive (see **Animal Safety**).

Bravecto Plus has not been shown to be effective in kittens less than 6 months of age.

The safety of Bravecto Plus has not been established in breeding, pregnant, and lactating cats.

The effectiveness of Bravecto Plus to prevent heartworm disease after bathing or water immersion has not been evaluated.

Adverse Reactions:
In a well-controlled U.S. field study, which included a total of 176 treated cats (135 with Bravecto Plus and 41 with a monthly topical active control), there were no serious adverse reactions.

Percentage of Cats with Adverse Reactions (AR) in the Field Study

Adverse Reaction	Bravecto Plus Group: Percent of Cats with the AR During the 120-Day Study (n=135 cats)	Active Control Group: Percent of Cats with the AR During the 120-Day Study (n=41 cats)
Vomiting	5.9%	12.2%
Alopecia (not at application site)	5.2%	2.4%
Pruritus	4.4%	12.2%
Application site pruritus	4.4%	4.9%
Diarrhea	3.7%	7.3%
Lethargy	3.7%	9.8%
Dry Skin	3.0%	0.0%
Elevated alanine aminotransferase (ALT)*	3.0%	0.0%
Hypersalivation	1.5%	1.5%
Application site alopecia	0.7%	0.0%

*ALT was greater than twice the upper reference range of 100 IU/L. These cats also had mild elevations of aspartate aminotransferase (AST) (less than twice the upper reference range of 100 IU/L). No clinical signs associated with liver disease were noted in these cats.

In well-controlled laboratory effectiveness studies, the following adverse reactions were seen after application of Bravecto Plus: pyrexia, tachypnea, mydriasis, pruritus, scabbing, and bloody stool.

Foreign Market Experience: The following adverse events were reported voluntarily during post-approval use of the product in cats in foreign markets: polydipsia, swelling of chin and lips, periorbital swelling, blepharospasm, pruritus, erythema, aggression, agitation, pyrexia, mydriasis, hypersalivation, hyperactivity, alopecia, and excessive grooming. These adverse events occurred within 48 hours of administration.

In a European field study for fluralaner topical solution for cats, there were three reports of facial dermatitis in humans after close contact with the application site which occurred within 4 days of application. In foreign market experience reports for Bravecto Plus, one veterinarian experienced tingling and numbness of the fingers, hand, and arm, and swelling of the hand and arm after getting Bravecto Plus on her fingers. Additional signs, including blurred vision and disorientation, occurred after taking an antihistamine.

To report suspected adverse events, for technical assistance or to obtain a copy of the Safety Data Sheet (SDS), contact Merck Animal Health at 1-800-224-5318. Additional information can be found at www.bravecto.com. For additional information about adverse drug experience reporting for animal drugs, contact FDA at 1-888-FDA-VETS or online at http://www.fda.gov/reportanimalae.

Clinical Pharmacology:
Peak fluralaner concentrations are achieved between 3 and 21 days following topical administration and the elimination half-life ranges between 11 and 18 days. Peak moxidectin concentrations are achieved between 1 and 5 days following topical administration and the elimination half-life ranges between 20 and 30 days.

Mode of Action:
Fluralaner is for systemic use and belongs to the class of isoxazoline-substituted benzamide derivatives. Fluralaner is an inhibitor of the arthropod nervous system. The mode of action of fluralaner is the antagonism of the ligand-gated chloride channels (gamma-aminobutyric acid (GABA)-receptor and glutamate-receptor).

Moxidectin is for systemic use and is a semisynthetic derivative of nemadectin, belonging to the milbemycin group of macrocyclic lactones. It binds to gamma-aminobutyric acid (GABA) and glutamate-gated chloride channels of the nerves and muscles of the parasite resulting in hyperpolarization, paralysis and death.

Effectiveness:
In two well-controlled laboratory studies, Bravecto Plus was 100% effective against induced heartworm infections when administered 2 months prior to infection. Bravecto Plus was not effective when administered more than 2 months prior to infection.

In well-controlled laboratory studies, Bravecto Plus was effective against naturally and experimentally induced adult and experimentally induced 4th stage larval and immature adult *Toxocara cati* and *Ancylostoma tubaeforme* infections in cats.

In a well-controlled laboratory study, Bravecto Plus killed 100% of fleas within 12 hours after treatment and reduced the numbers of live fleas on cats by >99% within 12 hours after treatment or infestation for 2 months. In well-controlled laboratory studies, Bravecto Plus demonstrated >90% effectiveness against *Dermacentor variabilis* 48 hours after treatment or infestation for 2 months but failed to demonstrate ≥ 90% effectiveness beyond 2 months. In well-controlled laboratory studies, Bravecto Plus demonstrated ≥ 98.1% effectiveness against *Ixodes scapularis* 48 hours after treatment or infestation for 2 months.

Animal Safety:
Margin of Safety Study: In a margin of safety study, Bravecto Plus was administered topically to 9- to 13-week-old (mean age 12 weeks) kittens at 1X, 3X, and 5X the maximum labeled dose of 93.0 mg fluralaner/kg and 4.7 mg moxidectin/kg at three, 8-week intervals (10 kittens per group). The kittens in the control group (0X) were treated with mineral oil. There were no clinically-relevant, treatment-related effects on physical examination, body weights, food consumption, clinical pathology (hematology, clinical chemistries, coagulation tests, serum amyloid A, and urinalysis), gross pathology, histopathology, or organ weights. Single incidences of self-limiting hypersalivation in three kittens (one kitten in the 1X group and two kittens in the 3X group) and pruritus at the administration site in one kitten in the 3X group were observed on the day of dose administration. Cosmetic changes at the application site included matting/clumping/spiking of hair, wetness, or a greasy appearance.

Oral Safety Studies: In an oral safety study, one dose of Bravecto Plus was administered orally to 4- to 9-month-old kittens at the maximum labeled dose of 93.0 mg fluralaner/kg and 4.7 mg moxidectin/kg. The kittens in the control group were administered saline orally. There were no clinically-relevant, treatment-related effects on physical examination, body weights, food consumption, or clinical pathology (hematology, clinical chemistries, coagulation tests, serum amyloid A, and urinalysis). Five of six treated kittens experienced hypersalivation. One treated kitten experienced vomiting 2 hours after administration and another 8 hours after treatment. Treated kittens had reduced food consumption on the day of treatment.

In an oral safety study for fluralaner topical solution for cats, four out of six cats experienced coughing immediately after oral administration of the maximum labeled dose of 93.0 mg fluralaner/kg.

In a pilot oral safety study, adult cats orally administered 0.5X or 1X the maximum labeled dose of Bravecto Plus had foaming hypersalivation for up to five minutes and reduced food consumption on the day of dosing. One cat exhibited transient lacrimation from one eye during the first 15 minutes after dosing.

Safety in cats infected with adult heartworm (Dirofilaria immitis): Bravecto Plus was administered topically to cats infected with adult heartworm at 1X or 3X the maximum labeled dose of 93.0 mg fluralaner/kg and 4.7 mg moxidectin/kg (8 cats per group). The cats in the control group (0X) received mineral oil topically. Two untreated cats were found dead prior to dosing. There were no clinically-relevant, treatment-related effects on body weights, clinical pathology (hematology, clinical chemistry, and coagulation profile), gross pathology or histopathology. Self-limiting hypersalivation due to grooming was observed on the day of treatment in both treatment groups (6/8 cats in the 1X group and 7/8 cats in the 3X group). In addition, three treated cats (2/8 cats in the 1X group and 1/8 cats in the 3X group) developed adverse neurologic signs during the study and were euthanized due to quality-of-life concerns. Clinical signs in one cat in the 1X group included vomiting, depression, vocalization, and ataxia 38 days that included ataxia, paresis, and muscle tremors 25 days after dosing. A cat in the 3X group exhibited depression, dehydration, a hunched position, and inability to stand 22 days after dosing. Heartworms were found in the epidural space in the second cat of the 1X group and the cat in the 3X group.

Field Safety Study: In a well-controlled field study, Bravecto Plus was used concurrently with other medications, such as vaccines, anthelmintics, antibiotics and steroids. No adverse reactions were observed from the concurrent use of Bravecto Plus with other medications.

Storage Conditions:
Do not store above 77°F (25°C). Store in the original package in order to protect from moisture. The pouch should only be opened immediately prior to use.

How Supplied:
Bravecto Plus is available in three tube sizes to treat cats ranging in weight from 2.6 lb – 27.5 lb (1.2 kg to 12.5 kg). Each tube is packaged individually in a pouch. Product may be supplied in 1 or 2 tubes per carton.

Approved by FDA under NADA # 141-518

Rev: 08/2019

MERCK Animal Health

Cloudy Eye in a Labrador Retriever

Mary Rebecca Telle, DVM*
Gillian J. McLellan, BVMS, PhD, DECVO, DACVO
University of Wisconsin–Madison

THE CASE

A 7-year-old spayed Labrador retriever crossbreed is presented for a 5-day history of an intermittently red, cloudy left eye. The owner states that the patient had previously been diagnosed with allergic conjunctivitis and has had intermittent flare-ups. The patient has reportedly been coughing for 3 days and, although still eating and drinking, her appetite is decreased. Her BCS is 7/9, which is consistent with previous visits.

On general physical examination, mild mandibular lymphadenopathy, moderate dental tartar, rectal temperature of 103.8ºF (39.9ºC), and a tense abdomen on palpation were noted. An initial ophthalmologic examination of the left eye reveals blepharospasm; absent menace response; questionable dazzle reflex; a fixed, mid-range pupil with subtle dyscoria and no apparent direct pupillary light reflex or consensual pupillary light reflex from the left to the right eye; pronounced episcleral injection and conjunctival hyperemia; mild edema, and suspected moderate aqueous flare (***Figure 1***, next page). Although a tapetal reflex is visible, the fundus in the left eye cannot be visualized by indirect or direct ophthalmoscopy. The right eye appears normal.

What are your next steps?

*Byline reflects affiliation on original publication. On publication in January 2020, the author's current affiliation is Mississippi State University.

IOP = intraocular pressure
STT = Schirmer tear test

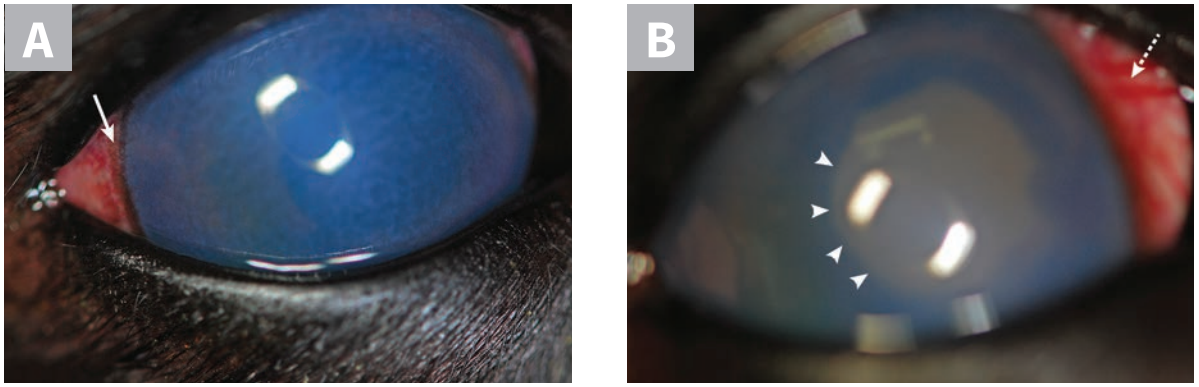
THE CHOICE IS YOURS ...

CASE ROUTE 1

To recommend a more in-depth ophthalmologic examination, including detailed examination of both eyes, Schirmer tear test (STT), fluorescein staining, tonometry, and gonioscopy, based on suspicion of primary glaucoma, and refer the case to an ophthalmologist, go to page 18.

CASE ROUTE 2

To recommend measuring intraocular pressure (IOP) and a systemic diagnostic investigation, including CBC, serum chemistry profile, and chest radiography, based on suspicion of uveitis and secondary glaucoma, go to page 21.



▲ **FIGURE 1** The affected eye showing (***A***) pronounced conjunctival hyperemia (***arrow***) and moderate-to-severe corneal edema, as well as (***B***) episcleral injection (***dashed arrow***) and a mid-sized pupil with slight dyscoria (***arrowheads***)

CASE ROUTE 1

You recommend a more in-depth ophthalmologic examination, including detailed examination of both eyes, STT, fluorescein staining, tonometry, and gonioscopy, based on suspicion of primary glaucoma, and refer the case to an ophthalmologist.

Case Progression

The case was referred to a board-certified ophthalmologist. On further ophthalmologic examination, the right eye appears normal with an intact menace response, dazzle reflex, and a normal-sized pupil with positive direct pupillary light reflex but absent consensual pupillary light reflex from right to left. Indirect ophthalmoscopy of the right eye reveals a small, well-demarcated, circular, hyper-reflective lesion in the peripheral tapetum, most consistent with an inactive chorioretinal scar.

STT readings are >15 mm/min and fluorescein staining is negative in both eyes. Tonometry reveals an IOP of 18 mm Hg in the right eye and 57 mm Hg in the left eye (normal, 10-25 mm Hg with <20% difference in IOP between eyes). Evaluation of the iridocorneal angle (via gonioscopy) of the unaffected eye is performed by gently touching an indirect ophthalmoscopic lens on the axial cornea after applying a topical anesthetic and looking through the lens at the point of contact. Evaluation reveals a narrow iridocorneal angle, which indicates pectinate ligament dysplasia. Based on these findings, one drop of a topical prostaglandin analog (latanoprost 0.005% ophthalmic solution) is administered in the left eye, and the patient is admitted to the clinic for a few hours to monitor for a drop in IOP.

Clinical Considerations

Based on signalment and clinical findings, including evidence of pectinate ligament dysplasia in the unaffected eye, primary angle closure glaucoma is an important differential diagnosis in this case. Other important differentials to consider for a red, cloudy, painful eye include keratoconjunctivitis sicca, corneal ulceration, and uveitis, the latter potentially with secondary glaucoma. Keratoconjunctivitis sicca and corneal ulceration as underlying causes were ruled out, and because the aqueous flare is mild, the uveitis and IOP are likely attributable to primary glaucoma rather than a systemic cause.

Glaucoma is a leading cause of blindness in dogs, with goniodysgenesis-related primary angle closure glaucoma (PACG) being the most common of the primary glaucomas.[1-4] Goniodysgenesis refers to abnormal architecture of the iridocorneal angle that contributes to obstruction of outflow of aqueous humor. This abnormality is believed to have an underlying genetic component[1-3] and is seen with relatively high prevalence in purebred dogs, including American Cocker spaniels, basset hounds, Siberian huskies, chow chows, and Boston terriers, among others.[1]

PACG typically manifests as an acutely painful eye with increased IOP and blindness. Some breeds (eg, basset hounds) also have significant anterior uveitis and corneal edema associated with an acute attack, which can be clinically confusing and may complicate treatment.[5] Although canine glaucoma is generally associated with elevated IOP (≥50 mm Hg), IOP may fluctuate widely in glaucoma and may in fact be within or lower than the normal range at the time of presentation. This may especially be true of chronic disease involving pressure damage to the ciliary body's production of aqueous humor or in patients with significant intraocular inflammation, which also can have a negative impact on aqueous humor production.

Prognosis for vision and globe retention is dependent on quick recognition of clinical signs and prompt treatment to decrease IOP, as just a few hours of pronounced IOP elevation can result in blindness. In general practice settings, medical management is the safest and most accessible way to decrease IOP. Prostaglandin analog (eg, latanoprost) therapy, typically coadministered with topical carbonic anhydrase inhibitors (eg, dorzolamide), is the most effective medical therapy for PACG in dogs.[6] β-blockers (eg, timolol) also reduce IOP but, when administered alone, their IOP-lowering effect is insufficient[7]; thus, they should be reserved for prophylactic or adjunctive therapies. Systemic hyperosmotics (eg, intravenous mannitol, oral glycerol) may also be used for marked IOP reduction[6,8] but should be used with caution and only after routine blood work (eg, renal values, electrolytes), especially in older or debilitated animals or animals with cardiovascular disease (see ***Table***). Surgical interventions in acute cases are typically reserved for patients with a fair-to-good prognosis for vision. These procedures should be performed by a board-certified veterinary ophthalmologist and may include gonioimplants, cyclophotocoagulation (transcleral laser or endolaser), and/or aqueocentesis.

Outcome

Approximately an hour after administering latanoprost, the patient's IOP has decreased to 28 mm Hg and the pupil is miotic. The patient appears more comfortable, and corneal edema is subjectively reduced but vision is still questionable. The patient is discharged on latanoprost (1 drop in the left eye q12h), prednisolone acetate 1% (1 drop in the left eye q12h), and dorzolamide (1 drop in the left eye q8h).

Continues ▶

TABLE

To view a table showing commonly used glaucoma drugs, go to **cliniciansbrief.com/article/top-5-glaucoma-drugs** or scan the QR code.

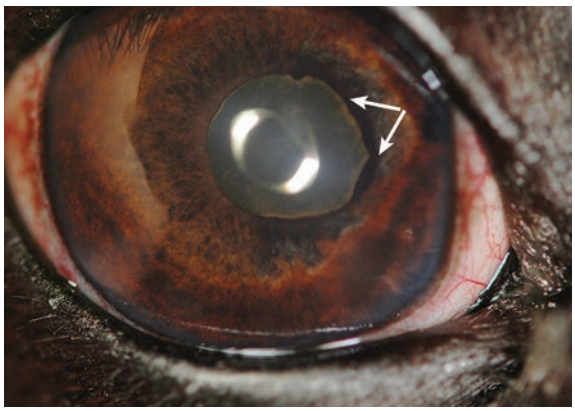
Using QR codes from your mobile device is easy and quick!

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.

IOP = intraocular pressure
PACG = primary angle closure glaucoma
STT = Schirmer tear test

On recheck examination in one week, the patient's blepharospasm, anterior uveitis, corneal edema, and episcleral injection have significantly improved in the left eye (***Figure 2***); however, dyscoria and pigment dispersion are present, along with an inconsistent menace response and posterior synechiae. On tonometry, IOP is 13 mm Hg OS and 11 mm Hg OD, but the optic nerve head looks dark in the left eye on indirect ophthalmoscopy, likely indicating loss of myelin due to damage from the elevated IOP.

The patient is discharged with instructions to continue latanoprost twice daily in the left eye, start timolol twice daily in the right eye for prophylaxis, and taper prednisolone acetate over 1 week in the left eye. In addition to recommending IOP checks every few months, you recommend ongoing evaluation by a veterinary ophthalmologist to monitor primary glaucoma and assess risk to the other eye, through specialized tests and expertise (eg, confirmation of gonioscopic findings, high-resolution ultrasonography).[4]



▲ **FIGURE 2** Corneal edema and episcleral injection have improved. Dyscoria and posterior synechiae are still present (***arrows***).

Your Choice's Implications

Immediate medical intervention for PACG was implemented to control IOP; the eye was comfortable and vision was restored, although menace response was inconsistent. Although medical therapy may be initially effective at lowering IOP, most cases stop responding to medications because the outflow eventually becomes impaired,[9] so most PACG patients ultimately require some form of surgical management, including possible enucleation for irreversibly blind, painful eyes.

Of importance, serious systemic illnesses, including infectious disease and neoplasia, were not considered despite the history of inappetence and lethargy, coughing, and presence of chorioretinal scarring in the right eye. If the patient had secondary glaucoma from uveitis instead of PACG, she could have had a treatable but serious underlying illness that could progress over the week until recheck. In addition, without treatment of the underlying cause of uveitis, the uveitis and secondary changes in the eye could have worsened and affected the other eye, greatly affecting the prognosis for vision, globe retention, and life.

Most primary angle closure glaucoma patients ultimately require some form of surgical management, including possible enucleation for irreversibly blind, painful eyes.

CASE ROUTE 2

You recommend measuring intraocular pressure (IOP) and a systemic diagnostic investigation, including CBC, serum chemistry profile, and chest radiography, based on suspicion of uveitis and secondary glaucoma from the apparent dyscoria, aqueous flare, episcleral injection, and systemic clinical signs.

Case Progression

Tonometry reveals IOP of 18 mm Hg in the right eye and 57 mm Hg in the left eye (normal, 10-25 mm Hg with <20% difference in IOP between eyes). CBC reveals a stress leukogram and mildly elevated hematocrit but is otherwise unremarkable. Serum chemistry profile reveals mildly elevated total protein and mild hypokalemia but is otherwise within normal limits. Thoracic radiographs reveal a mildly diffuse generalized bronchial lung pattern indicative of bronchitis. A SNAP 4Dx Plus test (idexx.com) is negative for *Dirofilaria immitis*, *Anaplasma* spp, *Borrelia burgdorferi*, and *Ehrlichia* spp. Based on geographic location, fungal disease testing may be appropriate. Urine antigen testing for blastomycosis is elected.

Although the diagnostic investigation did not identify an underlying cause for the uveitis, an IOP of 57 mm Hg confirms the suspicion of glaucoma, and the patient is sent home on a topical carbonic anhydrase inhibitor (ie, dorzolamide q8h in the left eye), prednisolone acetate 1% (q6h in the left eye), and oral carprofen (2.2 mg/kg PO q12h). Although the SNAP 4Dx test results are negative, prescribed doxycycline (5 mg/kg PO q12h for 4 weeks) was prescribed empirically for other potential tick-borne diseases.

Clinical Considerations

Based on findings from physical and ophthalmologic examination (ie, lethargy, coughing, inappetence, significant aqueous flare with corneal edema), uveitis with secondary glaucoma is an important differential diagnosis, along with keratoconjunctivitis sicca, corneal ulceration, and uveitis (potentially with secondary glaucoma).

Although there are many causes of secondary glaucoma in dogs, the most common are lens-induced uveitis in dogs with cataract, primary lens luxation, infectious or immune-mediated uveitis, and neoplastic disease.[10] Ocular signs associated with systemic infectious (particularly tick-borne disease) or neoplastic diseases may be unilateral or bilateral and are sometimes present with no other clinical signs. Thus, treatment with doxycycline in this case was a reasonable and safe choice in the event a tick-borne illness was contributing to uveitis. Infectious causes of uveitis may be regional (eg, tick-borne or fungal disease). Signalment may also be important when determining risk for certain immune-mediated diseases.

Prognosis for vision and globe retention with secondary glaucoma is greatly dependent on prompt lowering of IOP and aggressive treatment of uveitis, including identification and treatment of possible underlying infectious or neoplastic causes. It is important to recognize the mechanism responsible for IOP elevation in all cases of secondary glaucoma. Certain medications (eg, latanoprost) that intensify miosis could actually worsen IOP

Infectious causes of uveitis may be regional (eg, tick-borne or fungal disease).

IOP = intraocular pressure
PACG = primary angle closure glaucoma
OD = right eye
OS = left eye

elevation in conditions such as primary lens luxation (common in terrier breeds[11]), in which the primary mechanism of IOP elevation is a pupil block. Because uveitic glaucoma can be caused by cell infiltrates and debris obstructing the iridocorneal drainage angle and/or pupillary block from synechiae, adequate control of intraocular inflammation is imperative. This can typically be achieved by high-dosing frequency of topical corticosteroids (up to q4-6h) if the patient's cornea is fluorescein-stain negative with no ulceration and/or NSAIDs (up to q6h). If a thorough diagnostic investigation, including blood work to evaluate kidney values, has been performed, oral NSAIDs may be beneficial, particularly if there is posterior segment involvement. Oral corticosteroids may also be used in some cases but may not be recommended if all potential infectious and neoplastic causes have not been investigated and excluded. Topical carbonic anhydrase inhibitors (eg, dorzolamide) decrease aqueous humor production and are the treatment of choice for adequate control of IOP in these cases. Surgical treatments such as cyclophotocoagulation and gonioimplants may be performed by a veterinary ophthalmologist but tend to have poorer outcomes than in primary glaucoma patients because of underlying inflammation.

Because the underlying causes and secondary ocular effects of uveitis may be difficult to treat, the prognosis for vison and globe retention in uveitic glaucoma is guarded, particularly in chronic cases. Consultation with a veterinary ophthalmologist is strongly recommended.

Outcome

At the one-week recheck, the patient is slightly improved clinically, with subjective improvement in comfort, and is eating again. In the left eye, there is no menace, dazzle, or consensual PLR from left to right eye, and the pupil is fixed and midrange in size. She has trace corneal edema, the episcleral injection is approximately the same, and the owner reports that the eye appears to be "bulging" more. IOP is 47 mm Hg despite treatment with dorzolamide. Results of testing for blastomycosis are negative. Suspicious of primary glaucoma with the resolution of aqueous flare but increased IOP, you recommend referral to a veterinary ophthalmologist. However, the owner declines your recommendation due to financial concerns. In an effort to decrease IOP, a drop of latanoprost is administered in the left eye and the patient is admitted for the day to recheck IOP. Thirty minutes later, IOP is still elevated at 50 mm Hg, and another drop of latanoprost is given. IOP is still elevated at 48 mm Hg 1.5 hours after the initial dose.

Due to the poor prognosis for vision and globe retention, enucleation with histopathology of the affected eye is elected by the owner. By the time of suture removal 2 weeks later, histopathology confirms a diagnosis of goniodysgenesis with severe optic nerve head cupping and ganglion cell loss, consistent with primary angle closure glaucoma (PACG). You start the patient on timolol in the remaining eye (1 drop q12h) and the client is referred for further diagnostics. Treatment with a topical β-blocker in the remaining eye was instituted based on a randomized, prospective study showing that prophylactic treatment of at-risk fellow eyes in dogs diagnosed with PACG with either topical β-blocker or demecarium bromide delayed onset of glaucoma relative to the control group.[7] Recheck of IOP in the remaining eye every 1 to 3 months indefinitely is recommended, and the owner is warned to be vigilant for any signs of redness, cloudiness, squinting, or decreased vision in that eye, as PACG is a bilateral disease and the fellow eye is high risk for developing glaucoma.

Your Choice's Implications

Secondary glaucoma was suspected due to the presence of uveitis, elevated IOP, and other clinical signs on physical examination that suggested possible systemic disease. A thorough uveitis diagnostic investigation was appropriate based on aqueous flare, episcleral injection, systemic clinical signs, and dyscoria, as many of the possible differentials for systemic disease are serious and may warrant immediate intervention. When results were rela-

tively unremarkable, treatment for clinical signs of secondary glaucoma and uveitis was implemented. Ultimately, the patient had PACG, and persistent IOP elevation resulted in loss of the eye. Because IOP fluctuates throughout the day and from day to day,[12,13] one measurement does not provide a complete picture. Thus, rechecking IOP sooner (ie, in 2 to 3 days versus 1 week) may have been helpful in this case by prompting additional therapy; however, given the 5-day duration of clinical signs prior to initial presentation, it may not have significantly impacted eventual outcome.

Many serious systemic illnesses were ruled out in this case by performing a thorough diagnostic investigation. Most importantly, the eye was submitted for histopathologic evaluation to confirm diagnosis of PACG. Histopathologic evaluation of the globe is of utmost importance in glaucoma cases in which owners elect enucleation, as it provides important prognostic information including likelihood of undiagnosed infectious or neoplastic disease, as well as the risk for disease similarly affecting the other eye, thus informing rational treatment planning.

IOP = intraocular pressure
PACG = primary angle closure glaucoma

Conclusion

This case highlights the challenge of determining whether glaucoma is primary or secondary, especially if owners are financially constrained or unable to accept referral. In addition, many cases of PACG exhibit a degree of inflammation and pigment dispersion, which can further complicate the clinical picture. This case illustrates the importance of recognizing that primary glaucoma may be encountered in any breed, including crossbreed dogs.

References

1. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7(2):97-111.
2. Komáromy AM, Petersen-Jones SM. Genetics of canine primary glaucomas. *Vet Clin North Am Small Anim Pract*. 2015;45(6):1159-1182.
3. Bedford PGC. A gonioscopic study of the iridocorneal angle in the English and American breeds of Cocker Spaniel and the Basset Hound. *J Small Anim Pract*. 1977;18(10):631-642.
4. Miller PE, Bentley E. Clinical signs and diagnosis of the canine primary glaucomas. *Vet Clin North Am Small Anim Pract*. 2015;45(6):1183-vi.
5. Reilly CM, Morris R, Dubielzig RR. Canine goniodysgenesis-related glaucoma: a morphologic review of 100 cases looking at inflammation and pigment dispersion. *Vet Ophthalmol*. 2005;8(4):253-258.
6. Scott EM, McLellan GJ. Top 5 glaucoma drugs. *Clinician's Brief*. 2013;11(3)81-83.
7. Miller PE, Schmidt GM, Vainisi SJ, Swanson JF, Herrmann MK. The efficacy of topical prophylactic antiglaucoma therapy in primary closed angle glaucoma in dogs: a multicenter clinical trial. *J Am Anim Hosp Assoc*. 2000; 36(5):431-438.
8. Lorimer DW, Hakanson NE, Pion PD, Merideth RE. The effect of intravenous mannitol or oral glycerol on intraocular pressure in dogs. *Cornell Vet*. 1989;79(3):249-258.
9. Gelatt KN, Gilger BC, Kern TJ, eds. *Veterinary Ophthalmology*. 5th ed. Ames, IA: John Wiley & Sons; 2013.
10. Gelatt KN, MacKay EO. Secondary glaucomas in the dog in North America. *Vet Ophthalmol*. 2004;7(4):245-259.
11. Curtis R. Lens luxation in the dog and cat. *Vet Clin North Am Small Anim Pract*. 1990;20:755-773.
12. Martín-Suárez E, Molleda C, Tardón R, Galán A, Gallardo J, Molleda J. Diurnal variations of central corneal thickness and intraocular pressure in dogs from 8:00am to 8:00pm. *Can Vet J*. 2014;55(4):361-365.
13. Sanchez RF, Veira da Silva MJ, Dawson C. Design of an intraocular pressure curve protocol for use in dogs. *J Small Anim Pract*. 2017;58(1):42-48.

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Cannabis for Pet Pain

Demand for veterinary cannabis products is growing, fueled primarily by pet owners; however, negative bias toward its use as a legitimate medical treatment persists. In the United States, a potential factor in this bias is the increase in cases of tetrahydrocannabinol (THC) toxicity reported to the Animal Poison Control and Pet Poison Hotline since medical marijuana was legalized.

It is important to distinguish between hemp plants and marijuana plants. Hemp plants have far lower levels of THC and have subsequently been favored by veterinarians due to the lower risk for THC toxicity. However, no US states allow veterinarians to prescribe medical cannabis, and many states do not allow veterinarians to recommend over-the-counter, hemp-based products.

Despite this, studies relevant to the practical use of medical cannabis in veterinary medicine continue to be conducted to provide information regarding its safety and efficacy. Colorado State University and Cornell University have performed studies on effective and safe dosing and administration of cannabidiol-dominant cannabis in dogs.[1,2] Both universities are also evaluating the efficacy of cannabis in the treatment of canine osteoarthritis. Colorado State is also evaluating its efficacy in reducing seizure frequency in epileptic dogs. Preliminary results appear favorable, and both studies indicate that nonpsychotropic cannabinoids, particularly cannabidiol, have a wide safety margin with minimal adverse effects (ie, diarrhea, elevated ALP). Additional research evaluating the efficacy of medical cannabis in the treatment of anxiety, canine atopic dermatitis, and feline hypersensitivity dermatitis is underway.

As data continue to expand current knowledge, clinicians should educate themselves about medical cannabis and manufacturers should base recommendations on science rather than anecdotal evidence.—*Cital S**

References

1. Gamble LJ, Boesch JM, Frye CW, et al. Pharmacokinetics, safety, and clinical efficacy of cannabidiol treatment in osteoarthritic dogs. *Front Vet Sci*. 2018;5:165.
2. Bartner LR, McGrath S, Rao S, Hyatt LK, Wittenburg LA. Pharmacokinetics of cannabidiol administered by 3 delivery methods at 2 different dosages to healthy dogs. *Can J Vet Res*. 2018;82(3):178-183.

*Cital S is affiliated with ElleVet Sciences.

Using α_2s to Your Advantage

Dexmedetomidine is widely used for sedation in veterinary medicine but is also labeled for use as an analgesic. Its analgesic effects occur primarily through spinal antinociceptive activity, which inhibits the release of norepinephrine, preventing further transmission of nerve impulses.

A CRI of dexmedetomidine may be used for rough anesthetic recoveries or breakthrough pain; a low-dose CRI can provide sedation and analgesia for very painful or anxious patients. Dexmedetomidine may also be used epidurally, enhancing effects of other epidural agents and acting synergistically with epidural opioids. Transmucosal dexmedetomidine has also been used in cats; although a surgical plane of anesthesia is generally not achieved via this route, it can provide sufficient sedation for physical examinations, blood draws, and IV catheter placement.

Dexmedetomidine has the potential to cause severe bradycardia and hypotension. Patients receiving this drug should be monitored closely, and the drug's use should be reserved for patients in good cardiac health that do not exhibit any exercise intolerance. This class of drugs should not be used in patients that have respiratory or cardiovascular compromise.
—*McNerney T*

NUTRITIONAL NOTES

Finding Hope for Relinquished Cats with Lower Urinary Tract Disease

Rakefet Orobona, DVM

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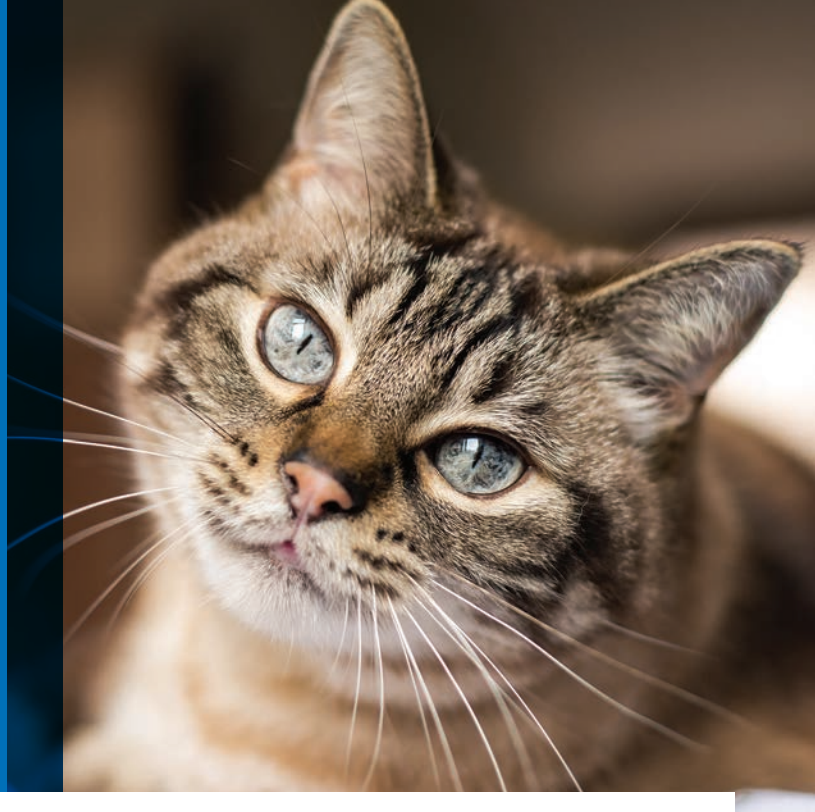

Inappropriate urination is a common problem in cats and a common cause of relinquishment.[1] Many of these patients may have some form of feline lower urinary tract disease (FLUTD), which includes diseases such as feline idiopathic cystitis, bacterial cystitis, and cystic calculi. Dolly was one such patient that was brought to the animal shelter and, through proper management, was able to be adopted despite her disease.

Dolly's Case

Dolly, a 3-year-old spayed domestic shorthair cat (***Figure 1***), was presented to the Dumb Friends League as a stray. Within 24 hours of intake, Dolly was noted to have hematuria. She received a full physical examination, urinalysis, and radiography of her urinary bladder and kidneys. She was found to have a cystic urolith and was taken to surgery. Cystotomy was routine, and Dolly recovered uneventfully.

Urinalysis results were consistent with sterile cystitis, and stone analysis revealed a calcium oxalate stone. Dolly was switched to Hill's Prescription Diet c/d Multicare Feline (***Figure 2***), which is specially formulated to support urinary health and reduce the risk for calculi.[2] Dolly had no recurrence of clinical signs on her new food and was ultimately adopted.

Managing FLUTD

Although cats with urinary disease—such as Dolly—typically have longer stays in the shelter, they are still considered adoptable in most cases.[3] With counseling of future owners on proper management, the Dumb Friends League has found that many of these cats go on to live a happy, healthy life.

Potential owners should be educated about stress reduction and weight control, both of which are important components of FLUTD management.[1,4] Any stressful change of routine, such as a new caretaker or reduced play time, has been

▲ **FIGURE 1** Dolly was presented to the Dumb Friends League as a stray and revealed to have cystitis. She was fed Hill's Prescription Diet c/d Multicare Feline to manage her signs and make her adoptable.

shown to trigger a variety of sickness behaviors, including inappropriate urination.[4] Adherence to routine and environmental enrichment (eg, proper hiding and perching locations) may help prevent recurrence of FLUTD.[1,4]

In addition, adopters should be counseled about dietary management, which has been shown to influence FLUTD recurrence.[5] Along with mineral concentrations and maintenance of urinary pH, antioxidant levels and omega-3 fatty acids can influence urinary health.[5] A prospective, randomized, double-blinded study showed that Hill's Prescription Diet c/d Multicare Feline reduced the recurrence rate of feline idiopathic cystitis signs in client-owned cats by 89% over a 12-month period as compared with a control food.[5]

A therapeutic food can also help alleviate stress; dietary supplements L-tryptophan and hydrolyzed casein have both been shown to manage stress in cats.[6,7] These supplements have been added to Hill's Prescription Diet c/d Multicare Feline to create Hill's Prescription Diet c/d Multicare Feline Stress, which provides Hill's primary solution to help prevent FLUTD in cats in potentially stressful situations (eg, relinquishment to a shelter, conflict with other pets, rehoming, new baby, travel).[8]

▲ **FIGURE 2** Dolly eating Hill's Prescription Diet c/d Multicare Feline

Conclusion

Shelters often have to meet the challenge of treating and preventing FLUTD in relinquished and stray cats. This challenge can be exacerbated by the stress cats may experience from leaving their familiar surroundings to be housed in a shelter. Focused dietary options such as Hill's Prescription Diet c/d Multicare and Hill's Prescription Diet c/d Multicare Feline Stress, coupled with behavioral counseling, can help make these cats more adoptable or able to rejoin their family.

References

1. Carney HC, Sadek TP, Curtis TM, et al. AAFP and ISFM Guidelines for diagnosing and solving house-soiling behavior in cats. *J Feline Med Surg*. 2014;16(7):579-598.
2. Hill's Prescription Diets. Hill's Prescription Diet c/d Multicare Feline with chicken. Hill's Prescription Diets website. https://www.hillspet.com/cat-food/pd-cd-multicare-feline-with-chicken-dry?gclid=Cj0KCQjwl8XtBRDAARIsAKfwtxBbHMqKrS_659RhMqpOpdPQi0YZVQkrFILlqn594BeYJlEcaxa4m6MaAusTEALw_wcB&gclsrc=aw.ds. Accessed October 24, 2019.
3. Palamara C. See how this organization is helping shelter cats with FLUTD find their forever homes. *Clinician's Brief* website. https://www.cliniciansbrief.com/hills-video-series. Accessed October 24, 2019.
4. Stella JL, Lord LK, Buffington CAT. Sickness behaviors in response to unusual external events in healthy cats and cats with feline interstitial cystitis. *J Am Vet Med Assoc*. 2011;238(1):67-73.
5. Kruger JM, Lulich JP, Merrills J, et al. Comparison of foods with differing nutritional profiles for long-term management of acute nonobstructive idiopathic cystitis in cats. *J Am Vet Med Assoc*. 2015;247(5):508-517.
6. Pereira GG, Fragoso S, Pires E. Effect of dietary intake of L-tryptophan supplementation on multi-housed cats presenting stress related behaviors. Paper presented at BSAVA Congress; April 8-11, 2010; Birmingham, UK.
7. Beata C, Beaumont-Graf E, Coll V, et al. Effect of alpha casozepine (Zylkene) on anxiety in cats. *J Vet Behav*. 2007;2(2):40-46.
8. Hill's. Stress and feline idiopathic cystitis: Let's break the cycle together. Hill's website. https://www.hillsvet.com/content/dam/cp-sites/hills/hills-vet/en_us/resource-center/research/MC-Stress-Feline-Detailer-secured.pdf. Accessed November 7, 2019.

Focused dietary options such as Hill's Prescription Diet c/d Multicare and Hill's Prescription Diet c/d Multicare Feline Stress, coupled with behavioral counseling, can help make cats with FLUTD more adoptable or able to rejoin their family.

Medical Management of Benign Prostatic Hyperplasia

Benign prostatic hyperplasia (BPH) is common in intact male dogs. Although neutering can resolve this problem, surgery is not always the best option for some patients. In such instances, medical management of uncomplicated cases is frequently successful. Medical management can also serve as a temporary option in patients unable to undergo surgery until a later date.

Suspicion of BPH as a differential diagnosis may begin with the patient's history. Hematuria, stranguria, and/or changes in urinary patterns are often reported by owners; in some cases, flattened stool and/or dyschezia may be observed. An enlarged prostate may be palpated during rectal examination or transabdominally during physical examination; the prostate in patients that have BPH is usually smooth, symmetrical, and nonpainful. Imaging, preferably ultrasonography, can be supportive of a BPH diagnosis; however, evaluation of prostatic fluid yields the most useful information. Visual examination of the fluid is helpful, but centrifugation followed by cytologic examination should also be performed. Culture of the fluid may provide information regarding possible involvement of prostatitis in disease.

BPH only requires treatment in dogs with clinical signs or ultrasonographic evidence of prostatic cysts. Medical treatment involves regular oral administration of a 5-α-reductase inhibitor, which prevents conversion of testosterone to dihydrotestosterone. In the United States, finasteride is most commonly used. Once-daily dosing is recommended for the first 3 months, after which ultrasonography should be performed. Dose frequency may be decreased to every other day or twice weekly once improvement is observed. Recheck examinations should be performed every 3 months until disease is stable and then every 6 months. Finasteride is safe and well tolerated in dogs on a long-term basis, and clinical disease can recur if medication is discontinued. For dogs with refractory or nonresponsive disease, neutering may be required; reduction in prostate size can be expected within 2 to 3 months of neutering.—*Hesser A*

Evaluation of prostatic fluid yields the most useful information.

Chronic Kidney Disease: The New Paradigm of Early Diagnosis & Evolving Treatments

It is generally believed that 30% of cats will develop chronic kidney disease (CKD) by age 9. Although the exact pathophysiology has not been determined, multiple kidney injuries secondary to ischemia or chronic inflammation have been increasingly suspected.

Diagnosis of CKD in cats has historically been made based on the presence of renal azotemia and inappropriate urine specific gravity (USG) for ≥3 months' duration. However, by the time azotemia is typically noted, 75% of nephron mass will have been lost, and by the time isosthenuria develops, 68% to 70% of renal function will have been lost. Symmetric dimethylarginine (SDMA) increases when ≈40% of renal function has been lost and is more sensitive than creatinine in the detection of CKD, particularly in earlier stages of the disease. SDMA is a stable molecule and is not impacted by muscle mass, hemolysis, icterus, or lipemia.

Once CKD is diagnosed, staging of the disease is important. International Renal Interest Society (IRIS) staging guidelines provide clear, objective guidelines for the treatment of CKD based on creatinine, proteinuria, and the presence of hypertension. Updates to the guidelines have added SDMA as a tool for both diagnosis and staging. An SDMA value >14 µg/dL is consistent with CKD. Values <25 µg/dL reflect IRIS stages 1 and 2; these patients often have minimal or no clinical signs. Cats with IRIS stage 1 CKD have been particularly difficult to diagnose because of this, and evaluating SDMA values has enabled earlier diagnosis in these patients.—*Chalhoub S, Boysen S*

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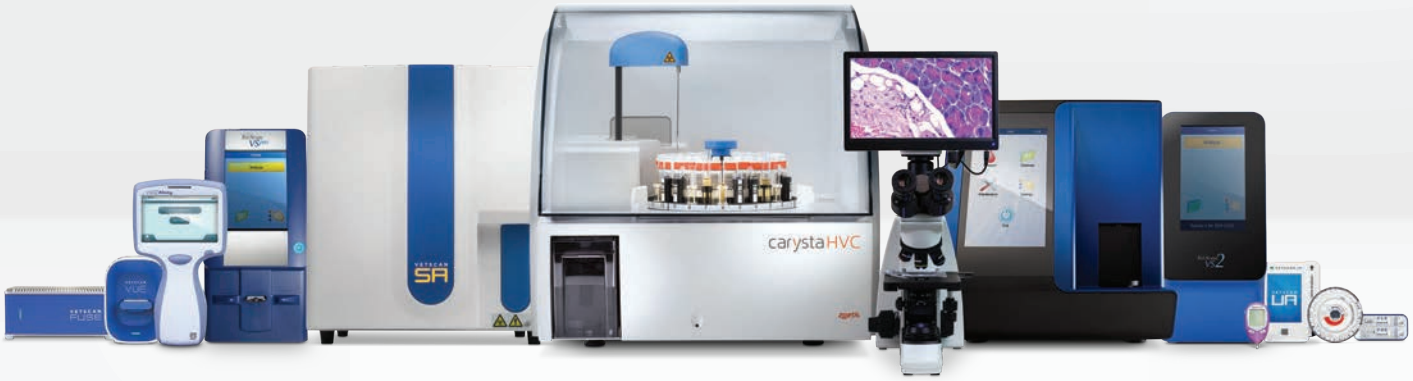

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Revamping Our Understanding of Epilepsy

Epilepsy is more than a seizure disorder; it is also a brain disorder, with seizures as its most clinically apparent sign. Additional clinical signs that affect the interictal period, particularly changes in behavior and cognition, are being increasingly recognized. Such changes are believed to share a pathophysiologic pathway. In humans, for example, patients with depression are more likely to develop epilepsy and epileptic patients are more likely to develop depression. It is unknown whether this bidirectional relationship between neurobehavioral disorders and epilepsy occurs in veterinary patients.

Few studies of interictal behavior changes in dogs exist. In one study, two-thirds of dogs with idiopathic epilepsy developed a behavior change,[1] and dogs with idiopathic epilepsy unresponsive to medication showed a greater amount of behavior changes as compared with dogs responsive to medication. The main behavior change reported in dogs with idiopathic epilepsy is anxiety. Other clinical signs have included changes in impulsivity, trainability, and spatial memory. It has therefore been proposed that canine epileptic management include reducing effects of possible behavior comorbidities in addition to controlling seizures.

One study examining the safety and tolerability of antiseizure medications in dogs found that 10% of dogs exhibited anxiety as an adverse effect when treated with primidone[2]; this was not observed in dogs treated with phenobarbital, potassium bromide, levetiracetam, zonisamide, or felbamate. There have been conflicting results from studies evaluating the effects of imepitoin on anxiety in epileptic dogs. Selective serotonin reuptake inhibitors have been recommended as a first-line treatment for anxiety in epileptic humans, but only anecdotal evidence exists for their use in epileptic dogs.

Another potential alternative to medication for behavior modification is dietary therapy. One study has reported a significant reduction in chasing behavior and a reduction in stranger-directed fear in patients fed a diet enriched with medium-chain fatty acids[3]; this could potentially indicate anxiolytic properties of medium-chain fatty acids.—*Volk H*

Selective serotonin reuptake inhibitors have been recommended as a first-line treatment for anxiety in epileptic humans, but only anecdotal evidence exists for their use in epileptic dogs.

References

1. Shihab N, Bowen J, Volk HA. Behavioral changes in dogs associated with the development of idiopathic epilepsy. *Epilepsy Behav*. 2011;21(2):160-167.
2. Charalambous M, Brodbelt D, Volk HA. Treatment in canine epilepsy: a systematic review. *BMC Vet Res*. 2014;10(1):257.
3. Packer RMA, Law TH, Davies E, Zanghi B, Pan Y, Volk HA. Effects of a ketogenic diet on ADHD-like behavior in dogs with idiopathic epilepsy. *Epilepsy Behav*. 2016;55:62-68.

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Hypophosphatemia

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

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- Basophilia
- Decreased Total Thyroxine
- Eosinophilia
- Epistaxis
- Hypercholesterolemia
- Hyperkalemia
- Hypoalbuminemia
- Hypocholesterolemia
- Hypoglycemia
- Hypokalemia
- Increased & Decreased Blood Urea Nitrogen
- Increased & Decreased Creatinine
- Increased Total Thyroxine
- Neutropenia
- Panting
- Regurgitation

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

- Transcellular shifts
  - Diabetes mellitus, particularly diabetic ketoacidosis, following insulin therapy (common)
  - Respiratory alkalosis due to hyperventilation caused by hypoxia, stress, anxiety, salicylate toxicity, CNS disease, fever, heat stroke, sepsis, and/or gram-negative infections
  - Refeeding syndrome
- Decreased absorption
  - Vomiting/diarrhea, particularly secondary to severe malabsorptive disease
  - Anorexia
  - Vitamin D deficiency
  - Low-phosphorus diet
  - Overdose of phosphate-binding antacids
  - Steatorrhea
  - Following significant intestinal resection
- Increased renal excretion
  - Diabetes mellitus
  - Diuretics
  - Corticosteroids
  - Hyperadrenocorticism
  - Hypercalcemia of malignancy
  - Primary hyperparathyroidism
  - Renal tubular disorder (eg, Fanconi syndrome)
  - Hyperaldosteronism
  - Increased phosphatonins (eg, following renal transplantation [cats])
  - Eclampsia
  - Recovery from hypothermia
  - Following hepatic resection
- Miscellaneous
  - Hepatic lipidosis (cats)
- Pseudohypophosphatemia
  - Paraproteinemia

References

Adams LG, Hardy RM, Weiss DJ, Bartges JW. Hypophosphatemia and hemolytic anemia associated with diabetes mellitus and hepatic lipidosis in cats. *J Vet Intern Med*. 1993;7(5):266-271.

Allen-Durrance AE. A quick reference on phosphorus. *Vet Clin North Am Small Anim Pract*. 2017;47(2):257-262.

DiBartola SP, Willard MD. Disorders of phosphorus: hypophosphatemia and hyperphosphatemia. In: DiBartola SP, ed. *Fluid, Electrolyte, and Acid-Base Disorders*. 4th ed. St Louis, MO: Elsevier Saunders; 2012:197-201.

Dimeski G, Hamer A, Cooper C, Johnston J, Brown NN. Pseudohypophosphataemia secondary to paraproteinaemia may occur without the presence of hypergammaglobulinaemia. *Pathology*. 2016;48(1):102-103.

Ferguson DC, Hoenig M. Endocrine system. In: Latimer KS, ed. *Duncan and Prasse's Veterinary Laboratory Medicine: Clinical Pathology*. 5th ed. Ames, IA: Wiley-Blackwell; 2011:295-304.

Hardcastle MR, Dittmer KE. Fibroblast growth factor 23: a new dimension to diseases of calcium-phosphorus metabolism. *Vet Pathol*. 2015;52(5):770-84.

Paster ER, Mehl ML, Kass PH, Gregory CR. Hypophosphatemia in cats after renal transplantation. *Vet Surg*. 2009;38(8):983-989.

Stockham SL, Scott MA. Calcium, phosphorus, magnesium and regulatory hormones. In: Stockham SL, Scott MA. *Fundamentals of Veterinary Clinical Pathology*. 2nd ed. Ames, IA: Blackwell Publishing; 2008:615-619.

Suarez N, Conway N, Pickett T. Panic-related hyperventilation resulting in hypophosphataemia and a high lactate. *BMJ Case Rep*. 2013;2013:bcr2013009307.

CONSULT THE EXPERT

FELINE COMPULSIVE DISORDER

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Feline compulsive disorder (CD) involves abnormal, repetitive behavior that occurs without an apparent trigger when other physical or behavioral causes have been excluded. The behavior can result from frustration, anxiety, and/or stress and presents significant concerns for patient welfare and the human–animal bond.[1,2]

Approximately 3.5% to 7% of cats seen by veterinary behaviorists are diagnosed with CD.[3-5] Feline CD encompasses a variety of behavioral presentations that can be categorized as self-directed, oral, locomotor, vocal, or visual/hallucinatory (***Table***, pages 34-35). Self-directed behavior (eg, overgrooming) is most common, followed by oral behavior (eg, pica).[3,5,6]

Background & Pathophysiology

The pathophysiology of feline CD is likely multifactorial due to the wide variety of clinical presentations. Altered function in cortico-striatal-thalamo-cortical pathways, including the basal ganglia, has been implicated in human and animal models of CD.[7,8] Varying neurotransmitter (eg, serotonin, dopamine, glutamate, acetylcholine) levels at different locations along this pathway can influence the category of CD behavior expressed.[8] Psychopharmaceuticals to modify these neurotransmitter levels have successfully been used to treat CD in some cats.[9-11]

Physical and environmental stressors have been implicated in some types of feline CD. In a study of 11 cats with psychogenic alopecia, 9 cats experienced an environmental change or stressful event (eg, separation from owner, death of an animal companion, moving to a new home) around the time of alopecia onset.[9] Wool-sucking has also been shown to be triggered by stressful events, including being left alone for extended durations.[12] Early weaning (<7 weeks of age) has been found to increase the risk for wool-sucking and overgrooming but has not been associated with an increased risk for pica.[12-14] In another study, medical issues (eg, cardiovascular disease, neoplasia, allergies) were more prevalent in wool-sucking cats as compared with non-wool–sucking cats.[12]

History & Clinical Signs

Several breed predispositions have been identified for various CD behaviors, suggesting genetic factors may play a role (***Table***, pages 34-35). Overgrooming and self-directed behavior are more commonly observed in Siamese, Burmese, and Oriental cats,[5,9,15] and wool-sucking appears to be more prevalent in Siamese, Birman, and crossbreed house cats.[6,12,15] Analysis of the genealogies of wool-sucking Siamese and Birman cats has indicated a dominant mode of inheritance, with possible incomplete penetrance.[16] Some studies have concluded that Bengal, Burmese-type, and Siamese cats may be more likely than other breeds to exhibit pica and oral behavior,[4,5] although one study did not identify breed associations for these behaviors.[14]

The mean age of onset of CD is ≈2 years,[6] although breeds that are predisposed to CD may exhibit signs at a younger age. For example, in one study, the mean age of onset of fabric-sucking in Siamese and Birman cats was 41.6 and 67.6 weeks, respectively.[12] In the previously mentioned study of 11 cats with psychogenic alopecia, 4 cats (2 Oriental and 2 domestic shorthair) exhibited fabric-sucking prior to 1 year of age.[9]

Overgrooming tends to be directed at the abdomen, flanks, back, thorax,[9] and medial aspects of the thoracic limbs and thighs.[17] However, overgrooming in these areas is not pathognomonic for psychogenic alopecia, as physical causes of overgrooming (eg, pruritus, pain) can result in the same pattern.[17] In some cases, excoriation of the underlying skin may be present.

Pica may be directed at one or several objects, with shoelaces or threads, plastic, fabric, rubber, paper or cardboard, and wood being the most common.[14] Cats exhibiting pica may chew on, suck on, or ingest various objects.[14] In a study, cats that sucked on fabric were likely to also ingest fabric.[14]

Diagnosis

Feline CD is a diagnosis of exclusion; numerous medical differential diagnoses (***Table***, pages 34-35) must be ruled out before CD can be diagnosed. In a

CD = compulsive disorder

study of 21 cats referred to a veterinary behaviorist for psychogenic alopecia, medical (ie, nonbehavioral) causes of repetitive behavior were identified in 76% of the cases[17]; only 2 cases were identified to have behavioral causes, and 3 exhibited a combination of psychogenic alopecia and pruritus. After presumptive medical causes have been identified and treated, the repetitive behavior may persist to the same or a lesser degree, which can indicate that the physical ailment was either not the primary inciting factor or that medical and behavioral comorbidities were present.

A diagnosis of CD can be supported when physical and behavioral causes of an abnormal, repetitive behavior that interferes with a cat's quality of life have been ruled out. To make this determination, a thorough behavior history—including but not limited to a description (ideally including a video) of the behavior, initiating factors, situations in which the behavior is likely to occur, pet owner's response, and previous treatment attempts and their degree of success—should be obtained. Behavior history forms are available from several resources (see ***Suggested Reading***, page 37).

Obtaining an accurate verbal history may be difficult, as pet owners may mislabel or not have witnessed their cat's behavior. For example, cats with psychogenic alopecia are likely to be presented for hair loss rather than overgrooming because owners may not witness overgrooming. Similarly, a pet owner may not realize that the cat exhibits pica until it vomits or foreign bodies are detected on imaging or during exploratory surgery. Some CD behavior may be difficult for pet owners to describe and are subject to misinterpretation. Skin rippling associated with feline hyperesthesia may be described as itching, twitching, or a seizure by the pet owner. When possible, owners should be encouraged to record a video of their cat's behavior. A trichogram exhibiting barbered hairs with sharp, broken ends can help differentiate between overgrooming and hair loss or poor regrowth.[18]

Treatment & Management

Treatment of feline CD includes educating owners, minimizing the repetitive behavior, reinforcing alternative behavior, and alleviating stress through environmental enrichment and anxiolytics.

Verbal or physical punishment (eg, yelling, swatting, scruffing) should not be used to treat CD. Because repetitive behavior often originates from stress or frustration, use of harsh verbal or physical punishment that increases the cat's anxiety may exacerbate the disease. Moreover, cats may avoid punishment by learning to engage in the CD behavior out of the pet owner's sight. If the cat engages in CD behavior and must be interrupted, it is best to use remote punishment not associated with the owner's presence (eg, dropping a book to make a noise out of the cat's sight, tossing a pillow across the cat's line of sight to break its concentration).

Minimizing the practice of the CD behavior reduces opportunities for reinforcement of the behavior and may be necessary for the health and welfare of the cat, particularly if the behavior is self-injurious. If overgrooming or hyperesthesia results in wounds, an Elizabethan collar may be required. Similarly, cats exhibiting pica may need to be confined to a single room or cage where the environment and access to objects can be strictly

A trichogram exhibiting barbered hairs with sharp, broken ends can help differentiate between overgrooming and hair loss or poor regrowth.[18]

TABLE

BREED PREDISPOSITIONS, PHYSICAL EXAMINATION FINDINGS, & MEDICAL DIFFERENTIALS FOR FELINE COMPULSIVE DISORDER

Category	Repetitive Behavior	Breed Predispositions
SELF-DIRECTED; SELF-INJURIOUS	Overgrooming Psychogenic alopecia	Siamese[5,9] Burmese[9,15] Oriental[9,15] Bengal[2]
	Hyperesthesia syndrome	Siamese[21] Burmese[21] Persian[21] Abyssinian[21]
	Feline behavioral ulcerative dermatitis	No breed predispositions have been identified.
	Self-sucking	No breed predispositions have been identified.
	Chewing feet/claws	No breed predispositions have been identified.
	Feline orofacial pain syndrome	Burmese[22]
ORAL	Pica Wool-sucking	Siamese[2,4,6,12] Birman[8] Bengal/Burmese[5] Crossbreed house cat[15]
LOCOMOTOR	Pacing Tail-chasing	No breed predispositions have been identified.
	Hyperesthesia syndrome	Siamese[21] Burmese[21] Persian[21] Abyssinian[21]
VOCAL	Excessive vocalization	Siamese
VISUAL; HALLUCINATORY	Chasing unseen prey	No breed predispositions have been identified.

*Pain and neurologic disorders (eg, seizures) are physical differential diagnoses for all repetitive behaviors.

Possible Concurrent Physical Examination Findings	Medical Differential Diagnoses*
Alopecia of the abdomen, flanks, back, thorax, and medial thoracic limbs and/or thighs Blunt or broken hairs on trichogram Self-inflicted excoriation or injury	Dermatologic disease Endocrine disease Pain
Rippling or twitching skin (similar to panniculus reflex) Tail-twitching; patient may attack tail before running away	Neurologic/neuromuscular disease Dermatologic disease
Ulcerative excoriations along dorsolateral neck secondary to scratching	Dermatologic disease Neurologic disease
Self-sucking, often directed at tail tip	Dermatologic disease Neurologic disease
Short claws Claw bed infection	Dermatologic disease Neurologic disease
Repetitive licking, chewing, pawing at the mouth Oral ulcerations	Dental disease Oral pain
GI disease GI obstruction secondary to foreign body ingestion	Polyphagia Iron deficiency GI disease Endocrinopathy
Muscular, orthopedic, or neurologic repetitive stress injury Difficulty maintaining weight Self-injury from tail-biting	Endocrine disease (eg, hyperthyroidism) Lumbosacral or other neurologic disease Orthopedic disease
Rippling or twitching skin (similar to panniculus reflex) Tail-twitching; patient may attack tail before running away	Neurologic/neuromuscular disease Dermatologic disease
	Normal or reinforced behavior Endocrinopathy Neurologic disease and/or loss of hearing Feline cognitive dysfunction
	Ocular disease Neurologic disease

Continues ▶

controlled. Although necessary, these measures may increase the cat's stress, which may perpetuate the CD behavior.

Preventing situations that trigger the repetitive behavior or preemptively engaging the cat in another activity before the CD behavior occurs is ideal. For example, childproof locks may help prevent a cat with pica from breaking into closets to chew on clothing or shoelaces. If bouts of overgrooming coincide with environmental stressors (eg, owner's departure), owners can engage cats in play with a new toy before leaving. Attempts to distract the cat with food, toys, or attention while it is engaged in the repetitive behavior may inadvertently reinforce the behavior.

Positive reinforcement training should be used to teach alternative behavior and create pleasurable associations with previously stressful situations. For example, for cats that exhibit CD behavior associated with the owner's departure, a positive emotional response may be elicited if the owner's departure is consistently paired with a treat before the cat engages in the behavior. Cats that repetitively pace or vocalize can be taught to go to a specific spot (eg, a chair) on command to await a reward (eg, treat, play time, brushing). Directing the cat to a quiet, convenient location teaches an alternative coping strategy to mitigate the CD behavior.

Positive reinforcement training should be used to teach alternative behavior and create pleasurable associations with previously stressful situations.

In most cases, owners are unaware of the specific triggers of the behavior or the behavior occurs unexpectedly or not in the owner's presence. In such cases, the goal of treatment should be to reduce the cat's global anxiety and frustration through environmental enrichment and anxiolytics. Feline environmental enrichment provides a means to avoid stressful situations (eg, abundance and wide distribution of resources, including hidden or elevated spaces), mental and physical stimulation (eg, foraging toys, active play; see ***Suggested Reading***), and opportunities to engage in normal, species-typical behavior (eg, provision of scratching posts and litter boxes). In a study of cats diagnosed with feline behavioral ulcerative dermatitis (ie, nonhealing ulcerations secondary to psychogenic pruritus), implementation of an environmental enrichment plan resulted in cessation of pruritus within 2 days and complete healing over several days depending on lesion severity; none of the cats that improved relapsed during the 12- to 24-month follow-up period.[19]

Treatment options to decrease anxiety include pheromones (eg, feline facial and appeasing pheromones), supplements (eg, α-casozepine, L-theanine), and pharmaceuticals (eg, tricyclic antidepressants, selective serotonin reuptake inhibitors; see ***Suggested Reading***).

The relatively few anxiolytic efficacy studies that have been conducted for feline CD have produced varying results. For example, in a retrospective study, 5 cats exhibiting psychogenic alopecia groomed less frequently and experienced hair regrowth when treated with clomipramine (1.25-2.5 mg/cat PO every 24 hours)[9]; 3 of the 5 cats also received environmental modification to reduce stress. However, in a different prospective, double-blind, placebo-controlled study of 25 cats with psychogenic alopecia, 11 cats treated with clomipramine (0.5 mg/kg PO every 24 hours) for 56 days did not experience a significantly decreased number of grooming bouts or hair regrowth as compared with placebo-treated cats.[11] Mixed success has also been reported following treatment with

other behavior medications (eg, amitriptyline).[9,20] These studies indicate that the response to psychopharmaceutical treatment is highly variable. Furthermore, because no medications are currently licensed by the US FDA for the treatment of feline CD, it is important to review possible adverse effects and obtain informed consent from the owner prior to use.

Prognosis

Prognosis for reduction in the frequency or intensity of CD behavior is fair but poor for complete resolution or cure. Owners should be informed that the goal of treatment is to improve the cat's welfare and quality of life by limiting the risk for self-injury and increasing the amount of time engaged in pleasurable activities rather than the compulsive behavior.

Clinical Follow-Up & Monitoring

Feline CD affects the well-being of both the cat and its owner and may result in relinquishment or euthanasia of the pet if not addressed. Ongoing communication with the owner is essential to increase the likelihood of compliance with the treatment plan. Because treatment response depends on many factors and may be unpredictable, frequent consultation may be needed to adjust the treatment plan.

CD = compulsive disorder

References

1. Hewson CJ, Luescher UA, Ball RO. The use of chance-corrected agreement to diagnose canine compulsive disorder: an approach to behavioral diagnosis in the absence of a 'gold standard.' *Can J Vet Res*. 1999;63(3):201-206.
2. Tynes VV, Sinn L. Abnormal repetitive behaviors in dogs and cats: a guide for practitioners. *Vet Clin North Am Small Anim Pract*. 2014; 44(3):543-564.
3. Amat M, de la Torre JLR, Fatjó J, Mariotti VM, Van Wijk S, Manteca X. Potential risk factors associated with feline behavior problems. *Appl Anim Behav Sci.* 2009;121(2):134-139.
4. Bamberger M, Houpt KA. Signalment factors, comorbidity, and trends in behavior diagnoses in cats: 736 cases (1991–2001). *J Am Vet Med Assoc.* 2006;229(10):1602-1606.
5. Wassink-van der Schot AA, Day C, Morton JM, Rand J, Phillips CJC. Risk factors for behavior problems in cats presented to an Australian companion animal behavior clinic. *J Vet Behav.* 2016;14:34-40.
6. Overall KL, Dunham AE. Clinical features and outcome in dogs and cats with obsessive-compulsive disorder: 126 cases (1989-2000). *J Am Vet Med Assoc*. 2002;221(10):1445-1452.
7. Stein DJ. Obsessive-compulsive disorder. *Lancet.* 2002;360(9330): 397-405.
8. Dodman NH, Shuster L. Animal models of obsessive-compulsive behavior: a neurobiological and ethological perspective. In: Abramowitz JS, Houts AC, eds. *Concepts and Controversies in Obsessive-Compulsive Disorder.* Boston, MA; Springer: 2005;53-71.
9. Sawyer LS, Moon-Fanelli AA, Dodman NH. Psychogenic alopecia in cats: 11 cases (1993-1996). *J Am Vet Med Assoc.* 1999;214(1):71-74.
10. Seksel K, Lindeman MJ. Use of clomipramine in the treatment of anxiety-related and obsessive-compulsive disorders in cats. *Aust Vet J*. 1998; 76(5):317-321.
11. Mertens PA, Torres S, Jessen C. The effects of clomipramine hydrochloride in cats with psychogenic alopecia: a prospective study. *J Am Anim Hosp Assoc*. 2006;42(5):336-343.
12. Borns-Weil S, Emmanuel C, Longo J, et al. A case-control study of compulsive wool-sucking in Siamese and Birman cats (n=204). *J Vet Behav.* 2015;10(6):543-548.
13. Ahola MK, Vapalahti K, Lohi H. Early weaning increases aggression and stereotypic behaviour in cats. *Sci Rep*. 2017;7(1):10412.
14. Demontigny-Bédard I, Beauchamp G, Bélanger MC, Frank D. Characterization of pica and chewing behaviors in privately owned cats: a case-control study. *J Feline Med Surg*. 2016;18(8):652-657.
15. Salonen M, Vapalahti K, Tiira K, Mäki-Tanila A, Lohi H. Breed differences of heritable behaviour traits in cats. *Sci Rep*. 2019; 9(1):7949.
16. Dodman NH. Recognition, management and genetic findings in canine and feline obsessive compulsive disorders. Paper presented at: 7th Tufts' Canine and Feline Breeding & Genetics Conference; September 11-12, 2015; Dedham, MA.
17. Waisglass SE, Landsberg GM, Yager JA, Hall JA. Underlying medical conditions in cats with presumptive psychogenic alopecia. *J Am Vet Med Assoc*. 2006;228(11):1705-1709.
18. Scarampella F, Zanna G, Peano A, Fabbri E, Tosti A. Dermoscopic features in 12 cats with dermatophytosis and in 12 cats with self-induced alopecia due to other causes: an observational descriptive study. *Vet Dermatol*. 2015;26(4):282-e63.
19. Titeux E, Gilbert C, Briand A, Cochet-Faivre N. From feline idiopathic ulcerative dermatitis to feline behavioral ulcerative dermatitis: grooming repetitive behaviors indicators of poor welfare in cats. *Front Vet Sci.* 2018;5:81.
20. Amengual Batle P, Rusbridge C, Nuttall T, Heath S, Marioni-Henry K. Feline hyperaesthesia syndrome with self-trauma to the tail: retrospective study of seven cases and proposal for an integrated multidisciplinary diagnostic approach. *J Feline Med Surg.* 2019;21(2):178-185.
21. Horwitz D, Neilson J. Psychogenic alopecia/overgrooming: feline. In: Horwitz D, ed. *Blackwell's Five-Minute Veterinary Consult Clinical Companion: Canine and Feline Behavior.* Ames, IA: Wiley-Blackwell; 2007:425-431.
22. Rusbridge C, Heath S, Gunn-Moore DA, Knowler SP, Johnston N, McFadyen AK. Feline orofacial pain syndrome (FOPS): a retrospective study of 113 cases. *J Feline Med Surg*. 2010;12(6):498-508.

Suggested Reading

Ellis SL, Rodan I, Carney HC, et al. AAFP and ISFM feline environmental needs guidelines. *J Feline Med Surg*. 2013;15(3):219-230.

Sinn L. The behavioral assessment. *Veterinary Team Brief*. 2018;6(5):34-38.

Sueda KLC. Canine compulsive disorder. *Clinician's Brief*. 2019;17(9):57-62.

Tynes VV, Sinn L. Abnormal repetitive behaviors in dogs and cats: a guide for practitioners. *Vet Clin North Am Small Anim Pract*. 2014;44(3):543-564.

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FROM PAGE TO PATIENT

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.

Lymph Node Status in Canine Mast Cell Tumors

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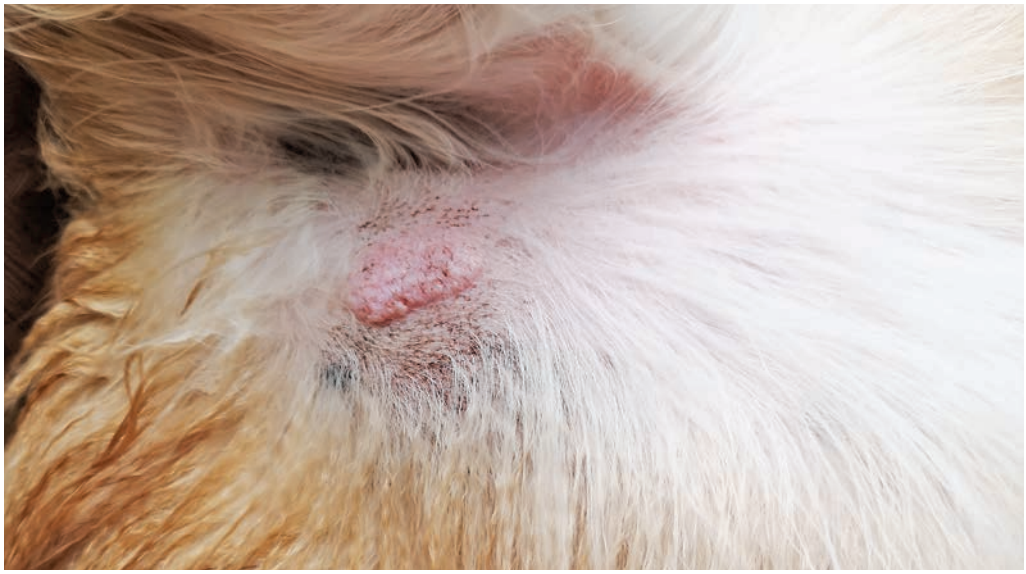
In the Literature

Ferrari R, Marconato L, Buracco P, et al. The impact of extirpation of non-palpable/normal-sized regional lymph nodes on staging of canine cutaneous mast cell tumours: a multicentric retrospective study. *Vet Comp Oncol.* 2018;16(4):505-510.

FROM THE PAGE ...

Identifying lymph node status in mast cell tumors (MCTs) is important for determining prognosis and whether further staging is necessary. Although palpation and cytology of regional lymph nodes are often performed, their value is limited; thus, histopathology remains the gold standard.[1-3] It is generally understood that enlarged lymph nodes should be removed in all cases, but less is known regarding how to



manage lymph nodes that are normal in size or nonpalpable, as well as how to definitively diagnose metastatic disease on histopathology. A recent study categorized lymph nodes as HN0 (nonmetastatic), HN1 (premetastatic), HN2 (early metastasis), or HN3 (overt metastasis), according to the degree of metastatic cell aggregates present and evaluation of lymph node architecture.[4]

In the current study, the authors aimed to assess the metastatic rate of nonpalpable or normal-sized regional lymph nodes in dogs with MCTs. Included in the study were 93 dogs with solitary cutaneous MCTs that were negative for distant metastasis. Regional lymph nodes that were nonpalpable or normal in size were removed, and clinical characteristics, including tumor size and histologic grade, were evaluated. Of the 93 dogs, 46 were found to have histologically detectable metastatic disease. The only clinical factor significantly associated with metastatic disease was a tumor diameter >3 cm.

These study findings highlight the importance of regional lymph node removal at the time of MCT removal. Lymph node status is important for staging and potential chemotherapy decision-making and may also guide the need for further staging, as MCTs tend to metastasize to the regional lymph nodes before becoming widely metastatic.[5] Removal of metastatic lymph nodes may also provide a survival advantage.[6] Regional lymph node removal was a high-yield test in this study; however, further investigation is needed to determine whether sentinel lymph node mapping would be a more effective method of staging.[7]

Regional lymph node removal was a high-yield test in this study.

… TO YOUR PATIENTS

Key pearls to put into practice:

1. Palpation characteristics are an insensitive method for detecting metastatic disease in MCTs and many other cancers.
2. The use of the Patnaik 3-tier[8] and Kiupel 2-tier[9] histologic grading systems in this study highlights a problematic issue with the Patnaik system. Patnaik grade II MCTs are the most common MCT classification[10]; however, this study found discrepancies between the Patnaik grade II classification of some lymph nodes when they were compared with the Kiupel grading system. These discrepancies create a gray area in how to manage Patnaik grade II MCTs.
3. Removal of the regional lymph node with MCT resection may yield a high rate of metastatic disease, as seen in this study.
4. Larger MCTs (>3 cm) have a higher rate of nodal metastasis.

References

1. Fournier Q, Cazzini P, Bavcar S, Pecceu E, Ballber C, Elders R. Investigation of the utility of lymph node fine-needle aspiration cytology for the staging of malignant solid tumors in dogs. *Vet Clin Pathol*. 2018;47(3):489-500.
2. Williams LE, Packer RA. Association between lymph node size and metastasis in dogs with oral malignant melanoma: 100 cases (1987-2001). *J Am Vet Med Assoc*. 2003;222(9):1234-1236.
3. Boston SE, Lu X, Culp WT, et al. Efficacy of systemic adjuvant therapies administered to dogs after excision of oral malignant melanomas: 151 cases (2001-2012). *J Am Vet Med Assoc*. 2014;245(4):401-407.
4. Weishaar KM, Thamm DH, Worley DR, Kamstock DA. Correlation of nodal mast cells with clinical outcome in dogs with mast cell tumour and a proposed classification system for the evaluation of node metastasis. *J Comp Pathol*. 2014;151(4):329-338.
5. Warland J, Amores-Fuster I, Newbury W, Brearley M, Dobson J. The utility of staging in canine mast cell tumours. *Vet Comp Oncol*. 2014;12(4):287-298.
6. Lejeune A, Skorupski K, Frazier S, et al. Aggressive local therapy combined with systemic chemotherapy provides long-term control in grade II stage 2 canine mast cell tumour: 21 cases (1999-2012). *Vet Comp Oncol*. 2015;13(3):267-280.
7. Worley DR. Incorporation of sentinel lymph node mapping in dogs with mast cell tumours: 20 consecutive procedures. *Vet Comp Oncol*. 2014;12(3):215-26.
8. Patnaik AK, Ehler WJ, MacEwen EG. Canine cutaneous mast cell tumor: morphologic grading and survival time in 83 dogs. *Vet Pathol*. 1984;21(5):469-474.
9. Kiupel M, Webster JD, Bailey KL, et al. Proposal of a 2-tier histologic grading system for canine cutaneous mast cell tumors to more accurately predict biological behavior. *Vet Pathol*. 2011;48(1):147-155.
10. Stefanello D, Buracco P, Sabattini S, et al. Comparison of 2- and 3-category histologic grading systems for predicting the presence of metastasis at the time of initial evaluation in dogs with cutaneous mast cell tumors: 386 cases (2009-2014). *J Am Vet Med Assoc*. 2015;246(7):765-769.

Owner Perspectives on Feline Diabetic Management

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Of concern, 25% of owners reported not being taught how to draw insulin, and 27% were not taught to administer insulin.

In the Literature

Albuquerque CSC, Bauman BL, Rzeznitzeck J, Caney SMA, Gunn-Moore DA. Priorities on treatment and monitoring of diabetic cats from the owners' points of view. *J Feline Med Surg*. 2019. doi.org/10.1177/1098612X19858154

FROM THE PAGE …

Cats are commonly affected by diabetes mellitus,[1,2] which can have a significant impact on pet owners due to the time commitment and costs associated with its management.[3] Diabetic cats require a structured plan for feeding and insulin administration that owners must follow; aggressive monitoring and treatment are typically needed if diabetic remission is a goal of therapy.[4,5] Most owners of recently diagnosed diabetic cats will be experiencing drawing up and administering injections for the first time, which can be a source of fear and anxiety. Many concerns can be alleviated, though, by providing good owner education in the clinic and resources owners can access on their own (eg, handouts, videos, websites, online support groups).

In this study,* owners were surveyed regarding their perceptions about treatment and monitoring of diabetic cats. A total of 748 questionnaires predominately from the United States (43%) and United Kingdom (36%) were submitted. As compared with prior studies in which diabetic remission rates were reportedly ≤84%,[5,6] remission in this study was only reported in 18% of cats alive at the time of questionnaire completion. Fewer than 50% of owners reported their veterinarian discussing diabetic remission, use of home blood glucose monitoring, or how to recognize unstable disease. Of concern, 25% of owners reported not being taught how to draw insulin, and 27% were not taught to administer insulin. Owners also noted that websites they found on their own were the most useful resources. When owners were asked what influenced their treatment decision, the answer options "what is best for my cat" (almost 100% of

*This study was partially supported by Vet Professionals and MSD Animal Health.

respondents) and "veterinarian recommendations" (86% of respondents) were selected as the most important factors.

Approximately 70% of owners chose home blood glucose monitoring as a preferred method of monitoring; of these, 53% learned about the method online, 27% learned from their veterinarian, and the remaining 20% learned from other sources or had personal/previous experience with home blood glucose monitoring. Many owners used home blood glucose monitoring several times a day as part of a tight regulation protocol; some owners reported checking blood glucose as often as every 2 hours and ≤20 to 30 times daily. Overall, owners reportedly felt that caring for a diabetic cat had less of an effect on their daily life and relationship with their pet than they had thought it would prior to starting treatment.

… TO YOUR PATIENTS

Key pearls to put into practice:

1. At the time of diagnosis, clinicians and staff members should dedicate time to discuss all aspects of care and monitoring of diabetic cats with owners. This should include demonstrating and having owners practice proper insulin administration.
2. Owners are likely to seek information online. Clinicians should be ready to direct owners to accurate and useful websites.
3. Many owners may be interested in home glucose monitoring to help manage their diabetic cat and reduce the cost of care. This may be accomplished with blood glucose meters or continuous glucose monitors.

References

1. O'Neill DG, Gostelow R, Orme C, et al. Epidemiology of diabetes mellitus among 193,435 cats attending primary-care veterinary practices in England. *J Vet Intern Med.* 2016;30(4):964-972.
2. Prahl A, Guptill L, Glickman NW, Tetrick M, Glickman LT. Time trends and risk factors for diabetes mellitus in cats presented to veterinary teaching hospitals. *J Feline Med Surg.* 2007;9(5):351-358.
3. Niessen SJ, Powney S, Guitian J, et al. Evaluation of a quality-of-life tool for cats with diabetes mellitus. *J Vet Intern Med.* 2010;24(5):1098-1105.
4. Roomp K, Rand J. Intensive blood glucose control is safe and effective in diabetic cats using home monitoring and treatment with glargine. *J Feline Med Surg.* 2009;11(8):668-682.
5. Gostelow R, Forcada Y, Graves T, Church D, Niessen S. Systematic review of feline diabetic remission: separating fact from opinion. *Vet J.* 2014;202(2):208-221.
6. Gottlieb S, Rand J. Managing feline diabetes: current perspectives. *Vet Med (Auckl).* 2018;9:33-42.

Research Note: **Novel Protoparvovirus in Cats**

In 2016, a novel protoparvovirus similar to human bufaviruses was identified in dogs with respiratory signs and termed *canine bufavirus*. Considering the ability of canine parvovirus type 2 variants to infect and cause clinical signs in cats, the authors of this study investigated whether canine bufavirus could do the same. A total of 574 archival feline nasal and oropharyngeal swabs and enteric samples from 2 universities in Italy were analyzed. Canine bufavirus DNA was identified in 9.2% of samples. DNA was most commonly identified in samples from the respiratory tract. The role of this novel virus in feline respiratory disease complex warrants further investigation.

Source

Diakoudi G, Lanave G, Capozza P, et al. Identification of a novel parvovirus in domestic cats. *Vet Microbiol*. 2019;228:246-251.

DNA was most commonly identified in samples from the respiratory tract.

Relationship Between Periodontal & Systemic Disease in Dogs

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In the Literature

Pereira Dos Santos JD, Cunha E, Nunes T, Tavares L, Oliveira M. Relation between periodontal disease and systemic diseases in dogs. *Res Vet Sci*. 2019;125:136-140.

FROM THE PAGE ...

Periodontal disease is a common inflammatory disease in dogs. Bacteremia, bacterial metabolic products and toxins, and inflammatory mediators and immune complexes that result from periodontal disease can all have an impact on distal organ health.

This study sought to evaluate the association between periodontal disease and systemic disease, specifically renal, hepatic, and cardiac disease. Records of 136 dogs presented to a veterinary teaching hospital were retrospectively reviewed. Dogs were separated into 2 groups: those that had periodontal disease ($n = 75$) and those that did not have periodontal disease ($n = 61$). The average age of dogs in the periodontal disease group was 12.1 years, and >50% of dogs in this group weighed <22 lb (10 kg).

A significant association was found between periodontal disease and cardiac disease. Of the 75 dogs that had periodontal disease, 38 (50.67%) demonstrated cardiac signs, whereas only 2 of the 61 dogs (3.28%) that did not have periodontal disease showed these signs. Although an association between periodontal and cardiac disease was demonstrated in this study, conclusions must be tempered with the understanding that—although periodontal disease may be a risk factor for dogs predisposed to cardiac disease, particularly myxomatous mitral valve disease—a specific causal relationship cannot be proven.

No statistical correlation was found between periodontal disease and either renal or hepatic disease; however, this was determined based on clinical features rather than histopathology. Study limitations, as noted by the authors, included limited sample size, its retrospective nature, and lack of periodontal disease staging.

Evidence-based research directly connecting periodontal disease to a causal relationship with systemic disease is challenging to validate and substantiate. However, the lack of hard evidence does not negate the potential risk factor for periodontal disease, especially when the potential impact of chronic inflammation is considered.

... TO YOUR PATIENTS

Key pearls to put into practice:

1. Owners should be educated about how periodontal disease can contribute to overall health. Bacteria are present in the gingival sulcus of the teeth in a biofilm that has direct contact with the gingiva. The gingiva has a local immune response to this encroaching bacterium and its toxic products. As periodontal disease progresses, significant local effects occur and have the potential to contribute to overall systemic disease.
2. Although periodontal disease involves bacteria, routine dental prophylaxis in a healthy patient does not generally necessitate systemic antibiotic therapy.
3. Prevention of periodontal disease through regular dental care to avoid substantial local and systemic impact caused by disease is ideal. Regular dental care is particularly important for any patient with systemic disease.

Virbac

sentinel® spectrum® chews

(milbemycin oxime·lufenuron·praziquantel)

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

Description: SENTINEL® SPECTRUM® Chews are available in four strengths in color-coded packages for oral administration to dogs and puppies according to their weight. Each chewable flavored tablet is formulated to provide a minimum of 0.23 mg/pound (0.5mg/kg) of milbemycin oxime, 4.55 mg/pound (10mg/kg) of lufenuron, and 2.28 mg/pound (5mg/kg) of praziquantel.

Milbemycin oxime consists of the oxime derivatives of 5-didehydromilbemycins in the ratio of approximately 80% A4 (C32H45NO7, MW 555.71) and 20% A3 (C31H43NO7, MW 541.68). Milbemycin oxime is classified as a macrocyclic anthelmintic.

Lufenuron is a benzoylphenylurea derivative with the following chemical composition: N-[2,5-dichloro-4-(1,1,2,3,3,3,-hexafluoropropoxy)-phenyl-aminocarbonyl]-2,6-difluorobenzamide (C17H8Cl2F8N2O3, MW 511.15). Benzoylphenylurea compounds, including lufenuron, are classified as insect development inhibitors (IDIs).

Praziquantel is an isoquinolone anthelmintic with the chemical name 2-(Cyclohexylcarbonyl)-1,2,3,6,7,-11b-hexahydro-4H-pyrazino[2,1-a] isoquinolin-4-one.

Indications: SENTINEL SPECTRUM Chews are indicated for the prevention of heartworm disease caused by Dirofilaria immitis; for the prevention and control of flea populations (*Ctenocephalides felis*); and for the treatment and control of adult roundworm (*Toxocara canis*, *Toxascaris leonina*), adult hookworm (*Ancylostoma caninum*), adult whipworm (*Trichuris vulpis*), and adult tapeworm (*Dipylidium caninum*, *Taenia pisiformis*, *Echinococcus multilocularis* and *Echinococcus granulosus*) infections in dogs and puppies two pounds of body weight or greater and six weeks of age and older.

Dosage and Administration: SENTINEL SPECTRUM Chews should be administerd orally, once every month, at the minimum dosage of 0.23 mg/lb (0.5 mg/kg) milbemycin oxime, 4.55 mg/lb (10 mg/kg) lufenuron, and 2.28 mg/lb (5 mg/kg) praziquantel. For heartworm prevention, give once monthly for at least 6 months after exposure to mosquitoes (see **EFFECTIVENESS**).

Dosage Schedule

Body Weight	Milbemycin Oxime per chewable	Lufenuron per chewable	Praziquantel per chewable	Number of chewables
2 to 8 lbs.	2.3 mg	46 mg	22.8 mg	One
8.1 to 25 lbs.	5.75 mg	115 mg	57 mg	One
25.1 to 50 lbs.	11.5 mg	230 mg	114 mg	One
50.1 to 100 lbs.	23.0 mg	460 mg	228 mg	One
Over 100 lbs.	Administer the appropriate combination of chewables			

To ensure adequate absorption, always administer SENTINEL SPECTRUM Chews to dogs immediately after or in conjunction with a normal meal.

SENTINEL SPECTRUM Chews may be offered to the dog by hand or added to a small amount of dog food. The 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, and treated animals should be observed a few minutes after administration to ensure that no part of the dose is lost or rejected. If it is suspected that any of the dose has been lost, redosing is recommended.

Heartworm Prevention: SENTINEL SPECTRUM Chews should be administered at monthly intervals beginning within one month of the dog's first seasonal exposure to mosquitoes and continuing until at least 6 months after the dog's last seasonal exposure (see **EFFECTIVENESS**). SENTINEL SPECTRUM Chews may be administered year-round without interruption. When switching from another heartworm preventative product to SENTINEL SPECTRUM Chews, the first dose of SENTINEL SPECTRUM Chews should be given within a month of the last dose of the former product.

Flea Treatment and Prevention: Treatment with SENTINEL SPECTRUM Chews may begin at any time of the year, preferably starting one month before fleas become active and continuing monthly through the end of flea season. In areas where fleas are common year-round, monthly treatment with SENTINEL SPECTRUM Chews 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 protection product, as necessary.

Intestinal Nematode and Cestode Treatment and Control: Dogs may be exposed to and can become infected with roundworms, whipworms, hookworms, and tapeworms throughout the year, regardless of season or climate. Clients should be advised of appropriate measures to prevent reinfection of their dog with intestinal parasites. Because the prepatent period for *E. multilocularis* may be as short as 26 days, dogs treated at the labeled monthly intervals may become reinfected and shed eggs between treatments.

Contraindications: There are no known contraindications to the use of SENTINEL SPECTRUM Chews.

Warnings: Not for use in humans. Keep this and all drugs out of the reach of children.

Precautions: Treatment with fewer than 6 monthly doses after the last exposure to mosquitoes may not provide complete heartworm prevention (see **EFFECTIVENESS**).

Prior to administration of SENTINEL SPECTRUM Chews, dogs should be tested for existing heartworm infections. At the discretion of the veterinarian, infected dogs should be treated to remove adult heartworms. SENTINEL SPECTRUM Chews are not effective against adult *D. immitis.*

Mild, transient hypersensitivity reactions, such as labored breathing, vomiting, hypersalivation, and lethargy have been noted in some dogs treated with milbemycin oxime carrying a high number of circulating microfilariae. These reactions are presumably caused by release of protein from dead or dying microfilariae.

Do not use in puppies less than six weeks of age.

Do not use in dogs or puppies less than two pounds of body weight.

The safety of SENTINEL® SPECTRUM® Chews has not been evaluated in dogs used for breeding or in lactating females. Studies have been performed with milbemycin oxime and lufenuron alone (see **ANIMAL SAFETY**).

Adverse Reactions: The following adverse reactions have been reported in dogs after administration of milbemycin oxime, lufenuron, or praziquantel: vomiting, depression/lethargy, pruritus, urticaria, diarrhea, anorexia, skin congestion, ataxia, convulsions, salivation, and weakness.

To report suspected adverse drug events, contact Virbac at 1-800-338-3659 or the FDA at 1-888-FDA-VETS.

For technical assistance, call Virbac at 1-800-338-3659.

Information for Owner or Person Treating Animal: *Echinococcus multilocularis* and *Echinococcus granulosus* are tapeworms found in wild canids and domestic dogs. *E. multilocularis* and *E. granulosus* can infect humans and cause serious disease (alveolar hydatid disease and hydatid disease, respectively). Owners of dogs living in areas where *E. multilocularis* or *E. granulosus* are endemic should be instructed on how to minimize their risk of exposure to these parasites, as well as their dog's risk of exposure. Although SENTINEL SPECTRUM Chews were 100% effective in laboratory studies in dogs against *E. multilocularis* and *E. granulosus*, no studies have been conducted to show that the use of this product will decrease the incidence of alveolar hydatid disease or hydatid disease in humans. Because the prepatent period for *E. multilocularis* may be as short as 26 days, dogs treated at the labeled monthly intervals may become reinfected and shed eggs between treatments.

Effectiveness

Heartworm Prevention: In a well-controlled laboratory study, SENTINEL SPECTRUM Chews (*milbemycin oxime, lufenuron, praziquantel*) were 100% effective against induced heartworm infections when administered once monthly for 6 consecutive months. In well-controlled laboratory studies, neither one dose nor two consecutive doses of SENTINEL SPECTRUM Chews provided 100% effectiveness against induced heartworm infections.

Intestinal Nematodes and Cestodes Treatment and Control: Elimination of the adult stage of hookworm (*Ancylostoma caninum*), roundworm (*Toxacara canis, Toxascaris leonina*), whipworm (*Trichuris vulpis*) and tapeworm (*Dipylidium caninum, Echinococcus multilocularis, Echinococcus granulosus, Taenia pisiformis*) infections in dogs was demonstrated in well-controlled laboratory studies.

Flea Prevention and Control: In well-controlled studies, SENTINEL SPECTRUM Chews were effective in preventing flea eggs from hatching, thus providing control of the development of flea populations (*Ctenocephalides felis*).

Palatability: In a field study of 117 dogs offered SENTINEL SPECTRUM Chews, 113 dogs (96.6%) accepted the product when offered from the hand as if a treat, 2 dogs (1.7%) accepted it from the bowl with food, 1 dog (0.9%) accepted it when it was placed in the dog's mouth, and 1 dog (0.9%) refused it.

Animal Safety: In a margin of safety study, 40 ten-week-old puppies (10 per group) were administered either a sham dose (0X) or doses of 1, 3, or 5X the maximum exposure dose of SENTINEL SPECTRUM Chews once every two weeks for a total of seven treatments. Transient ataxia, lethargy, tremors, and salivation were seen in the 3X and 5X groups following each of the seven doses. Lethargy and ataxia were occasionally reported in sham-dosed (0X) and 1X dogs. Tremors were observed twice post-treatment in the 1X treatment group. Vomiting was seen in all treatment groups but at a higher incidence in the 3X and 5X groups. At the 5X dose, shallow breathing was noted in two dogs and one dog was unable to stand following two different doses. All clinical signs resolved within 24 hours.

In a second margin of safety study, 64 six-week-old puppies (16 per group) were dosed with either a sham (0X) or 1, 3, or 5X the maximum exposure dose of SENTINEL SPECTRUM Chews on days 1, 15, 29, and 43. A dose dependent increase in ataxia, decreased activity, tremors, and salivation was seen within 24 hours of treatment. Splayed hind limbs were observed once in one dog in the 5X treatment group. Vomiting was observed in the 5X treatment group.

For SENTINEL SPECTRUM Chews, the maximum exposure based on product dosing is 2.5 mg/kg for milbemycin oxime, 50.7 mg/kg for lufenuron and 25.1 mg/kg for praziquantel, which is higher than the minimum effective dose used in the safety studies for milbemycin oxime and lufenuron (see below).

Milbemycin Oxime: Two studies were conducted in heartworm-infected dogs treated with milbemycin oxime. Mild, transient hypersensitivity reactions were observed in dogs with high microfilariae counts (see **PRECAUTIONS**).

Safety studies in pregnant dogs demonstrated that doses of 0.6X the maximum exposure dose of SENTINEL SPECTRUM Chews, (1.5 mg/kg of milbemycin oxime), administered daily from mating through weaning, resulted in measurable concentrations of milbemycin oxime in milk. Puppies nursing these females demonstrated milbemycin oxime-related effects (depression, decreased activity, diarrhea, dehydration, nasal discharge). A subsequent study, which evaluated the daily administration of 0.6X the maximum exposure dose of SENTINEL SPECTRUM Chews, from mating until one week before weaning, demonstrated no effects on the pregnant females or their litters. A study, in which pregnant females were dosed once, at 0.6X maximum exposure dose of SENTINEL SPECTRUM Chews before, on the day of, or shortly after whelping, resulted in no effects on the puppies.

Some nursing puppies, at 2, 4, and 6 weeks of age, administered oral doses of 9.6 mg/kg milbemycin oxime (3.8X the maximum exposure dose of SENTINEL SPECTRUM Chews) exhibited tremors, vocalization, and ataxia. These effects were all transient and puppies returned to normal within 24 to 48 hours. No effects were observed in puppies administered 0.5 mg/kg milbemycin oxime (minimum label dose).

A rising-dose safety study conducted in rough-coated Collies resulted in ataxia, pyrexia, and periodic recumbency in one of fourteen dogs administered milbemycin oxime at 12.5 mg/kg (5X the maximum exposure dose of SENTINEL SPECTRUM Chews). Prior to receiving the 12.5 mg/kg dose on day 56 of the study, all animals had undergone a dosing regimen consisting of 2.5 mg/kg milbemycin oxime on day 0, followed by 5.0 mg/kg on day 14, and 10.0 mg/kg on day 32. No adverse reactions were observed in any of the Collies treated with doses less than 12.5 mg/kg.

Lufenuron: In a ten-month study, doses of lufenuron up to 2X the maximum exposure dose of SENTINEL SPECTRUM Chews (10 mg/kg) caused no overt toxicity. A single dose of 200 mg/kg had no marked effect on adult dogs, but caused decreased activity and reduced appetite in eight-week-old puppies. Lufenuron tablets were evaluated with concurrent administration of flea adulticides containing carbaryl, permethrin, chlorpyriphos, and cythioate. No toxicty resulted from these combinations. Lufenuron tablets did not cause cholinesterase inhibition nor did they enhance cholinesterase inhibition caused by exposure to organophoshphates.

Two laboratory and two well-controlled field studies were conducted to evaluate reproductive safety of lufenuron tablets in breeding dogs. In one of the laboratory studies, in which lufenuron was administered to Beagle dogs as three divided doses, equivalent to 17.8X the maximum exposure dose of SENTINEL SPECTRUM Chews (10 mg/kg), the ratio of gravid females to females mated was 8/8 or 100% in the control group and 6/9 or 67% in the lufenuron-treated group. The mean number of pups per litter was two animals higher in the lufenuron versus control groups and mean birth weights of pups from treated females in this study was lower than control groups. These pups grew at a similar rate to the control pups. The incidence of nasal discharge, pulmonary congestion, diarrhea/dehydration, and sluggishness was higher in the lufenuron-treated pup group than in the control pup group. The incidence of these signs was transient and decreasing by the end of lactation.

Results from three additional reproductive safety studies, one laboratory and two field studies, evaluating eleven breeds of dogs, did not demonstrate any adverse findings for the reproductive parameters measured, including fertility, pup birth weights, and pup clinical signs, after administration of lufenuron up to 1X the maximum exposure dose of SENTINEL SPECTRUM Chews. The average milk: blood concentration ratio was approximately 60 (i.e. 60X higher drug concentrations in the milk compared to drug levels in the blood of treated females). Nursing puppies averaged 8-9 times higher blood concentrations of lufenuron compared to their dams.

Storage Information: Store in a dry place at controlled room temperature, between 59° and 77°F (15-25°C).

How Supplied: SENTINEL SPECTRUM Chews are available in four strengths, formulated according to the weight of the dog. Each strength is available in color-coded packages of six or twelve chewable tablets each.

Manufactured by: Virbac AH, Inc.
P.O. Box 162059
Fort Worth, TX 76161
NADA 141-333, Approved by FDA.

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IVERHART **MAX**®

Soft Chew

(ivermectin/pyrantel pamoate/praziquantel)

For oral use in dogs only.

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

Description: IVERHART MAX® Soft Chew is a combination of three anthelmintics (ivermectin/pyrantel pamoate/praziquantel). The soft chews are available in four sizes in color-coded packages for oral administration to dogs according to their weight **(see Dosage and Administration)**.

Indications: For use in dogs to prevent canine heartworm disease by eliminating the tissue stage of heartworm larvae *(Dirofilaria immitis)* for a month (30 days) after infection and for the treatment and control of roundworms *(Toxocara canis*, *Toxascaris leonina)*, hookworms *(Ancylostoma caninum*, *Uncinaria stenocephala*, *Ancylostoma braziliense*), and tapeworms *(Dipylidium caninum*, *Taenia pisiformis).*

Dosage and Administration: IVERHART MAX Soft Chew should be administered orally at monthly intervals and the recommended minimum dose level of 6 mcg of ivermectin per kilogram (2.72 mcg/lb), 5 mg of pyrantel (as pamoate salt) per kg (2.27 mg/lb), and 5 mg of praziquantel per kg (2.27 mg/lb) of body weight, as follows:

Dog Weight Pounds	Soft Chew per Month	Soft Chew Size	Ivermectin Content	Pyrantel Pamoate Content	Praziquantel Content
6.0 to 12	1	Toy	34 mcg	28.5 mg	28.5 mg
12.1 to 25	1	Small	68 mcg	57 mg	57 mg
25.1 to 50	1	Medium	136 mcg	114 mg	114 mg
50.1 to 100	1	Large	272 mcg	228 mg	228 mg

IVERHART MAX Soft Chew is recommended for dogs 8 weeks of age or older. For dogs over 100 lbs, use the appropriate combination of these soft chews.

Remove only one dose at a time from the packaging. Return the remaining soft chew(s) to their box to protect from light. The soft chew can be offered to the dog by hand or added, intact, to a small amount of dog food. Care should be taken to ensure that the dog consumes the complete dose. The treated dog should be observed for a few minutes after administration to confirm that none of the dose has been lost or rejected. If it is suspected that any of the dose has been lost, redosing is recommended.

IVERHART MAX Soft Chew should be given at monthly intervals during the period of the year when mosquitoes (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 mosquitoes. The final dose must be given within a month (30 days) after the dog's last exposure to mosquitoes.

When replacing another heartworm preventative product in a heartworm disease prevention program, the first dose of IVERHART MAX Soft Chew must be given within a month (30 days) of the last dose of the former medication. A heartworm test should be performed prior to switching heartworm preventative products.

If the interval between doses exceeds a month (30 days), the effectiveness of ivermectin can be reduced. Therefore, for optimal performance, the soft chew 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 IVERHART MAX Soft Chew and the recommended dosing regimen will minimize the opportunity for the development of adult heartworms.

Warnings:

For use in dogs only. Keep this and all drugs out of reach of children and pets. In safety studies with ivermectin/pyrantel pamoate/praziquantel tablets, testicular hypoplasia was observed in some dogs receiving 3 and 5 times the maximum recommended dose monthly for 6 months (see Animal Safety).

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.

Precautions: Use with caution in sick, debilitated, or underweight animals and dogs weighing less than 10 lbs **(see Animal Safety).** The safe use of this drug has not been evaluated in pregnant or lactating bitches.

All dogs should be tested for existing heartworm infection before starting treatment with IVERHART MAX Soft Chew, which is not effective against adult *Dirofilaria immitis*. Infected dogs should be treated to remove adult heartworms and microfilariae before initiating a heartworm prevention program.

While some microfilariae may be killed by the ivermectin in IVERHART MAX Soft Chew at the recommended dose level, IVERHART MAX Soft Chew 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.

Adverse Reactions: In a field study with IVERHART MAX Soft Chew, self-limiting adverse reactions, including vomiting, diarrhea, lethargy, difficulty swallowing, excessive salivation, increased water consumption, and coughing were reported. Self-limiting adverse reactions, including lethargy, limpness, salivation, shaking, diarrhea, decreased appetite, licking lips, and belching were reported between 20 minutes and 72 hours following treatment in a field study with ivermectin/pyrantel pamoate/praziquantel tablets.

In field studies with ivermectin/pyrantel pamoate tablets, vomiting or diarrhea within 24 hours of dosing was rarely observed (1.1% of administered doses). The following adverse reactions have been reported in dogs following the use of ivermectin products: depression/lethargy, vomiting, anorexia, diarrhea, mydriasis, ataxia, staggering, convulsions, and hypersalivation.

To report suspected adverse events, for technical assistance, or to obtain a copy of the Safety Data Sheet (SDS), contact Virbac AH, Inc. at 1-800-338-3659 or us.virbac.com. For additional information about adverse drug experience reporting for animal drugs, contact the FDA at 1-888-FDA-VETS or online at http://www.fda.gov/AnimalVeterinary/SafetyHealth.

Effectiveness: Prevention of the tissue larval stage of heartworm *(Dirofilaria immitis)* and the elimination of the adult stage of hookworm *(Ancylostoma caninum*, *Uncinaria stenocephala*, *Anyclostoma braziliense)*, roundworm *(Toxocara canis*, *Toxascaris leonina)*, and tapeworm *(Dipylidium caninum*, *Taenia pisiformis)* infections in dogs was demonstrated in well-controlled laboratory studies.

Palatability: In a field study of 132 dogs, IVERHART MAX Soft Chew was offered once monthly for 3 months. The dogs voluntarily consumed 86.3% of the doses from the owner's hand or from a bowl within 5 minutes, 13.0% accepted the dose when it was offered in food or administered by placing onto the back of the dog's tongue (pilling), and 0.7% of the doses were unable to be administered.

Animal Safety: Studies with ivermectin indicate that certain dogs of the Collie breed are more sensitive to the effects of ivermectin administered at elevated dose levels (more than 16 times the target dose level of 6 mcg/kg) than dogs of other breeds. At elevated doses, sensitive dogs showed more adverse reactions, which included mydriasis, depression, ataxia, tremors, drooling, paresis, recumbency, excitability, stupor, coma, and death. No signs of toxicity were seen at 10 times the recommended dose (27.2 mcg/lb) in sensitive Collies. Data from these studies support the safety of ivermectin products in dogs, including Collies, when used at the label recommended dose.

Because ivermectin and praziquantel are approximately 30% more bioavailable in the IVERHART MAX Soft Chew than in the ivermectin/pyrantel pamoate/praziquantel tablets used in the following target animal safety studies, the margin of safety is narrower than reported in these studies. The potential for adverse reactions may be greater in individual dogs administered IVERHART MAX Soft Chew than ivermectin/pyrantel pamoate/praziquantel tablets.

In a target animal safety study using ivermectin/pyrantel pamoate/praziquantel tablets, doses were administered to 8-week-old Beagle puppies at one, three, and five times the maximum recommended dose of 12.5 mcg/kg ivermectin, 10.47 mg/kg pyrantel, and 10.47 mg/kg praziquantel. The dogs were treated every 30 days for 6 months. Vomiting within 6 hours of dosing and soft or watery feces within 24 hours of dosing were observed. Other observations during the study were: ano-genital swelling, lethargy, head movements, shallow, audible or difficult breathing, and salivation. One dog in the 5X group had tremors and decreased activity. All of these signs were transient. No treatment was required. Histopathology showed testicular hypoplasia in the 3X and 5X groups **(see Warnings)**.

In a laboratory safety study using ivermectin/pyrantel pamoate/praziquantel tablets, 12-week-old Beagle puppies receiving 3 and 5 times the recommended dose once weekly for 13 weeks demonstrated a dose-related decrease in testicular maturation compared to controls. In this study, all treated puppies had significantly higher cholesterol levels compared to untreated controls.

In a reproductive safety study, adult males were treated at 37.5 mcg/kg ivermectin, 31.4 mg/kg pyrantel, and 31.4 mg/kg praziquantel every 14 days during two full spermatogenic cycles (112 days). The quality of semen and reproductive health were not affected by treatment. Treatment-related vomiting and soft feces were reported during this study.

In a study of the effectiveness of ivermectin/pyrantel pamoate/praziquantel tablets for the treatment of *Toxocara canis*, one 8.1 lb, 72-day-old puppy died 6 days after administration of the label dose. This puppy and many other puppies in the study had high worm burdens and were reported to have diarrhea, sometimes bloody, frequently before and after treatment. Dehydration and signs of anemia (pale mucous membranes) were the only abnormal gross necropsy finding observed. No definitive cause was determined. In a 90-day field study using ivermectin/pyrantel pamoate/praziquantel tablets, the most serious adverse reactions (lethargy, limpness, and salivation) were seen in dogs weighing less than 10 lbs **(see Precautions)**.

Storage Information: Store at 20°C to 25°C (68°F to 77°F), excursions permitted between 15°C and 30°C (59°F to 86°F).

How Supplied: IVERHART MAX Soft Chew is available in four dosage strengths **(see Dosage and Administration)** for dogs of different weights. Each strength comes in a package of 6 soft chews.

NADA 141-441, Approved by FDA.

Manufactured by:

Virbac AH, Inc.
Fort Worth, TX 76137 USA
Phone: 1-800-338-3659

302143-03

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Virbac

Conjunctival Microflora in Relation to Conjunctivitis in Guinea Pigs

Tracey K. Ritzman, DVM, DABVP (Avian), DABVP (Exotic Companion Mammal)
Cascade Hospital for Animals
Grand Rapids, Michigan

In the Literature

Faghihi H, Rajaei SM, Ansari-Mood M, Azizi F. Conjunctival microflora in guinea pigs with and without signs of conjunctivitis. *J Exotic Pet Med*. 2019;30:65-68.

FROM THE PAGE ...

Anecdotal information suggests that guinea pigs have a high prevalence of ocular issues. Guinea pigs have prominent eyes, with eyelids open at birth, relatively small third eyelids, and low tear production, which can all predispose them to conditions that affect conjunctival and corneal health.

In this study, 9 clinically normal guinea pigs and 11 guinea pigs that had clinical conjunctivitis were examined and tested to evaluate their conjunctival microflora. Conjunctival swabs were obtained from both eyes of each guinea pig for bacterial culture and susceptibility testing. Culture results revealed bacterial growth in 77% of the clinically normal guinea pig eyes and in 72% of guinea pig eyes with clinical evidence of conjunctivitis.

In the clinically normal guinea pigs, the most common bacterial isolates were *Staphylococcus* spp, *Bacillus* spp, and *Streptococcus* spp, all of which have been reported as part of the normal microflora of guinea pig conjunctiva. Bacteria isolated from guinea pigs with signs of conjunctivitis consisted primarily of *Staphylococcus* spp, *Moraxella* spp, *Clostridium* spp, *Listeria* spp, and *Streptococcus* spp. Most of the isolated bacteria were sensitive to common antibiotics used in guinea pigs (eg, enrofloxacin, doxycycline, vancomycin). No significant difference between groups was found in the number of isolated *Staphylococcus* spp and *Streptococcus* spp. One limitation of this study was the use of a general bacterial susceptibility panel; use of an ophthalmologic susceptibility panel would have been preferable.

... TO YOUR PATIENTS

Key pearls to put into practice:

1. A sterile microswab sample of the cornea and mucosal surface of the lower conjunctival fornix for culture and susceptibility testing is sufficient for determining the bacterial flora of a guinea pig with conjunctivitis.
2. When bacterial culture and susceptibility testing is requested for a guinea pig, the clinician should request an ophthalmologic susceptibility panel from the laboratory rather than a general antimicrobial susceptibility panel.
3. Bacterial growth from a conjunctival swab in a guinea pig does not automatically equate to a diagnosis of bacterial conjunctivitis. Healthy guinea pigs without clinical signs of conjunctivitis also have the potential for positive bacterial cultures.
4. Although pathogenic bacterial infection is a common cause of conjunctivitis in guinea pigs, infectious agents are not the only cause; vitamin C deficiency can also result in conjunctivitis in these patients. The clinician should consider all potential etiologies when diagnosing a patient.

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For complete product information, please see pages 46 and 47.

Reference: 1. AHS announces findings of new heartworm incidence survey. American Heartworm Society website. https://heartwormsociety.org/newsroom/in-the-news/347-ahs-announces-findings-of-new-heartworm-incidence-survey. Accessed January 17, 2019.

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Tracking Body Weight in Cats

Elizabeth A. Berliner, DVM, DABVP (Shelter Medicine Practice & Canine and Feline Practice)
Cornell University

In the Literature

Campigotto AJ, Poljak Z, Stone EA, Stacey D, Bernardo TM. Investigation of relationships between body weight and age among domestic cats stratified by breed and sex. *J Am Vet Med Assoc*. 2019;255(2):205-212.

FROM THE PAGE ...

Feline obesity is of growing concern and mirrors similar trends in humans and other pet species.[1,2] A 2006 US study reported 35.1% of cats older than 1 year to be overweight or obese, with obesity occurring most frequently between the ages of 5 and 11 years.[3] Obesity in cats has been identified as a risk factor for arthritis, urinary tract disease, skin disease, diabetes mellitus, neoplasia, and hepatic lipidosis.[3-5]

This retrospective study* analyzed a dataset of 19,015,888 adult cat records from clinics in the United States and Canada between 1981 and 2016 and represented 52,945,410 recorded body weight (BW) measurements. The objective of the study was to characterize BW changes over a pet's lifespan and investigate associations between BW and breed, sex, and spay/neuter status.

When data from 1995 were compared with data from 2005, peak BW occurred between 6 and 10 years of age in neutered Siamese, Persian, Himalayan, and Maine Coon cats, then declined. When data for short-, medium-, and longhair domestic cats were evaluated, small but significant increases in mean BW were noted in spayed and neutered cats as compared with intact cats. Confounding factors (eg, diet, lifestyle, health status) were not considered in the analysis but could play a role in BW alteration over time. In addition, because this study focused on BW measurements and not body fat or BCS, conclusions could not be made regarding the prevalence of obesity in this population. Of note, 52% of cats had their BW measured only once, which suggests that BW was not routinely recorded at visits or that regular visits were not occurring. The high number of missing BW measurements suggests that this important component of feline health monitoring is routinely being missed in the clinic.

Continues ▶

*This study was supported by the IDEXX Chair in Emerging Technologies and Bond-Centered Animal Care.

… TO YOUR PATIENTS

Key pearls to put into practice:

1. Monitoring BW is an important component of feline healthcare. Tracking changes in BW over time can help guide clinicians and owners in risk assessment for disease and in developing personalized care plans for cats.

2. BW is an objective measurement that can be useful in tracking the health status of an individual cat. As compared with BW, BCS is more closely correlated with representing body fat but requires staff be trained on how to obtain BCS measurements to be reliable.[6,7]

3. Communicating with owners about their cat's BW is an important but sometimes difficult aspect of an annual examination. A positive attitude and patient-directed speech (ie, directly addressing the cat in an empathetic and amusing manner) have been demonstrated to aid in successful clinician–owner interactions regarding weight gain in cats.[8]

References

1. Sandøe P, Palmer C, Corr S, Astrup A, Bjørnvad CR. Canine and feline obesity: a One Health perspective. *Vet Rec*. 2014;175(24):610-616.
2. Chandler M, Cunningham S, Lund EM, et al. Obesity and associated comorbidities in people and companion animals: a One Health perspective. *J Comp Pathol*. 2017;156(4):296-309.
3. Lund EM, Armstrong PJ, Kirk CA, Klausner JS. Prevalence and risk factors for obesity in adult cats from private US veterinary practices. *Intern J Appl Res Vet Med*. 2005;3(2):88-96.
4. Tarkosova D, Story MM, Rand JS, Svoboda M. Feline obesity - prevalence, risk factors, pathogenesis, associated conditions and assessment: a review. *Vet Med-Czech*. 2016;61(6):295-307.
5. German AJ, Ryan VH, German AC, Wood IS, Trayhurn P. Obesity, its associated disorders and the role of inflammatory adipokines in companion animals. *Vet J*. 2010;185(1):4-9.
6. Shoveller AK, DiGennaro J, Lanman C, Spangler D. Trained vs untrained evaluator assessment of body condition score as a predictor of percent body fat in adult cats. *J Feline Med Surg*. 2014;16(12):957-965.
7. Laflamme D. Development and validation of a body condition score system for cats: a clinical tool. *Feline Pract*. 1997;25(5/6):13-18.
8. Phillips AM, Coe JB, Rock MJ, Adams CL. Feline obesity in veterinary medicine: insights from a thematic analysis of communication in practice. *Front Vet Sci*. 2017;4:117.

Research Note: **Needle Gauge Influence on Hemostasis Measures in Cats**

Diagnostic measures of hemostasis include platelet count, prothrombin time (PT), activated partial thromboplastin time (aPTT), fibrinogen, and fibrinogen degradation products. During venipuncture in humans, the shear force exerted by a needle smaller in diameter has been shown to affect platelet count but not PT or aPTT. As compared with human platelets, feline platelets have greater aggregability in response to shear stress. This prospective, observational, randomized clinical study evaluated whether needle size (22-g vs 25-g) affected routine coagulation variables in cats. Blood was sampled from the left and right jugular veins of 20 healthy, client-owned cats. Results showed no difference between the needle sizes in aPTT, platelet count, fibrinogen degradation products, or fibrinogen. PT was significantly higher when blood was drawn with the smaller diameter needle, but the degree of elevation was considered to have little clinical impact. The authors concluded that jugular venipuncture with either a 22-g or 25-g needle did not introduce any clinically meaningful difference in routine coagulation variables or platelet counts in cats.

Source

Solbak S, Epstein SE, Hopper K. Influence of needle gauge used for venipuncture on measures of hemostasis in cats. *J Feline Med Surg*. 2019;21(2):143-147.

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[1]Kruger JM, Lulich JP, MacLeay J, et al. Comparison of foods with differing nutritional profiles for long-term management of acute nonobstructive idiopathic cystitis in cats. *J Am Vet Med Assoc.* 2015;247(5):508-517. [2]Lulich JP, Kruger JM, MacLeay JM, et al. Efficacy of two commercially available, low-magnesium, urine acidifying dry foods for the dissolution of struvite uroliths in cats. *J Am Vet Med Assoc.* 2013;243(8):1147-1153. Average 27 days *in vivo* study in urolith forming cats. [3]Pereira GG, Fragoso S, Pires E. Effect of dietary intake of L-tryptophan supplementation on multi-housed cats presenting stress related behaviours, in *Proceedings.* BSAVA 2010. [4]Beata C, Beaumont-Graff E, Coll V, et al. Effect of alpha-casozepine (Zylkene) on anxiety in cats. *J Vet Behav.* 2007;2(2):40-46.

ADVERTORIAL

SMART INVENTORY CABINETS:

by Mark Magazou, II, MPA, JD
Saint Francis Veterinary Center
President & CEO

It may seem harmless or even smart to have a lot of excess stock, but manual inventory is a drag in more ways than you might think. We fully automated our inventory ten years ago and haven't looked back; in retrospect, **there are three reasons smart inventory cabinets have really made sense for us** at Saint Francis Veterinary Center, and why they seem poised to be come one of the trends of the coming decade.

Our smavrt cabinet for controlled substances

1: Protecting your people

First and foremost, uncontrolled inventory poses a risk to your staff. I never thought about it much growing up, but the reality is that my Dad was always an arm's reach from a locker full of narcotics, some of which are deadly by design. And when I say 'locker' it's a little bit of a misnomer. Like most practices, there were certainly times when that lockbox wasn't locked.

These days, the risk to staff from controlled substances is much more real. Levels of addiction in America have never been higher, as over 130 people die every single day from opioid related drug overdoses.[1] Some of these deaths occur within the veterinary community, as ready access to these drugs is sometimes a gateway to addiction, or the inverse: addiction becomes the reason to seek employment at an animal hospital. According to a recent survey, 12% of veterinarians are aware of opioid abuse or diversion by a staff member, so this isn't something that leaders of practices are in the dark about.[2]

Tragically, veterinarians are also 2-4 times as likely as the general population to take their own life.[3] The causes for this trend are complicated, but ready access to narcotics provides a means for those who find themselves in a bad place.

Automated dispensing does not solve the opioid & suicide epidemics any more than seat belts solve car accidents. Neither is a 100% solution, but at the same time, not using them is needlessly dangerous. Smart cabinets significantly reduce staff risk in three important ways:

- Each drug gets its own double-locked container
- Fingerprint access - no keys
- The option to require a second person's fingerprint to access schedule II drugs

We see CUBEX smart cabinets as mandatory elements of a practice-wide effort to improve staff safety.

2. Protecting Your Practice

Veterinarians are generally shielded from legal consequences of professional wrongdoing because, as heartless as it sounds, pets are considered property, and liability for harming a pet is usually the value of the property – a few thousand dollars at most. Employees, however, are people, and that's a whole other ballgame.

In the event of an incident of employee self-harm (overdose or suicide), it's possible that the little plastic tacklebox or open lockbox that is so commonly used to store loaded syringes ahead of surgeries could be characterized as gross negligence or willful, reckless conduct. If the informal standard operating procedure of the practice ('this is how we do things here') provided a reliable, open-access source of narcotics, a wrongful death suit brought by the family of the deceased could potentially carry damages into the millions of dollars.

With all of that added attention comes an increased risk of involvement from the DEA or state regulatory authorities. Federal fines start at over $14,000 per infraction, and there's almost never just one. More dangerous, however, is the risk to the registrant's DEA and medical license. As seen in a recent case in Colorado, a veterinarian can be forced to surrender their means to earn a living as part of a settlement to resolve the mishandling controlled substances.[4]

At our practice, smart drug cabinets show us exactly who had access to which controlled substances and when. There are no keys to be stolen or shared, since it's a biometric, fingerprint-driven system, and records are kept automatically. When combined with other elements of a narcotics safety program, like cameras, regular background checks, drug testing, and most importantly, a formalized standard operating procedure, proper use of smart drug cabinets can help to protect your practice and your medical license from accusations of negligence and reckless

Smart cabinets can manage the entire pharmacy, capturing every charge automatically

TREND OF THE 2020s

conduct, potentially shielding you from a career-altering lawsuit.

3. Protecting Your Profit

When I take the legal hat off and put the business management hat on, I look at the top and bottom line of the P&L. Inventory controlled by smart cabinets helps in both places.

Top line – missed revenue, missed profit.

Think of how easy it is in your practice for the staff to grab medications when asked, then forget to put those charges on the client invoice. It happens daily! Your staff is focused on patient care first, and sometimes things just get busy.

- AAHA found that 17% of charges are missed when tracked manually
- Industry consultant Mark Opperman looked at 300 practices and saw over $64,000 in missed revenue per doctor, per year, $7,000 per year ($23 per day) from just injectables alone.[5]

Service codes are often recommended as a remedy for missed medication charges and we certainly make use of this approach at Pathway, but it still doesn't create a physical control on the inventory. A smart cabinet that's integrated with your practice management system will automatically bill the client whenever a medication or other item is dispensed, and closing that loophole has massive implications for your P&L and your balance sheet.

Bottom line – too much cost, at the expense of profit.

When you're tracking inventory manually, you never really know how much you have, and as a result you carry more than necessary so you don't run out. Prior to automating our inventory in 2010, we had back stock all over the place. It occupied space that we now use to generate revenue: exams, lab diagnostics and imaging. Inventory automation with smart cabinets allowed us to dramatically reduce the amount of inventory we carry thanks to the fully automated, high-density storage of our CUBEX system. The difference between what that space earned us as storage (essentially nothing) and what it earns us now is tens of thousands of dollars a year.

Smart cabinets are also very effective at reducing waste and overuse. When there's a big pile of supplies sitting in the open, human nature is to grab more than we need. Putting those items behind a door, with a recorded quantity, makes everyone more conscious of waste, with the added bonus of preventing pilferage. All of this reduces COGS (cost of goods sold).

COGS is an often quoted but frequently misunderstood part of the P&L. When the time for transition finally comes, your EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) will be center stage because your practice's sale price will largely be determined by your EBITDA multiplied by a number (your 'multiple'). That multiplie recently has generally been between five and ten.

If revenue remains constant, COGS and EBITDA become inversely correlated. Every dollar of COGS reduction usually goes right onto your EBITDA, meaning that $10,000 in reduced annual COGS translates into $50,000-$150,000 in your pocket when the practice is sold. Having just gone through this process, I can say the reduced COGS from CUBEX had a very positive impact on our transition from a financial perspective.

The last word

Smart inventory cabinets will tbe one of the biggest trends of the 2020s in veterinary hospital management. They've been standard of care in human health for decades, and are finally making serious inroads into our industry thanks to improving technology, falling prices, and increased attention from manufacturers. If you've considered these in years past but put them on the wish list or the back burner, it may be time to re-consider; it's a whole new decade and automated inventory is more important and affordable than ever.

1. CDC/NCHS, National Vital Statistics System, Mortality. CDC WONDER, Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://wonder.cdc.gov.
2. "Prescription Opioid Epidemic: Do Veterinarians Have a Dog in the Fight?" Derek S. Mason, MPH, et. Al, Am J Public Health. 2018 September; 108(9): 1162–1163
3. Suicide among veterinarians in the United States from 1979 through 2015, Suzanne E. Tomasi DVM, MPH et al, Full Text Journal of the American Veterinary Medical Association, January 1, 2019, Vol. 254, No. 1, Pages 104-112
4. https://www.justice.gov/usao-co/pr/veterinarian-pays-226000-and-surrenders-license-resolve-allegations-he-failed-properly
5. http://veterinarybusiness.dvm360.com/veterinary-practices-miss-64000-fees-each-year

About the author

My father, Dr. Mark Magazu, founded Saint Francis Veterinary Center back in 1986, so I was raised in a veterinary practice. We've come a long way from that first tiny clinic, ultimately becoming the only three-time Finalist for AAHA Accredited Practice of the Year for North America, winning first place in 2019.

When I was considering careers, I went my own way and studied economics, public policy, management and the law rather than veterinary medicine – and still I found my way back to the family business .

Our recent ownership transition to Pathway Vet Alliance has furthered this continued pursuit of innovation designed to increase efficiency and profitability, giving me a unique perspective on how technologies like Cubex are shaping our industry in the wake of increased consolidation and other market trends.

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Preventing Parasitism in Breeding Kennels

Audrey Ruple, DVM, MS, PhD, DACVPM, MRCVS
Purdue University

The 2 major risk factors associated with parasitism were the dominant surface the dogs were housed on and the age of the dog.

In the Literature

Ash A, Lymbery A, Godfrey S, Shiel R, Paul A. Substrate type and age are risk factors for gastrointestinal parasitism in greyhound kennels. *Vet Parasitol*. 2019;265:7-14.

FROM THE PAGE ...

Dog kennels can present challenges to parasite-control programs due in part to dogs of all life stages being housed in close proximity.[1,2] For instance, reactivation of some parasitic infections (eg, *Toxocara canis*, *Ancylostoma caninum*) can occur during whelping, and puppies can be a source of infection for uninfected dogs in the same location.[3,4] Although detrimental to any dog, parasitic infection can be particularly problematic for athletic dogs, as acute infection with some species can lead to anemia, and chronic infection can result in growth retardation and failure to thrive.[5,6]

Continues ▶

This study evaluated the impact of parasitism on greyhounds in Australian breeding kennels. Previous studies have reported parasite prevalence in greyhound kennels in other countries to be ≈40% to 46%.[1,7] Parasite prevalence has also been determined in other dog populations in Australia, including other breeds in breeding kennels, in which the parasite prevalence was estimated to be ≈33%.[8] However, no information about parasite prevalence or risk factors for infection had yet been determined for greyhounds in breeding kennels in Australia.

In this study, fecal samples were collected from 721 greyhounds in breeding kennels across 5 Australian states, and questionnaires were supplied to each dog owner/trainer. Two parasitic tests were applied to each fecal sample (ie, wet malachite-stained smear, zinc sulphate centrifugation flotation), and ova/cysts were identified at the level of genus and/or species when possible. A subset of samples positive for *A caninum*, *Giardia* spp, *Taenia* spp, and/or *Neospora/Hammondia* spp underwent molecular characterization to determine which species were present. Risk factor analysis was performed using modeling techniques that accounted for the effects of individual kennels.

Total parasite prevalence was determined to be 60.3%, which is higher than what has been reported in greyhounds in breeding kennels in other countries. The parasite genera reported most frequently were *Sarcocystis*, hookworm (ie, *Ancylostoma*, *Uncinaria stenocephala*), *Giardia*, and *Toxocara*. The 2 major risk factors associated with parasitism were the dominant surface the dogs were housed on and the age of the dog; geographic region was also a risk factor. Dogs housed on concrete had a lower proportion of parasitism than did dogs housed on grass or sand, and adult dogs had a lower prevalence of parasitism than did juvenile dogs. The geographic region in which the kennel was located influenced the prevalence of the different parasite genera.

… TO YOUR PATIENTS

Key pearls to put into practice:

1. Kennel flooring in breeding facilities may impact overall parasite prevalence; thus, choosing surfaces that can be more easily cleaned and disinfected may help decrease parasite load.
2. Restricting access of juvenile dogs to adult housing areas may help prevent the spread of parasites in the kennel environment.
3. Recognizing which parasite species are prevalent in the geographic region in which the kennel is located may help inform best practices when designing a parasite-control program.

References

1. Jacobs DE, Prole JHB. Helminth infections of British dogs: prevalence in racing greyhounds. *Vet Parasitol*. 1976;1(4):377-387.
2. Overgaauw PA, Boersema JH. Nematode infections in dog breeding kennels in the Netherlands, with special reference to *Toxocara*. *Vet Q*. 1998;20(1):12-15.
3. Miller TA. Blood loss during hookworm infection, determined by erythrocyte labeling with radioactive 51-chromium. I. Infection of dogs with normal and with x-irradiated *Ancylostoma caninum*. *J Parasitol*. 1966;52(5):844-855.
4. Anderson RM, May RM. Regulation and stability of host-parasite population interactions: I. Regulatory processes. *J Anim Ecol*. 1978;47(1):219-247.
5. Buret AG. Mechanisms of epithelial dysfunction in giardiasis. *Gut*. 2007;56(3):316-317.
6. Traversa D. Are we paying too much attention to cardio-pulmonary nematodes and neglecting old-fashioned worms like *Trichuris vulpis*? *Parasit Vectors*. 2011;4:32.
7. Ridley RK, Dryden MW, Gabbert NH, Schoning P. Epidemiology and control of helminth parasites in Greyhound breeding farms. *Compend Contin Educ Vet*. 1994.
8. Bugg RJ, Robertson ID, Elliot AD, Thompson RCA. Gastrointestinal parasites of urban dogs in Perth, Western Australia. *Vet J*. 1999;157(3):295-301.

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Research Note:
Long-Term Outcome in Hoarded Cats

Animal hoarders pathologically accumulate more animals than they can properly care for. This study compared long-term outcomes for 371 cats that were surrendered to a high-quality private shelter from 14 hoarding environments. Various illnesses related to overcrowding, including upper respiratory infection, skin disease (eg, inflammation, alopecia, wounds), fleas, ear mites, and gingivitis, were common. Upper respiratory infection was significantly more prevalent in cats from institutional hoarding environments (ie, organizations advertising themselves as rescues or shelters). In 11 of the 14 hoarded groups, ≥90% of the cats were eventually adopted. The authors attributed this high success rate to manageable group sizes and managed intake, generous funding, and collaboration with community members.

Source

Jacobson LS, Giacinti JA, Robertson JV. Medical conditions and outcomes in 371 hoarded cats from 14 sources: a retrospective study (2011–2014). *J Feline Med Surg*. 2019. doi.org/10.1177/1098612X19854808

Research Note:
Pregabalin in the Treatment of Neuropathic Pain

This double-masked, randomized, crossover, placebo-controlled clinical trial evaluated the use of pregabalin in 8 dogs that had neuropathic pain associated with Chiari-like malformations and syringomyelia. Each dog underwent a placebo and a pregabalin treatment phase. Using a numerical scale, owners reported improved daily pain scores when dogs were treated with pregabalin. Pregabalin also significantly improved quantitative sensory testing, including mechanical hyperalgesia, cold hyperalgesia at 32°F (0°C), and cold allodynia at 59°F (15°C). In addition to its efficacy, pregabalin was well tolerated and noncumulative and had few adverse effects other than mild sedation.

Source

Sanchis-Mora S, Chang YM, Abeyesinghe SM, et al. Pregabalin for the treatment of syringomyelia-associated neuropathic pain in dogs: a randomised, placebo-controlled, double-masked clinical trial. *Vet J*. 2019. doi.org/10.1016/j.tvjl.2019.06.006

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Episodic Shaking & Facial Twitching in a Terrier

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Woburn, Massachusetts

Max, a 2-year-old, 17.2-lb (7.8-kg), neutered male cairn terrier, was presented to an emergency clinic for neurologic evaluation following a recent onset of episodic shaking and facial twitching.

Initial Presentation

The owner reported that Max was twitching and convulsing while lying awake in his bed the day before presentation. He was shaky the rest of the day and tentative in gait, and he had a similar but more severe episode of shaking the same night ≈2 to 3 minutes in duration. There was no reported salivation, vocalization, or elimination during the episode. Max had no known history of head trauma, toxin exposure, or travel and was up to date on vaccinations. Lead exposure was considered unlikely.

Max was evaluated ≈4 hours after the second episode by an emergency clinician, who suspected that Max was experiencing seizures. Physical and neurologic examinations were normal. CBC, serum chemistry profile, and urinalysis were unremarkable. Bile acid testing revealed normal preprandial bile acids (3.27 µg/mL; range, 0-4.9 µg/mL) and mildly elevated postprandial bile acids (15.89 µg/mL; range, 0-10.21 µg/mL), which were attributed to possible microvascular dysplasia, but other disorders (eg, portosystemic shunt) could not be excluded.

Max was prescribed phenobarbital (2 mg/kg PO every 12 hours) as a maintenance anticonvulsant and 2 doses of rectal diazepam (1 mg/kg per dose) for emergency seizure control and was discharged and referred to a neurologist. He was presented to the neurology service 2 days later with generalized tremors that had not responded to diazepam.

Neurologic Examination

On presentation to the neurology service, Max was alert and responsive. Neurologic examination revealed whole-body, small-amplitude, high-frequency tremors that were most apparent when Max was moving or being examined (see ***Video***). The tremors were substantially reduced when Max was sitting or lying down and stopped when he was completely at rest or asleep. The tremors resumed when he awoke and/or became active. Gait analysis revealed dysmetria (ie, hypermetric thoracic limbs) and vestibular ataxia (eg, veering, drifting, occasional stumbling). No resting nystagmus was observed, but opsoclonus (ie, pendular nystagmus with no fast phase) was observed when he was placed on his back.

VIDEO

To watch a video of this patient's presentation, visit **cliniciansbrief.com/article/episodic-shaking-facial-twitching-terrier** or scan the QR code below. Portions of the neurologic examination that were normal are not shown in the video.

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.

RELATED ARTICLE

For a list of differential diagnoses for patients presented with tremors, see **Tremors** on page 69.

SRTS = steroid-responsive tremor syndrome

Postural reactions, patellar reflexes, and withdrawal reflexes were normal.

Clinical signs were localized to the cerebellum, and vestibular signs were thought to be due to involvement of vestibular components of the cerebellum (ie, flocculonodular lobe, fastigial nucleus, caudal cerebellar peduncle). The initial convulsions reported by the owner may have been a milder version of the tremors the dog later displayed.

Diagnosis

The primary differential diagnoses were steroid-responsive tremor syndrome (SRTS) and toxicosis (eg, mycotoxicosis). Other differential diagnoses included encephalitis, brain malformation, and neurodegenerative disorders (see ***Related Article***). Toxicity was considered less likely, as there was no known exposure to mold in the house and the patient was confined to a fenced-in yard when outside.

Routine MRI of the brain was within normal limits. CSF analysis showed normal protein content (15.7 mg/dL; range, <25 mg/dL) and a mildly elevated nucleated cell count (6 cells/µL; range, <3-5 cells/µL). Cytologic examination of a concentrated CSF sample revealed mononuclear pleocytosis composed of mostly small, mature lymphocytes (66%), with fewer reactive macrophages (26%) and non-degenerate neutrophils (8%). CSF bacterial culture was negative. Serologic testing for *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, *Ehrlichia canis*, and *Rickettsia rickettsii* was negative. PCR testing of CSF for *Anaplasma* spp, *Bartonella* spp, *Blastomyces dermatitidis*, *B burgdorferi*, canine distemper virus, *Coccidiodes* spp, *Cryptococcus* spp, *Ehrlichia* spp, *Histoplasma capsulatum*, *Neospora caninum*, *R rickettsii*, *Toxoplasma gondii*, and West Nile virus was also negative.

Based on the lack of toxin exposure combined with the results of diagnostic testing, SRTS was strongly suspected.

DIAGNOSIS:

PRESUMPTIVE STEROID-RESPONSIVE TREMOR SYNDROME

Treatment & Outcome

Max received immunosuppressive doses of prednisone (7.5 mg [1 mg/kg] PO every 12 hours) and diazepam (0.5 mg/kg PO every 12 hours for 1 week; see ***Treatment at a Glance***).

At the 2-week follow-up visit, Max's owner reported that the tremors had stopped within 2 to 3 days of discharge and gait had returned to normal during the first week of treatment. Neurologic examination was within normal limits. The prednisone dose was reduced to 5 mg PO every 12 hours for 1 month, then to 5 mg PO every 24 hours for 2 months, and finally to 5 mg PO every 48 hours for 2 months.

Max was presented for a recheck examination 6 months after the 2-week follow-up. The owner had discontinued prednisone 2 weeks prior. Because there was no sign of relapse during the treatment period or after the owner discontinued treatment, prednisone was not restarted. Max was still normal ≈3 months after the 6-month recheck.

Common Causes of Tremors

Tremors are involuntary, somewhat rhythmic, oscillating muscle contractions and relaxations of ≥1 body part.[1-3] Tremors are common but incompletely characterized in veterinary medicine.

The terminology used to define tremor syndromes is under debate, and classification schemes are continually evolving. Veterinary classification schemes typically divide tremors into the following broad categories: physiologic or pathologic, congenital or acquired, and resting or action related.[2-4] Tremor syndromes can fall into multiple categories; for example, tremors caused by hypomyelination/dysmyelination in young springer spaniels, Samoyeds, chow chows, and other breeds are both congenital and action related.[2]

The most common causes of acquired, small-amplitude, high-frequency, action-related tremors are SRTS and toxicity, particularly mycotoxicosis.[1]

Steroid-Responsive Tremor Syndrome

SRTS is reported most commonly in small-breed dogs typically younger than 5 years.[1-3] SRTS was originally described—and appeared to be more common in—small white dogs (eg, bichon frises, Maltese terriers, West Highland white terriers), leading to the term little white shaker syndrome.[2,5,6] This term is no longer recommended, as more than half of affected dogs are not white and any breed can be affected.[1,7,8] Other terms for this condition include shaker dog syndrome, corticosteroid-responsive tremors, and acquired action-related repetitive myoclonus.[2]

Although its cause is unknown, SRTS is suspected to be an autoimmune disorder due to its response to corticosteroid administration. Gross histologic examination of brain tissue is often normal,[5] but histologic findings in some dogs have shown mild, diffuse meningoencephalitis characterized by mild perivascular cuffing with lymphocytic infiltrates.[2]

Continues ▶

TREATMENT AT A GLANCE

- Corticosteroids (eg, prednisone [1-2 mg/kg PO every 12 hours for 2 weeks, followed by gradual tapering to the lowest effective dose]) are most commonly prescribed. Many patients can be weaned off steroids in 6 to 8 months. Recurrence/relapse is more likely if tapering occurs too quickly.
- Some patients may benefit from 1 week of benzodiazepine treatment (eg, diazepam [0.5 mg/kg PO every 12 hours]) for mild sedation and skeletal muscle relaxation.
- Other immunosuppressants (eg, azathioprine, cyclosporine) may be needed if prednisone is contraindicated or severe adverse effects are observed.

Most patients with SRTS are presented for evaluation of tremors and incoordination. Owners may misconstrue the tremors as fear, anxiety, or shivering. As seen in Max, patients with SRTS exhibit small-amplitude, high-frequency, whole-body tremors when moving[1-3,9]; these tremors typically resolve when resting or asleep. Affected dogs also frequently display signs of ocular tremors (ie, opsoclonus), cerebellar or vestibular ataxia, head tilt, absent menace, weakness, and, potentially, seizures.[2,3] Clinical signs of SRTS are indistinguishable from those of tremors due to mycotoxicosis.[2,3]

A presumptive diagnosis of SRTS can be made based on signalment, clinical signs, neurologic examination findings, and exclusion of other potential causes. MRI results are usually normal in SRTS patients, but evidence of mild meningoencephalitis may be apparent.[1,7,9] CSF in SRTS patients typically contains normal to mildly elevated protein content and has a nucleated WBC count.[1,5,7-9] CSF differential cytology most often reveals lymphocytic pleocytosis.

SRTS is generally responsive to corticosteroids. Immunosuppressive doses of corticosteroids (eg, prednisone [1-2 mg/kg PO every 12 hours for 2 weeks]) often resolve tremors within a few days.[1,5-9]

TAKE-HOME MESSAGES

- Whole-body, small-amplitude, high-frequency tremors are most commonly associated with SRTS and toxicosis, particularly mycotoxicosis.
- Patients with SRTS frequently exhibit cerebellovestibular signs.
- MRI results are often normal in these patients, and CSF analysis may be normal or mildly abnormal (eg, mild lymphocytic pleocytosis).
- Patients with tremors should be screened for possible exposure to mycotoxins via moldy food, trash, or compost, as well as other potential toxins (see ***Related Article***, page 64).

Once the tremors resolve, the dose should be slowly tapered to the lowest effective dose over several months as for other autoimmune disorders. Anecdotally, clinical signs are more likely to recur if treatment is tapered and discontinued before 6 months. Some patients may need to remain on low-dose treatment (eg, prednisone [0.25-0.5 mg/kg PO every 48 hours]) long-term to prevent recurrence. In rare cases, other immunosuppressive medications may be required, typically to reduce the adverse effects of corticosteroids. Affected dogs may also benefit from a short course of diazepam (0.5 mg/kg PO every 8 hours for 1 week).[1,5,9] Prognosis is excellent if disease is treated early and aggressively. Many patients can be successfully weaned off corticosteroids entirely.

Toxicosis

Toxicosis is the second most common cause of small-amplitude, high-frequency tremors in dogs. Although many toxins have been reported to cause tremors in dogs, mycotoxins are the most commonly reported toxic cause of generalized tremors (see ***Related Article***, page 64).[10-15] Mycotoxins are produced by *Penicillium* spp, *Aspergillus* spp, and *Claviceps* spp.[10] The most commonly implicated mycotoxins, penitrem A and roquefortine, are produced by *P crustosum* and *P roqueforti*, respectively, although *P crustosum* can produce both toxins concurrently.[10] Common sources of mycotoxins include garbage, compost, contaminated feed/grain, and moldy foods, particularly dairy products, bread, and nuts.[10-15]

Clinical signs include generalized tremors, seizures, and muscle tremors.[10-15] As with SRTS, tremors caused by mycotoxins tend to be of low amplitude and high frequency (ie, small, fast tremors) and occur when the patient is moving but tend to resolve at rest.[10-15] Diagnosis is typically based on compatible clinical signs and exposure risk. Measurement of penitrem A or roquefortine in biologic samples (eg, GI contents) can be performed to confirm diagnosis, but testing is generally not necessary, as tremors tend to resolve within a few days.[10-15] Treatment is largely sup-

portive with GI decontamination, IV fluids, oxygen and ventilatory support, methocarbamol, and, if indicated, anticonvulsants.[12-15] Prognosis for full recovery is excellent, particularly when treated early and aggressively. Clinical signs often resolve within 1 to 4 days of treatment, although long-term signs (eg, lasting 2-3 months) have been reported.[12-15]

Conclusion

Generalized tremors are a relatively common neurologic disorder. Affected patients may have severe clinical signs. Fortunately, the most common causes in dogs, SRTS and mycotoxicosis, have a very good prognosis if treated early and effectively.

SRTS = steroid-responsive tremor syndrome

References

1. Wagner SO, Podell M, Fenner WR. Generalized tremors in dogs: 24 cases (1984-1995). *J Am Vet Med Assoc*. 1997;211(6):731-735.
2. de Lahunta A, Glass E, Kent M. Uncontrolled involuntary skeletal muscle contractions. In: de Lahunta A, Glass E, Kent M, eds. *Veterinary Neuroanatomy and Clinical Neurology*. 4th ed. St. Louis, MO: Elsevier; 2015:509-524.
3. Sanders SG. Cerebellar diseases and tremor syndromes. In: Dewey CW, da Costa RC, eds. *Practical Guide to Canine and Feline Neurology*. 3rd ed. Ames, IA: Wiley-Blackwell; 2016:299-327.
4. Podell M. Tremor, fasciculations, and movement disorders. *Vet Clin North Am Small Anim Pract*. 2004;34(6):1435-1452.
5. Bagley RS, Kornegay JN, Wheeler SJ, et al. Generalized tremors in Maltese: clinical findings in seven cases. *J Am Anim Hosp Assoc*. 1993;29(2):141-145.
6. Ross JA. Tremor and ataxia in a West Highland white terrier. *Vet Rec*. 1985;117(3):71.
7. Yamaya Y, Iwakami E, Goto M, et al. A case of shaker dog disease in a miniature dachshund. *J Vet Med Sci*. 2004;66(9):1159-1160.
8. Vanvooren N. A suspected case of idiopathic generalised tremor (shaker disease) in a shih tzu. *Vet Rec*. 1995;136(22):568.
9. Hazell KLA, Child G, Chin G. Clinical characteristics and outcome after treatment of shaker dog syndrome in 90 dogs. *Aust Vet Pract*. 2011;41(4):167-171.
10. Puschner B. Mycotoxins. *Vet Clin North Am Small Anim Pract*. 2002;32(2):409-419.
11. Eriksen GS, Jäderlund KH, Moldes-Anaya A, et al. Poisoning of dogs with tremorgenic *Penicillium* toxins. *Med Mycol*. 2010;48(1):188-196.
12. Young KL, Villar D, Carson TL, et al. Tremorgenic mycotoxin intoxication with penitrem A and roquefortine in two dogs. *J Am Vet Med Assoc*. 2003;222(1):52-53.
13. Boysen SR, Rozanski EA, Chan DL, et al. Tremorgenic mycotoxicosis in four dogs from a single household. *J Am Vet Med Assoc*. 2002;221(10):1441-1444.
14. Barker AK, Stahl C, Ensley SM, et al. Tremorgenic mycotoxicosis in dogs. *Compend Contin Educ Vet*. 2013;35(2):E1-6.
15. Walter SL. Acute penitrem A and roquefortine poisoning in a dog. *Can Vet J*. 2002;43(5):372-374.

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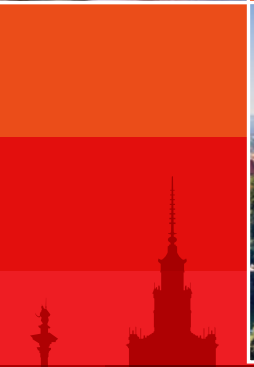

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Tremors

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FOR MORE
Find more Differential Diagnosis lists in upcoming issues of *Clinician's Brief* and on cliniciansbrief.com

- Basophilia
- Decreased Total Thyroxine
- Eosinophilia
- Epistaxis
- Hyperkalemia
- Hyperphosphatemia
- Hypoalbuminemia
- Hypocholesterolemia
- Hypoglycemia
- Hypokalemia
- Increased & Decreased Blood Urea Nitrogen
- Increased & Decreased Creatinine
- Increased Total Thyroxine
- Neutropenia
- Panting
- Regurgitation

Following are differential diagnoses* for dogs presented with tremors (ie, repetitive myoclonus).

- Primary neurologic disease
  - Steroid-responsive tremor syndrome (ie, little white shaker syndrome)
  - Cerebellar disorders
    - Congenital action-related tremors (eg, hypomyelination/dysmyelination)
    - Cerebellitis (infectious, immune-mediated)
    - Neoplasia
  - Idiopathic episodic tremors (eg, idiopathic head tremors, benign postural tremors [geriatric dogs])
- Toxin exposure
  - Tremorgenic mycotoxins (penitrem A and roquefortine)
  - Metronidazole intoxication (more commonly causes central vestibular dysfunction rather than tremors)
  - Other less common toxins
    - Amphetamines/pseudoephedrine
    - Bromethalin
    - Carbamates
    - Cocaine
    - Ethylene glycol
    - Heavy metals (eg, lead, aluminum)
    - Ivermectin
    - Macadamia nuts
    - Marijuana
    - Metaldehyde
    - Methylxanthines (eg, caffeine, theobromine, theophylline)
    - Organophosphates
    - Paintballs
    - Strychnine
- Endocrine/metabolic disease
  - Hepatic encephalopathy
  - Hypocalcemia/eclampsia
  - Hypoglycemia
- Infectious disease
  - Canine distemper virus
  - Rabies
- Iatrogenic disease
  - Blood transfusion reactions

References

Barker AK, Stahl C, Ensley SM, Jeffery ND. Tremorgenic mycotoxicosis in dogs. *Compend Contin Educ Vet*. 2013;35(2):E2.

Eriksen GS, Jäderlund KH, Moldes-Anaya A, et al. Poisoning of dogs with tremorgenic Penicillium toxins. *Med Mycol*. 2010;48(1):188-196.

Gfeller RW, Messonnier SP. Toxic drugs and chemicals. In: Gfeller RW, Messonnier SP. *Handbook of Small Animal Toxicology and Poisonings*. St. Louis, MO: Mosby; 1998:211-212.

Wagner SO, Podell M, Fenner WR. Generalized tremors in dogs: 24 cases (1984-1995). *J Am Vet Med Assoc*. 1997;211(6):731-735.

Young KL, Villar D, Carson TL, Ierman PM, Moore RA, Bottoff MR. Tremorgenic mycotoxin intoxication with penitrem A and roquefortine in two dogs. *J Am Vet Med Assoc*. 2003;222(1):52-53.

*These differential diagnoses are listed in no particular order, as there is no published literature to accurately describe frequency/incidence to the author's knowledge.

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1 **CASE IN POINT** **PAGE 11**

In cases of cryptococcosis, _____ is the initial antifungal agent of choice due to its good tissue penetration in the brain, eyes, and urinary tract and its relatively low cost.

A. Metronidazole
B. Itraconazole
C. Fluconazole
D. Miconazole

2 **CASE ROUTES** **PAGE 17**

_____ therapy is the most effective medical treatment for primary angle closure glaucoma in dogs.

A. Topical carbonic anhydrase inhibitor
B. Prostaglandin analog
C. β-blocker
D. Systemic hyperosmotic

3 **CONSULT THE EXPERT** **PAGE 30**

Which of the following presentations of feline compulsive disorder is most common?

A. Self-directed
B. Oral
C. Vocal
D. Visual/hallucinatory

4 **CASE IN POINT** **PAGE 63**

Whole-body tremors experienced by patients with steroid-responsive tremor syndrome typically resolve while the patient is _____.

A. Eating
B. Resting/sleeping
C. Engaging in activity
D. Being touched/groomed

Answer Key:
1: C 2: B 3: A 4: B

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

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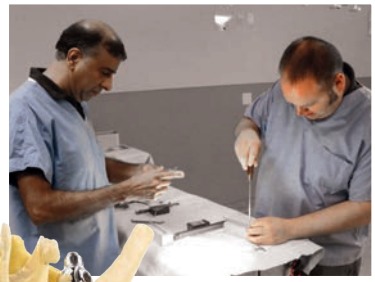

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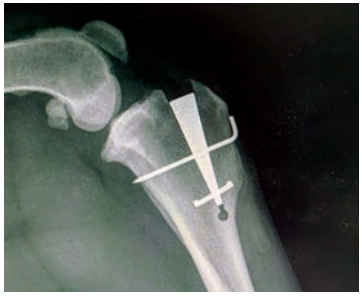
MMP - A progression of the TTA procedure for treatment of hindlimb lameness caused by cranial cruciate ligament insufficiency



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- Biomechanics and theoretical foundation of the MMP procedure
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Course Agenda

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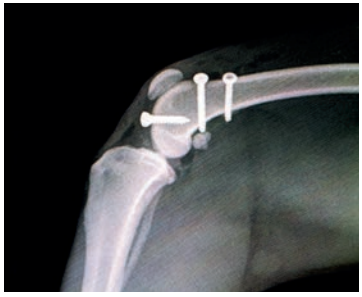

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Key Learning Objectives

By the end of the course, delegates will have an understanding of:

- Diagnosis and classifying degree of patella luxation
- Treatment selection in patella luxation
- The concept of RidgeStop™
- Ability and confidence to carry out the RidgeStop™ procedure

Course Agenda

- Overview of patella luxation pathophysiology
- Diagnosis and current surgical treatments for patella luxation
- Classifying the degree of luxation and associated deformities
- The development and rationale of RidgeStop™
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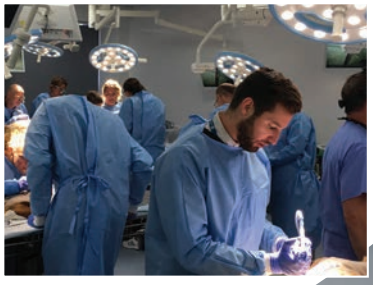

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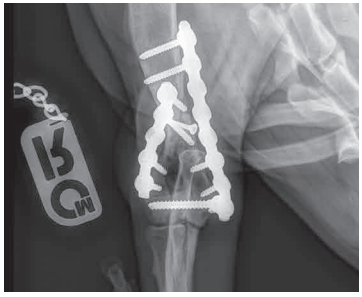

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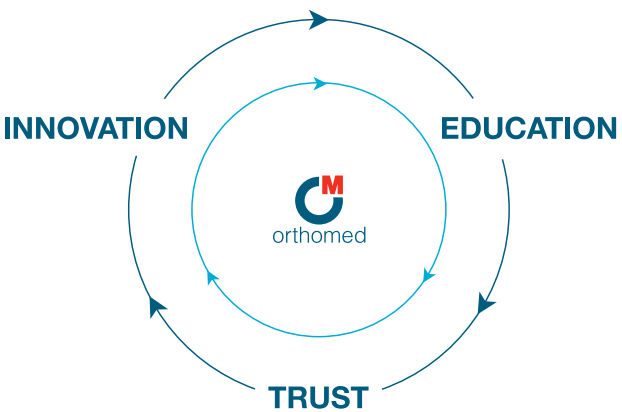

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Scott Rutherford

BVMS, CertSAS, DipECVS, MRCVS

RCVS Recognised and European Specialist in Small Animal Surgery

After graduating from Glasgow University in 2001, Scott spent six years in general practice before moving to Croft Veterinary Hospital in Northumberland in 2007 where he completed an ECVS residency in Small Animal Surgery in 2012. Scott became a European Veterinary Specialist in Small Animal Surgery in 2013 and an RCVS Recognised Specialist in 2014. He spent two years at both North Downs Specialist Referrals and then Willows Referral Services. He is a co-founder and director of frank. Pet Surgeons. Scott is actively involved in clinical research and teaching and he recently became an Associate Tutor at Chester University.

Bruce Nwadike

DVM DipACVS MRCVS

Dr. Bruce Nwadike is a board-certified veterinary surgeon with a special interest in orthopedics, surgical oncology, general and reconstructive surgery. He has co-owned and operated a private referral practice in southern Maryland since 2002 after relocating from NC where he was a faculty surgeon at the North Carolina State University College of Veterinary Medicine. He has published clinical and original research articles in peer-reviewed journals and also served for 6 years on the editorial review board for the Veterinary Surgery journal.

Robert L. Bergman

DVM, MS, Diplomate ACVIM (Neurology)

Dr. Bergman received his DVM from the University of Georgia. Following internship, he pursued a residency in neurology and neurosurgery at the Virginia-Maryland Regional College of Veterinary Medicine. Concurrently, he completed a Master's Degree at Virginia Tech with a focus on neuroscience and cerebrospinal fluid analysis. He became a diplomate of ACVIM specialty of neurology in 2001. Dr. Bergman recently served 5 years and was chair of the ACVIM Neurology Certification Exam Committee. While busy in private practice, he enjoys teaching neurosurgery to residents and those interested in the advancement of veterinary neurosurgery. He has a particular interest in spinal fusion, spinal trauma and neuro-oncology.

Dr. Karl Kraus

DVM, MS, Diplomate ACVS

Dr. Kraus is Chief of Small Animal Surgery at Lloyd Veterinary Medical Center at Iowa State University and diplomate of the American College of Veterinary Surgeons. He graduated from Kansas State University in 1985, completed residency training at University of Missouri-Columbia in 1989 and was professor of surgery at Tufts University from 1989 to 2007. He also held a joint appointment at Harvard University where he helped develop neurosurgical procedures on humans at Brigham and Women's Hospital from 1989 to 1998. His major areas of interest include fracture repair, external fixation, ACL repair, spinal stabilisation, and neurosurgery.

Peter Early

Clinical Professor, Neurology and Neurosurgery, DVM, ACVIM

Dr. Early is a graduate of the University of Florida, College of Veterinary Medicine. He spent two years at Cornell University, where he first completed a small animal rotating internship, followed by a second year as a staff veterinarian. He completed a Neurology/Neurosurgery residency at North Carolina State University and is a Diplomate of the American College of Veterinary Internal Medicine. He presently serves as a Clinical Associate Professor in Neurology and Neurosurgery at NCSU and provides regular locum work at multiple university and specialty hospitals throughout the country. Dr. Early's special interests include neurosurgery, specifically decompression and stabilization techniques.

United States

Course Locations

1 Atlanta
2 Austin
3 Charlotte
4 Chicago
5 Denver
6 Las Vegas
7 Miami
8 Milwaukee
9 Orange (CA)
10 Orlando
11 Philadelphia
12 Phoenix
13 Portland
14 San Francisco
15 Seattle

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Orlando **23rd** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **24th** - Fracture Repair (Sawbone)	**Las Vegas** **20th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **21st** - Fracture Repair (Sawbone)	**Las Vegas, Oquendo Center*** **28th - Canine Cruciate Disease (Wet-lab)** **- Patella Luxation (Wet-lab)** **29th - Fracture Repair (Wet-lab)**
Atlanta **25th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **26th** - Fracture Repair (Sawbone)	**San Francisco** **22nd** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **23rd** - Fracture Repair (Sawbone)	

April	May	June
Chicago **16th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **17th** - Fracture Repair (Sawbone)	**Orange (CA), Improve International**** **9th-10th** **- Canine Cruciate Disease (Wet-lab)** **- Patella Luxation (Wet-lab)** **- Fracture Repair (Wet-lab)**	**Las Vegas, Oquendo Center*** **6th - Canine Cruciate Disease (Wet-lab)** **- Patella Luxation (Wet-lab)** **7th - Fracture Repair (Wet-lab)**
Austin **18th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **19th** - Fracture Repair (Sawbone)		

July	August	September
Denver **16th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **17th** - Fracture Repair (Sawbone)	**Charlotte** **13th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **14th** - Fracture Repair (Sawbone)	**Chicago** **23rd** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **24th** - Fracture Repair (Sawbone)
Milwaukee **18th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **19th** - Fracture Repair (Sawbone)	**Philadelphia** **15th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **16th** - Fracture Repair (Sawbone)	**Las Vegas, Oquendo Center*** **26th - Canine Cruciate Disease (Wet-lab)** **- Patella Luxation (Wet-lab)** **27th - Fracture Repair (Wet-lab)**

October	November	December
Miami, Improve International** **25th-26th** **- Canine Cruciate Disease (Wet-lab)** **- Patella Luxation (Wet-lab)** **- Fracture Repair (Wet-lab)**	**Las Vegas, Oquendo Center*** **13th - Canine Cruciate Disease (Wet-lab)** **- Patella Luxation (Wet-lab)** **14th - Fracture Repair (Wet-lab)**	**Phoenix** **3rd** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **4th** - Fracture Repair (Sawbone)
	Atlanta **16th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **17th** - Fracture Repair (Sawbone)	**Portland** **5th** - Canine Cruciate Disease (Sawbone) - Patella Luxation (Sawbone) **6th** - Fracture Repair (Sawbone)

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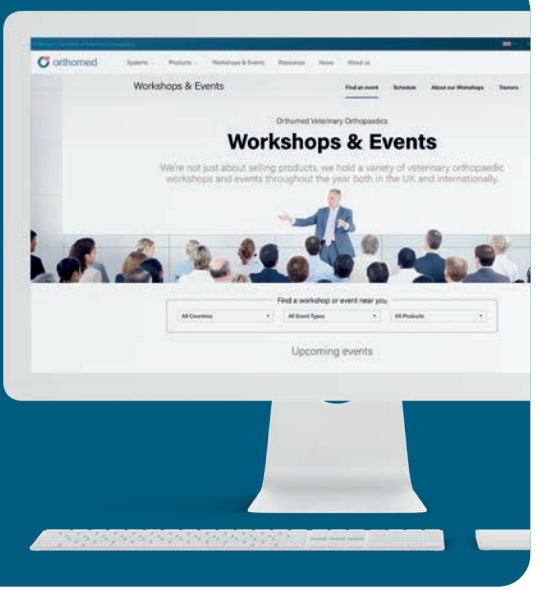

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clinician's forum™

Expert Views from a Roundtable on Feline Treatment

Reducing Feline Stress While Treating Chronic Disease

Cats often need to receive oral medication and have multiple practice visits, both of which can be stressful for the cats and their owners. The following discussion focuses on ways to reduce stress during veterinary visits and medication administration to cats.

Dr. Stark: How can veterinarians embrace the uniqueness of cats and their owners to make practice visits less stressful?

Dr. Rodan: As solitary hunters and survivors, cats have strong protective mechanisms, such as scent-marking their territory. That works very well for cats, but we as humans don't understand it. Things that we can understand are that they withdraw or hide and will become aggressive if we don't recognize the earlier signs.

Cat owners are also unique. They are more likely to be college-educated, more open-minded, and more agreeable—all of which make them outstanding clients. They want us to educate them. They want to know why they should bring their cat in if their cat seems healthy. What subtle signs should they look for at home between appointments? How are they going to prevent stress for their cat and for themselves before, during, and following the appointment? We have a great opportunity to make the visit a good experience for them and for us. When we do that, we are improving the cat's health and welfare, we are improving our client loyalty, and we are protecting ourselves. We increase our safety working with cats.

There are 5 steps to addressing the

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Field Practitioner, Behavior Consultant
Cat Behavior Solutions
Feline Friendly Consulting

MODERATOR

Patricia Stark, DVM

We have a great opportunity to make the visit a good experience for them and for us.

—Dr. Rodan

Loosely restraining cats and allowing them to hide will help increase efficiency and get those cats back home faster.

—Dr. Rodan

challenge to the cat owner and the cat surrounding the veterinary appointment. The first step is to encourage owners to implement carrier training to make cats more comfortable during the visit and when receiving medication. For clinicians, the appointment may seem like 20 to 30 minutes, but for the patient and client, it can seem like hours. Putting these cats on long-term medication can cause long-term stress and may impact the human–animal bond. Carrier training works well for these owners and for the cats. Cats are smart, and carrier training is easy. All this information is available from the American Association of Feline Practitioners (AAFP) at catvets.com; clinicians can share it on your practice website and share the link with owners when they schedule their appointments or educate them in the exam room.

Step 2 is changing mindset, which is probably the most challenging thing to do. We may think of a cat as being "bad" or "evil." However, as practitioners, we know that cats are only fearful, painful, or otherwise stressed—they are never bad. Having this mindset, and adjusting our vocabulary, will make a huge difference, not only for clinicians, but for the entire veterinary team. Knowing a cat is fearful can prompt us to find proper solutions to address it. Knowing it is painful, we can give it analgesics and reassess.

Step 3 is adjusting the environment. Making the practice cat-friendly is critical. The Cat Friendly Practice program developed by the AAFP is a really important program. It is free, and it's good for companion animal, mixed-animal, and feline practices. It is a mentored program, which helps ensure all team members are educated.

Step 4 is providing hiding options instead of tight restraint. We now know that tight restraint increases the chance of a cat's aggression. Studies show that cats that are tightly restrained, scruffed, or restrained with clipnosis are more difficult to work with than cats that are gently restrained.[1,2] This also doubles the appointment time. Loosely restraining cats and allowing them to hide will help increase efficiency and get those cats back

home faster. Also, if you train a cat to a carrier, that cat can hide in the carrier while you are doing most of the exam and even some of the procedures, especially if the bottom half of a hard-sided carrier or a soft-sided carrier has a large opening. Coming from the side or behind allows a cat to still feel hidden.

The last step is sedating before it's too late. I like to start with preventing problems. Cats known to be fearful or that have chronic anxiety and those that have had a previous negative veterinary experience should be prescribed an anxiolytic medication (eg, gabapentin) to be given at home prior to veterinary visits. The capsules can be opened and the contents mixed into a small amount of canned food to reduce anxiety. Also, if a cat is struggling, instead of getting more people to handle that cat, sedate it. Let the owners know it will make it easier for their cat and facilitate future visits. The AAFP's Feline Anesthesia Guidelines (see ***Additional Resources***, page 6) are a great resource.

Dr. Bourgeois: What often gets overlooked is that fear-free practice really starts at home. We need to educate our clients better, such as teaching them how a carrier can be a safe place and not a fearful place, because we can do a lot of our dermatologic exams with the patient in the carrier, and that's been a game changer for a lot of our feline patients.

Dr. Stark: Why aren't more veterinarians taking steps to destress visits, and what can be done to encourage them to make their practice more cat-friendly?

Dr. Lund: Habit is a big driver. Many veterinarians still believe that tight restraint is safer. I think that they believe that it is better for their team when these cats are held tightly, and they don't necessarily see that the opposite occurs. Education can be helpful there; the AAFP has lots of information on this topic that can really help an office through how to manage visits (see ***Additional Resources***, page 6). There's really very little that I do that is more impactful than the way I restrain a cat during an examination. Gentle and respectful restraint sends a very powerful message to our clients that we do respect their cat and we pay attention

Gentle and respectful restraint sends a very powerful message to our clients that we do respect their cat and we pay attention to their comfort and their emotional well-being.

—Dr. Lund

What often gets overlooked is that fear-free practice really starts at home. We need to educate our clients better.

—Dr. Bourgeois

It really comes down to education. ... It's a matter of us doing a better job in the veterinary schools and educating our veterinary nurses, client services representatives, and practice owners about appropriate things to do.

—Dr. DeBoer

to their comfort and their emotional well-being. That builds trust, and trust is key in veterinary medicine. It helps facilitate the exam and encourages owners to return with their cat.

Dr. Diesel: I think a lot of veterinarians still have difficulty reading feline behavior. We know what an aggressive dog looks like, and we know how to handle aggressive dogs. But cats are trickier, and I think many veterinarians struggle when trying to read the behavior of a cat. It's not something that has been readily taught in the veterinary curriculum. We're starting to see changes, but there's a long history of it being appropriate to scruff cats. We now know that this can heighten the stressful experience for the animal and make examinations more difficult. So I think it's overcoming a lot of these hurdles and previously thought knowledge to find better ways to handle our feline patients and make the visit a lot easier for ourselves and our clients.

Dr. DeBoer: It really comes down to education. How many of us during veterinary school had somebody train us or tell us how to handle cats in a fear-free manner? I would guess almost no one. So it's a matter of educating ourselves. It's a matter of us doing a better job in the veterinary schools. It's a matter of educating our veterinary nurses, client services representatives, and practice owners about appropriate things to do.

Dr. Stark: What do veterinarians need to see, hear, or know to be inspired to take these simple actions?

Dr. Diesel: Showing that it's a lot easier to perform an examination on a cat that is more gently handled. Using things like towels and what I call the "kitty burrito technique," where you swaddle them up a little more readily, allowing them to have areas to hide. We are able to get to the parts of the body that we need to examine a lot more effectively without them feeling threatened or stressed during the process. In addition, using E-collars as a way to protect ourselves from being bitten, along with the towel can again provide a safe option for the veterinary team while making the cat feel less confined and less stressed by being forcefully held down and scruffed or stretched during the examination process. Demonstrating

these techniques to both veterinarians and veterinary nurses would show that the fear-free handling techniques can be really excellent and provide a lot better experience for everybody involved.

Dr. Stark: Is there a source for general practitioners to reference for implementing these techniques on their own?

Dr. Rodan: The AAFP's' Cat Friendly Practice program has excellent information on making the environment and the handling more friendly. Also, the AAFP's Feline-Friendly Handling webinar was updated in 2018 and is a great resource.

Dr. Bourgeois: Our clinic became Fear Free certified within the past year. Although there is a cost to become certified, it's well worth it, and the program has a lot of free resources available on its website (see ***Additional Resources***, page 6). Another often overlooked resource is Fear Free Happy Homes (see ***Additional Resources***, page 6), which provides printable client and staff handouts to educate on how to properly handle cats. It's important to have these resources available to clients to reduce their fear of veterinary visits.

Dr. Stark: Zoetis recently performed some market research to gauge cat owners' experience with giving oral medication. Many owners reported challenges, which often lead to missed doses and owner and patient frustration. Does this response match the feedback you've heard from owners?

Dr. DeBoer: Owner distress when trying to medicate a cat is probably a universal experience. It leads to a discussion about what happens when there are missed doses. How many times have you heard, "I pilled my cat and then I found the pill the next day under the sofa because he had thrown it up."

Dr. Rodan: I think the problem is that we end up with compliance problems that lead to treatment failures, and then owners think the medication doesn't work and they don't want to come back because the veterinarian didn't do a good job, and it goes on and on from there.

Having the veterinary nurse teach owners how to give the medication can be really helpful.

—Dr. Rodan

Habit is a big driver. Many veterinarians still believe that tight restraint is safer.

—Dr. Lund

ADDITIONAL RESOURCES

- **American Association of Feline Practitioners**
  - Anesthesia guidelines: catvets.com/guidelines/practice-guidelines/anesthesia-guidelines
  - Feline-friendly handling guidelines, client brochure, & video: catvets.com/guidelines/practice-guidelines/handling-guidelines
  - Educational videos: catvets.com/education/online/videos
  - Cat Friendly Practice Program: catvets.com/cfp/veterinary-professionals
  - Online CE webinars (Feline-Friendly Handling, 5 Cat-Friendly Concepts to Integrate in Your Practice): catvets.com/education/online/webinars/
  - Ten Solutions to Increase Cat Visits: catvets.com/public/PDFs/Education/Solutions/solutionsbrochure.pdf
- **Fear Free**
  - Resources for veterinary professionals: fearfreepets.com
  - Resources for pet owners: fearfreehappyhomes.com

Dr. Lund: I think part of the preference by owners for over-the-counter treatments is because they really don't want to come to the practice because it's not a positive experience. We need to flip that around and somehow make going to the practice less of a chore and more of a positive experience for both the owner and the cat. Even though we may not have a lot of materials right now that we can use, there is an enormous opportunity here to do good.

Dr. DeBoer: That brings up another very important point, which is owners losing confidence in their veterinarian. If every time they visit a practice they are given another pill that they have to jam down their cat's throat that doesn't work because they are not able to give it often enough, they are not going to return. They are going to go to somebody else—hopefully not somebody who is going to give the cat a long-acting steroid injection. That sometimes is the case, and that's not a good situation for the cat. So, this loss of confidence in the veterinarian and the whole diagnostic process is also an issue.

Dr. Stark: What tips do you have for making oral medication administration less stressful for cat owners and patients?

Dr. Bourgeois: I always give owners tricks for giving oral medication. I also ask them to call me if they can't give it, because I hate when they come back for a recheck (if they even come back, because they might be so frustrated they don't want to come see me again) and say they haven't been giving the medication for the last 2 weeks because the cat hated it. I would rather them call me with an update so I can give them more tips. I've had owners shocked when I showed them how to give an appropriate medication if the cat won't take it in a treat or wet food, because they were doing it wrong or approaching it in a bad way, in regards to coming from different angles.

Dr. Rodan: Cats are creatures of habit; they like routine and they like familiarity. It helps to start giving them soft treats at home, even when they are kittens, so that by the time they need medication, you can put it in the treat. If the owners didn't try treats early on, they can try giving

different treats to see if any work. Cats are smart; if you start them on something or if you train them to come and sit and get a treat and then sneak in the medication with that, that will make a big difference.

Another issue is cats that have multiple medical conditions and need different medications. Clinicians can try prescribing medications that only need to be given once daily or less frequently and sending home small gel capsules containing all medications to administer at one time. For cats that will not take any type of treat, owners should be taught to approach the cat calmly from the side or behind to administer medication. This should be followed with a reward (eg, positive attention).

Veterinary nurses are critical to client education about medication administration. If owners continue to have difficulty medicating their cat, they could consider hiring a cat sitter or veterinary nurse to administer medication at home; many owners appreciate this service, regardless of expense. Other alternatives are to have a veterinary nurse or cat sitter go to the house daily and give the medication so that the owner's bond with the cat is not compromised.

LIFELINE: A NEW RESOURCE

Treating cats is an important opportunity to provide excellent veterinary care and to build the small animal practice.

After using some simple solutions to make their practice more welcoming to cats, 79% of practices reported increased revenue, increased satisfaction, new feline patients, and more patient visits.*

In addition to creating products to facilitate convenient and complete care for cats such as Revolution PLUS, Simbadol, Convenia, and more, Zoetis has also created its Li**feline** initiative, which provides focused, easy-to use resources for veterinary professionals and cat owners.

Clinicians can use these resources to educate themselves and their team and clients on topics such as:

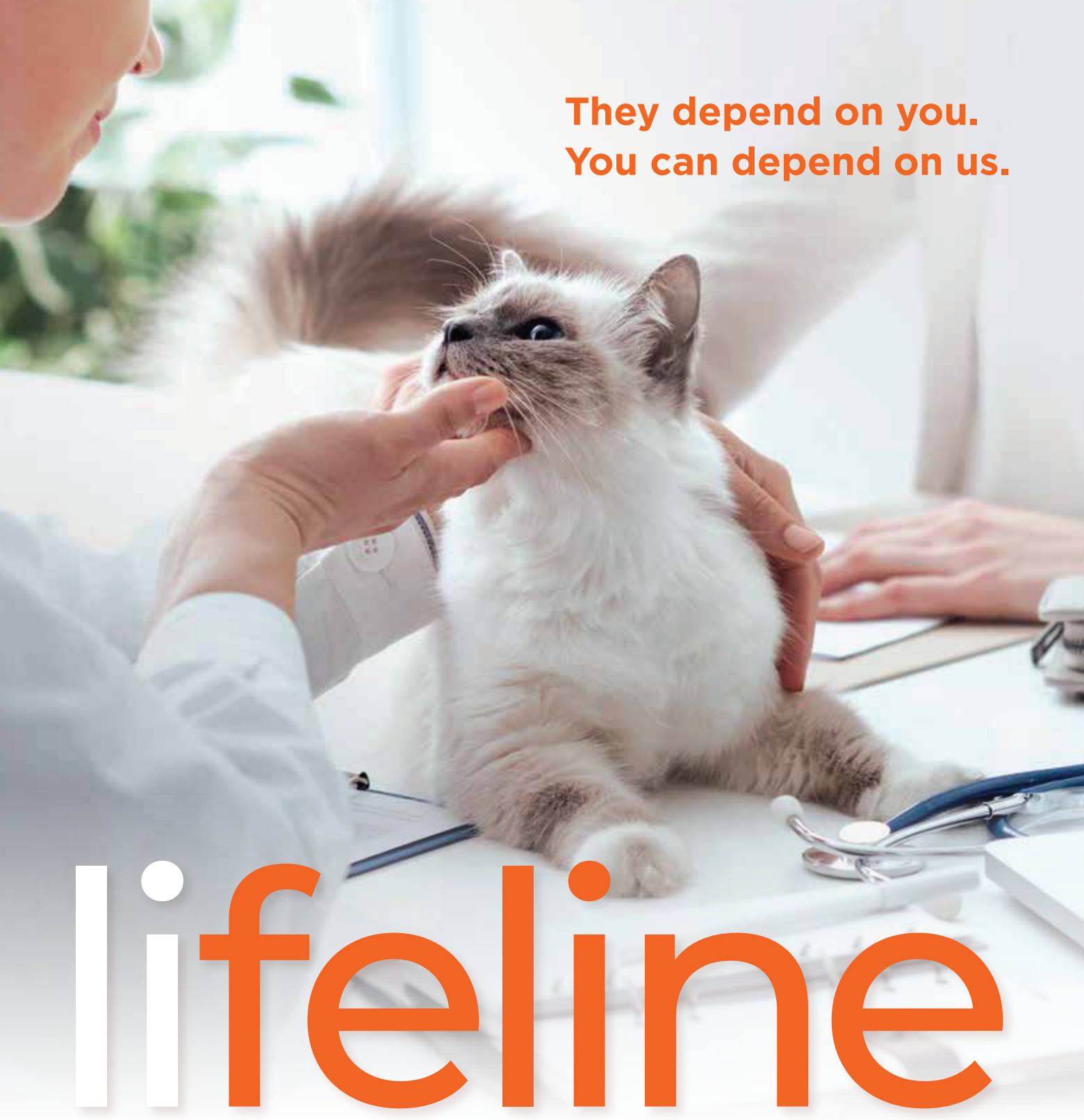
- 4 reasons feline veterinary care is vital
- 4 behaviors cat owners should monitor regularly
- 5 ways to decrease stress during veterinary visits

More information can be found at dvmlifeline.com and catlifeline.com.

*American Association of Feline Practitioners. 2018 Survey Results. AAFP website. https://catvets.com/public/PDFs/CatFriendlyPractice/2018-CFP-Survey-Results.pdf. Accessed November 2019.

References

1. Moody CM, Mason GJ, Dewey CE, Landsberg GM, Niel L. Testing two behavioural paradigms for measuring post-handling cat aversion behavior. *Appl Anim Behav Sci*. 2019:210:73-80.
2. Moody CM, Mason GJ, Dewey CE, Niel L. Getting a grip: cats respond negatively to scruffing and clips. *Vet Rec*. 2019: doi: 10.1136/vr.105261



As a veterinarian, you are a cat owner's lifeline to a long and healthy life for their beloved family member. At Zoetis Petcare, our mission is to support you along the way, by understanding the unique needs of cats and providing advanced resources, medicines, and diagnostics. Together, these tools and your expertise can create a more cat-compassionate practice. To learn more visit DVMLifeline.com.

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