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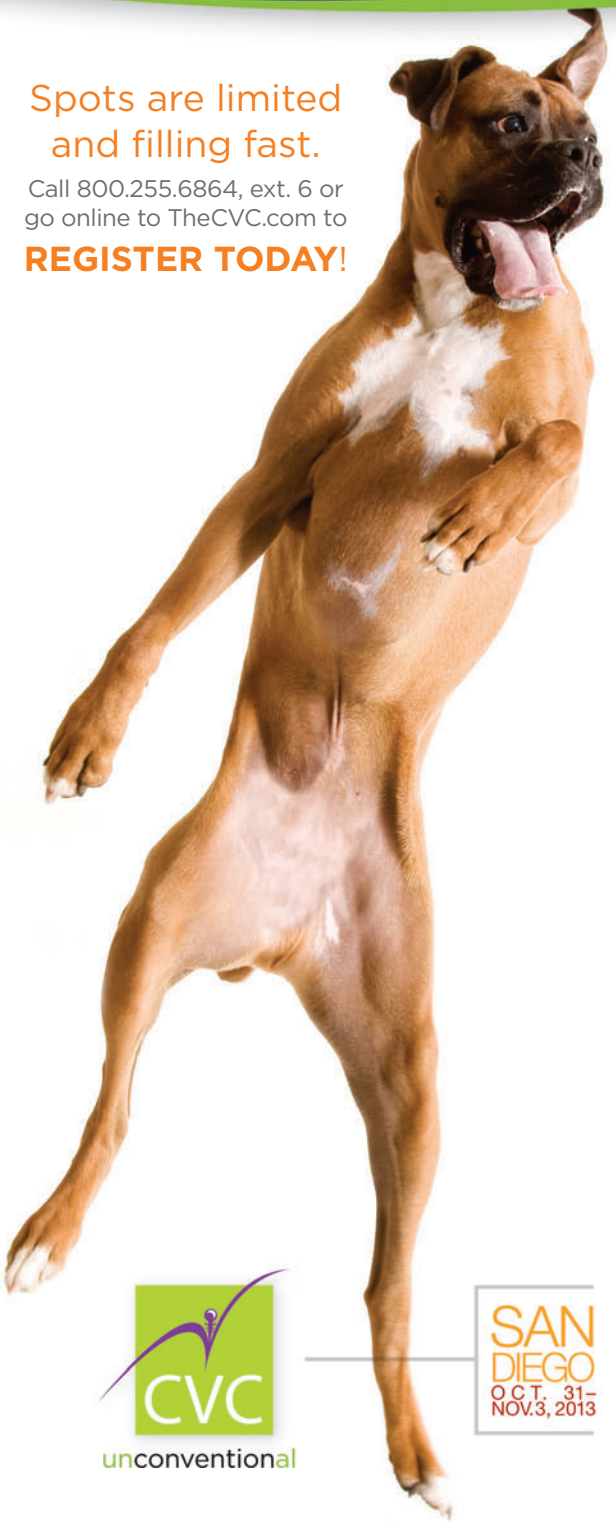

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# Feline infectious peritonitis

Strategies for diagnosing and treating this deadly disease in young cats p430

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# Feline infectious peritonitis

## Strategies for diagnosing and treating this deadly disease in young cats

Although this lethal infectious disease is difficult to diagnose definitively, by performing multiple diagnostic tests, you may be able to rule out other diseases and put together enough puzzle pieces to form a relatively complete clinical picture. **page 430**
*Audrey K. Cook, BVM&S, MRCVS, DACVIM, DECVIM-CA, and Whitney R. Nelson, DVM, DACVIM*

## TOXICOLOGY BRIEF

### Naproxen toxicosis in dogs

At high doses, naproxen, an NSAID commonly found in our medicine cabinets, can be harmful in dogs. Be prepared to recognize and treat this toxicosis in your canine patients. **page 420**
*Camille DeClementi, VMD, DABT, DABVT*

## CLIENT HANDOUT

### Osteoarthritis in your senior cat: Do you know the signs? **page 428**

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[1] Straubinger RK, Chang YF, Jacobson RH, Appel MJ. Sera from OspA-vaccinated dogs, but not those from tick-infected dogs, inhibit *in vitro* growth of *Borrelia burgdorferi*. *J Clin Microbiol.* 1995;33(10):2745-2751.

[2] Rice Conlon JA, Mather TN, Tanner P, Gallo G, Jacobson RH. Efficacy of a nonadjuvanted, outer surface protein A, recombinant vaccine in dogs after challenge by ticks naturally infected with *Borrelia burgdorferi*. *Vet Ther.* 2000;1(2):96-107.

[3] Probert WS, Crawford M, Cadiz RB, LeFebvre RB. Immunization with outer surface protein (Osp) A, but not OspC, provides cross-protection of mice challenged with North American isolates of *Borrelia burgdorferi*. *J Infect Dis.* 1997;175(2):400-405.

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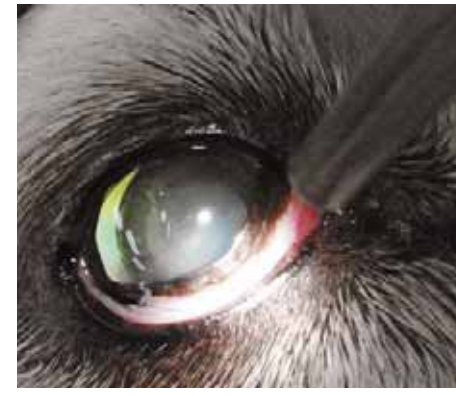

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# How are you combating **healthcare-associated infections** in *your practice?*

It is clear that patients, veterinary personnel, and animal owners can be affected by healthcare-associated infections (HAIs) that can occur in veterinary care settings. There is good evidence that these risks can be substantial, both for epidemic disease (*e.g.* infection with *Salmonella* or viral respiratory agents) and for endemic risks related to common hazards (*e.g.* surgical site infections, infections related to intravenous or urinary catheters). Veterinarians have clear-cut ethical and legal responsibilities to minimize risks for infectious disease transmission in healthcare settings, and experts agree that there is a recognizable standard of practice for infection control in veterinary medicine.[1,2]

Despite the general acceptance of these concepts, there is substantial evidence that the veterinary profession has not fully embraced the need to actively track and manage HAIs.[2]

## Developing guidelines in your practice

All veterinary practices need to develop comprehensive infection control programs that are tailored to their specific facilities and patient populations.[1] Several published references can guide development,[3,4] and this type of focused effort has been shown to have a significant impact on the occurrence of HAIs. Good comprehensive programs will address all aspects of patient care, emphasizing the control of the most important and impacting problems.

However, focusing on protocol development can give a false sense of security. To be maximally effective we need to actually work to document outcomes that we are trying to affect (*e.g.* surgical site infections).

## Can you document the quality of your patient care?

One of the major drivers of change regarding promotion of infection control in human healthcare has been the use of standardized surveillance tools. This helped demonstrate a need for these efforts, promoted the use of benchmarking to assess the quality of care that is being achieved at individual hospitals, and allowed greater comparability of research findings across different settings.

Unfortunately, this type of surveillance is not commonly used in veterinary medicine. Few would argue that a core goal for every clinical practice is to compassionately deliver the highest quality care to patients and clients. But what if I asked you to prove that you were meeting this goal in your practice—could you do it? What evidence can you provide documenting the quality of patient care in your practice?

This question strikes at the heart of the need to actively pursue excellence in infection control. You do not really know if you are controlling surgical site infections or catheter-related problems if you are not actively documenting their occurrence. This can be accomplished quite simply (*e.g.* tracking the number of catheters placed and the number that show defined evidence of problems) or can be implemented with a bit more rigor in more comprehensive programs. For example, syndromic surveillance methods are quite easy



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and inexpensive to implement and show great promise for use in veterinary settings.[5]

## Closing thoughts

Regardless of the approach, it is clear that we need to improve our ability to develop formalized infection control programs for all veterinary care settings, and we need to develop methods that document the quality of our care if we are to compassionately deliver the highest quality care to our patients and clients. VM

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**1.** Morley PS, Anderson ME, Burgess BA, et al. Report of the third Havemeyer workshop on infection control in equine populations. *Equine Vet J* 2013;45(2):131-136.
**2.** Morley PS. Evidence-based infection control in clinical practice: if you buy clothes for the emperor, will he wear them? *J Vet Intern Med* 2013;27(3):430-438.
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**5.** Ruple-Czerniak AA, Aceto HW, Bender JB, et al. Using syndromic surveillance to estimate baseline rates for healthcare-associated infections in critical care units of small animal referral hospitals. *J Vet Intern Med* [In Press].

*Paul S. Morley, DVM, DACVIM, is a professor at Colorado State University (CSU) and the Director of Infection Control at CSU's James L. Voss Veterinary Teaching Hospital.*


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[1]Data on file. Bayer HealthCare, Animal Health.

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**Baytril®**
Antibacterial Tablets & Injectable Solution
(enrofloxacin)

# Baytril®

## (enrofloxacin)

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**For Dogs Only**

**BRIEF SUMMARY:**
Before using Baytril 2.27% Injectable (for dogs only), please consult the product insert, a summary of which follows:

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

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**DESCRIPTION:**
Enrofloxacin is a synthetic chemotherapeutic agent from the class of the quinolone carboxylic acid derivatives. It has antibacterial activity against a broad spectrum of Gram negative and Gram positive bacteria. Each mL of injectable solution contains: enrofloxacin 22.7 mg, n-butyl alcohol 30 mg, potassium hydroxide for pH adjustment and water for injection, q.s.

**INDICATIONS:**
Baytril® (brand of enrofloxacin) Injectable Solution is indicated for the management of diseases in dogs associated with bacteria susceptible to enrofloxacin.

**CONTRAINDICATIONS:**
Enrofloxacin is contraindicated in dogs known to be hypersensitve to quinolones.

Based on the studies discussed under the section on Animal Safety Summary, the use of enrofloxacin is contraindicated in small and medium breeds of dogs during the rapid growth phase (between 2 and 8 months of age). The safe use of enrofloxacin has not been established in large and giant breeds during the rapid growth phase. Large breeds may be in this phase for up to one year of age and the giant breeds for up to 18 months. In clinical field trials utilizing a daily oral dose of 5.0 mg/kg, there were no reports of lameness or joint problems in any breed. However, controlled studies with histological examination of the articular cartilage have not been conducted in the large or giant breeds.

**ADVERSE REACTIONS:**
No drug-related side effects were reported in 122 clinical cases treated with Baytril® (enrofloxacin) Injectable Solution followed by Baytril® Tablets at 5.0 mg/kg per day.

For medical emergencies or to report adverse reactions, call 1-800-422-9874.

**ANIMAL SAFETY SUMMARY:**
Adult dogs receiving enrofloxacin orally at a daily dosage rate 52 mg/kg for 13 weeks had only isolated incidences of vomition and inappetence. Adult dogs receiving the tablet formulation for 30 consecutive days at a daily treatment of 25 mg/kg did not exhibit significant clinical signs nor were there effects upon the clinical chemistry, hematological or histological parameters. Daily doses of 125 mg/kg for up to 11 days induced vomition, inappetence, depression, difficult locomotion and death while adult dogs receiving 50 mg/kg/day for 14 days had clinical signs of vomition and inappetence.

Adult dogs dosed intramuscularly for three treatments at 12.5 mg/kg followed by 57 oral treatments at 12.5 mg/kg, all at 12 hour intervals, did not exhibit either significant clinical signs or effects upon the clinical chemistry, hematological or histological parameters.

Oral treatment of 15 to 28 week old growing puppies with daily dosage rates of 25 mg/kg has induced abnormal carriage of the carpal joint and weakness in the hindquarters. Significant improvement of clinical signs is observed following drug withdrawal. Microscopic studies have identified lesions of the articular cartilage following 30 day treatments at either 5, 15 or 25 mg/kg in this age group. Clinical signs of difficult ambulation or associated cartilage lesions have not been observed in 29 to 34 week old puppies following daily treatments of 25 mg/kg for 30 consecutive days nor in 2 week old puppies with the same treatment schedule.

Tests indicated no effect on circulating microfilariae or adult heartworms (*Dirofilaria immitis*) when dogs were treated at a daily dosage rate of 15 mg/kg for 30 days. No effect on cholinesterase values was observed.

No adverse effects were observed on reproductive parameters when male dogs received 10 consecutive daily treatments of 15 mg/kg/day at 3 intervals (90, 45 and 14 days) prior to breeding or when female dogs received 10 consecutive daily treatments of 15 mg/kg/day at 4 intervals; between 30 and 0 days prior to breeding, early pregnancy (between 10th & 30th days), late pregnancy (between 40th & 60th days), and during lactation (the first 28 days).

**DRUG INTERACTIONS:**
Concomitant therapy with other drugs that are metabolized in the liver may reduce the clearance rates of the quinolone and the other drug.

Enrofloxacin has been administered to dogs at a daily dosage rate of 10 mg/kg concurrently with a wide variety of other health products including anthelmintics (praziquantel, febantel), insecticides (pyrethrins), heartworm preventatives (diethylcarbamazine) and other antibiotics (ampicillin, gentamicin sulfate, penicillin). No incompatibilities with other drugs are known at this time.

**WARNINGS:**
**For use in animals only. The use of this product in cats may result in Retinal Toxicity. Keep out of reach of children.**

Avoid contact with eyes. In case of contact, immediately flush eyes with copious amounts of water for 15 minutes. In case of dermal contact, wash skin with soap and water. Consult a physician if irritation persists following ocular or dermal exposure. Individuals with a history of hypersensitivity to quinolones should avoid this product. In humans, there is a risk of user photosensitization within a few hours after excessive exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight.

For customer service or to obtain product information, including Material Safety Data Sheet, call 1-800-633-3796.

**PRECAUTION:**
Quinolone-class drugs should be used with caution in animals with known or suspected Central Nervous System (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation which may lead to convulsive seizures.

Quinolone-class drugs have been associated with cartilage erosions in weight-bearing joints and other forms of arthropathy in immature animals of various species.

The use of fluoroquinolones in cats has been reported to adversely affect the retina. Such products should be used with caution in cats.



08715583-80003870, R.8 July, 2010
GHG082013

Bayer HealthCare

Bayer HealthCare LLC, Animal Health Division
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## (enrofloxacin)

### Antibacterial Tablets For Dogs and Cats

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Before using Baytril Tablets, please consult the product insert, a summary of which follows:

**CAUTION:**
Federal (U.S.A.) law restricts this drug to use by or on the order of a licensed veterinarian.
Federal law prohibits the extralabel use of this drug in food-producing animals.

**INDICATIONS:**
Baytril® (brand of enrofloxacin) Antibacterial Tablets are indicated for the management of diseases associated with bacteria susceptible to enrofloxacin. Baytril Antibacterial Tablets are indicated for use in dogs and cats.

**CONTRAINDICATIONS:**
Enrofloxacin is contraindicated in dogs and cats known to be hypersensitive to quinolones.

**Dogs:** Based on the studies discussed under the section on Animal Safety Summary, the use of enrofloxacin is contraindicated in small and medium breeds of dogs during the rapid growth phase (between 2 and 8 months of age). The safe use of enrofloxacin has not been established in large and giant breeds during the rapid growth phase. Large breeds may be in this phase for up to one year of age and the giant breeds for up to 18 months. In clinical field trials utilizing a daily oral dose of 5.0 mg/kg, there were no reports of lameness or joint problems in any breed. However, controlled studies with histological examination of the articular cartilage have not been conducted in the large or giant breeds.

**ADVERSE REACTIONS:**
**Dogs:** Two of the 270 (0.7%) dogs treated with Baytril® (brand of enrofloxacin) Tablets at 5.0 mg/kg per day in the clinical field studies exhibited side effects, which were apparently drug-related. These two cases of vomition were self-limiting.

**Post-Approval Experience:** The following adverse experiences, although rare, are based on voluntary post-approval adverse drug experience reporting. The categories of reactions are listed in decreasing order of frequency by body system.
Gastrointestinal: anorexia, diarrhea, vomiting, elevated liver enzymes
Neurologic: ataxia, seizures
Behavioral: depression, lethargy, nervousness

**Cats:** No drug-related side effects were reported in 124 cats treated with Baytril® (brand of enrofloxacin) Tablets at 5.0 mg/kg per day for 10 days in clinical field studies.

**Post-Approval Experience:** The following adverse experiences, although rare, are based on voluntary post-approval adverse drug experience reporting. The categories of reactions are listed in decreasing order of frequency by body system.
Ocular: Mydriasis, retinal degeneration (retinal atrophy, attenuated retinal vessels, and hyperreflective tapeta have been reported), loss of vision. Mydriasis may be an indication of impending or existing retinal changes.
Gastrointestinal: vomiting, anorexia, elevated liver enzymes, diarrhea
Neurologic: ataxia, seizures
Behavioral: depression, lethargy, vocalization, aggression
To report adverse reactions, call 1-800-422-9874.

**ANIMAL SAFETY SUMMARY:**
**Dogs:** Adult dogs receiving enrofloxacin orally at a daily dosage rate of 52 mg/kg for 13 weeks had only isolated incidences of vomition and inappetence. Adult dogs receiving the tablet formulation for 30 consecutive days at a daily treatment of 25 mg/kg did not exhibit significant clinical signs nor were there effects upon the clinical chemistry, hematological or histological parameters. Daily doses of 125 mg/kg for up to 11 days induced vomition, inappetence, depression, difficult locomotion and death while adult dogs receiving 50 mg/kg/day for 14 days had clinical signs of vomition and inappetence.

Adult dogs dosed intramuscularly for three treatments at 12.5 mg/kg followed by 57 oral treatments at 12.5 mg/kg, all at 12 hour intervals, did not exhibit either significant clinical signs or effects upon the clinical chemistry, hematological or histological parameters.

Oral treatment of 15 to 28 week old growing puppies with daily dosage rates of 25 mg/kg has induced abnormal carriage of the carpal joint and weakness in the hindquarters. Significant improvement of clinical signs is observed following drug withdrawal. Microscopic studies have identified lesions of the articular cartilage following 30 day treatments at either 5, 15 or 25 mg/kg in this age group. Clinical signs of difficult ambulation or associated cartilage lesions have not been observed in 29 to 34 week old puppies following daily treatments of 25 mg/kg for 30 consecutive days nor in 2 week old puppies with the same treatment schedule.

Tests indicated no effect on circulating microfilariae or adult heartworms (*Dirofilaria immitis*) when dogs were treated at a daily dosage rate of 15 mg/kg for 30 days. No effect on cholinesterase values was observed.

No adverse effects were observed on reproductive parameters when male dogs received 10 consecutive daily treatments of 15 mg/kg/day at 3 intervals (90, 45 and 14 days) prior to breeding or when female dogs received 10 consecutive daily treatments of 15 mg/kg/day at 4 intervals: between 30 and 0 days prior to breeding, early pregnancy (between 10th & 30th days), late pregnancy (between 40th & 60th days), and during lactation (the first 28 days).

**Cats:** Cats in age ranges of 3 to 4 months and 7 to 10 months received daily treatments of 25 mg/kg for 30 consecutive days with no adverse effects upon the clinical chemistry, hematological or histological parameters. In cats 7-10 months of age treated daily for 30 consecutive days, 2 of 4 receiving 5 mg/kg, 3 of 4 receiving 15 mg/kg, 2 of 4 receiving 25 mg/kg and 1 of 4 nontreated controls experienced occasional vomition. Five to 7 month old cats had no side effects with daily treatments of 15 mg/kg for 30 days, but 2 of 4 animals had articular cartilage lesions when administered 25 mg/kg per day for 30 days.

Doses of 125 mg/kg for 5 consecutive days to adult cats induced vomition, depression, incoordination and death while those receiving 50 mg/kg for 6 days had clinical signs of vomition, inappetence, incoordination and convulsions, but they returned to normal.

Enrofloxacin was administered to thirty-two (8 per group), six- to eight-month-old cats at doses of 0, 5, 20, and 50 mg/kg of body weight once a day for 21 consecutive days. There were no adverse effects observed in cats that received 5 mg/kg body weight of enrofloxacin. The administration of enrofloxacin at 20 mg/kg body weight or greater caused salivation, vomition, and depression. Additionally, dosing at 20 mg/kg body weight or greater resulted in mild to severe fundic lesions on ophthalmologic examination (change in color of the fundus, central or generalized retinal degeneration), abnormal electroretinograms (including blindness), and diffuse light microscopic changes in the retina.

**DRUG INTERACTIONS:**
Compounds that contain metal cations (e.g., aluminum, calcium, iron, magnesium) may reduce the absorption of some quinolone-class drugs from the intestinal tract. Concomitant therapy with other drugs that are metabolized in the liver may reduce the clearance rates of the quinolone and the other drug.

**Dogs:** Enrofloxacin has been administered to dogs at a daily dosage rate of 10 mg/kg concurrently with a wide variety of other health products including anthelmintics (praziquantel, febantel, sodium disophenol), insecticides (fenthion, pyrethrins), heartworm preventatives (diethylcarbamazine) and other antibiotics (ampicillin, gentamicin sulfate, penicillin, dihydrostreptomycin). No incompatibilities with other drugs are known at this time.

**Cats:** Enrofloxacin was administered at a daily dosage rate of 5 mg/kg concurrently with anthelmintics (praziquantel, febantel), an insecticide (propoxur) and another antibacterial (ampicillin). No incompatibilities with other drugs are known at this time.

**WARNINGS:**
**For use in animals only. In rare instances, use of this product in cats has been associated with Retinal Toxicity. Do not exceed 5 mg/kg of body weight per day in cats. Safety in breeding or pregnant cats has not been established. Keep out of reach of children.**

Avoid contact with eyes. In case of contact, immediately flush eyes with copious amounts of water for 15 minutes. In case of dermal contact, wash skin with soap and water. Consult a physician if irritation persists following ocular or dermal exposure. Individuals with a history of hypersensitivity to quinolones should avoid this product. In humans, there is a risk of user photosensitization within a few hours after excessive exposure to quinolones. If excessive accidental exposure occurs, avoid direct sunlight.

For customer service or to obtain product information, including Material Safety Data Sheet, call 1-800-633-3796.

**PRECAUTIONS:**
Quinolone-class drugs should be used with caution in animals with known or suspected Central Nervous System (CNS) disorders. In such animals, quinolones have, in rare instances, been associated with CNS stimulation which may lead to convulsive seizures.

Quinolone-class drugs have been associated with cartilage erosions in weight-bearing joints and other forms of arthropathy in immature animals of various species.

The use of fluoroquinolones in cats has been reported to adversely affect the retina. Such products should be used with caution in cats.



Bayer

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NADA 140-441 GHG082013
 16349 February, 2011

# Ruptured CCL surgery: TPLO vs. extracapsular repair

## Why they did it

You have a variety of options to choose from for surgical repair of a cranial cruciate ligament (CCL) rupture in your canine patients. This study sought to determine which of two common repair techniques results in faster recovery and better overall results.

## What they did

Researchers evaluated force plate gait analysis preoperatively and two weeks, eight weeks, six months, and 12 months after repair of a CCL rupture with either extracapsular repair (ECR; n=23) or tibial plateau leveling osteotomy (TPLO; n=15). These results were compared with force plate gait analysis in normal adult dogs (n=79). Symmetric indices including peak vertical force, contact time, and vertical impulse were calculated between the operated and unoperated limbs.

## What they found

The researchers found more symmetric limb loading at eight weeks among patients in the TPLO group compared with those in the ECR group at a walk and trot. Symmetric indices were similar between the TPLO and control groups six months and one year postoperatively but were less symmetric among the ECR group for all time periods. Median time to normal function was shorter for the TPLO group for vertical impulse and peak vertical force, but there was no difference at a walk between groups.

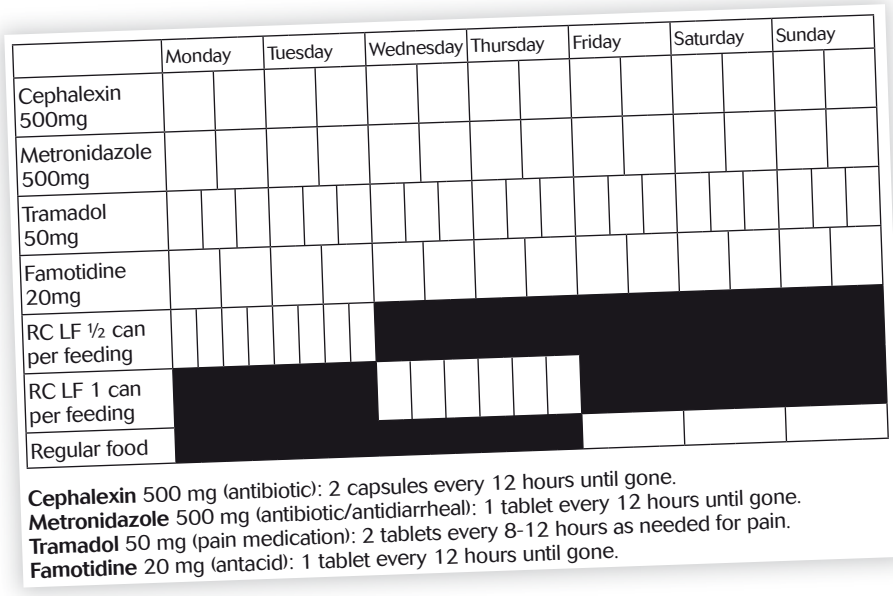
THINKSTOCK

## Take-home message

After TPLO surgery, dogs were able to bear weight on the operated leg faster than those that underwent ECR surgery. In addition, limb function in dogs in the TPLO group was indistinguishable from the control dogs by one year. The researchers acknowledge that the sample size of the study was small and the assignment to a treatment group was not randomized, which may have introduced bias. The long evaluation period also resulted in a number of dogs being lost to follow-up. Whether the type of surgery chosen has an effect on the development or progression of osteoarthritis over time will require further study.

**Nelson SA, Krotscheck U, Rawlinson J, et al. Long-term functional outcome of tibial plateau leveling osteotomy versus extracapsular repair in a heterogeneous population of dogs. *Vet Surg* 2013;42(1):38-50.**

*This "Journal Scan" summary was contributed by Jennifer L. Garcia, DVM, DACVIM, a veterinary internal medicine specialist at Sugarland Veterinary Specialists in Houston, Texas.*



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| Regular food | | | | | | | |

**Cephalexin** 500 mg (antibiotic): 2 capsules every 12 hours until gone.
**Metronidazole** 500 mg (antibiotic/antidiarrheal): 1 tablet every 12 hours until gone.
**Tramadol** 50 mg (pain medication): 2 tablets every 8-12 hours as needed for pain.
**Famotidine** 20 mg (antacid): 1 tablet every 12 hours until gone.

## Dosage calendars help save sanity and may increase compliance

Clients are often stressed when taking home several medications for their pets. To make things simpler, I often make them calendars that have check-off boxes for each of their pets' medication doses. It takes me about five minutes to create the calendars with Microsoft Excel.

*Amanda Bruder, CVT*
*Stevens Point, Wis.*

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## Correction

In the pull-out poster "A Practitioner's Quick Reference to Selected Parasiticides for Dogs and Cats" that accompanied the August 2013 issue, please note in the chart for dogs that Vectra 3D (Ceva Animal Health) is also effective against *Amblyomma americanum* (Lone star tick).

We regret any confusion this may have caused. Download a corrected PDF of the poster by scanning the QR code above or visiting **dvm360.com/ParasiticideChart2013**.

## Tie a ribbon 'round the ol' radiograph marker

We were constantly losing our radiograph markers. To solve this issue, we tied a ribbon to a marker and to the radiography table. We have not lost a marker since we implemented this simple solution.

*Heather Vargo, DVM*
*San Antonio, Texas*

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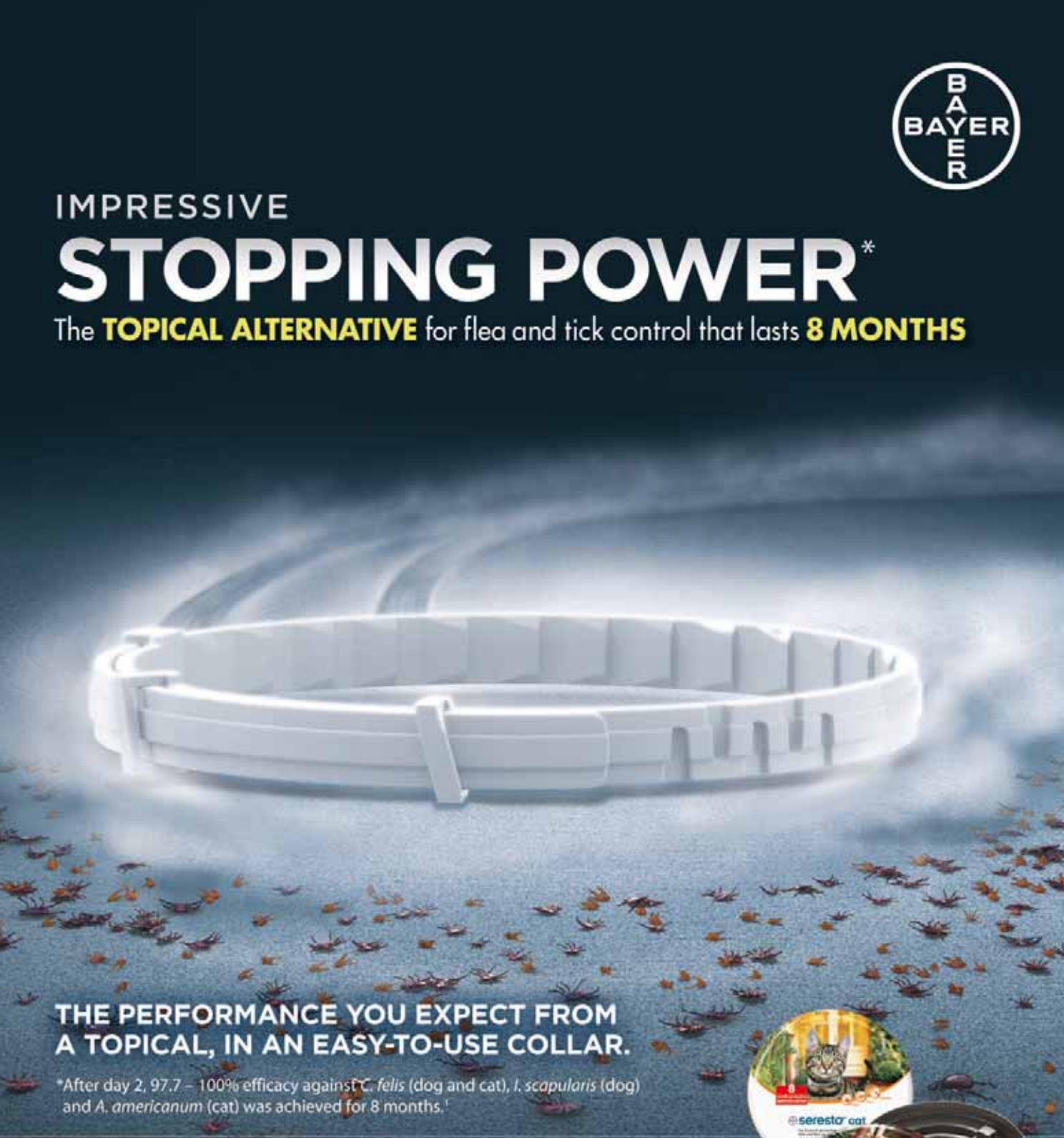

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[1]Data on file.

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# NAPROXEN TOXICOSIS *in dogs*

At high doses, naproxen, an NSAID commonly found in our medicine cabinets, can be harmful in dogs. Be prepared to recognize and treat this toxicosis in your canine patients. *By Camille DeClementi, VMD, DABT, DABVT*

Naproxen is a nonsteroidal anti-inflammatory drug (NSAID) used in people as an analgesic and antipyretic to treat multiple diseases including cancer, gout, arthritis, lupus, and musculoskeletal injuries. It is sold by prescription for human use as an oral suspension (25 mg/ml); 250-, 375-, and 500-mg tablets; and 750-mg extended-relief tablets, and is also sold over-the-counter as naproxen sodium in 220-mg tablets.[1] In the



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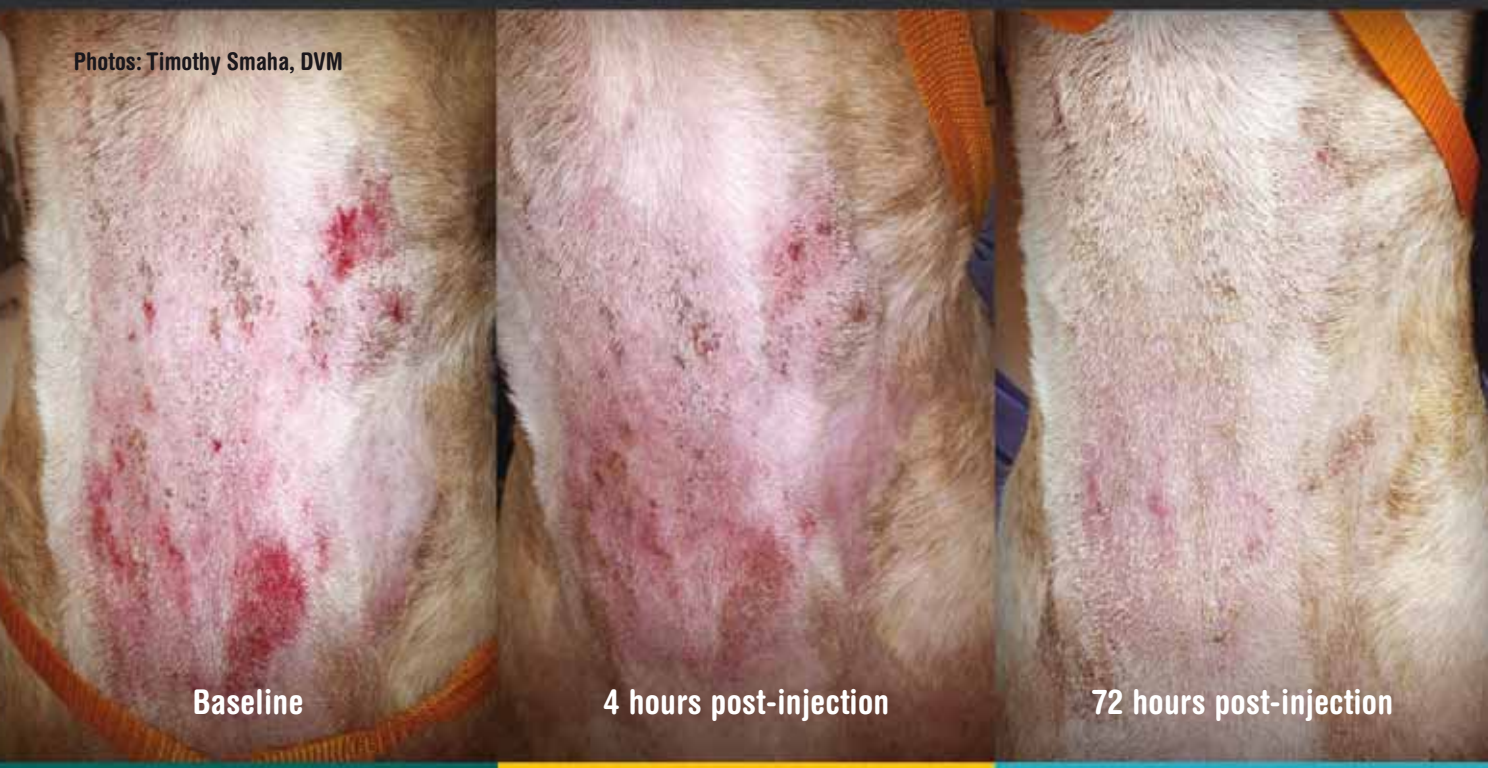
## See how quickly clinical signs of skin infections can begin to improve with CONVENIA.*,†




# Not weeks.

# Not days.

# Hours.

*Two-year-old American Staffordshire terrier with acute moist dermatitis treated only with CONVENIA® (cefovecin sodium) 8 mg/kg.

†Case included an initial skin cleansing with a dilute topical antiseptic.


For more information, go to **convenia.com** or talk to your Zoetis™ representative.

IMPORTANT SAFETY INFORMATION: CONVENIA is not for use in dogs or cats with a history of allergic reactions to penicillins or cephalosporins. Similar to other cephalosporins, side effects for both dogs and cats include vomiting, diarrhea, decreased appetite/anorexia and lethargy. The safety of CONVENIA has not been determined in lactating or breeding animals. For more information, please see Brief Summary of Full Prescribing Information on page 422.



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**Brief Summary of Prescribing Information**

# convenia®

(cefovecin sodium)

Antimicrobial for Subcutaneous Injection in Dogs and Cats Only

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

**INDICATIONS:**

**Dogs**

CONVENIA is indicated for the treatment of skin infections (secondary superficial pyoderma, abscesses, and wounds) in dogs caused by susceptible strains of *Staphylococcus intermedius* and *Streptococcus canis* (Group G).

**Cats**

CONVENIA is indicated for the treatment of skin infections (wounds and abscesses) in cats caused by susceptible strains of *Pasteurella multocida*.

**CONTRAINDICATIONS:** CONVENIA is contraindicated in dogs and cats with known allergy to cefovecin or to β-lactam (penicillins and cephalosporins) group antimicrobials. Anaphylaxis has been reported with the use of this product in foreign market experience. If an allergic reaction or anaphylaxis occurs, CONVENIA should not be administered again and appropriate therapy should be instituted. Anaphylaxis may require treatment with epinephrine and other emergency measures, including oxygen, intravenous fluids, intravenous antihistamine, corticosteroids, and airway management, as clinically indicated. Adverse reactions may require prolonged treatment due to the prolonged systemic drug clearance (65 days).

**WARNINGS: Not for use in humans. Keep this and all drugs out of reach of children.** Consult a physician in case of accidental human exposure. For subcutaneous use in dogs and cats only. Antimicrobial drugs, including penicillins and cephalosporins, can cause allergic reactions in sensitized individuals. To minimize the possibility of allergic reactions, those handling such antimicrobials, including cefovecin, are advised to avoid direct contact of the product with the skin and mucous membranes.

**PRECAUTIONS:** Prescribing antibacterial drugs in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to treated animals and may increase the risk of the development of drug-resistant animal pathogens.

The safe use of CONVENIA in dogs or cats less than 4 months of age and in breeding or lactating animals has not been determined. Safety has not been established for IM or IV administration. The long-term effects on injection sites have not been determined. CONVENIA is slowly eliminated from the body, approximately 65 days is needed to eliminate 97% of the administered dose from the body. Animals experiencing an adverse reaction may need to be monitored for this duration.

CONVENIA has been shown in an experimental *in vitro* system to result in an increase in free concentrations of carprofen, furosemide, doxycycline, and ketoconazole. Concurrent use of these or other drugs that have a high degree of protein-binding (e.g. NSAIDs, propofol, cardiac, anticonvulsant, and behavioral medications) may compete with cefovecin-binding and cause adverse reactions.

Positive direct Coombs' test results and false positive reactions for glucose in the urine have been reported during treatment with some cephalosporin antimicrobials. Cephalosporin antimicrobials may also cause falsely elevated urine protein determinations. Some antimicrobials, including cephalosporins, can cause lowered albumin values due to interference with certain testing methods.

Occasionally, cephalosporins and NSAIDs have been associated with myelotoxicity, thereby creating a toxic neutropenia[4]. Other hematological reactions seen with cephalosporins include neutropenia, anemia, hypoprothrombinemia, thrombocytopenia, prolonged prothrombin time (PT) and partial thromboplastin time (PTT), platelet dysfunction and transient increases in serum aminotransferases.

**ADVERSE REACTIONS:**

**Dogs**

A total of 320 dogs, ranging in age from 8 weeks to 19 years, were included in a field study safety analysis. Adverse reactions reported in dogs treated with CONVENIA and the active control are summarized in Table 2.

**Table 2: Number of Dogs* with Adverse Reactions Reported During the Field Study with CONVENIA.**

| Adverse Reaction | CONVENIA (n=157) | Active Control (n=163) |
|---|---|---|
| Lethargy | 2 | 7 |
| Anorexia/ Decreased Appetite | 5 | 8 |
| Vomiting | 6 | 12 |
| Diarrhea | 6 | 7 |
| Blood in Feces | 1 | 2 |
| Dehydration | 0 | 1 |
| Flatulence | 1 | 0 |
| Increased Borborygmi | 1 | 0 |

*Some dogs may have experienced more than one adverse reaction or more than one occurrence of the same adverse reaction during the study.

Mild to moderate elevations in serum γ-glutamyl trans-ferase or serum alanine aminotransferase were noted post-treatment in several of the CONVENIA-treated dogs. No clinical abnormalities were noted with these findings.

One CONVENIA-treated dog in a separate field study experienced diarrhea post-treatment lasting 4 weeks. The diarrhea resolved.

**Cats**

A total of 291 cats, ranging in age from 2.4 months (1 cat) to 21 years, were included in the field study safety analysis. Adverse reactions reported in cats treated with CONVENIA and the active control are summarized in Table 3.

**Table 3: Number of Cats* with Adverse Reactions Reported During the Field Study with CONVENIA.**

| Adverse Reaction | CONVENIA (n=157) | Active Control (n=163) |
|---|---|---|
| Vomiting | 10 | 14 |
| Diarrhea | 7 | 26 |
| Anorexia/ Decreased Appetite | 6 | 6 |
| Lethargy | 6 | 6 |
| Hyper/Acting Strange | 1 | 1 |
| Inappropriate Urination | 1 | 0 |

*Some cats may have experienced more than one adverse reaction or more than one occurrence of the same adverse reaction during the study.

Four CONVENIA cases had mildly elevated post-study ALT (1 case was elevated pre-study). No clinical abnormalities were noted with these findings.

Twenty-four CONVENIA cases had normal pre-study BUN values and elevated post-study BUN values (37–39 mg/dL post-study). There were 6 CONVENIA cases with normal pre- and mildly to moderately elevated post-study creatinine values. Two of these cases also had an elevated post-study BUN. No clinical abnormalities were noted with these findings.

One CONVENIA-treated cat in a separate field study experienced diarrhea post-treatment lasting 42 days. The diarrhea resolved.

FOREIGN MARKET EXPERIENCE: The following adverse events were reported voluntarily during post-approval use of the product in dogs and cats in foreign markets: death, tremors/ataxia, seizures, anaphylaxis, acute pulmonary edema, facial edema, injection site reactions (alopecia, scabs, necrosis, and erythema), hemolytic anemia, salivation, pruritus, lethargy, vomiting, diarrhea, and inappetance.

**For a copy of the Material Safety Data Sheet, (MSDS) or to report a suspected adverse reaction call Zoetis Inc. at 1-888-963-8471.**

**STORAGE INFORMATION:**

Store the powder and the reconstituted product in the original carton, refrigerated at 2° to 8° C (36° to 46° F). **Use the entire contents of the vial within 56 days of reconstitution.** PROTECT FROM LIGHT. After each use it is important to return the unused portion back to the refrigerator in the original carton. As with other cephalosporins, the color of the solution may vary from clear to amber at reconstitution and may darken over time. If stored as recommended, solution color does not adversely affect potency.

**HOW SUPPLIED:**

CONVENIA is available as a 10 mL multi-use vial containing 800 milligrams of cefovecin as a lyophilized cake.

NADA# 141-285, Approved by FDA

zoetis

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January 2013
PAA035845A&P

past, naproxen was used as an extralabel drug in dogs, but most veterinarians currently prescribe NSAIDs labeled for use in dogs.[2]

## PHARMACOKINETICS AND MECHANISM OF ACTION

Oral naproxen is absorbed rapidly and has an oral bioavailability ranging from 68% to 100% in dogs. It is highly protein-bound, resulting in a low volume of distribution (0.13 L/kg in dogs). In most species, including people and horses, naproxen is eliminated in urine. However, in dogs, naproxen is eliminated in the feces and undergoes extensive enterohepatic recirculation. This accounts for the long half-life of 74 hours in dogs.[3]

Naproxen has been used therapeutically in dogs at an oral dosage of 2 mg/kg every other day to treat osteoarthritis and other musculoskeletal inflammatory diseases. However, because of potential adverse effects, it is now recommended that veterinarians only consider prescribing naproxen when FDA-approved NSAIDs have been ineffective.[2]

Like other NSAIDs, naproxen blocks the enzyme cyclooxygenase to prevent the synthesis of prostaglandins. There are two commonly known forms of cyclooxygenase: COX-1 and COX-2. COX-1 is considered a constitutive enzyme, meaning it is always present. Prostaglandins formed by COX-1 are important for normal physiologic function. They protect both the gastrointestinal (GI) tract and the kidneys. COX-2 is an inducible enzyme. It plays a role in the formation of prostaglandins that mediate inflammation. Naproxen is a nonselective inhibitor of cyclooxygenases; therefore, it inhibits both COX-1 and COX-2.[1]

Prostaglandins formed by COX-1 protect the GI tract by inhibiting gastric acid secretions, increasing the production of bicarbonate by epithelial cells, increasing mucosal blood flow, and promoting epithelial cell repair and turnover. Loss of these protective prostaglandins can lead to GI tract irritation and ulceration.

In the kidney, protective prostaglandins act as vasodilators. They maintain adequate renal blood flow and glomerular filtration rate, mediate renin release, and are involved in electrolyte transfer. Therefore, a decrease in

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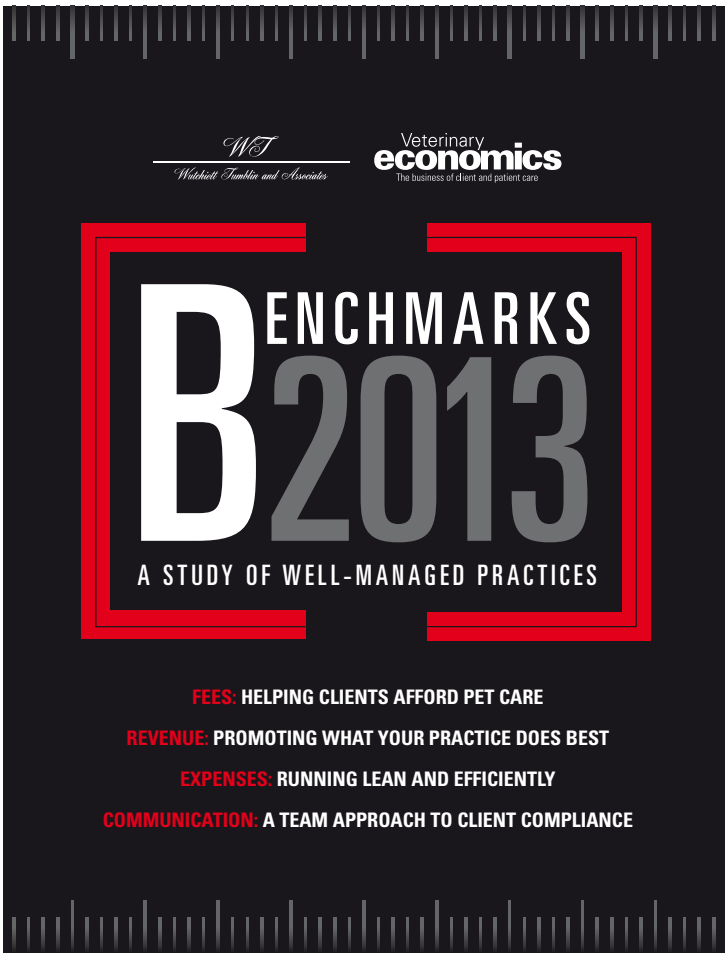


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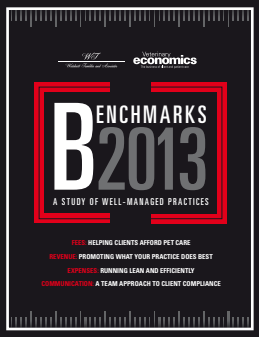



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these prostaglandins can lead to adverse renal effects, including vasoconstrictive acute renal failure, acute interstitial nephritis, fluid and electrolyte abnormalities, and renal papillary necrosis.[4]

## TOXICITY

Most cases surveyed in the literature on naproxen toxicosis in dogs report repeated exposure over multiple days. In one of these case reports, a 13-year-old male basenji was treated with 125 mg of naproxen orally twice a day for seven days for joint stiffness, arthritis, and mandibular swelling.[5] The patient's weight was not included in the report; however, assuming a weight of 20 to 25 lb (9.07 to 11.34 kg), the daily dosage would have been about 22 to 28 mg/kg.

This patient developed anorexia, weight loss, abdominal pain, melena, and anemia (most likely related to GI hemorrhage since no other sources of blood loss or destruction were identified). Urinalysis showed numerous granular and hyaline casts indicating renal tubular damage. Results of a serum chemistry profile showed a normal blood urea nitrogen (BUN) concentration of 22 mg/dl (reference range[2] = 7 to 26 mg/dl). The serum creatinine concentration was not reported. Naproxen was discontinued.

*The ASPCA Animal Poison Control Center database contains 4,404 cases of naproxen exposures in dogs dating from 2001 to 2011.*

At the three-week recheck, the dog had improved and gained weight. The melena resolved. No other treatment was documented in the case report.[5]

A second case report describes a 9-year-old male Samoyed that received 5.6 mg/kg naproxen once daily for seven days for periodic shoulder stiffness.[6] The patient developed vomiting and melena. Clinical pathology changes included anemia, increases in BUN and serum creatinine concentrations, increases in alkaline phosphatase (ALP) and alanine transaminase (ALT) activities, and a urine specific gravity of 1.019. The patient was treated with intravenous fluids for four days, a blood transfusion, antacid therapy (dimethicone, calcium carbonate and magnesium hydroxide combination), and cimetidine. The dog subsequently recovered.[6]

The only case report in a dog after a single dose of naproxen involved an elderly dachshund that received 35.7 mg/kg of the drug.[7] The next day the dog became lethargic and developed abdominal discomfort, vomiting, diarrhea, and profuse hematemesis and melena. The dog recovered after receiving supportive treatment. Detailed treatment information was not included in the report.[7]

## ASPCA Animal Poison Control Center data

The ASPCA Animal Poison Control Center (APCC) database contains 4,404 cases of naproxen exposures in dogs dating from 2001 to 2011.[8] Only the single-exposure cases that the APCC staff determined had a high or medium likelihood of causing the patient's clinical findings are included here. The most commonly reported signs after ingestion of naproxen in dogs were vomiting, lethargy, diarrhea, and anorexia.[8]

In dogs, single doses ranging from 1 to 7 mg/kg resulted in vomiting and lethargy. In a 1-year-old dog, 7.7 mg/kg of naproxen resulted in multiple episodes of vomiting that eventually became bloody. In two elderly dogs, 7.4 mg/kg of naproxen resulted in diarrhea, inappetence, and melena in one dog, and melena and a mildly increased BUN concentration

(likely due to GI bleeding) in the other dog.[8] Hemorrhage into the GI tract is catabolized by the body similar to any other dietary protein source, leading to increased urea.[9]

In a 2-year-old dog, ingestion of 13.4 mg/kg of naproxen resulted in mild increases in BUN (38 mg/dl; reference range = 7 to 26 mg/dl) and serum creatinine (2 mg/dl; reference range = 0.6 to 1.4 mg/dl) concentrations. Whether these increases in BUN and serum creatinine concentrations were prerenal or renal in origin was not determined; however, no GI effects, such as vomiting and diarrhea, associated with increased risk for dehydration were reported in this patient.

In two 5-year-old dogs, doses of about 14 mg/kg of naproxen resulted in azotemia. In the first dog, 13.9 mg/kg of naproxen resulted in melena, inappetence, and a mild increase in serum creatinine concentration (2 mg/dl; reference range = 0.6 to 1.4 mg/dl). Because of the presence of GI signs in this dog, it is possible that the azotemia was prerenal in origin. In the second dog, 14.2 mg/kg of naproxen resulted in vomiting and azotemia. Urine specific gravity was 1.008, the BUN concentration was 64 mg/dl (reference range = 7 to 26 mg/dl), and the serum creatinine concentration was 5.8 mg/dl (reference range = 0.6 to 1.4 mg/dl), which can be interpreted as renal in origin based on the isosthenuria.

In both cases, APCC treatment recommendations included GI-protectant medications (sucralfate, $H_2$ blockers, and misoprostol) and fluid diuresis. The actual treatments and outcomes subsequent to consultation were not reported for these patients.[8]

The APCC data suggest that a one-time dose of 7 mg/kg or greater can cause clinical signs of GI irritation and ulceration (vomiting, diarrhea, melena, anorexia), whereas azotemia is possible at doses ranging from 13 to 15 mg/kg. GI effects most frequently develop within two to 24 hours, and renal effects develop within 24 to 48 hours.[8] The risk of adverse GI or renal effects increases with concurrent use of other NSAIDs or corticosteroids.[4] Elderly patients also may be at increased risk for adverse renal effects if renal insufficiency is already present.[4]

## DECONTAMINATION

Decontamination may not be required for a dose less than 7 mg/kg in a dog but may decrease the risk of GI irritation. If ingestion of naproxen was recent (less than two hours) and the patient shows no clinical signs, emesis can be induced by using apomorphine (0.03 mg/kg intravenously; or, in the conjunctival sac, 0.25 mg/kg after dissolving the tablet in saline solution) or 3% hydrogen peroxide (2 ml/kg orally with a maximum of 50 ml). If emesis is unproductive, consider using activated charcoal (1 to 3 g/kg orally).[2]

If the patient exhibits no clinical signs and the ingestion occurred more than two hours before evaluation, consider administering activated charcoal (1 to 3 g/kg orally). The first dose of activated charcoal should be administered with a cathartic. However, with repeat doses of activated charcoal, a cathartic should not be used, particularly if the patient is dehydrated or has diarrhea.[10]

In dogs with ingestions of naproxen greater than 13 mg/kg, an initial dosage of activated charcoal (1 to 3 g/kg orally) may be followed with half the original amount every six to eight hours for 24 to 48 hours after ingestion to interrupt any enterohepatic recirculation.


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## MONITORING AND TREATMENT

Monitor the serum sodium concentration regularly if activated charcoal is given because administration of activated charcoal may be associated with hypernatremia.[10] Hypernatremia may manifest clinically as muscle fasiculations, tremors, and seizures. If the patient is not vomiting, allow access to water.[11] If hypernatremia develops, the APCC recommends warm-water enemas in addition to administration of appropriate intravenous fluids to lower the serum sodium concentration and decrease resultant adverse effects to the central nervous system.[12]

Monitor for signs of GI irritation and ulceration, and initiate GI protection by using a combination of sucralfate (0.5 to 1 g orally t.i.d.), misoprostol (2 to 5 µg/kg orally every 8 to 12 hours), and famotidine (0.1 to 0.2 mg/kg orally, subcutaneously, intramuscularly, or intravenously b.i.d.) or omeprazole (0.5 to 1 mg/kg orally once a day).[2] Continue administering GI-protective medications for at least seven to 14 days because of the long half-life of naproxen in dogs. Control vomiting with antiemetics as needed.[12] If severe gastric ulceration develops, colloid therapy or blood transfusions may be needed.[4]

For dosages at which adverse renal effects are possible, obtain a baseline serum chemistry profile, a complete blood count, and a urinalysis including a urine specific gravity before initiating fluid diuresis. Repeat a renal panel (BUN and serum creatinine and electrolyte concentrations) at 24, 48, and 72 hours. Repeat the complete blood count and urinalysis if indicated. Initiate intravenous fluid diuresis. Because of the long half-life of naproxen in dogs, the APCC recommends twice maintenance fluids for at least 72 hours. If results of the renal panel are within the reference range 72 hours later, gradually decrease the rate of fluid administration over the next 24 hours.

Increased liver enzyme activity has been reported subsequent to NSAID exposure in people[4] and after naproxen intoxication in dogs.[6] Monitor liver enzyme function and initiate liver-protective medications if marked elevations in liver enzyme activity develop. S-adenosyl-methionine (SAMe) (20 mg/kg orally once daily[2]) may be administered.

## PROGNOSIS

Gastrointestinal irritation or ulceration typically resolves with appropriate treatment. Patients that develop GI ulceration are at risk for GI perforation and death from GI bleeding or sepsis. Renal effects of NSAIDs generally are considered reversible if they are discovered early and treated aggressively.[12] Patients with underlying GI or renal disease are more at risk, as are patients that receive medications that interact with NSAIDs.

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*ASPCA Animal Poison Control Center*
*1717 S. Philo Road, Suite 36*
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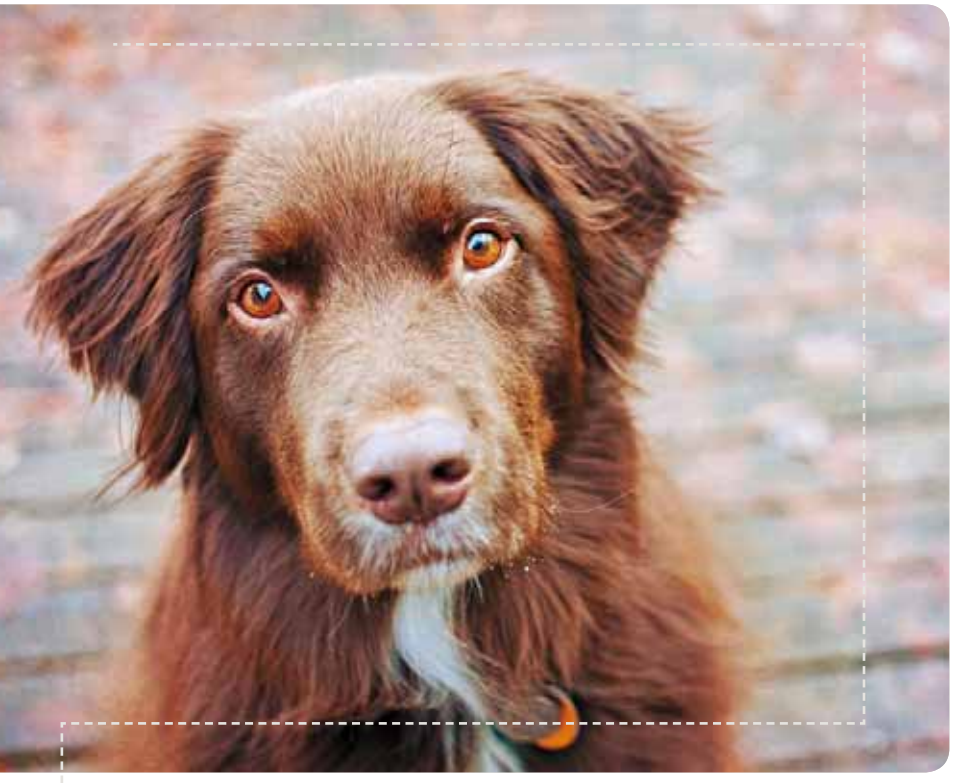

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### Sample script
>> Getting to the heart of the client conversation p10

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Veterinary medicine
Essential medicine for exemplary patient care

# *An argument for* year-round heartworm prevention *in dogs*

## Past commentary supports new developments in parasitology urging the importance of year-round heartworm preventives.

*By Dwight D. Bowman, MS, PhD*

Find the non sequitur in the following series of statements: Heartworms cause severe lung disease in dogs and cats and can kill them. Heartworms cause zoonotic disease in people. Heartworm disease can be prevented in dogs and cats by giving them medication once a month that also controls various internal and external parasites. Heartworm infections are diagnosed in about 250,000 dogs each year.[1] But there is no good reason for dogs to receive preventives all year; it is just not needed.

### The risk

Now let's do some math. The risk of a dog being infected with heartworm disease each year is 250,000 out of 50,000,000; this translates to one in 200 dogs becoming infected each year. The chance that you will be



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diagnosed with cancer this year is about one in 200—the same odds as a dog's acquiring heartworm disease.[2] Yet heartworm disease in dogs is virtually 100 percent preventable. Would you take medication once a month to prevent being diagnosed with cancer this year? But there is no good reason for dogs to receive preventives all year; it is just not needed.

## The treatment

Now let's look at the heartworm treatment options. Melarsomine dihydrochloride, an arsenical, is the treatment for heartworm infections in dogs; nothing is approved to treat cats. Melarsomine is given at a dose of 2.5 mg/kg. The LD50 for organic arsenic in mongrel dogs is 14 mg/kg.[3] A three-fold overdose of melarsomine can be lethal.[4] To put this in perspective, the EPA has set the limit for arsenic in drinking water at 10 parts per billion[5] —that is 10 µg/L—based on a no-effect risk of 1 to 10,000 to 1 to 1,000,000. So if you drink 10 liters of water each day containing arsenic at the maximum allowable level, you would consume 100 µg of arsenic a day, or 36.5 mg of arsenic a year. A 50-kg dog receives a total dose of 250 mg of melarsomine, which contains about 37.5 mg of arsenic, in two injections. It would take one year of drinking high levels of arsenic in your water to get the same dose of arsenic given to a dog to treat heartworm disease. Thus, the dose for killing heartworms in dogs is far from a negligible amount. But there is no good reason for dogs to receive preventives all year; it is just not needed.

*It would take one year of drinking high levels of arsenic in your water to get the same dose of arsenic given to a dog to treat heartworm disease.*

## The pathology

Of course, treatment with arsenicals is far better than the long-term effects of large worms living in the pulmonary arteries of their hosts. The lungs do get better after treatment.[6] The adult heartworms are long: males are 12 to 20 cm long, females are 25 to 31 cm long, and both are about 1 mm in diameter.[7] If a dog has a relatively light burden of 12 worms—six males and six females—that is still a large mass of worms in the pulmonary arteries.

The disease is one of chronicity caused by the worms interacting with the surface of the pulmonary vessels.[8] The presence of the worms in the bloodstream also leads to the physical rupture of red blood cells and the deposition of hemoglobin within fixed macrophages of the lungs, making the lungs of dogs with chronic heartworm infections appear brown. Villous proliferations on the vessels also lead to the formation of small thrombi that are carried deeper into the lungs and ultimately induce chronic lung disease.

Keep in mind that even with therapy, the worms are in the pulmonary arteries, not the intestinal tract. All that can happen after arsenical therapy is that the worms are driven deep into the lungs where they die in tightly coiled bundles, decay, and are ultimately cleared by the host's cellular response. However, this takes a long time and is not without effects; remember, each dead worm is about 20 cm long. But there is no good reason for dogs to receive preventives all year; it is just not needed.

dvm360 Find it all here. .com

**Clinical foresight**

**Dr. Bowman originally wrote this article in 2007, and though we updated some facts, its message holds true. For references, head over to dvm360.com/yearround.**

## 2013 Update: CAPC changes heartworm guidelines due to evidence of resistance

The Companion Animal Parasite Council (CAPC) has altered its guidelines after evidence of preventive-resistant *Dirofilaria immitis* strains was presented at the American Association of Veterinary Parasitologists Conference at the end of July in Chicago. Researchers have now identified heartworm isolates from the Mississippi Delta region that develop in adult dogs receiving routine monthly heartworm preventives.

This means treatment of heartworm-positive dogs should be immediate and aggressive, as noted in the newly revised CAPC guidelines. The "slow kill" therapy sometimes prescribed by veterinarians is never appropriate, as it has been demonstrated that using this modality—repeated macrocyclic lactone administration over a period of time—increases the proportion of circulating microfilariae that possess resistance markers.

Parasitology specialists emphasize that evidence for resistance does not mean abandoning current protocols but following them even more rigorously.

While new strains may be preventive-resistant, CAPC says current products are still effective. "Preventives are still the best protection we have, and consistently administering them is key," says CAPC board member Susan Little, DVM, PhD. Though the preventives cannot guarantee that infections will never occur, Little encourages veterinarians to "test dogs regularly to be sure they have not become infected, and when infections are identified in dogs, we have to treat whenever possible."

### The weather

Don't forget to factor in the unpredictability of nature. We know that *Culex tarsalis* mosquitoes can live up to two months when temperatures hold at 77 F,[9] but there is a good chance they can live longer at cooler temperatures. Near George Lake in Alberta, Canada, over half of the overwintering *Culex territans* female mosquitoes studied survived more than 138 days at 23 F.[10]

These mosquitoes will continue to seek blood meals every time they are about to lay eggs, and if they are infected with heartworms in October, they could still easily transmit the infection during an unseasonably warm December, like the one we experienced this winter in Ithaca, N.Y. Such microclimate situations put dogs at risk all year long and are part of the rationale that led to the recommendation in the CAPC guidelines that dogs receive preventives year-round.

With locally acquired heartworm transmission likely occurring in every state, it seems there is no good reason for a dog to be at risk in a nice November or in a warm March. And again, there is no good reason for dogs to receive preventives all year; it is just not needed.

### The precedent

Perhaps we could take a lesson from our counterparts in human medicine. Human lymphatic filariasis, a disease caused by cousins of the heartworm, is transmitted by mosquitoes that bite infected people. The disease induced—elephantiasis—is horrible. Small thread-like worms live in the lymphatics and cause severe disfiguring and immobilizing disease in human hosts.

The World Health Organization is leading the charge to eradicate these parasites through "mass drug administration strategies for disease elimination."[10] These mass treatments of populations have had a significant impact on the rate of infection in people and vectors.[11]

We can only hope that someday we will place similar pressure on the transmission of heartworms, thereby reducing the occurrence of such a devastating disease that heartworms cause in dogs.

# *Tough talk:* Have ***heartfelt*** heartworm discussions

Give clients the hard facts and stop heartworm infection before it starts.

With the abundance of effective heartworm preventives and tests, it's heartbreaking when you diagnose a pet with heartworm infection. Use these four steps to educate clients and safeguard their pets' health.

## 1 Teach clients about the importance of testing.

When a client asks why you test for heartworms when the pet already takes preventives, use this sample script: "Even though today's preventive medications are effective, pets are only protected if we treat them without interruption. A late or missed dose can open the window for infection. Heartworm testing is the only way to ensure we catch infection early."

## 2 Remind clients that testing helps you safeguard their pet's health.

If a pet does test positive for heartworm, a doctor will evaluate to determine the severity of the infection and the treatment plan. Let clients know that killing immature and adult heartworms with medication can be risky, so their pet will need careful monitoring by the veterinary team. And remind them that even well-intentioned pet owners may forget doses, administer them incorrectly, or fail to notice when a pet doesn't swallow a pill.

## 3 Explain that the heartworm tests available today are more sophisticated than past tests.

In fact, today's advanced heartworm tests might be able to detect the presence of just a single heartworm. This important type of early detection allows you to provide treatment before serious damage occurs to the heart and lungs.

## 4 Educate clients to recognize the signs of heartworms, especially in cats.

For example, symptoms of feline heartworm infection include asthma-like symptoms, such as coughing or wheezing.

GETTY IMAGES/ANDREW BRET WALLIS

# STRATEGY: Getting clients on board with FELINE HEARTWORM PREVENTIVE

Make sure your clients' kitties have worm-free tickers using these six simple communication strategies.

Don't tell your veterinary clients their cats *should* be on heartworm prevention, tell them their cats *need* to be on heartworm prevention, says Kristen Coe, head technician of Los Robles Animal Hospital in Tallahassee, Fla. Since she and her team members have become more confident in their recommendations, the clinic has seen a 40 percent jump in feline heartworm, flea, and intestinal parasite prevention sales.

Here are six ways to revamp your client communication strategy so you too can get cat owners on board.

## 1. Find proof in numbers

Contact an industry representative to conduct a compliance audit—or go ahead and do your own audit. "We thought we were doing a good job, but after the audit we realized we weren't promoting heartworm protection like we should," Coe says.

## 2. Team up

Hold a biweekly or monthly team meeting so your technicians, doctors, and receptionists can all brainstorm new ways to educate clients about heartworm and parasite prevention. Once you decide on a game plan, make sure every staff member knows about it. "Everyone needs to be on the same page so you send a consistent message to your clients," Coe says.

## 3. Check the charts

Before each feline appointment, do your research and find out whether the patient is already on heartworm prevention. Be sure to explain to your clients why it's so important to keep their cats on the medicine—or, if they aren't using preventives, encourage them to get their cats on heartworm prevention immediately. In both situations, it's crucial that you communicate your message clearly to your clients.



GETTY IMAGES/ISTOCKPHOTO

## 4. Educate your clients

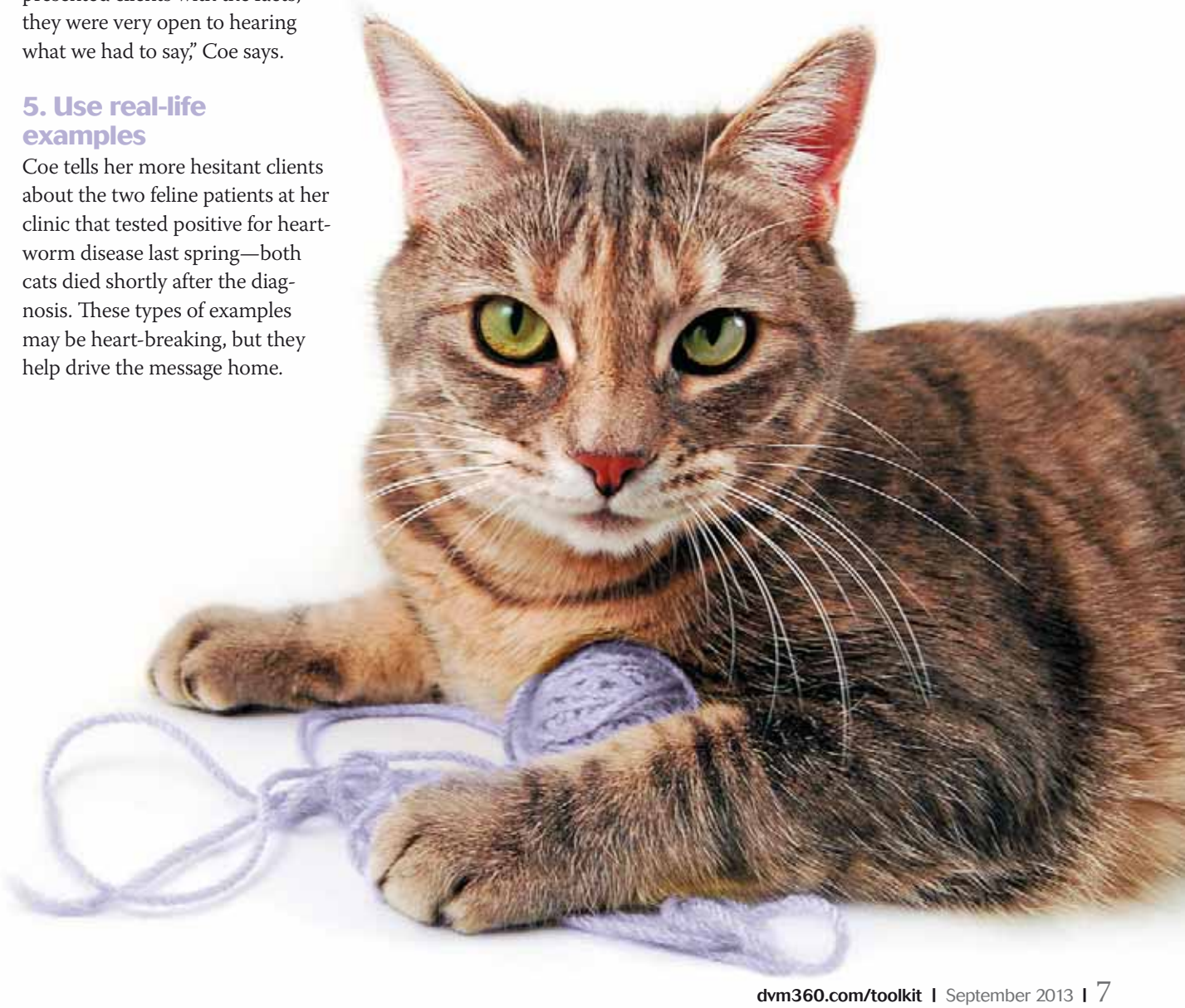
Coe was surprised at how little her clients knew about the disease and how much more they wanted to know about heartworm prevention. Explain that feline heartworm disease is life-threatening with no curative treatment. Follow up with a statement like: If you want your cat to live a long, healthy life, then it's best to get him on heartworm prevention today. "We thought it might be a turn-off, but after we presented clients with the facts, they were very open to hearing what we had to say," Coe says.

## 5. Use real-life examples

Coe tells her more hesitant clients about the two feline patients at her clinic that tested positive for heartworm disease last spring—both cats died shortly after the diagnosis. These types of examples may be heart-breaking, but they help drive the message home.

## 6. Make no exceptions

Clear up the misconception that only outdoor cats should be on heartworm prevention. Remind your clients that even indoor cats could run out the front door or a mosquito could fly into the house. The more knowledge you share, the more likely they'll trust your recommendation.



# *Have your clients heard* **about heartworms?**

## Use the power of social media to share crucial reminders and statistics about these deadly endoparasites.

Feeling frustrated with Facebook? Not sure how Twitter can be of service to you? Not to worry—we're here to help your practice get the right message out to clients on key pet healthcare topics like heartworm disease and the importance of preventives.

By serving up a mix of fun facts, statistics and reminders, you're encouraging your clients to join in the conversation—and learn something, too!

Visit **dvm360.com/heartwormposts** to get your hands on the Facebook posts and tweets (at right) for your practice's Facebook and Twitter pages. And for more ways to customize your social media message, head over to **dvm360.com/socialmediatoolkit**.

Use your mobile device to scan the QR code at left and send your first tweet right now.

Myth: Only outdoor pets are at risk of contracting heartworm disease. (You know those pesky mosquitoes can fly into the house.)

Heartworm prevention can save you money in the long run—not to mention it can save your pet's life.

A heartworm infection is difficult to treat in dogs—there's no approved treatment for cats. Good thing it's easy to prevent!

Our heartworm test is accurate to as few as one female heartworm—let's test your pet today and make sure everything is A-OK.

Heartworms can be hard to detect but we can help! Ask us how before they cause severve disease.

Fact: Heartworm disease is preventable—there's no reason a pet should have it today. Keep your best bud from becoming a statistic.

The American Heartworm Society encourages testing on an annual basis. When was the last time we tested your #pets for heartworms? #pethealth

DYK? Heartworms are transmitted through the bite of an infected mosquito. Don't let those bloodsuckers win! Get your #pets tested today.

Fact: #Pets may not show signs until late in the course of heartworm disease. That's why we need to run regular tests! #pethealth #petcare

Signs of heartworm disease: Coughing, panting, decreased activity level, sudden death. Let's run tests before it's too late! #pethealth

# TEACH CLIENTS TO *have a heart*

Get clients acquainted with heartworm dangers using an interactive iPad module.

Have a client who's heard it all? Maybe one who ignores your impassioned insistence on the importance of regular heartworm prevention? Maybe clients like these just need a visual aide to help bring your points home. Show them the newest client module inside the **dvm360 iPad app**. The heartworm edition focuses especially on cats, who are often ignored in the crusade against parasites—all the more reason clients should be made aware of the dangers heartworm poses to their beloved pets. Best of all? The client modules are free of charge, meaning your clients reap all the educational benefits at no cost to you.


**INTERESTED?** Update your app via iTunes to check out our client education tools right now. Don't have it yet? Visit **dvm360.com/ipadapp** on your iPad to download, or search "dvm360" in the Apple App Store. As always, the dvm360 app and client modules are free to download.

## SAMPLE SCRIPT:

# Getting *to the* heart *of the* conversation

Try this simple approach to the heartworm conversation.

Receptionist: *Good morning, Mrs. Smith.*
I see you've brought Buster in for his annual wellness exam with Dr. Cares. Before our technician Elizabeth takes you to an exam room, I have a few questions to update Buster's medical record. First, how often does Buster receive heartworm prevention?

### Option 1:

**Client:** I give it monthly.

**You:** That's great, Mrs. Smith. Buster's so lucky to have a pet parent who takes such good care of him. Do you need any product refills today?

*Note:* If the client bought a package of preventives six months ago and says she doesn't need refills at her visit, this may indicate the pet isn't receiving regular prevention. If a dose has been missed, remind clients that prevention could make the pet sick and a test is necessary.

### Option 2:

**Client:** I think I might have missed a few doses.

**You:** I understand. Today is a great opportunity to get Buster back on a prevention program. And we'll start with blood work today to test for heartworm infection. Then the doctor will evaluate Buster and help you choose the best products to keep Buster healthy and parasite-free.

Use your mobile device to scan the QR code above or visit **dvm360.com/parasitescript** to download a free form with this sample script.

Now, create your own script. To start, take five minutes in your next team meeting to discuss the scripts you need most in practice. Ask: What are the questions we hear most in practice? What client questions stump us? Are there any products or services we want to promote, such as year-round parasite preventives?

Once you've chosen the scripts you want to create, break into pairs again and use these steps to create your personalized script:

**1. Brainstorm phrases** that explain the benefits of the recommendation you're making—for example, the products you recommend keep Buster parasite-free, or prevention will save pet owners money in the long run.

**2. Talk about effectiveness.** For example, correct application of the product we're recommending prevents 99 percent of the parasite infestations we see.

**3. Limit your script** to two to three sentences, so it's easy for the team to remember.

# *Change* the conversation

Use this tool to remind clients about the cost of prevention over treatment.


Our staff is happy to help you find the right heartworm prevention for your pet—just ask us!

Do you feel like your team is explaining the importance of parasite control already—but clients still aren't getting the message? Try hanging this sign in your practice. By comparing the cost-effectiveness of preventives versus expensive treatment, this display gives clients something to think about. Download your own copy at **dvm360.com/heartwormtoolkit**.

Visit **dvm360.com/heartwormtoolkit** for free handouts to promote client education.

# BUST heartwork myths *for clients*

Make sure your clients know the truth when it comes to this deadly but preventable disease in cats.

At the CVC in Washington, D.C., in May 2013, Kristin MacDonald, DVM, PhD, DACVIM (cardiology), co-author of *Feline Cardiology* (Wiley-Blackwell), addressed 11 fallacies (and their ensuing realities) practitioners may encounter in an effort to ensure more cats are protected with heartworm preventives year-round. Download this form for your team and clients to make sure everyone has the facts on feline heartworm disease.

## BUSTED! 11 myths about *feline heartworm disease*



**Myth #1: Cats won't develop heartworm disease because of a strong immune response.**
**Reality:** Prevalence rates in cats are only up to 20% that of canine rates in the same region. The national prevalence rate in cats is 16% based on studies measuring positive antibodies to heartworms. Plus, prevalence rates are likely grossly underestimated because antibodies may subside over time.

**Myth #2: Indoor cats aren't susceptible to heartworm disease.**
**Reality:** In the United States, 27% of cats infected with heartworms are indoor-only cats. Mosquitoes may enter the home through screened doors and open windows.

**Myth #3: Cats with heartworm don't show clinical signs.**
**Reality:** Nearly two-thirds of heartworm-infected cats have signs such as coughing, wheezing, vomiting, dyspnea, tachypnea, and weight loss.

**Myth #4: A negative heartworm antibody test rules out heartworm disease in cats.**
**Reality:** A recent study found that 50% of cats experimentally infected with heartworms had a negative antibody test; 100% of the cats had a negative antibody test 18 months after infection.

**Myth #5: A negative heartworm antigen test rules out heartworm disease in cats.**
**Reality:** A negative test result may occur because of a prepatent infection with immature worms less than seven or eight months after infection or with male-only infection.

**Myth #6: Heartworm disease often causes cardiac disease in cats.**
**Reality:** The target organ in cats is the lung, not the heart. Heartworm-associated respiratory disease (HARD) is the main manifestation of heartworm disease in cats.

**Myth #7: An echocardiogram is not a useful test in cats since heartworm disease rarely causes cardiac disease.**
**Reality:** Echocardiography is a complementary test to identify adult worms in the proximal pulmonary artery and main pulmonary artery branches, which may be seen in 40% of infected cats. It is also necessary to diagnose caval syndrome, a rare but life-threatening condition that requires immediate extraction of worms from the tricuspid valve.

**Myth #8: Treatment of heartworm disease is the same in cats and dogs.**
**Reality:** Adulticidal treatment with melarsomine in cats is contraindicated because it can lead to rapid worm death and subsequent death of the cat. Instead, heartworm treatment in cats involves the use of corticosteroids to decrease the inflammatory response to the heartworms in the lungs, bronchi, and pulmonary arterioles.

**Myth #9: Heartworm preventives are only effective against early larval infections.**
**Reality:** The different heartworm preventives have a variable retroactive efficacy, or reach-back effect, which means that if a preventive is delayed for a period of time it still may be able to kill larvae that have matured, if subsequent doses are given consecutively every month.

**Myth #10: A heartworm test is necessary before starting heartworm prevention.**
**Reality:** Don't wait. There is no reason not to start a preventive if you have not tested for heartworm disease. Fewer than 20% of infected cats have circulating microfilaria, which exist for only one to two months.

**Myth #11: Heartworm disease is a death sentence in cats.**
**Reality:** Ten to twenty percent of cats with adult heartworms die. However, even if a cat survives the death of the adult heartworms, chronic pulmonary disease may persist. An Italian study showed that the probability of death was not related to the length of time a cat lived with the infection after diagnosis or to the presence of clinical signs—even cats that remain asymptomatic for more than three years are still at risk of dying of heartworm disease.


**Online tool**

Don't gamble with heartworm disease—encourage year-round prevention for pets. Need to fine-tune your preventive pitch? Get this handout from the American Heartworm Society by scanning the QR code above with your mobile device, and find more client tools at heartwormsociety.org.

# Practicing Veterinarians Share Best Practices for Heartworm Preventive Compliance

It is no surprise that cases of heartworm disease in dogs have been reported in all 50 states or that the disease is spreading to new parts of the country each year. In its 2010 guidelines, the American Heartworm Society (AHS) states that "Environmental changes created by humans and changes in natural climatic conditions, as well as animal movement, have increased heartworm infection potential."[1] However, less than 40 percent of medicalized dogs are receiving heartworm preventive prescriptions from their veterinarian.[2] Data from the 2009 American Animal Hospital Association (AAHA) Compliance Study indicates that only about half of dog owners are compliant obtaining heartworm preventives as prescribed by their veterinarian.[3]

The Companion Animal Parasite Council (CAPC) estimated that in 2012, nearly 4.3 million dogs were tested for the parasite, with approximately 48,000 (or one in 89 dogs) testing positive for heartworm.[4]

How can veterinarians help pet owners protect their dogs from this potentially fatal disease?

## Many Practicing Veterinarians Recommend—and Use—Injections

"I'm the worst at compliance with heartworm preventive myself," said Carri Hampton, DVM, of Blue Flint Animal Hospital in Asheboro, N.C. "So I know firsthand the benefits of ProHeart® 6 (moxidectin) to provide six months of continuous heartworm protection with one injection. That's why I am confident to recommend it to appropriate patients in our clinic."

"Many of my clients are busy people, so they appreciate that with a six-month injection, giving monthly heartworm medication becomes one less thing they have to worry about," noted Chris Thomson, DVM, of Montgomery Animal Hospital in Pineville, La. "When you look at two ProHeart 6 injections each year compared to monthly medications, it's also cost-effective."

## Practicing Best Medicine

Client convenience and compliance aren't the only reasons these veterinarians recommend a six-month injectable heartworm preventive to their clients. "ProHeart 6 contributes to overall wellness," said Jennifer Patton, DVM, of Advanced Care Veterinary Hospital in Sapulpa, Okla. "When a client brings their dog in for their six-month injection, it gives us the opportunity to check for internal parasites, perform dental exams and cleanings; in general, it allows us to practice best medicine."

Dr. Hampton suggested that timing can also help facilitate a positive client experience. "Whenever possible, we time our clients' visits for ProHeart 6 injections to spring and fall, so we can also treat for allergies, examine ears, perform dental checkups and general wellness exams. That way, not only is it convenient for the pet owner to have the peace of mind of six months continuous heartworm protection for their dog, it saves them time because they can come in for one visit and take care of other conditions their dog may be experiencing as well."

## Staff Involvement is Key

"Our staff is critical in helping promote general wellness, including the benefits of a six-month injectable heartworm preventive," Dr. Patton explained. "We talk about the seriousness of heartworm disease, and I ask my team how compliant they are in giving their own dogs heartworm preventive. Most are surprised to realize that they aren't as compliant as they think they are. That really reinforces the value of a six-month injectable option and helps our staff speak confidently about it with clients."

"Giving ProHeart 6 injections is a good way for our new associate veterinarians to get to know the patients and clients who come to our clinic," Dr. Hampton suggested. "The six-month visit also allows the new associates to check the dogs

for other issues that may need attention and earn confidence with our clients."

Dr. Thomson agreed and encourages colleagues to consider recommending injectable heartworm preventive in their practices. "I tell my colleagues that there are two components to helping their clients be more compliant about heartworm prevention: client communication and staff education. I spend time with my clients reviewing all the information about ProHeart 6 so they understand the benefits and risks. The staff can also be influential in client decisions, so I make sure all our staff members know about the product. In fact, after I talk with them, staff members ask to have their own dogs on ProHeart 6."

## New Data Reinforces ProHeart 6 Safety

ProHeart 6 is a veterinarian-administered injectable parasiticide for dogs that provides six months of heartworm protection, as well as treatment for common hookworm infections. In an extensive analysis of adverse events reported over a 4 ½-year period from June 2008 through December 31, 2012, representing an estimated 2,700,000 doses of ProHeart 6 sold in the United States, total adverse events were reported at a rate of 4.4 per 10,000 doses.[5] This represents 0.04 percent of doses sold. The majority of the cases reported involved gastrointestinal upset including vomiting, diarrhea or anorexia, and/or allergic reactions, and these reported events responded to symptomatic therapy. "I recommend the injection to our clients," Dr. Patton added. "These new data reinforce my confidence in ProHeart 6 as my primary choice for heartworm prevention for all healthy dogs in my practice." ■

## FDA Lifts Significant Use Requirements for ProHeart 6

The U.S. Food and Drug Administration (FDA) Center for Veterinary Medicine recently updated the Risk Minimization Action Plan (RiskMAP) for ProHeart 6, the sustained-release injectable heartworm preventive for dogs. The revisions are based on a review of safety history over a 4 ½-year period.

This means that the protection of ProHeart 6 is now available to a wider population of dogs, and easier to implement in veterinary practices.

Under the newly updated RiskMAP:

- ProHeart 6 may now be initiated in healthy dogs 6 months of age and up.
- Veterinarians are no longer required to obtain a consent signature from pet owners before the product is administered.
- Veterinary technicians and assistants who successfully complete a web-based training and certification program may administer ProHeart 6, at the discretion and direction of a ProHeart 6–certified veterinarian.

"We are pleased that the FDA has recognized the predictable, safe and efficacious performance of ProHeart 6," said J. Michael McFarland, DVM, DABVP and group director of Companion Animal Veterinary Operations for Zoetis™ Inc. "Veterinarians can now offer six months of uninterrupted heartworm protection to all healthy dogs ages 6 months and older, and provide greater peace of mind to their owners, who no longer have to worry about giving monthly doses to keep their dog protected."

Zoetis will continue to uphold the remaining RiskMAP provisions, including a commitment to ongoing veterinarian and pet owner education about the benefits and risks of ProHeart 6, as well as reporting and evaluation of any potential adverse events. For more information about ProHeart 6 and the RiskMAP revisions, go to http://online.zoetis.com/us/en/products/pages/ProHeart6.aspx, or call 1-888-ZOETIS1 (888-963-8471).

**IMPORTANT SAFETY INFORMATION:** ProHeart 6 should not be used in sick, debilitated or underweight dogs, or those with a history of weight loss. Use with caution in dogs with pre-existing allergic disease. Some dogs show mild, transient swelling or itching at the injection site. Owners should be given the Client Information Sheet for ProHeart 6 before the drug is administered, and observe their dog for potential drug toxicity and allergic reactions described in the sheet. Animals showing signs of drug toxicity or allergic reactions should receive immediate veterinary assistance. In people, ProHeart 6 may be slightly irritating to the eyes. ProHeart 6 is available only through a restricted distribution program. Veterinarians enrolled in this program can receive and administer ProHeart 6. To obtain additional information including a copy of the product labeling, visit www.ProHeart6dvm.com or call 1-888-ZOETIS1 (963-8471). For more information, please see full Prescribing Information on page immediately following the toolkit.

[1]Executive Board of the American Heartworm Society. Current canine guidelines for the diagnosis, prevention, and management of heartworm *(Dirofilaria immitis)* infection in dogs. Revised January 2012. Available at: http://www.heartwormsociety.org/veterinary-resources/canine- guidelines.html. Accessed August 8, 2013.
[2]Data on file. Zoetis Inc. VetInsite™ Analytics; 2013.
[3]American Animal Hospital Association. Taking quality care to the next level: A report of the 2009 AAHA Compliance Follow-up Study. AAHA Press; 2009.
[4]Carpenter C. Heartworm prevention key to reduce disease threat in 2013. Companion Animal Parasite Council Web site. Available at: http://www.capcvet.org/expert-articles/heartworm-prevention-key-to-reduce-disease-threat-in-2013. Accessed July 24, 2013.
[5]Data on file. Zoetis Inc. 2013.



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# The next step

Teaching clients about the risk of heartworm disease in dogs and cats and stressing the importance of preventives should be at the core of your parasite discussions with clients. Make sure your team is on board and ready to talk ticker health with pet owners by following these critical next steps:

**1. Tackle tough talks.** Some clients are still going to resist when you recommend yearly heartworm testing so make sure you're ready to face reluctance head-on—and get every client on board with your recommendations. Review the **facts about testing on page 5** to give your pitch a boost.

**2. Don't forget felines.** Heartworm disease in cats is life-threatening and there's no curative treatment, so prevention is a must. Problem is, it can be a harder sell than pitching heartworm prevention for dogs. Prep your team with the **communication strategies on page 6** to make sure you're ready to have the preventives talk with all of your cat clients.

**3. Drive home the message.** Everyone's on social media these days, so why not take advantage of the opportunity to plug the importance of heartworm prevention *after* clients leave your clinic? Use the **tweets and posts on page 8** to get started.

**4. Make it relatable.** Some pet owners overestimate the cost of monthly prevention and think they can't afford it. By giving them a better understanding of the cost of prevention versus the cost of treatment—and relating it to a common, everyday purchase—you'll put it in perspective. The **poster on page 11** breaks down the cost in a way every client can relate to. Print it out and post it in your practice.

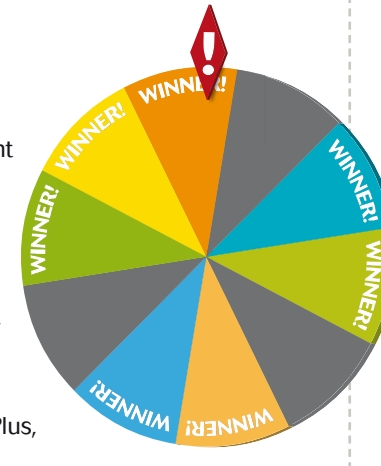
***One more tip***

# Spread heartworm awareness with client games

For heartworm awareness in April, our veterinary clinic made a spin wheel and asked our vendors for free products that we can give away—such as hats and pens, says Elizabeth Fellows, CVT, a veterinarian technician in Show Low, Ariz.

When a client purchases a box of heartworm prevention and flea and tick repellent, or gets a heartworm test for a pet along with a box of prevention, the client gets to spin for the free prize.

To promote these activities, we make big, bright posters to hang in the reception area and in the exam rooms, and we put notices on our monthly reminder cards. The activities really increase client awareness and the clients love spinning the wheel. Plus, they're thrilled if they win!



NADA 141-189, Approved by FDA

# ProHeart® 6
## (moxidectin)

Sustained Release Injectable for Dogs

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

### DESCRIPTION:
ProHeart 6 (moxidectin) Sustained Release Injectable consists of two separate vials: One vial contains 10% moxidectin sterile microspheres and the second vial contains a specifically formulated sterile vehicle for constitution with the microspheres. No other diluent should be used. A clear or translucent appearance of the vehicle is normal. Each mL of constituted drug product contains 3.4 mg moxidectin, 3.1% glyceryl tristearate, 2.4% hydroxypropyl methylcellulose, 0.87% sodium chloride, 0.17% methylparaben, 0.02% propylparaben and 0.001% butylated hydroxytoluene. Hydrochloric acid is used to adjust pH.

### PHARMACOLOGY:
Moxidectin is a semi-synthetic methoxime derivative of nemadectin which is a fermentation product of *Streptomyces cyaneogriseus* subspecies *noncyanogenus*. Moxidectin is a pentacyclic 16-membered lactone macrolide. Moxidectin has activity resulting in paralysis and death of affected parasites. The stage of the canine heartworm affected at the recommended dose rate of 0.17 mg moxidectin/kg body weight is the tissue larval stage. The larval and adult stages of the canine hookworms, *Ancylostoma caninum* and *Uncinaria stenocephala*, are susceptible. Following injection with ProHeart 6, peak moxidectin blood levels will be observed approximately 7-14 days after treatment. At the end of the six month dosing interval, residual drug concentrations are negligible. Accordingly, little or no drug accumulation is expected to occur with repeated administrations.

### INDICATIONS:
ProHeart 6 is indicated for use in dogs six months of age and older for the prevention of heartworm disease caused by *Dirofilaria immitis*.

ProHeart 6 is indicated for the treatment of existing larval and adult hookworm (*Ancylostoma caninum* and *Uncinaria stenocephala*) infections.

### DOSAGE AND ADMINISTRATION:
**Owners should be given the Client Information Sheet for ProHeart 6 to read before the drug is administered and should be advised to observe their dogs for potential drug toxicity described in the sheet.**

**Frequency of Treatment:** ProHeart 6 prevents infection by *D. immitis* for six months. It should be administered within one month of the dog's first exposure to mosquitoes. Follow-up treatments may be given every six months if the dog has continued exposure to mosquitoes and if the dog continues to be healthy without weight loss. When replacing another heartworm preventive product, ProHeart 6 should be given within one month of the last dose of the former medication.

ProHeart 6 eliminates the larval and adult stages of *A. caninum* and *U. stenocephala* present at the time of treatment. However, persistent effectiveness has not been established for this indication. Re-infection with *A. caninum* and *U. stenocephala* may occur sooner than 6 months.

**Dose:** The recommended subcutaneous dose is 0.05 mL of the constituted suspension/kg body weight (0.0227 mL/lb.). This amount of suspension will provide 0.17 mg moxidectin/kg bodyweight (0.0773 mg/lb.). To ensure accurate dosing, calculate each dose based on the dog's weight at the time of treatment. Do not overdose growing puppies in anticipation of their expected adult weight. The following dosage chart may be used as a guide.

**DOSAGE CHART**

| Dog Wt. | | Dose Volume | Dog Wt. | | Dose Volume |
|---|---|---|---|---|---|
| lb | kg | mL/Dog | lb | kg | mL/Dog |
| 11 | 5 | 0.25 | 77 | 35 | 1.75 |
| 22 | 10 | 0.50 | 88 | 40 | 2.00 |
| 33 | 15 | 0.75 | 99 | 45 | 2.25 |
| 44 | 20 | 1.00 | 110 | 50 | 2.50 |
| 55 | 25 | 1.25 | 121 | 55 | 2.75 |
| 66 | 30 | 1.50 | 132 | 60 | 3.00 |

**Injection Technique:** The two-part sustained release product must be mixed at least 30 minutes prior to the intended time of use (See **CONSTITUTION PROCEDURES** for initial mixing instructions). Once constituted, **swirl the bottle gently before every use to uniformly re-suspend the microspheres**. Withdraw 0.05 mL of suspension/kg body weight into an appropriately sized syringe fitted with an 18G or 20G hypodermic needle. Dose promptly after drawing into dosing syringe. If administration is delayed, gently roll the dosing syringe prior to injection to maintain a uniform suspension and accurate dosing.

Using aseptic technique, inject the product subcutaneously in the left or right side of the dorsum of the neck cranial to the scapula. No more than 3 mL should be administered in a single site. The location(s) of each injection (left or right side) should be noted so that prior injection sites can be identified and the next injection can be administered on the opposite side.

### INFORMATION FOR DOG OWNERS:
Always provide Client Information Sheet and review with owners before administering ProHeart 6. Owners should be advised of the potential for adverse reactions, including anaphylaxis, and be informed of the clinical signs associated with drug toxicity (see **WARNINGS, PRECAUTIONS and ADVERSE REACTIONS** sections). Owners should be advised to contact their veterinarian immediately if signs of toxicity are observed. The vast majority of patients with drug related adverse reactions have recovered when the signs are recognized and veterinary care, if appropriate, is initiated.

### CONTRAINDICATIONS:
ProHeart 6 is contraindicated in animals previously found to be hypersensitive to this drug.

### HUMAN WARNINGS:
**Not for human use. Keep this and all drugs out of the reach of children.** May be slightly irritating to the eyes. May cause slight irritation to the upper respiratory tract if inhaled. May be harmful if swallowed. If contact with the eyes occurs, rinse thoroughly with water for 15 minutes and seek medical attention immediately. If accidental ingestion occurs, contact a Poison Control Center or a physician immediately. The material safety data sheet (MSDS) contains more detailed occupational safety information.

### WARNINGS:
ProHeart 6 should be administered with caution in dogs with pre-existing allergic disease, including food allergy, atopy, and flea allergy dermatitis. In some cases, anaphylactic reactions have resulted in liver disease and death. Anaphylactic and anaphylactoid reactions should be treated immediately with the same measures used to treat hypersensitivity reactions to vaccines and other injectable products.

**Owners should be given the Client Information Sheet for ProHeart 6 to read before the drug is administered and should be advised to observe their dogs for potential drug toxicity described in the sheet.**

**Do not administer ProHeart 6 to dogs who are sick, debilitated, underweight or who have a history of weight loss.**

### PRECAUTIONS:
Caution should be used when administering ProHeart 6 concurrently with vaccinations. Adverse reactions, including anaphylaxis, have been reported following the concomitant use of ProHeart 6 and vaccinations (see **WARNINGS**).

Prior to administration of ProHeart 6, the health of the patient should be assessed by a thorough medical history, physical examination and diagnostic testing as indicated (see **WARNINGS**).

ProHeart 6 should not be used more frequently than every 6 months.

The safety and effectiveness of ProHeart 6 has not been evaluated in dogs less than 6 months of age.

Caution should be used when administering ProHeart 6 to heartworm positive dogs (See **ADVERSE REACTIONS**).

Prior to administration of ProHeart 6, dogs should be tested for existing heartworm infections. Infected dogs should be treated to remove adult heartworms. ProHeart 6 is not effective against adult *D. immitis* and, while the number of circulating microfilariae may decrease following treatment, ProHeart 6 is not effective for microfilariae clearance.

### ADVERSE REACTIONS:
In field studies, the following adverse reactions were observed in dogs treated with ProHeart 6: anaphylaxis, vomiting, diarrhea (with and without blood), listlessness, weight loss, seizures, injection site pruritus, and elevated body temperature. Dogs with clinically significant weight loss (>10%) were more likely to experience a severe adverse reaction.

In a laboratory effectiveness study, dogs with 4- and 6-month-old heartworm infections experienced vomiting, lethargy and bloody diarrhea. These signs were more severe in the dogs with 4-month-old heartworm infections, including one dog that was recumbent and required supportive care, than in the dogs with older (6-month-old) infections.

**Post-Approval Experience (Rev. 2010)**

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

**Immune:** anaphylaxis and/or anaphylactoid reactions, urticaria, head/facial edema, pruritus, pale mucous membranes, collapse, cardiovascular shock, erythema, immune-mediated hemolytic anemia, immune-mediated thrombocytopenia (signs reflected in other system categories could be related to allergic reactions, i.e., gastrointestinal, dermatologic, and hematologic)

**Gastrointestinal:** vomiting (with or without blood), diarrhea with or without blood, hypersalivation

**General:** depression, lethargy, anorexia, fever, weight loss, weakness

**Dermatological:** injection site pruritus/swelling, erythema multiforme

**Neurological:** seizures, ataxia, trembling, hind limb paresis

**Hematological:** leukocytosis, anemia, thrombocytopenia

**Respiratory:** dyspnea, tachypnea, coughing

**Hepatic:** elevated liver enzymes, hypoproteinemia, hyperbilirubinemia, hepatopathy

**Urinary:** elevated BUN, elevated creatinine, hematuria, polydipsia, polyuria

Cardiopulmonary signs such as coughing and dyspnea may occur in heartworm positive dogs treated with ProHeart 6.

**In some cases, death has been reported as an outcome of the adverse events listed above.**

To report suspected adverse reactions, to obtain a Material Safety Data Sheet, or for technical assistance, call 1-800-366-5288.

For a complete listing of adverse reactions for moxidectin reported to the CVM see: http://www.fda.gov/AnimalVeterinary/SafetyHealth/ProductsSafetyInformation/ucm055394.htm

### ANIMAL SAFETY:
*General Safety*: ProHeart 6 has been administered to a wide variety of healthy dogs six months of age and older, including a wide variety of breeds, pregnant and lactating females, breeding males, and ivermectin-sensitive collies. In clinical studies, two geriatric dogs with a history of weight loss after the initial ProHeart 6 injection died within a month of the second 6 month injection. A third dog who was underweight for its age and breed and who had a history of congenital problems experienced lethargy following the initial injection of ProHeart 6. The dog never recovered and died 3 months later (see **WARNINGS**).

ProHeart 6 administered at 3 times the recommended dose in dogs with patent heartworm infections and up to 5 times the recommended dose in ivermectin-sensitive collies did not cause any adverse reactions. ProHeart 6 administered at 3 times the recommended dose did not adversely affect the reproductive performance of male or female dogs. ProHeart 6 administered up to 5 times the recommended dose in 7-8 month old puppies did not cause any systemic adverse effects.

In well controlled clinical field studies, ProHeart 6 was used in conjunction with a variety of veterinary products including anthelmintics, antiparasitics, antibiotics, analgesics, steroids, non-steroidal anti-inflammatory drugs (NSAIDs), anesthetics and flea control products.

*Injection Site Reactions*: Injection site observations were recorded during effectiveness and safety studies. In clinical studies, ProHeart 6 was administered at six-month intervals to client-owned dogs under field conditions. There were no reports of injection site reactions in these field studies and evaluations of the injection sites revealed no abnormalities.

In a laboratory safety study, ProHeart 6 was administered at 1, 3 and 5 times the recommended dose to 7-8 month old puppies. Injection sites were clipped to facilitate observation. Slight swelling/edema at the injection site was observed in some dogs from all treated groups. These injection site reactions appeared as quickly as 8 hours post injection and lasted up to 3 weeks.

A three-year repeated injection study was conducted to evaluate the safety of up to 6 injections of ProHeart 6 administered at the recommended dose (0.17 mg/kg) every 6 months. Mild erythema and localized deep subcuticular thickening were seen in dogs that received four injections in the same area on the neck and in one dog that received two injections in the same area on the neck. Microscopic evaluation on the injection sites from all dogs 6 months after the last injection consistently showed mild granulomatous panniculitis with microvacuolation.

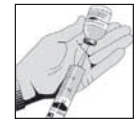
The only adverse reaction seen that was not related to the injection site was weight loss in one dog.

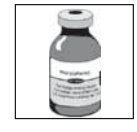
Some dogs treated with ProHeart 6 in laboratory effectiveness studies developed transient, localized inflammatory injection site reactions. These injection site reactions were visible grossly for up to 3 weeks after injection. Histologically, well-defined granulomas were observed in some dogs at approximately 5 months after injection.

### CONSTITUTION PROCEDURES:
The two-part ProHeart 6 product must be mixed at least 30 minutes prior to the intended time of use.

Items needed to constitute ProHeart 6:
- Microspheres
- Vehicle
- Transfer needle (18G or 20G)
- Enclosed vent needle (25G)
- Sterile 20 mL syringe for transfer

Constitution of the 20 mL vial product.





1. Shake the microsphere vial to break up any aggregates prior to constitution.
2. Using an 18G or 20G needle and sterile syringe withdraw 17.0 mL of the unique vehicle from the vial. **There is more vehicle supplied than the 17.0 mL required**.
3. Insert the enclosed 25G vent needle into the microsphere vial.
4. Slowly transfer the vehicle into the microsphere vial through the stopper using the transfer needle and syringe.
5. Once the vehicle has been added, remove the vent and transfer needles from the microsphere vial. Discard unused vehicle and needles.
6. Shake the microsphere vial vigorously until a thoroughly mixed suspension is produced.
7. Record the time and date of mixing on the microsphere vial.
8. Allow suspension to stand for at least 30 minutes to allow large air bubbles to dissipate.
9. **Before every use, gently swirl the mixture to achieve uniform suspension**. The microspheres and vehicle will gradually separate on standing.
10. Use a 1 mL or 3 mL syringe and an 18G or 20G needle for dosing. Dose promptly after drawing into dosing syringe. If administration is delayed, gently roll the dosing syringe prior to injection to maintain a uniform suspension and accurate dosing.
11. Refrigerate the unused product. The constituted product remains stable for 4 weeks in a refrigerator. Avoid direct sunlight.

### STORAGE INFORMATION:
Store the unconstituted product at or below 25°C (77°F). Do not expose to light for extended periods of time. After constitution, the product is stable for 4 weeks stored under refrigeration at 2° to 8°C (36° to 46°F).

### HOW SUPPLIED:
ProHeart 6 is available in the following three package sizes.

**1. 1-Pack**
20 mL vial product:
1 - 10% moxidectin sterile microspheres - 598 mg/vial
1 - Sterile vehicle - 17 mL/vial

**2. 5-Pack**
20 mL vial product:
5 - 10% moxidectin sterile microspheres - 598 mg/vial
5 - Sterile vehicle - 17 mL/vial

**3. 10-Pack**
20 mL vial product:
10 - 10% moxidectin sterile microspheres - 598 mg/vial
10 - Sterile vehicle - 17 mL/vial

For a copy of the Material Safety Data sheet (MSDS) or to report a suspected adverse reaction, call Pfizer Animal Health at 1-800-366-5288.

Pfizer
Fort Dodge Animal Health
a div. of Wyeth
a wholly owned subsidiary of Pfizer Inc
New York, NY 10017

Revised August 2011

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**Online TOOL**

Download this client handout by using the QR code below or by visiting **dvm360.com/FelineOAHandout**.

# Osteoarthritis *in your senior cat*

## Do you know the signs?

**Just like people, cats commonly develop osteoarthritis as they age. It's best to catch the signs of this painful disease early so you can alleviate any suffering and get them back to their spry selves. If you note any of these signs in your cat, be sure to make an appointment with your veterinarian:**

- **Decreased grooming**
- **Reluctance to jump**
- **Inability to jump as high as before**
- **Urinating or soiling outside the litter box**
- **Increased or decreased sleep**
- **Avoiding human interaction**
- **Hiding**
- **Dislike of being stroked or brushed**

*Information from Sheilah A. Robertson, BVMS (Hons), PhD, DACVA, DECVA, CVA, MRCVS, College of Veterinary Medicine, University of Florida, Gainsville, Fla.*

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The ~~treats~~ toxins she packed for her 6-year-old ~~daughter's~~ Retriever's afternoon ~~snack.~~ seizure.

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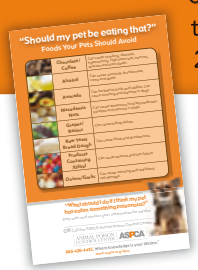


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# Feline infectious peritonitis

## Strategies for diagnosing and treating this deadly disease in young cats

Although this lethal infectious disease is difficult to diagnose definitively, by performing multiple diagnostic tests, you may be able to rule out other diseases and put together enough puzzle pieces to form a relatively complete clinical picture.

*By Audrey K. Cook, BVM&S, MRCVS, DACVIM, DECVIM-CA, and Whitney R. Nelson, DVM, DACVIM*

Feline infectious peritonitis (FIP) is one of the leading infectious causes of mortality in young cats.[1] In this article, we review the clinical signs, diagnostic options, and treatments for this complex disorder.

**Between patients?**
**An article synopsis**

No definitive test and no definitive treatments make this inflammatory disease particularly difficult. The disease is a mutation of feline coronavirus, a common infection, although fewer than 10% of coronavirus-infected cats develop FIP. Clinical signs and diagnostic testing can help you zero in on a diagnosis. Immunocytochemistry and immunohistochemistry of samples of effusion or affected tissue are considered the diagnostic gold standard. Medical intervention such as glucocorticoid therapy can help prolong a cat's life. And strategies that alleviate stress on the immune system in young cats can help prevent FIP in the first place.



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*n=218 (sample size)* *CI= 95% Confidence Interval*

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***Specificity represents the ability to correctly identify negative samples. Data on file, Study Report No. DH69W-US-12-001, Zoetis Inc.*



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## FIP OVERVIEW

### How it all begins

Feline coronavirus is a single-stranded RNA virus that is endemic in many multicat households, shelters, and catteries.[2] In the common enteric form, feline coronavirus replicates in enterocytes and causes mild, self-limiting diarrhea. The virus may be shed in feces for several months after infection and is spread to other cats through oral ingestion. It survives in the environment for several weeks, and transmission may occur through shared litter pans, mutual grooming, or fomites. Young cats are more vulnerable to infection than adults are.[2]

Mutations routinely occur within the feline coronavirus genome through nucleotide substitution, deletion, and recombination.[3] Certain mutations transform the virus into a virulent biotype, which is able to replicate in monocytes and macrophages. This mutated form is called *FIP virus* and causes a fatal systemic inflammatory disease. Estimates vary, but fewer than 10% of cats infected with feline coronavirus will develop FIP.[2] Why the disease arises in some cats but not in others is not completely understood.[2] Purebreed cats appear to be predisposed, although the incidence within specific breeds varies among countries.[2]

The cat's immune system appears to play a crucial role. Those with a prompt and robust cell-mediated immune response are able to destroy the FIP virus and are unlikely to develop clinical disease.[2]

### Effusive vs. noneffusive

There are two main forms of FIP: effusive (wet) and noneffusive or granulomatous (dry). Some patients will switch between the two forms over the course of their illness. The development of one type vs. the other depends on the balance between the host's humoral (antibody-related) and cell-mediated immune responses. Cats with strong humoral responses develop effusive FIP, while those with mixed responses manifest the dry form.[2]

### How FIP takes hold

The FIP virus infects mononuclear phagocytes and spreads hematogenously through infected monocytes. These may attach to the vascular endothelium or migrate into tissues. The virus replicates within macrophages, which die as the virus is released. This death of the cell and viral release triggers a marked inflammatory reaction, with the recruitment of more inflammatory cells and the release of cytokines and the activation of complement.

Vasoactive agents result in vasculitis and effusion in the chest, abdomen, or pericardial sac.[4] Perivascular pyogranulomatous lesions develop on serosal surfaces and within solid organs and are characterized by an infiltrate of macrophages and neutrophils.

Because the FIP virus is strongly cell-bound and tissue-bound, shedding is unlikely unless there is effacement of the renal tubules or intestinal mucosa. Consequently, FIP is not regarded as a contagious disease, and the risk of horizontal transmission to other cats is minimal.[2]

## DIAGNOSIS

In some cases, the diagnosis can be elusive and may depend on the logical exclusion of other possibilities. Clinicians often have to piece together supportive evidence and weigh the likelihood of FIP in a particular patient. Since feline coronavirus is endemic in many cat populations, FIP cannot be definitively

diagnosed based solely on evidence of exposure to the virus. Instead, evidence is needed that the virus has moved beyond the gastrointestinal tract and is replicating in the internal organs, as this behavior differentiates the virulent virus from the nonvirulent forms. Unfortunately, proving this key piece of evidence can be difficult.

## Clinical presentation

FIP is commonly reported in cats < 2 years of age, although it may arise in older cats from shelter environments. Generally, affected cats have an insidious onset of clinical signs with episodes of fever, malaise, and hyporexia (*see the sidebar "Managing a 9-month-old kitten with FIP" on page 436*). Kittens may fail to thrive and appear stunted.

Cats with effusive disease may present with abdominal distention, dyspnea, or both. Abdominal palpation may indicate mesenteric lymphadenopathy, renomegaly, or areas of thickened intestine.

Uveitis or chorioretinitis may be noted in cats with the dry form, and a careful ophthalmologic examination should be performed in any cat with an unexplained fever. Neurologic problems, including seizures, changes in mentation, and spinal compromise, are routinely reported in cats with dry FIP.[2]

## Routine laboratory findings

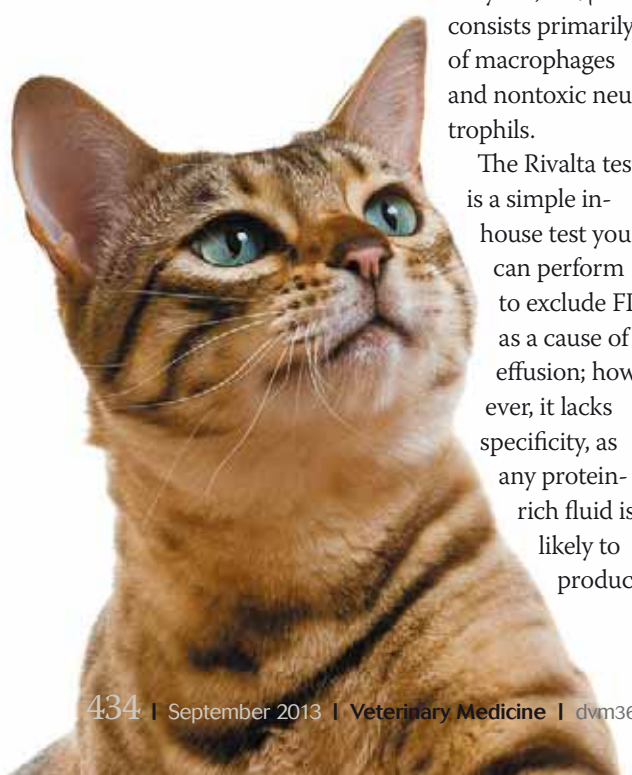
A mature neutrophilia is expected in cats with FIP, along with lymphopenia. Many cats have concurrent nonregenerative anemia, attributed to chronic inflammatory disease

and secondary suppression of erythropoiesis.[5] Hyperglobulinemia is routinely reported in cats with FIP, particularly the dry form. The albumin:globulin ratio is often < 0.8 (a ratio < 0.6 is highly suggestive of FIP).[2] Hyperbilirubinemia is also commonly noted, although overt icterus is unusual.

## Fluid analysis

FIP is the most common cause of abdominal effusion in cats < 2 years of age.[2] An examination of abdominal or pleural effusion often provides strong supportive evidence of FIP. The fluid is usually light to dark yellow and may be cloudy or mucinous.[5] The total protein content is predictably > 3.5 g/dl, with an albumin:globulin ratio < 0.6. The nucleated cell count is generally < 5,000/µl and consists primarily of macrophages and nontoxic neutrophils.

The Rivalta test is a simple in-house test you can perform to exclude FIP as a cause of effusion; however, it lacks specificity, as any protein-rich fluid is likely to produce a positive result.[6] Mix one drop of 98% acetic acid with 5 ml of distilled water in a test tube. Place a drop of the effusion on top of this solution and observe its motion. If the effusion dissipates, the fluid is transudate and is not consistent with FIP. If the effusion is still clearly visible, it is consistent with an exudate but not diagnostic for FIP.



GETTY IMAGES/ISTOCKPHOTO

## Imaging studies

Radiography can confirm the presence of free fluid in effusive cases but has limited value in cats with dry FIP. Abdominal ultrasonography permits the identification and collection of ascitic fluid along with an evaluation of the internal organs. Renomegaly, lymphadenopathy, and regional thickening of the small bowel or colon are commonly noted in affected cats.

## Gross surgical or postmortem findings

In cats with effusive FIP, serosal surfaces are often covered in pyogranulomatous lesions of varying size.[2] The omentum is often markedly thickened and contracted. Firm white or mottled granulomas may be seen on the surface of affected organs. Lymphadenopathy is expected, and affected nodes are firm and nodular. In cats with dry FIP, fewer but larger lesions are noted. These start on the serosal surface of the organs and extend into the parenchyma.

## Cytologic and histologic examination

The results of a cytologic examination of affected tissues in cats with effusive FIP show a pyogranulomatous reaction with clusters of macrophages and neutrophils.[2] A histologic evaluation of affected tissues reveals widespread perivascular inflammation, with a predominance of macrophages. Edema and necrosis are also evident. In cats with dry FIP, dense lymphocytic aggregates are often noted around affected vessels. Necrosis and fibrin deposition are less dramatic than in the effusive form.

## Additional testing for FIP

**Antibody testing.** Many veterinary laboratories provide qualitative and quantitative testing for feline coronavirus antibodies in serum. An in-clinic ELISA test is also available and can be performed on serum or plasma. These tests cannot differentiate cats with exposure to the harmless enteric form from those with FIP. Negative results strongly discount FIP infection, but a positive titer has little diagnostic value unless it is more than 1:1,600.[6]

It is interesting to note that titers can fall dramatically in the terminal stages of the disease. Efforts have been made

to improve the specificity of serologic tests for FIP, including the development of an assay for antibodies against the 7b protein of feline coronavirus. This antigen was thought to be associated with FIP viral strains but is also expressed by the enteric biotype. Thus, positive results with the FIP 7b ELISA test should not be regarded as definitive evidence of the disease.[7]

**PCR testing.** A polymerase chain reaction (PCR) test for identification of feline coronavirus messenger RNA (mRNA) is offered through several commercial laboratories. The concept behind this test is that the presence of mRNA indicates active viral replication within the body, which would be indicative of FIP rather than enteric feline coronavirus infection.[8] The test can be performed on whole blood, cavity effusions, or aqueous humor.

Conflicting reports exist regarding the reliability of this test, and it seems as though results from the testing of whole blood are questionable. In one report, more than half of the healthy control group had positive results, suggesting poor specificity.[9] However, real-time testing of effusions appears to be much more reliable and can accurately differentiate cats with FIP from those with other causes of ascites or pleural fluid.[6]

**Immunocytochemistry and immunohistochemistry.** Samples of effusion or affected tissues may be tested for the presence of viral antigens using anti-FIP antibodies.[10] Essentially, polyclonal or monoclonal antibodies with high specificity for the feline coronavirus are mixed with the sample and allowed to attach to infected macrophages. The antibodies are subsequently detected using a marker agent, either fluorescein (effusion or fresh tissue) or horseradish peroxidase (formalin-fixed tissue).

These tests are generally regarded as the diagnostic gold standard, and a positive result is definitive confirmation of FIP. Unfortunately, false negative results may occur when low cellularity effusions are tested or if unaffected organs are biopsied.[2]

## TREATMENT

Most experts regard FIP as an incurable disease, although some cases of apparently spontaneous remission have been reported. Numerous medical therapies are described in the literature, usually with conflicting accounts of efficacy. It seems likely that some medical interventions have a positive effect, but such responses are generally transient, and owners should always be informed of the grave prognosis associated with FIP.

Administering glucocorticoids appears to improve survival times in cats with FIP and may mitigate morbidity associated with fever and hyporexia. Giving other immunosuppressive agents, such as

*Main article continues on page 438.*

# Managing a 9-month-old kitten with FIP

Sully, a 9-month-old 6.4-lb (2.9-kg) neutered male domestic shorthaired cat, was presented for evaluation of hyporexia and labored breathing of three weeks' duration.

## History

Sully was adopted from a shelter at 3 months of age and had negative results for feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) at the time of the adoption. Sully was current on core vaccines at presentation and was kept exclusively indoors.

## Physical examination and routine laboratory findings

Sully's respiratory rate was 60 breaths/min. Its temperature (102 F [38.9 C]) and pulse rate (200 beats/min) were normal. Heart and lung sounds were muffled on the left side and clearly audible on the right. Significant complete blood count and serum chemistry profile findings are listed in *Table 1*. FeLV and FIV test results were negative.

Table 1

**Significant laboratory results**

| Parameter | Patient's value | Reference range |
|---|---|---|
| **Complete blood count** | | |
| WBC (/µl) | 24,300 | 5,500–19,500 |
| Neutro (/µl) | 13,365 | 2,500–12,500 |
| Lymph (/µl) | 8,262 | 1,500–7,000 |
| PCV (%) | 31.6 | 24–45 |
| **Serum chemistry profile** | | |
| Total protein (g/dl) | 8.4 | 6.1–7.7 |
| Globulin (g/dl) | 5.8 | 2.3–3.8 |
| Phosphorus (mg/dl) | 9.1 | 3.8–7.5 |

## Diagnostic imaging

A radiographic examination showed fluid or a soft tissue density in the left hemithorax (*Figure 1*). A thoracic ultrasonographic examination showed a large fluid-filled cavity in the left hemithorax, bounded by a 3-mm distinct capsule (*Figure 2*). No fluid was seen in the mediastinum or the right pleural space.

## Fluid analysis and PCR testing

A thoracocentesis was performed, and 120 ml of thick straw-colored fluid were removed from left side of the chest. Analysis of the yellow, slightly turbid fluid showed a total protein concentration of 4.5 g/dl, an albumin:globulin ratio of 0.45, and a nucleated cell count of 1,471/µl with primarily nondegenerate neutrophils. The results of PCR FIP mRNA tests performed on whole blood and pleural fluid were negative.

## Thoracotomy

A thoracotomy was performed, and a cystic lesion was found to occupy the left side of the chest. It was adhered to the parietal pleura and a section of atelectatic or malformed lung. Both the cystic lesion and attached lung tissue were removed (*Figure 3*).

## Histology

The tissue labeled *cyst* was a capsule composed of smooth muscle and granulation tissue surrounding fibrinonecrotic and suppurative inflammation. The tissue labeled *lung* was atelectatic lung with a capsule of smooth muscle and granulation tissue surrounding fibrinonecrotic and suppurative inflammation. Special stains for bacteria and fungi were negative.

## Immunohistochemistry

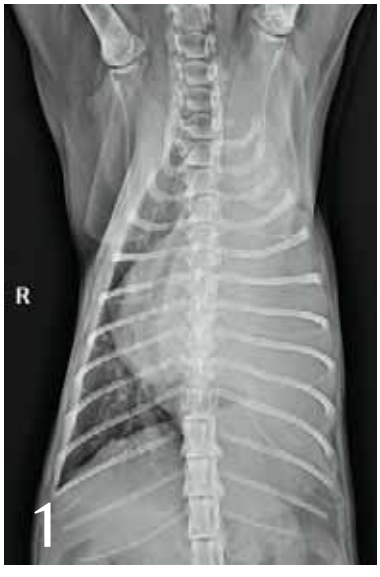
The portions of the tissue submitted for immunochemistry were positive for the FIP antigen, which confirmed the diagnosis of FIP.

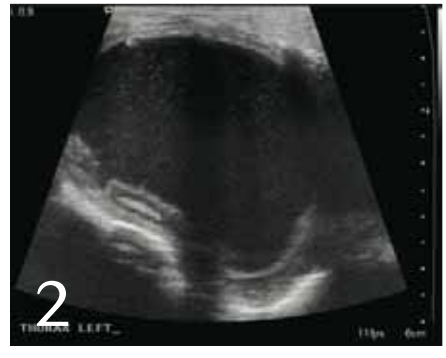
## Outcome

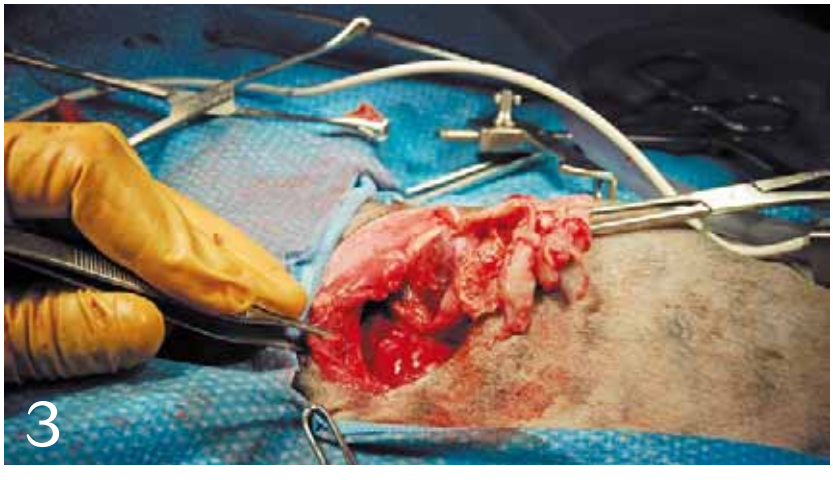
Sully was treated with glucocorticoids (prednisolone 2 mg/kg orally once a day). It did well until three months after the surgery, when the cat developed pericardial effusion. Sully was euthanized about four months after the thoracotomy. At necropsy, fibrinous plaques were noted on the pleura and pericardial sac and covering the abdominal viscera.

## Comments

This case is unusual because FIP is not commonly associated with a unilateral pleural effusion. Although there was strong suggestive evidence of FIP on the basis of the fluid analysis, mature neutrophilia, and hyperglobulinemia, the owner was determined to establish a definitive diagnosis and opted to pursue a thoracotomy. It is interesting to note that mRNA PCR test results were negative, despite the final diagnosis of FIP. This case highlights the challenges associated with this disorder and the limitations of noninvasive diagnostic tests.




**>>>1.** A ventrodorsal thoracic radiograph. Note the fluid or soft tissue density on the left side of the thorax. The cardiac silhouette is displaced to the right.

**>>>2.** An ultrasonographic image of the left hemithorax. Note the thick-walled cystic structure. (*This image is courtesy of the Texas A&M University Radiology Service.*)

**>>>3.** An intraoperative view of the left hemithorax. The cystic structure and affixed lung tissue are visible, following their removal from the chest.

*A new cat should not be introduced into a single-cat household until three months after the demise of the cat with FIP.*

cyclophosphamide or chlorambucil, appears to offer little advantage and may cause myelosuppression.[2]

Feline interferon omega administration was reported to induce remission in one study but showed no benefit in a larger population of affected cats.[11,12]

Pentoxifylline therapy has been suggested because it inhibits tumor necrosis factor alpha and has an antivasculitis effect; however, a recent placebo-controlled study using a related agent failed to identify a positive effect in cats with FIP.[13]

The administration of various antiviral agents has demonstrated efficacy against feline coronavirus in vitro, but we are not aware of any reports describing their effects in cats with experimental or spontaneous infections.[14]

A report published in 2009 described the effect of Polyprenyl Immunostimulant (Sass & Sass) administration in three cats with dry FIP.[15] The findings were encouraging, as two of the three cats were alive > 24 months after diagnosis. This product is thought to upregulate innate immunity and is marketed for the reduction of clinical signs in cats with rhinotracheitis.

## PROGNOSIS

Most cats with effusive disease die or are euthanized within a few weeks of the onset of clinical signs.[2] The dry form tends to move more slowly, and cats may survive for several months from when signs are first noted. Cats with neurologic involvement often have a short survival time.

## PREVENTION

An intranasal vaccine (Felocell FIP—Zoetis) is licensed for cats > 16 weeks old. This attenuated, temperature-sensitive strain of FIP virus is presumed to trigger protective IgA antibodies. Based on independent testing, the efficacy of this product is questionable, and it is not regarded as a core vaccine.[16]

Because the virus can survive in the environment for several weeks, a new cat should not be introduced into a single-cat household until three months after the demise of the cat with FIP. In multicat households, fecal PCR testing has been proposed as a way to identify those cats that are shedding feline coronavirus and assess the risk to a newcomer. However, fecal excretion can be sporadic, and these tests suffer from low sensitivity. If a new cat is introduced, it is prudent the owner select an adult rather than a kitten, as older cats are innately more resistant to infection with feline coronavirus.

In shelter environments, feline coronavirus is generally endemic,

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and efforts to eradicate it are futile. However, the incidence of FIP can be reduced through management strategies such as preventing overcrowding and diagnosing and treating common intestinal and respiratory infections. These factors are thought to stress the immune system and predispose juveniles to the development of FIP.[17]

Most cats in breeding facilities are also infected with feline coronavirus, and kittens are predictably exposed from contact with the queen or the contaminated environment. As infection with feline coronavirus occurs around 9 or 10 weeks of age, isolation of the litter at 6 weeks of age may be helpful.[17] However, strict quarantine regulations are needed, including separate caretakers and air space. As genetic factors probably influence the development of FIP, any queen or tom with two or more infected litters should be removed from a breeding program.[2]

## CONCLUSION

In many patients, diagnosing FIP requires a careful assessment of the entire clinical picture and systematic collection of supportive and corroborative data. Clinicians need a good understanding of the tests available and must be prepared to counsel clients about the limitations and reliability of diagnostic methods. A definitive antemortem diagnosis may be difficult, particularly in cats with the dry form of the disease, and it may be necessary to reach a conclusion based on overall likelihood rather than irrefutable test results. VM

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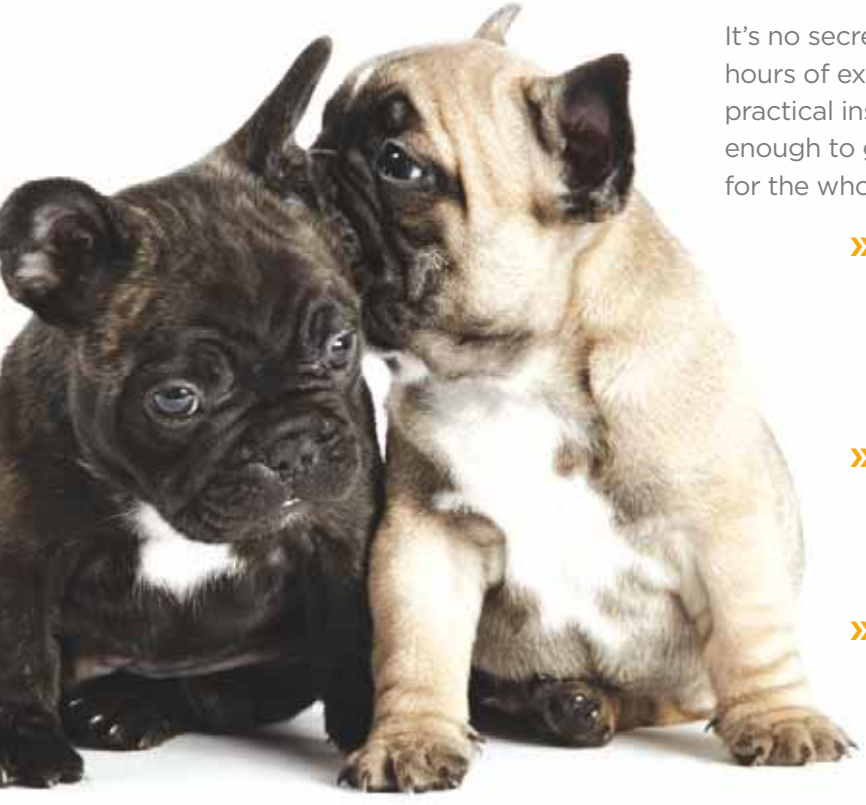

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# CRACKING THE CODE
## *Who's taking care of our pets?*

Our clients no longer "own" their pets. Our patients do not have "owners" any longer. A well-known radio pet show host calls them *guardians*. A popular dog magazine refers to people who have dogs as *parents*.

And what if one owns a guard dog? Can one be a "guardian" of a guard dog? Who guards whom? And whatever happened to the term *watchdog*? Does a watchdog need a guardian?

How about disabled pets? Are we owners or guardians or parents to them? Or are we caretakers? Assistants? Nurses? Which is it?

If I must choose, the term *parent* seems more logical to me. I don't think a guardian is automatically responsible for the medical bills of his or her guarded individual, whereas a parent is responsible.

But wait! According to the dictionary, a *parent* is a father or mother, or it is someone who has begotten or borne a child. Can one, therefore, parent a pet? Isn't that against the law? In fact, isn't that physiologically improbable? If it were possible, wouldn't the offspring be known as a *hybrid*, rather than a *pet*?

All of this confuses me, especially since my pets own *me*. It used to be clear to me—it was back in 1927 when I was born, and it was still clear in 1956 when I became a veterinarian. But now I don't know.

No, the little one is my watch dog. The big one is my pet. I am his guardian.

These changes in terminology have legal implications, too. For example, if the owner/guardian/parent of a dog bites somebody, that owner/guardian/parent is legally responsible. So if a child bites a stranger, is the child's parent similarly liable? What if a child bites someone else's dog? Who's responsible for the veterinary bill? The parent? Which parent?

And here's another problem: If we are now parents to our pets, whose name goes on the registration papers—the sire's, the dam's, or the owner's? Excuse me, I mean the parent's. No wait, the guardian's.

You see, all of this was created to separate ownership of things from ownership of *living* things. So we can own a house, a car, a motorcycle, or an endoscope, but henceforth we can't own a dog or a cat. We can parent them or guard them, but no longer can we own them. And what about horses, goats, or hamsters? What about cattle or chickens? How about goldfish? They're all living things, too. I guess you could even ask about rosebushes or elm trees. But now you're just being silly. VM

*Robert M. Miller, DVM, is an author and a cartoonist, speaker and* Veterinary Medicine *Practitioner Advisory Board member. His thoughts in "Mind Over Miller" are drawn from 32 years as a mixed-animal practitioner. Visit his website at robertmmiller.com.*

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