Cornell University
College of Veterinary Medicine
Feline Health Center

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CatWatch

Expert information on medicine, behavior and health from a world leader in veterinary medicine

INSIDE

IN THE NEWS ...

A Larger Litter Box Wins Out as More Cat-friendly

Conventional wisdom holds that cats prefer large litter boxes for easy entry. Researchers at Atlantic Veterinary College at the University of Prince Edward Island in Canada set out to prove it. They studied responses of 73 healthy indoor cats to two sizes of litter boxes: a commercial one 22 inches long and a special one measuring 33 inches in length.

Owners logged the frequency of urination and defecation in each box. Over 28 days, the larger boxes had 5,031 urine and fecal deposits, the small ones 3,239.

While the boxes were kept equally clean, most cats showed a preference for a larger litter box than is typically available in households, researchers report in the Journal of Veterinary Behavior, concluding, "Use of the term 'inappropriate' to describe a cat's failure to use a litter box is something of a misnomer. The choice of an elimination area may not be inappropriate from the cat's perspective." ❖

Fearful Cats Can Go on the Attack

Strangers, car rides and fight-related sounds will trigger aggression when cats feel threatened with no way of escape

Chibi was a therapy cat, placid and friendly. She visited senior homes and was sociable around dogs, other cats, even doves and a guinea pig. Imagine her owner's surprise when she saw a large red warning banner on Chibi's chart at the veterinary clinic.

Aggression is their second most common behavior problem.

Daleen Comer of Mission Viejo, Calif., was stunned to learn that the technicians considered her otherwise mellow cat dangerous. She clawed and hissed, especially when they had to draw blood. "For vets or vet techs, she was an extremely scary cat," Comer says. "After that, I always made sure I trimmed her nails before vet visits."

Defensive Reaction. Aggression is the most common feline behavior issue animal behaviorists see after litter box problems, according to the ASPCA. Aggressive cats may threaten or injure people, other cats and dogs. Ilana Reisner, DVM, Ph.D., of Media, Penn., describes it to her clients as self-defense.

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Half-foot-long Worms Found in 2 Cats

Cornell researchers verify the first feline cases of a parasite that usually infects raccoons and other wildlife

New research at Cornell University College of Veterinary Medicine has bolstered advice to keep cats indoors, allowing them outside only when they can be supervised to protect them from parasitic infection.

Veterinarians discovered unsightly half-foot-long worms in a 9-year-old domestic cat from upstate New York and a 14-year-old one from Pembroke, Mass. They're believed to be the first two confirmed cases of cats in the United States infected by *Dracunculus insignis*, a parasitic worm that primarily targets raccoons and other wildlife. The findings were published earlier this year in the Journal of Feline Medicine and Surgery.

Protective Measures. "The cats that contracted the *Dracunculus insignis* worms likely ingested the parasites by drinking unfiltered water or by hunting frogs," says Araceli Lucio-Forster, Ph.D., a parasitologist in the Department of Microbiology and Immunology, and lead author of the report. "Although rare in cats, this worm may be common in wildlife in certain areas, and the only way to protect animals from it is to keep them from drinking unfiltered water

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CatWatch

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Exploring the Placebo Effect in Caregivers — Us!

The placebo effect has been the subject of frequent research in human medicine, with results ranging from the psychological — you expect to feel better taking a medicine and you do — to the physiological — endorphins in the brain and spinal fluid caused your improvement.

Veterinary researchers, however, face the challenge of their subjects' lack of speech. How do they weigh the placebo effect when studying a medication's effectiveness? Owner observation can be wildly subjective. Is your cat lethargic after taking the medicine or simply napping on a sunny windowsill?

A study at North Carolina State College of Veterinary Medicine, published in the Journal of Veterinary Internal Medicine, put science to work to investigate the caregiver placebo effect in a clinical trial of meloxicam, a nonsteroidal anti-inflammatory drug commonly used to relieve pain in cats with degenerative joint disease.

"Merely observing behavior can change it, and any changes in daily routine, like administering medication, will affect the way you relate to that animal and change its behavior," says behaviorist Margaret Gruen, DVM, at North Carolina. Here's how her team worked around that obstacle in a study of 58 client-owned cats:

- They first gave owners a two-week placebo to accustom their cats to taking the medication and told them they were indeed giving a placebo.
- They then gave half the owners a placebo and half the meloxicam for three weeks without either knowing it. All the owners said their cats improved. The reason: the caregiver placebo effect, Dr. Gruen says.
- In the final three-week period, all owners gave their cats a placebo, unaware of it. Owners who had been giving the medication in the second phase said their cat's signs of pain were returning. Owners of cats who had received placebo in the first phase saw no change.

Because owners in the final phase recognized pain returning in their dogs given the placebo, researchers determined the medication is effective in cats with degenerative joint disease, Dr. Gruen says, adding that the approach needs further investigation but may be useful in veterinary and human studies where the placebo effect is strong

Book Buddies for Shelter Cats

Kristi Rodriguez, program coordinator at the Animal Rescue League of Berks County, brought her son, Sean, to the league's shelter in Birdboro, Pa. The fifth-grader had been having difficulty reading at school, and she thought reading to the cats there might help him.

So began a program called Book Buddies for children in grades one to eight. They read to the cats in the adoption room, benefitting both the children and the animals. "Cats find the rhythmic sound of a voice very comforting and soothing," the league says. And since the program officially began in August 2013, Sean has shown remarkable improvement in reading.

"Sean's story is similar to those of many other children who have participated in Book Buddies," the league says, adding that they include home-schooled children, Brownie Troops, autistic children and those whose parents want them exposed to animals.

Parent Katie Procyk says the program not only helped her son, it gave him a chance to help animals "who do not have warm, loving homes and [to understand] that we must help speak up for the critters who do not have a voice." ❖

Animal Rescue League of Berks County

Children comfort shelter cats at the Animal Rescue League of Berks County by simply reading to them.

Essentials of the First Kitten Exam

The veterinarian will check for abnormalities from nose to tail, looking for infections and parasites

Kitten season — an increase in litters and adoptable pets — seems to span three seasons, starting in spring and extending into fall. If you're the proud owner of a new kitty — congratulations!

Tops on your to-do list: a full veterinary exam to help ensure many happy years together and prevent your newest family member from passing a parasite or disease to other pets or, in unusual cases, people.

"Exams are important to help identify problems early so that we start any appropriate treatment ASAP," says Brian Collins, DVM, a lecturer in The Community Practice Service at Cornell University Hospital for Animals. "Fortunately, the majority of kittens seen at veterinary hospitals are healthy with only minor problems such as parasites or an upper respiratory infection. Most kittens leave their first visit with a nearly clean bill of health."

Lab work often will be limited to a test of his stool to detect parasites and a blood test to test for feline leukemia virus and feline immunodeficiency virus.

Here's what to expect at a new kitten exam:

THE PHYSICAL

Purpose: determine overall health. "We keep our eyes and ears open for anything abnormal," Dr. Collins says. "We do a thorough exam from nose to tail."

The essentials: A check of temperature and heart and respiratory rate. Veterinarians will also look for heart murmurs, open fontanelles (soft spots in the skull when bones fail to close), abdominal hernias and lameness or orthopedic abnormalities. In male kittens, they make sure the testicles have descended from the abdomen into the scrotum as they should by 2 months of age.

Veterinarians take note of coughing, runny nose or discharge in the eyes — all signs of infection. They peek into ears and examine skin for signs of parasites and ringworm infection. If a kitten has a history of vomiting or diarrhea, they will feel the abdomen for evidence of discomfort and other abnormalities. They also may discuss the pros and cons of sterilization at different ages.

THE ORAL EXAM

Purpose: to check for an underbite, missing or extra teeth, gingivitis and cleft palate.

The essentials: In addition to examining the mouth, veterinarians will discuss daily home dental care because most cats develop evidence of gum disease by the age of 3, according to the American Veterinary Dental Society. Most cats will allow their teeth to be brushed if you introduce it gradually over a month or two. Start by letting him lick a feline toothpaste from your finger, then use a small feline toothbrush. Eventually, you can place the toothbrush in your kitten's mouth for brushing.

NUTRITION

Purpose: to make sure the kitten has appropriate food during this time of rapid growth.

The essentials: Is the kitten too thin? Overweight? His weight will be recorded and monitored.

CHECK FOR PARASITES

Purpose: to find and eliminate them.

The essentials: "It is helpful if the client brings a fresh sample of the animal's stool," Dr. Collins says, "so that it can be inspected for any gross abnormalities as well as microscopic examination for parasites."

If the kitten shows signs of feline distemper, his stool will be tested for that, too. Fecal exams should be done two to four times in a kitten's first year, the American Animal Hospital Association says, while deworming should be done every two weeks from 3 to 9 weeks of age, then monthly until 6 months of age. "We commonly prescribe medications for gastrointestinal parasites, fleas, ticks and ear mites," Dr. Collins says.

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Veterinarians check for heart murmurs, soft spots in the skull when bones fail to close and for abdominal hernias.

VACCINATIONS

Purpose: to protect against potentially deadly diseases.

The essentials: One shot guards against rabies, while a combination vaccine protects the kitten from respiratory illnesses and feline distemper.

BEHAVIOR SCREENING

Purpose: to help ensure your kitten grows into a social pet.

The essentials: The veterinarian may advise on teaching your kitten to use appropriate scratching surfaces.

AAHA guidelines point out that kittens have a high play drive, so provide toys to help prevent play biting. The veterinarian may ask about your litter box arrangement. Cats tend to prefer a clean, large box easily accessible but out of the way of busy household traffic.

BREED-SPECIFIC SCREENING

Purpose: to check for early signs of hereditary diseases. For example, Devon Rex, Ragdoll, American Shorthair, British Shorthair and Maine Coon cats are likelier to inherit the most common heart disease in cats, hypertrophic cardiomyopathy.

The essentials: Veterinarians examine the kitten's body for possible signs. For example, if cardiac disease is a problem for the breed, a heart murmur can be an early indication. ❖

Burns Call for Quick Action at Home

Some can result in shock, while others may not be initially painful, but all require veterinary care

Cats who explore countertops and jump on hot ceramic stovetops can burn their footpads.

Cats who counter surf during food preparation, chew on exposed electrical cords or brush up against burning candles are all at risk for burns. Pink-nosed, light-colored cats who seek sunny spots outdoors for prolonged naps are also vulnerable — another reason to keep cats inside.

The three main types of burns are chemical, electrical and thermal, which is caused by hot objects. First-degree burns affect the skin superficially and cause discomfort. Second degree painfully penetrates several underlying layers, and third-degree burns injure all layers of the skin and can result in shock.

"Thermal burns from going through a wash cycle in a washing machine or through the clothes dryer are some of the more common indoor injuries I have seen — and they can be fatal," says Elisa Mazzaferro, DVM, Ph.D., ACVECC, a specialist in emergency and critical care at Cornell University Veterinary Specialists in Stamford, Conn. "Also, cats who jump on a flat-surfaced ceramic stovetop can get burns to their footpads."

Hiding Pain. Don't be fooled if you cat doesn't display signs of pain immediately after a burn, Dr. Mazzaferro cautions. "A person may not be able to distinguish first- from second- or third-degree — also known as full thickness — burns. In fact, a first- or second-degree burn may be more painful initially than a third-degree burn. In a third-degree burn, the nerves have been burned and will not be painful until the overlying skin sloughs off and the underlying tissue and nerve endings are exposed. Whenever there is a burn, the animal should be evaluated by a veterinary professional."

If your cat suffers a burn, here's quick action you can take:

- Use a bath towel or pillowcase to safely restrain him and avoid being bitten or scratched. Don't wrap him too tightly in a towel because he can overheat en route to the veterinary clinic.
- Gently apply cool clean water to the burn using a damp cloth as a compress. Avoid wetting more than one-quarter of the body at any time to prevent hypothermia and never use ice cubes on the burn site for the same reason.
- Alert the staff at the nearest veterinary clinic that you are on the way so an extra room will be ready to treat this medical emergency.

To reduce the risk of your cat suffering a burn, Dr. Mazzaferro, recommends these precautions:

- Place electrical cords inside chew-resistant casings, especially if you have a kitten or young adult cat keen on exploring his surroundings.
- Always close washer and dryer doors when not in use and check inside them before use.
- Usher cats into an enclosed room with toys and treats while you prepare meals and wait to open their door until after the stovetop has cooled.
- Switch from flame candles to battery-operated ones that flicker but do not emit heat.
- Store all chemicals in storage areas out of pets' reach.
- Position a fireplace screen to block access to a wood-burning or gas-burning fireplace. The screen also prevents hot cinders from flying out and striking the coat of a cat napping close by.

Sadly, the prognosis for survival worsens when a cat incurs second and/or third-degree burns on more than 40 percent of his body. "If a client is aware of the prognosis and is committed to saving the animal's life, then I am committed to treat aggressively to give them a chance of surviving," Dr. Mazzaferro says, citing the case of a cat who was treated for burns on more than 40 percent of a body at a private clinic and lived with aggressive treatment. ❖

TACTICS YOU SHOULD *NOT* USE

Don't try these at-home remedies on a burn. These tactics worsen it and slow healing:

- Don't hold the cat by the scruff, or back, of the neck. Cats have flexible spines and can quickly swivel their back legs and bite or thrash your forearms.
- Don't use a gauze pad or gauze wrap on the burn site because gauze can disrupt a blister if one forms.
- Don't apply over-the-counter first-aid burn ointments formulated for people on the wound because some cats are sensitive to ingredients in products made for human use.
- Don't dab or pour vinegar or lemon juice or any other substance to try to neutralize a chemical burn. "Owners may want to negate the effects of an alkaline chemical burn, but the net result is a heat-producing, exothermic reaction, which can cause more tissue damage," says Elisa Mazzaferro, DVM, a Cornell specialist in emergency and critical care.

WORM... *(continued from cover)*
and from hunting. In other words, keep them indoors." (The vulnerability of cats in other parts of the U.S. is not known. Dogs have been rarely been infected.)

Dracunculus insignis worms can grow up to one foot in length in a host. When the female is ready to deposit young worms into fresh water, it crawls out of the skin of the host through a blister-like protrusion in an extremity, such as a leg. The only way they can grow to infect another host, typically a raccoon or mink, is to mature inside a copepod — a tiny freshwater crustacean — which acts as an intermediate host.

The worms' discovery and search for their identity sound much like a medical mystery novel. Credit two Cornell alumni, Jennifer Pongratz, DVM, and Sara Sanders, DVM, who have practices in Massachusetts and New York, respectively, for initiating the pursuit. In 2009, Dr. Pongratz's clients brought to her attention a suspicious lump on the leg of their neutered male diabetic cat; a biopsy of the mass revealed a worm to be the cause.

Three years later, a client delivered Dr. Sanders a long worm she pulled out from the side of her cat with a history of pituitary dependent hyperadrenocortisism. During examination, Dr. Sanders discovered another worm was about to emerge. In total, four worms emerged from Dr. Sander's patient over a period of about a month.

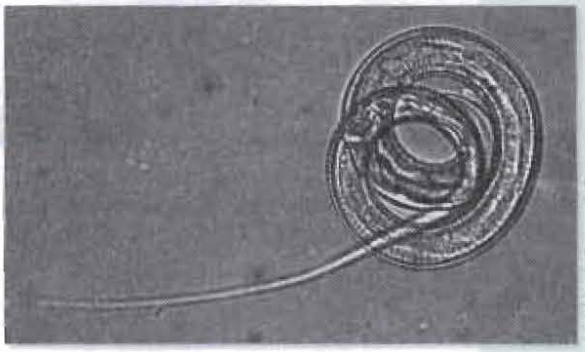
Search for Answers. In both cases, the cats had spent ample time outdoors. Curious about these unusual findings, the veterinarians turned to their alma mater for answers. They sought the expertise of Dr. Lucio-Forster and her faculty mentor, Dwight Bowman, Ph.D., professor of parasitology.

"With the help of our colleagues at the U.S. Centers for Disease Control, who helped with the confirmation of the identification of the worm, we were able to prove this was *D. insignis*," says Dr. Lucio-Forster.

Anabil Lucio-Forster, Ph.D.

At 14 centimeters, this *Dracunculus insignis* female worm is about five-and-a-half-inches long.

Dracunculus insignis is a slow-growing parasitic worm. Generally, it takes about a year from the time a mammal ingests the worm until it migrates to an extremity to create a shallow ulcer from which to emerge to lay live young worms, she says. The worms do not cause disease while in the cat but can be painful as they emerge through the skin. In addition, damaged or broken worms may trigger secondary infections in their host.


Anabil Lucio-Forster, Ph.D.

Copepods, the intermediate host for the parasitic worm *Dracunculus insignis* identified in two cats at Cornell, are typically about the size of the head of a pin.

"Prognosis is very good, but the concern would be if the long worm was ruptured while still partly inside the body or if the area where the worm is emerging out of the skin becomes infected with bacteria," Dr. Lucio-Forster says.

No medications are available today to treat *Dracunculus* infections; surgical removal of the worms remains the recommended treatment. Fortunately, both cats recovered completely after the worms were removed.

Nevertheless, the two cases emphasize the need to keep cats indoors and to keep them on year-round parasitic preventive medicines, Dr. Lucio-Forster says. "We do not think this parasite is cause for alarm; however, cats who are allowed outdoor access are at risk for roundworms and hookworms, and some parasites such as heartworms — which are closely related to *Dracunculus* — can be life threatening. For this reason, we strongly encourage cats to be kept indoors and on year-round parasite control for internal worms and external fleas and ticks." ❖

FROM LEAFY STREAMS TO OCEAN DEPTHS

Copepods, the intermediate host for the parasitic worm *Dracunculus insignis*, are crustaceans like crabs and lobsters. Their name derives from the Greek kope (oar) and *podos* (foot) because their antennae and legs move like oars when they swim. They are quite small, usually about the size of the head of a pin.

Their habitats vary "from fresh water to hypersaline conditions, from subterranean caves to water collected in bromeliad leaves or leaf litter on the ground and from streams, rivers, and lakes to the sediment layer in the open ocean," says the Smithsonian National Museum of Natural History. "Ecologically they are important links in the food chain linking microscopic algal cells to juvenile fish to whales."

Copepods also can act as controls for malaria by consuming mosquito larvae, and they're intermediate hosts of many human and animal parasites like the one recently identified in cats at Cornell.

FEAR...*(continued from cover)*

Dr. Reisner, who completed her residency at the Cornell University College of Veterinary Medicine, is one of only 52 members certified by the American College of Veterinary Behaviorists in the U.S.

"Most aggression in cats and dogs is defensive," she says. "Cats display 'emotional' responses in the form of attempts to escape, hissing, dilated pupils, biting and swatting. If they are closely threatened or startled, we may see piloerection—arched back and hair standing on end like the classic Halloween cat."

Car rides and veterinary visits frequently trigger fear aggression. Diane Claridge of Lake Forest, Calif., remembers the challenge of taking her cat, Morton, to the veterinarian. He had never been in a car, and she didn't own a carrier.

"He was a little sweetheart — until the car started moving down the street. Morton instantly resembled the Tasmanian devil. He climbed up on my shoulders and started howling. When I got to the vet's office, there was a man in line with a German Shepherd. I was trying to hold Morton close to comfort him, but he just wanted out of there. I still have a scar from the scratch he left on my chest."

Fear aggression can have numerous causes. Some cats fear the presence of strangers in the home. Others are often fearful in stressful environments, such as animal shelters or boarding kennels. Some cats can be afraid of sounds, especially high-pitched or unusual sounds resembling fight-related vocalizations of other cats. Dr. Reisner says. Hearing such sounds can cause cats to turn on whoever's closest. Pain from an unrecognized medical condition can also cause them to lash out.

Household Fights. "Any fearful animal will try to get away first and will be worse if there's no escape," Dr. Reisner says. "Fear-related aggression can be proactive and appear offensive.

When threatened or startled, cats can demonstrate piloerection — arching the back with the hair standing on end like the classic Halloween cat.

When household cats fight with each other, the fearful cat will typically be the more explosive and vocal one."

It's easy to recognize a fearful cat through body language. His pupils enlarge, letting in more light and giving him greater peripheral vision as he prepares to defend himself. More aggressive signals include growling and scratching.

"Cats commonly redirect that aggression to people or the nearest cat," Dr. Reisner says. "Unfortunately, that person or cat can then be seen as a conditioned stimulus for the fear long after the original trigger or noise has disappeared."

If your cat is in full aggressive display, the safest strategy is to back off. Claws and teeth can do serious damage. Don't try to soothe or speak to your cat; simply walk away and give him some space until he can relax. The last thing you want is for him to feel cornered or trapped.

Try a Time-out. You absolutely don't want to punish him. That will only increase his fear and aggression. If you have to move the cat, use an object such as a blanket or pillow — never your arms or legs. Gently guide him into a separate room and shut the door so that he has time to calm down.

Of course, your cat is going to have to go to the veterinarian or experience strangers in the home at some point. Sometimes you can manage his fear by desensitizing him to its source, taking steps to help him feel more comfortable in stressful situations and, when possible, avoiding those that frighten him.

For example, if your cat is fearful when strangers visit, gradually expose him to visitors at what he considers a safe distance. When he sees them far away, reward him with treats. If he's too frightened, allow him to leave the area and hide if he chooses to do so; it's important to give cats the opportunity to feel safe.

Food or toy rewards can counter-condition the cat's fear so that he associates the visitor with good things. Continue rewarding the cat with favorite treats as long as he chooses to be present. When this desensitization is done over a period of time — and

Unlike dogs who roll on their back to indicate submission, the behavior in cats can be a sign of impending aggression.

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BACK OFF FROM THESE TELLTALE SIGNS

It's essential to recognize fearfulness in your cat before he becomes aggressive, says veterinary behaviorist Ilana Reisner, DVM, Ph.D. "Watch the cat's body language carefully." Here's what to look for to avoid an encounter with his claws or teeth. When you see these signs, it is best to walk away and, if possible, shut a door to securely separate the cat until he calms down. In the unlikely situation that the cat lunges toward you, use a blanket or pillow to protect yourself as you back away.

A cat in a defensive mode who may be ready to attack will:

- Crouch
- Roll onto his back
- Tuck his head in
- Curl the tail around his body
- Flatten his ears
- Turn sideways to the threat
- Dilate his pupils

it will likely require multiple practice sessions — your cat will eventually learn to associate guests with his favorite salmon snacks and may even begin to welcome them. Then guests should ignore your cat but toss treats or a favorite soft toy in his direction. He learns that the person's presence is an opportunity for high-value food.

His Own Safe Room. An alternative is to avoid the situation by providing your cat with a safe room that contains everything he needs for comfort: food, water, toys, resting and climbing spots, and a litter box. Let him stay there when you have guests. There's no point in aggravating him if you don't have to.

Veterinary visits and car rides call for more patience and tactics. Teaching your cat to love his carrier is the first step for both. Marty Becker, DVM, who advises veterinary practices on fear-free visits for pets, recommends leaving the carrier out all the time so the cat becomes used to its presence and priming it with food, treats and toys. This helps the cat form positive associations with the carrier so he's not reluctant to ride in it. A carrier with openings on two ends is most attractive because the cat won't feel trapped and might enter more easily.

An hour before any car ride or visit to the veterinarian, release cat-relaxing pheromones – available in sprays and wipes at pet stores — in the room where the cat spends the most time and apply them to the interior or bedding of the carrier. At the clinic, check in while your cat waits in the car until you can take him directly into the exam room (be careful not to leave him in the car unattended in overly hot or cold climates for any length of time). If possible, instead of letting it hang at your side, hold the carrier as if it contains a valuable and delicate object — which, of course, it does.

Stress-free Travel. Practice car rides long before your cat needs to travel. Start by placing him in the carrier in the car and closing the door. It's best if the carrier is on a flat surface so the cat is comfortable. Sit in the car for a few minutes, and then take him back indoors. After doing this a few times, move on to starting the engine and then to backing down the driveway and back in. Eventually, go around the block or take him to the drive-through to pick up some burgers or a breakfast sandwich.

Rewarding him with a bite of beef or egg can go a long way toward enhancing his appreciation of car rides. Also, take him to the veterinarian for practice visits that involve only petting and treats from the staff, nothing scary or painful.

Socialization is important in preventing fear aggression, Dr. Reisner says, but the sensitive period for socialization is largely over by the time kittens are adopted at 7 to 8 weeks of age, and it's not always possible to influence their early experiences. If you have a choice, pick a kitten or cat who isn't fearful when approached or handled by people. And if your cat has injured you or others through his aggression, consult a veterinary behaviorist for expert help. ❖

Elizabeth

Elizabeth is thankful for the assistance of ***Bruce G. Kornreich, DVM, Ph.D., DACVIM,*** *Associate Director of the Cornell Feline Health Center, in providing the answer on this page.*

Should She Give Her Cats A Heartworm Preventive?

Q *I live in southern Pennsylvania, and I have two domestic indoor/outdoor shorthaired cats, one 3-year-old male and one 7-year-old female. I have never given them heartworm preventive because I thought that cats do not get heartworm, but a friend recently told me that this is not true. Do I need to be worried about my kitties getting heartworm, and should they be on preventive medicine for this?*

A Thank you for contacting me about this issue, as there is a lot of confusion about heartworm disease in cats. This disease is caused by infection with the parasitic worm *Dirofilaria immitis*. The short answer is yes, cats can get heartworm disease (called dirofilariasis). In fact, feline heartworm disease has been reported in every state in the union and has a similar distribution to that seen in dogs. There are some important differences in the way that heartworm disease affects cats and dogs, though.

Heartworm is transmitted from one animal to another by the following mechanism:

- A mosquito ingests *Dirofilaria* larvae (called microfilaria, which is the young stage of the worm circulating in the blood) from an infected animal during a blood meal.
- The larvae mature to their infective form in the gut of the mosquito.
- When a mosquito takes a blood meal from another animal (such as a cat) the infective form of the larvae is injected into the animal.

These newly injected larvae then migrate through the body tissues in the new host until they finally arrive as adults in the heart and blood vessels of the lungs. These adult worms can then breed and create new microfilaria, which circulate in the blood of the new host and start the infective cycle all over again.

Heartworm can cause problems by damaging the lining of the blood vessels in which they reside (mostly in the arteries carrying blood from the right side of the heart to the lungs), causing inflammation that may decrease the elasticity of the vessel and lead to elevation of pressure and to the development of blood clots. They can also cause inflammation in the lungs leading to respiratory distress. Less commonly, the host can mount an immune response against the heartworms that can lead to damage of vital organs like the kidney.

Cats with heartworm disease are generally infected with fewer adult heartworms than dogs, and the worms generally survive for a shorter period of time when compared to the lifespan of an adult heartworm in a dog. This is also true of microfilaria in cats. In addition, a much smaller percentage of infective larvae develop to become adult worms in cats as compared to dogs.

Another difference between canine and feline heartworm is that in cats, it is much more common for the migrating larvae to travel to an unusual place like the central nervous system or the skin. This aberrant migration may cause significant damage to the tissue that it travels through.

Canine heartworm disease can be treated by administration of a drug that kills the adult worms and then by the administration of drugs that kill microfilaria. Given the fact that infected cats generally harbor low numbers of worms with short lifespans, that they often do not show signs of the disease, and that the drug used to kill adult worms is not approved for use in cats and may cause significant side effects, feline heartworm disease is most commonly not treated.

In most feline cases, careful monitoring and supportive care are elected, and the adult worms mature and die without causing significant problems. There is a possibility, though, that heartworm disease can cause significant health problems in any cat, and in rare cases, feline heartworm disease can be life threatening.

The American Heartworm Society recommends that all cats be given heartworm preventive medication. Four approved products for use in cats are available, and they are all considered safe and effective. I certainly recommend that you follow this advice and speak with your veterinarian about heartworm preventive for your babies.

I hope this is helpful, and please keep in touch.

—Best regards, Elizabeth ❖

PLEASE SHARE YOUR QUESTIONS

We welcome questions on health, medicine and behavior, but regret that we cannot comment on prior diagnoses and specific products. Please write *CatWatch* Editor, 800 Connecticut Ave., Norwalk, CT, 06854 or email catwatcheditor@cornell.edu.

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