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Herbicide Kills Parasites Found in Cat Feces

Common weed killers destroy *Toxoplasma gondii*

Researchers recently reported in *ACS Infectious Diseases* that some common herbicides can kill the parasite *T. gondii*, which is found in cat feces and can cause birth defects. The infection, called toxoplasmosis, can occur in humans eating undercooked contaminated meat, exposed to infected cat feces, or mother-to-child transmission during pregnancy. The parasite causes mild or no symptoms in most people, but it can cause severe illnesses in immunocompromised people and birth defects in the fetuses of pregnant women.

T. gondii expresses an enzyme that more closely resembles the plant version of the enzyme than the mammalian one. The enzyme, which helps make an essential compound called heme, is the target of some common herbicides, including oxadiazon. The researchers wondered if these herbicides or their derivatives could kill not only weeds, but also *T. gondii*, without harming human cells. They found their theory was correct, confirming the derivatives inhibited the enzyme without harming human cells that hosted the parasites. ■

Rees KC, et al. "Oxadiazon Derivatives Elicit Potent Intracellular Growth Inhibition against *Toxoplasma gondii* by Disrupting Heme Biosynthesis." *ACS Infectious Diseases*, 2022; *Science Daily*.

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Probiotics For Digestion

They can help diarrhea and restore GI balance

Probiotics are live microorganisms (mainly bacteria) that live in a healthy gastrointestinal tract. Supplementing probiotics is thought to help replenish the population of good, normal bacteria to help get an upset GI tract back to normal.

"There is some evidence that cats with chronic diarrhea will modestly respond to addition of probiotics," says Joseph J. Wakshlag, DVM, PhD, board-certified veterinary nutritionist and chief of the nutrition service at Cornell University's College of Veterinary Medicine. "It is somewhat equivocal, but typically, probiotics can help with recovery from transient diarrhea a day or two quicker."

Many veterinarians send probiotics home with cats suffering from diarrhea, either as a sole treatment or with other medications such as the antidiarrheal medication metronidazole. For severe diarrhea and more serious GI issues, probiotics are unlikely to resolve the problem on their own. Probiotics are not medicine. "There is little evidence that they will help with IBD (inflammatory bowel disease) in any substantial way," says Dr. Wakshlag.

Healthy cats generally do not require supplementation with probiotics. Giving probiotics may be beneficial for situations in which your cat is likely to develop mild diarrhea, such as during a diet change or when staying at a boarding kennel. You can start giving the probiotics a few days before and continue until either your cat has completely transitioned to the new diet or is back home after being boarded. By giving the probiotics before the anticipated trigger, you may be able to keep your cat's GI

tract in balance and stave off loose stools.

Your veterinarian may send home probiotics for your cat when she needs an antibiotic. The probiotic can help support the good bacteria in your cat's gut that may be harmed by the antibiotic. For best results, you should give your cat the probiotic at a different time than you give the antibiotic. ■

What You Should Consider:

- ▶ Probiotics may help with simple diarrhea, but they are not a cure
- ▶ Healthy cats generally don't need probiotics
- ▶ Look for multiple strains, high volume, and the NASC seal



An upset GI tract drains your cat's energy.

Choosing a Probiotic

When choosing a product, look for live bacteria, which can stimulate the immune system and improve the GI bacteria. "Dead bacteria may stimulate the immune system but will not change the gut flora," says Dr. Wakshlag. Most veterinarians also recommend choosing a product with multiple strains of bacteria (*Lactobacillus* is one of the better bacteria) and a high number of colony-forming units (CFUs) to maximize the population and diversity of the microbiome. Look for products with a seal from the National Animal Supplement Council (NASC), which certifies products from its members that meet NASC quality standards.

How Cats Land on Their Feet

It's flexibility with a timed twist and a bit of luck

Cats are well-known for their ability to land on their feet almost all the time. This talent has fascinated people for centuries, and as buildings get taller, cats' ability to survive falls from extreme heights has perplexed many.

The secret? A cat's small size, flexible spine, incredible vestibular system, and a little bit of luck.

Balancing Act

All normal healthy cats have a natural sense of where their body parts are in relation to the ground. This is called proprioception, and almost all mammals have it. For example, if you pick up one of your cat's paws and place it so the top of the paw is touching the ground, she will immediately place it correctly with the pads touching the ground without "thinking" about it.

Proprioception also plays a role in cats' ability to jump, climb, and balance. Nerves throughout the limbs and body work together along with sensory whiskers (including ones on the back of her front legs) to tell your cat exactly where her feet are in relation to obstacles, such as tree branches, the back of the couch, or a thin porch railing.

Cats have been selected for these skills over generations because the ability to jump and balance effortlessly increases

their success as hunters and to evade predators, especially when climbing trees.

The Twist

In 1894, French physiologist Étienne-Jules Marey took an incredible series of photos capturing a falling cat. The cat starts with its feet pointing upward, then twists around to land on its feet. The series was published in *Nature*.

The May 1916 issue of *The American Journal of Physiology* included an analysis of how cats maneuver their bodies in the air to land gracefully. Researchers from Johns Hopkins University noted this same phenomenon: When a cat falls, she quickly rotates her body to orient herself correctly. If you drop your cat while carrying her, she will adjust her body based on how she knew she was positioned originally and where she "should" be. This allows her to land on her feet most of the time.

High-Rise Syndrome

But if a cat landing on her feet after being dropped by her owner doesn't impress you, cats have fallen from much higher heights and survived. Veterinarians call the injuries sustained by a cat in a fall from these heights "high-rise syndrome."

In 1987, the *Journal of the American Veterinary Medical Association* published a study that looked at the medical records

of 132 cats who fell out of high-rise windows in New York City and were brought to the Animal Medical Center. Many of the cats had serious injuries, but 90% of them survived despite an average fall of 5.5 stories.

Even stranger, the severity of injuries did not have a direct relation to the height of the fall. Cats who fell from up to seven stories were progressively more likely to be severely injured, but over seven stories, they did



Most cats manage to land on their feet without a lot of thought, and it is a natural maneuver. But it's not foolproof, and cats do get injured.

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At-Home Glucose Testing

You can monitor your diabetic cat's blood sugar

Just as in humans, feline diabetes is a chronic disease in which the body cannot properly produce or respond to the hormone insulin. This results in elevated levels of the sugar glucose in the blood, which is the main source of energy for the body. Uncontrolled, high blood sugar will damage the cat's body, eventually resulting in coma and death.

Diabetes is not uncommon in cats, especially overweight cats. It's an upsetting diagnosis for cat owners who worry they won't be able to manage it. They worry about cost, and they worry about giving shots. In the spirit of putting some of those fears to rest, if you're lucky and your cat's sugar gets under control easily, the cost may not be as scary as you think. And, once you learn how, a shot is a heck of a lot easier to give a cat than a pill.

You will incur some expenses when your cat is diagnosed with diabetes. A diagnostic workup is necessary to check for other possible diseases often seen in diabetic cats, including kidney disease, pancreatitis, dental disease, and urinary tract infection. These problems may make diabetic regulation trickier, so they're important for your veterinarian to identify.

You will need to purchase insulin and syringes. Prescription low-carb food is frequently prescribed as well, and it is usually pricier than a bag of food at the grocery store. Finally, your cat will need frequent (usually weekly) blood sugar monitoring, at least in the beginning, until a maintenance dose of insulin has been determined. This is sometimes your



Still beautiful, but on the path toward diabetes.

greatest expense, depending on how easy it is to achieve good glycemic (blood glucose) control.

Blood sugar monitoring for diabetes is ideally done with what's called a blood glucose (BG) curve. BG is checked either every two to four hours, depending on what type of insulin you're using, for 12 hours in a row. This allows your veterinarian to see how low the glucose gets with a certain dose of insulin and how long the dose keeps the glucose down. With this information in hand, dosage adjustments can be made. A new BG curve is usually recommended one week after a dosage change.

BG curves are typically done in the veterinary clinic. A day stay is required, which usually includes a hospitalization charge, multiple blood draws/glucose tests, and professional fees for your doctor and licensed veterinary technician. This can get pricey quickly and can be stressful for your cat.

An alternative is to do your BG curves at home, if you have the time, dedication, and your veterinarian is on board with the idea. If your cat requires multiple

dosage changes and weekly recheck curves, at-home BG checks can save a lot of money in the long run. They also eliminate the stress of hospital stays for your cat. This is important, as stress can increase blood glucose significantly in cats, making interpretation of in-hospital glucose tests more challenging in some cases. Since you will send the results of your at-home BG testing to your veterinarian for interpretation, there may be a nominal fee for this.

You will have to invest in a glucometer and test strips. These are readily available at medical supply stores and online. Not all glucometers are created equal, however, and some are better than others, especially when it comes to use for pets. The Alpha Trak 2 by Zoetis, specifically calibrated for cats and dogs, is generally the most popular, but talk to your veterinarian for advice. You could also consider having a blood glucose test done at your veterinarian's to compare with a simultaneous sample from your glucometer to check for glucometer accuracy.

The BG Curve

It's important to recognize what the medical goals are in diabetic management. Achieving a perfectly normal BG every minute of every day is not the goal. The main goals in diabetic management are:

- ▶ avoid low blood sugar events
- ▶ maintain a healthy weight and appetite
- ▶ minimize excessive thirst and urination
- ▶ prevent prolonged high blood sugar episodes

The best ways to achieve these goals are to feed the recommended

Random Glucose Readings Don't Work

Single, random BG and urine glucose values are useless in managing diabetic cats. The time to peak insulin activity is not always the same, and stress, activity/exercise will also alter BG values. One of the biggest reasons that a single, random BG check is useless is the Somogyi effect. This happens when a cat is getting too much insulin. When the BG drops too low in response to a high insulin dose, a number of hormonal mechanisms that raise blood glucose are activated. The result is often a rebound, significant increase in BG. If this is happening in your cat, and you measure a single random BG value that is very high, you may feel like he needs more insulin, which is likely not the case. Rather, the goal in such a case would be to carefully revisit and fine-tune the insulin dose (ideally using a blood glucose curve) so that the initiating event (low blood glucose caused by an insulin dose that is too high) does not occur.



To do blood sugar testing at home, you'll need the entire kit: glucometer that is specifically calibrated for use in pets, lancets, and test strips.



Humans generally test with a prick on a finger, but for cats, the ear is recommended.

low-carb diet twice daily on a regular schedule, give the recommended dose of insulin twice daily on a regular schedule, minimize stress, and follow your veterinarian's advice regarding BG curves and your cat.

Once your cat is on a steady dose of insulin, life usually gets easier. You can simply monitor your cat's attitude, appetite, water consumption, urine production, and body weight to assess how things are going. At this point, there is usually no need for blood sugar curves unless any of these things change.

Alternative Approaches

You may have wondered about the heavily

Diabetic Remission

Feline diabetic remission occurs when a diabetic cat that previously required insulin therapy no longer requires insulin to maintain a healthy blood glucose level. The best chance for achieving diabetic remission comes with feeding a low carb canned diet (such as Purina DM) and using glargine (long-acting) insulin. If your cat is going into remission, BG curves and fructosamine levels will be your clues. Some cats, unfortunately, may suffer low blood glucose (hypoglycemia) episodes before remission is identified. Signs of low blood sugar include weakness, confusion, collapse, frothing, vomiting, blindness, and seizures. If this happens, give your cat some Karo Syrup by mouth and rush to your veterinarian. Full remission is best achieved and retained by lowering insulin dose gradually once a week and continuing to feed the low carb canned food for life.

advertised Freestyle Libre flash glucose monitoring system for humans. This device can be used for BG monitoring in dogs and cats. It is applied by your veterinarian and is usually placed on the hip area in cats. The challenge, especially with cats, is securing the device to the skin, and having the pet leave it alone (you may need to experiment with shirts for the cat and/or Elizabethan collars). The sensor works for 14 days, so you'll need to purchase a new one when the insulin dose is adjusted and a BG curve is usually recommended.

You can use an iPhone app with the Freestyle Libre system. You just hold your phone up to the monitor attached to your cat to obtain a glucose reading. The kit also comes with a reader, so don't despair if you don't have an iPhone. This device measures glucose in the interstitial fluid (fluid outside the blood vessels), so the values lag a little behind the actual BG, but that's OK, provided you consistently use this system to monitor and compare blood glucose over time. The Guardian RT Real Time Continuous Glucose Monitor is a similar system that was developed for pets.

(Landing, continued from page 2)

better. One cat even survived a fall from a 46-story building.

One thing to keep in mind with this study is that it only looked at cats who were brought to the veterinary hospital. Cats who died on impact likely were not brought in and, therefore, are not included in the statistics.

In 2004, the *Journal of Feline Medicine and Surgery* published a study that reviewed 119 cats that fell from buildings in Zagreb, Croatia, and were brought in for evaluation. The average height of the fall for these cats was four stories, and 96.5% of the cats survived, which is close to the results from the previous study. The 2004 study observed that cats had more severe injuries as the height of the fall increased, but two other studies have observed similar results to the 1987 study. Once again, only cats who were brought to the veterinary hospital were included in the statistics.

It's Physics

While high-rise syndrome cats often do have injuries, ranging from fractures to punctured lungs, they do survive more often than it seems like they should. This may be because along with their

Another useful tool for monitoring BG in diabetic cats is the fructosamine blood test (fructosamine is a compound in the blood that is a combination of glucose and protein).

While the BG curve is like a fine-tuning tool, the fructosamine level is more coarse tuning. This blood test, done by your veterinarian, tells you approximately where the BGs have been over the past month. If the level is nice and normal, there's no need for a stressful BG curve. If the fructosamine is high, your veterinarian will likely recommend a BG curve. If it's low, there's a good chance your cat is going into diabetic remission.

If your cat is diagnosed with diabetes, this information should help you understand the finer points of diabetic management, so you can feel more confident treating and caring for your sweet (pun intended) furry friend. It will help you get your cat regulated as quickly as possible—maybe even achieve remission (at which time insulin therapy can be discontinued). Diabetic remission is a good, reasonable, achievable goal, and it's awesome when it happens. ■

incredible body awareness, they are also small and reach terminal velocity—maximum speed when falling—much more quickly than, for example, humans.

Cats have a terminal velocity of about 60 miles per hour (mph), while an adult human male has a terminal velocity of about 120 mph. In 2017, at the British Small Animal Veterinary Association conference, British veterinarian Alex Lynch noted that cats reach this speed at about five stories.

Why is this important? Before the cat reaches terminal velocity, she feels that she is accelerating and her limbs are extended out stiffly, braced for impact.

Once she hits terminal velocity, the cat relaxes her limbs and spreads them out like a flying squirrel. This position makes the cat's landing less jarring and spreads the force of impact over more of her body.

For the cats falling from higher than five stories, they likely have enough time to orient and reposition themselves and to reach terminal velocity and relax. All these factors combine to help the cat land upright and suffer less serious injuries than other animals experiencing the same fall. ■

Shots: Choosing Is Confusing

Many vaccine decisions are calculated risks

Vaccines have played a huge role in the prevention of infectious diseases, both in humans and in animals, for hundreds of years. They've no doubt saved millions of lives and prevented great suffering along the way. But vaccines do not come with a 100% guarantee, and there are potential risks and side effects. These negatives, however, rarely outweigh the benefits of vaccines and their impact on well-being.

The goal of vaccination is to prevent a specific infection. Additionally, many vaccines, if not 100% effective at preventing infection, will lessen the severity of illness in the face of infection. This is a beneficial outcome of vaccination, as suffering is limited, recovery time is faster, and the spread of disease in a population is minimized.

Another purpose for vaccinating animals is to avoid the transmission of zoonotic diseases from animals to humans. Rabies, a devastating viral disease that is routinely fatal once symptoms arise, is a perfect example. Your cat can get rabies, and you can get it from your cat. Avoiding a vaccine due to fear of side effects is not worth the risk of transmitting the disease.

Choosing a Vaccine

Feline vaccines are either core or non-core. Core vaccines are recommended by the American Animal Hospital Association (AAHA) for all cats. Non-core vaccines are considered on an individual basis (see sidebar). So which vaccines are right for your cat?

“Vaccines play a critical role in the prevention of disease, but there are always questions about which vaccines

are essential for cats,” says Elizabeth Dole, DVM, Cornell Class of '86 and Diplomate of the American Board of Veterinary Practitioners. “The 2022 AAHA Feline Vaccination Guidelines, prepared by a task force of experts, is the most up-to-date resource.”

Three significant recommendations from the recently updated guidelines for all cats are:

1. Kittens need to receive the core Panleukopenia/Feline Herpesvirus/Calicivirus (FPV/FHV/FCV) vaccine every three to four weeks beginning at 6 to 8 weeks of age until they are at least 16 weeks old (12 weeks was historically considered sufficient). Boosting out to 16 weeks is important due to the potential interference with response to vaccination from maternally derived antibodies, which wane over time.

2. Consider an initial booster of the FPV/FHV/FCV vaccine at 6 months of age, rather than at 1 year of age, to decrease the potential window of susceptibility for developing illness if the kitten still had maternally derived antibodies at the time of the last initial kitten vaccine series. Boost these vaccines every three years thereafter.

3. The feline leukemia virus (FeLV) vaccine is now considered a core vaccine for kittens and young adult cats under 1 year of age due to age-related susceptibility to this devastating and potentially fatal disease. This is true even if they don't go outdoors.

Putting It All Together

FPV/FHV/FCV: Kittens can start their FPV/FHV/FCV vaccination (this is the one you may know of as the

Non-Core Vaccines

If you also have dogs or horses, you are used to making choices about whether to give non-core vaccines. For example, dog owners who travel to dog events often choose to give the non-core Bordetella (commonly known as kennel cough) vaccine because their dog's risk of exposure to the kennel cough virus is higher than a stay-at-home dog.

With cats, however, the non-core vaccines are not routinely used. According to the AAHA, both Bordetella and Chlamydia are largely ineffective and usually only used when an active infection is found in a home or shelter with multiple cats. Feline infectious peritonitis (FIP) vaccine is not recommended for cats in the United States and is widely considered to be ineffective.

“distemper-respiratory” vaccine) series at 6 weeks of age and finish at 16 to 20 weeks old. After their first annual booster as adults, this vaccine is then recommended every three years for life. Pregnant cats should not be vaccinated due to the possibility of birth defects in the kittens.

Rabies: Rabies vaccination is recommended for all cats due to the extreme hazard rabies poses to humans. The type of rabies vaccine used in cats is important. While there is conflicting information regarding the safety of the two types of rabies vaccines available (recombinant vs inactivated), many practitioners believe the recombinant vaccines are safer for cats, particularly due to the possibility of feline injection site sarcoma (FISS), a potentially devastating side effect of vaccination. (Recombinant vaccines are produced using DNA technology. Inactivated vaccines contain a killed virus.)

FeLV: Cats and kittens should always be tested for FeLV before vaccination. While the vaccine won't hurt an FeLV positive cat, it won't help either.

Kittens can start the FeLV vaccination series at 8 weeks of age. The initial series involves two doses, three to four weeks apart. The next booster is recommended one year later.

After this, cats who stay strictly



Discuss vaccinations with your veterinarian.

indoors and do not live with an FeLV positive cat have negligible risk of FeLV infection, which is spread by direct contact with infected blood, urine or saliva, making vaccination unnecessary. For cats who go outdoors, annual vaccination is recommended.

Side Effects and Reactions

Fortunately, severe vaccine reactions like anaphylaxis (life-threatening immune-mediated shock) are rare in cats. An anaphylactic reaction typically happens within minutes of receiving the vaccine, so your cat will usually still be at the veterinary clinic to receive emergency treatment in the event of anaphylaxis.

For cats who do have a reaction, most experience mild symptoms, where they generally don't feel well, showing decreased appetite, lethargy, and hiding. This usually lasts less than 24 hours and typically does not require treatment.

Moderate reactions include persistent vomiting and/or diarrhea, facial swelling, hives, and itchiness. This type of reaction warrants a trip back to the veterinarian for evaluation and treatment.

FISS is a malignant tumor that is thought to be caused by inflammation associated with injections and the introduction of foreign materials into cats, including vaccines. Fortunately, it's not common, but when it happens, it is usually bad. This phenomenon is the reason veterinarians stopped administering vaccines in the nape of the neck and started giving them in a lower limb. Some veterinarians use the tail, although this can be difficult. The logic is that, if an injection-site sarcoma forms, limb (or tail) amputation can be performed and potentially be curative. Adjuvant is an ingredient added to inactivated (killed) vaccines to increase their potency. Some evidence suggests a possible link between vaccines with an adjuvant and FISS, which is why most practitioners favor recombinant or modified live, non-adjuvanted vaccines for cats. This remains controversial.

Bottom Line

It's always better to prevent disease when possible than to have to treat it. Vaccines are an important aspect of feline preventive health care, but not all vaccines are right for all cats. You and your veterinarian should do an individualized risk:benefit assessment for your cat to decide on an appropriate vaccination protocol. ■

Most Common Heart Disease

In HCM, a thickening of the muscle reduces the heart's ability to pump blood

It can be difficult to notice early heart disease in cats due to the fact that they are relatively sedentary and stoic in nature. You might notice your cat hiding or being less playful, but you could assume those changes are associated with age, especially since most cats that develop heart disease are diagnosed when they are middle-aged to older. Most cats that are initially presented for evaluation of their hearts are not showing signs of heart disease.

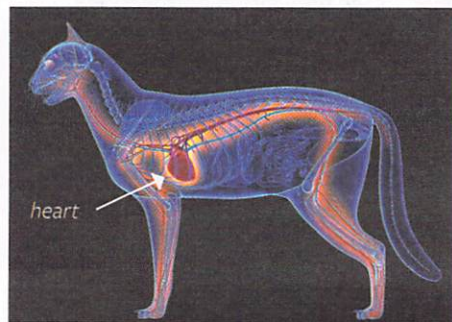
When symptoms do develop in cats with heart disease, they most commonly include rapid breathing (greater than 40 breaths/minute) and/or increased respiratory effort (working harder to breathe). If you feel her chest, you might be able to feel a rapid heart rate (greater than 240 beats/minute) or irregular beats. Many cats with heart problems also lose their appetite, are lethargic, and they may breathe with their mouths open. If you see any of these symptoms, contact a veterinarian promptly. There are heart medications that can help your cat live a longer life, especially when the disease is caught in its early stages.

"While we generally cannot 'cure' heart disease in cats, there are a number of therapeutic options that can improve the quality and duration of life in cats with heart disease," says Dr. Bruce Kornreich, veterinary cardiologist and director of the Cornell Feline Health Center at the Cornell University College of Veterinary Medicine.

Cardiomyopathy

Cardiomyopathy is the medical word for a disease of the heart muscle that makes it more difficult for the heart to pump blood. Hypertrophic cardiomyopathy (HCM) is the most common type of heart disease in cats. HCM is characterized by a thickening of the muscle in the left ventricle, the heart's main pump.

As many as 15% of cats are affected by HCM, and while it often doesn't produce any symptoms in its early stages, HCM is most commonly a progressive disease that can lead to congestive heart failure, arterial thromboembolism (the formation of blood clots in the heart that



The left ventricle is the heart's main pump, responsible for sending oxygenated blood throughout the body.

are then ejected to the arteries, blocking blood supply to parts of the body), or even sudden death.

When the left ventricle is thickened, its ability to pump blood to the body decreases, resulting in less oxygen being transported throughout the body. The heart may beat rapidly to compensate, which can lead to irregular beats (arrhythmias). Eventually, blood may backup into the lungs due to the inefficient pumping action (left-sided congestive failure).

Hypertension and hyperthyroidism can also cause the heart muscle to thicken, and these must be ruled out prior to arriving at a diagnosis of HCM. If either (or both) of these conditions is identified, specific therapy to address them should be instituted.

Most cases of HCM will have a heart murmur, but not all cats with murmurs have heart disease. A large multi-group epidemiologic study (known as the REVEAL study) involving over 1,000 cats with asymptomatic HCM showed that 82% of cats with HCM had murmurs. However, the study also noted that 46% of healthy cats did, too. Cats with HCM tended to have louder murmurs and were more likely have arrhythmias.

Diagnostics

If there are questions about your cat's heart, your veterinarian may recommend an electrocardiogram, chest radiographs, and/or an echocardiogram, the latter of which is the gold standard test for cardiac problems. A blood test for N-terminal Pro B-type natriuretic peptide (NT-ProBNP), a hormone that

is produced by the ventricular and atrial heart muscles when they are stretched, may be recommended. This is especially true if it is difficult to tell if your cat has problems breathing due to heart disease or some other problem (i.e., pneumonia). Provided that kidney function is normal, an elevated NT-ProBNP suggests that heart disease is present.

Owners of cats with heart disease but no clinical signs should monitor their cats' respiratory rates when the cats are sleeping at least once weekly. The normal rate is less than 40 breaths per minute, and this should be tracked in a log. If the log shows a respiratory rate of greater than 40/minute and/or a 25% increase in rate over two consecutive measurements, consult your veterinarian.

Treatment

Treatment of feline HCM is aimed at trying to address/prevent congestion, support the heart's ability to pump blood efficiently, and to prevent the formation of blood clots in the heart.

Diuretic drugs may be given to cats with congestive heart failure to induce urination and decrease blood volume. This can alleviate congestion in the lungs, making breathing more efficient. Antithrombotic (clot-preventing) drugs like clopidogrel and/or aspirin may help

prevent the clots in the heart if the atria are dilated.

"The formation of clots in the hearts of cats with HCM can lead to thromboembolism, one of the most devastating sequelae of this common disease," says Dr. Kornreich. This condition leads to the blockage of blood supply to various parts of the body, most commonly the hind limbs. Cats with HCM that experience thromboembolism can be quite painful and distressed, and this phenomenon significantly worsens the prognosis for cats with HCM.

In some cases, cats with HCM may also benefit from the use of drugs that increase the ability of the heart to generate pressure to move blood to the body (positive inotropes), although this remains a controversial issue.

Cats in acute heart failure may need to be hospitalized to receive diuretics intravenously and to be placed in an



Your veterinarian can hear abnormalities in your cat's heart with just a stethoscope, but to truly understand the cause, an echocardiogram is necessary.

oxygen-enriched environment. In many cases, once they have made it through this initial crisis, they can be sent home on oral cardiac medications.

Bottom Line

Early signs of heart disease can be easy to miss, especially since cats are so adept at hiding signs of discomfort. Rapid respiratory rate, increased respiratory effort, lethargy, decreased appetite, and hiding are ways your cat is telling you something is not right. Sudden onset of paralysis or difficulty walking in the hind limbs may suggest thromboembolism. When HCM is caught early, the disease progression can be slowed and the quality of life improved with medications, but it is not currently possible to "cure" the hearts of cats with HCM. ■

The Genes Behind the Scenes

Maine Coons and Ragdolls have genetic tests for HCM. The Sphynx may soon, too. In Maine Coons, the affected gene can be passed to male and female kittens. From 30 to 40% of all Maine Coons have at least one copy of the defective gene, with 90% only having one (one from each parent). The 10% of the cats who have two copies of this gene are at the greatest risk of developing HCM.

Up to 26% of Ragdoll cats in one survey had one copy of a different defective gene that influences the thickness of their heart walls. This same genetic defect is seen in some people with HCM. In Ragdolls, the mutation can be passed to male and female kittens. A defective mutation has been picked up in Sphynx cats, but there is no direct test or correlation with heart disease confirmed at this time. The mutations seen in Maine Coons and Ragdolls are distinct and have not been recognized in other breeds of cats, so routine testing of other breeds for these mutations is not recommended at this time.

Male cats of any breed are at higher risk for HCM. The Maine Coon, Ragdoll, British Shorthair, Persian, Bengal, Sphynx, Norwegian Forest Cat, and Birman breeds are at higher risk than the average cat.

While genetic tests have been developed to screen for mutant genes correlated with HCM in Maine Coon and Ragdoll cats, the presence of these mutations does not necessarily mean that a particular cat will develop HCM. It simply means that it has a higher risk of developing HCM than the average Maine Coon or Ragdoll. If purchasing a kitten from one of these breeds, knowing the genetic status of kitten and its parents is ideal.

Is a BNP Test Enough?

NT-Pro B-type natriuretic peptide (NT-ProBNP) is a blood test that helps evaluate the stage of heart disease. Stretching of heart muscle causes increased BNP production, which shows up in the bloodstream.

While NT-ProBNP levels are excellent for distinguishing respiratory problems that result from heart disease from those due to non-cardiac disease, they cannot tell you which heart problem your cat may have if they are elevated. An echocardiogram is needed to do that.

Regulating Sugar Levels

Diabetic cat has developed neuropathy in all four legs

Q My 11-year-old neutered male has developed diabetes. We've been giving insulin twice a day for over a month now, starting out at 1 unit twice daily. Now, we're up to 5 units twice daily (increased weekly by 1 unit). I monitor his glucose level at least once a day, per my veterinarian's instructions of usually 6 hours after injection. He registers anywhere from high on the monitor to a low of 412. He has developed neuropathy in all four legs and struggles to get around. The veterinarian says this will go away after we get him regulated.

My questions are:

How much is too much insulin for a 15-lb. cat (he's still losing weight from a high of almost 18 lbs. to 15.2 lbs. now)?

How long will it take to get him regulated (we've been trying to figure it out for a month now)?

Should I try a different insulin (currently using ProZinc)?

A Thanks for getting in touch, and I am sorry to hear of your cat's health problems. As you are experiencing, individualizing insulin therapy for cats with diabetes can be challenging in some cases, but perhaps a few points to consider would be helpful. Of course, it is very important that you continue to work carefully with your veterinarian to achieve the best possible outcome.

Determining the ideal dose of insulin for a cat with diabetes ideally involves selecting the type of insulin to be used (intermediate-acting or long-acting; ProZinc is a long-acting formulation), starting at a standard dose (usually 1 to 1.5 units twice daily), starting on a diabetes-friendly diet (low carbohydrate : <12% metabolizable energy (ME) from carbs, moderate to high protein : >40% ME from protein, and low energy density to promote weight loss if needed), and performing a glucose curve, during which

blood glucose is monitored over a 12-hour period, one week later. Adjustments to the dose of insulin and, in some cases, the type of insulin used are ideally based upon the results of the glucose curve.

If, for example, the curve shows that the blood glucose does not get low enough after insulin administration, an increase in dose (often in 0.5 U increments) may be required. If the blood glucose gets too low, a decrease in insulin dose may be warranted. If the duration of action of the insulin is either too long or too short, changing formulations of insulin may be necessary.

Another test that can be performed to evaluate long-term glucose control is a serum fructosamine test. Unlike the blood glucose curve, this blood test gives the clinician an idea of how well blood glucose is controlled over a longer period of time (approximately one month prior to sampling).

Different diabetic cats take different amounts of time to achieve good glycemic control, and in many cats, diabetic remission (defined as the point at which a well-controlled diabetic no

longer requires insulin) can be achieved. Cats that are overweight have a lower chance of achieving diabetic remission, so carefully managed weight loss is important in diabetic cats that may be carrying a bit too much weight.

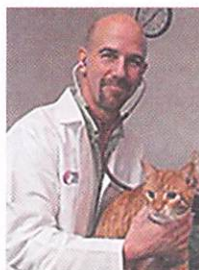
In some cases, cats may be resistant to the effects of insulin, and in these cases, control of blood glucose can be challenging. Insulin resistance is usually diagnosed when cats require more than 1 U/kg (unit per kilogram) of insulin twice daily to manage their blood glucose and continue to show signs of diabetes (i.e., increased thirst/urination, weight loss) despite these high doses.

Potential causes of apparent insulin resistance include technical problems (i.e., inappropriate insulin storage, poor injection technique, stress-induced hyperglycemia due to veterinary visit) and those of true insulin resistance include other medical problems like hyperthyroidism, growth hormone excess, the administration of steroids, and various causes of inflammation.

I hope that this brief review of some important topics in feline diabetes is helpful. Please continue to work closely with your veterinarian, and if he/she feels the need for assistance in managing this case, consultation with a veterinary internist can be very helpful. ■



Getting your cat's high blood sugar under control with insulin may help bring back his playfulness.



Do You Have a Health Concern?

Send your health questions to Bruce Kornreich, DVM, PhD, DACVIM, Director of the Cornell Feline Health Center and Editor-in-Chief of CatWatch. Email to catwatcheditor@cornell.edu or send by regular mail to CatWatch, 535 Connecticut Ave., Norwalk, CT 06854-1713.



Scan this code for more information on the Cornell Feline Health Center.

Coming Up ...

- ▶ Gabapentin for Soreness, Anxiety, and More
- ▶ Help for Feline Incontinence
- ▶ Understanding Senior-Cat Dementia
- ▶ What's the Most Efficient Way to Groom?
- ▶ The Scoop on Reading Cat-Food Labels