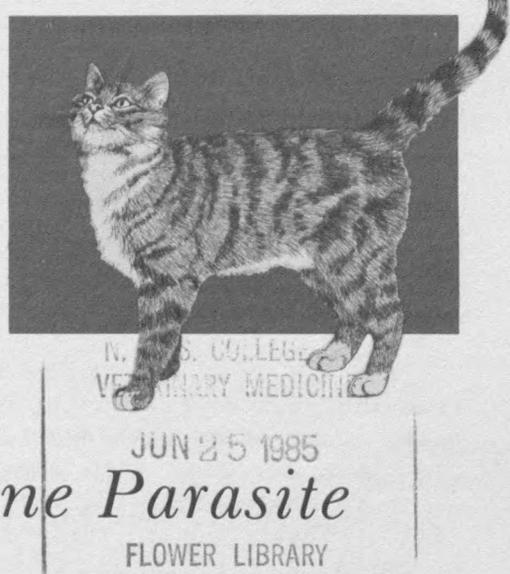


Perspectives On Cats

A Newsletter for Cat Fanciers
From The Cornell Feline Health Center

Summer 1985



Heartworm : A New Feline Parasite

Frank Smith, D.V.M.

Pet owners and veterinarians have long been aware of the problem of heartworms in dogs. More recently the problem is being recognized in cats. The increase in reported cases may be due to a heightened awareness of veterinarians to this problem in the cat, an increase in the number of autopsies performed each year, or growing numbers of mosquitoes that will bite cats. Unfortunately for cats, this disease can be very difficult to diagnose and complications are often associated with the treatment of the disease.

The Heartworm Cycle

Heartworms are parasites that require passage through a mammal and a mosquito to complete their lifecycle. The adult worms live in the heart of the cat. The adult females produce larva called microfilaria. The microfilaria pass through the lungs and then enter the bloodstream. In this process some of the microfilaria are removed by the immune system in the lungs. When a mosquito bites an infected cat, it ingests some blood containing microfilaria. Over the course of one to four weeks, the microfilaria mature into a more advanced larva. If the mosquito then bites another cat, it injects the advanced larva into the skin. During the next eight months, the larva continue to mature in the tissue below the skin. Finally they enter the blood, migrate to the heart and become adults. Two to three months later they produce the microfilaria and the whole cycle is repeated. The only way the worms can be transmitted from one animal to another is by a mosquito. Also a

mosquito can bite an infected dog and then transmit the parasite to a cat.

The dog appears to be the natural host of the heartworm. Although cats do get the disease, they are much more resistant to infection than the dog. The worms mature more slowly in the cat. The number of worms present in the heart is usually less. The adults don't live as long, and the cat's immune system is better at removing the microfilaria in the lungs.

This heightened immune response can also cause several problems for the cat. It makes the disease more difficult to diagnose because there might not be any microfilaria in the blood for the veterinarian to detect. Also, each worm can cause more lung damage in a cat than in a dog.

Damage Caused by Heartworms

Heartworms can harm the cat in several ways. They cause the blood vessels in the lungs to become thickened, resulting in poor circulation. Consequently the heart has to work harder and may become enlarged. Sometimes, though rarely, the heart becomes so overworked that heart-failure develops. The presence of the adults and the microfilaria in the lungs can result in an allergic reaction similar to asthma in humans. The worms can also cause blood clots. These blood clots can seriously damage the lungs, making it very difficult for the cat to breathe. Finally, heartworms can migrate to an abnormal location. Several cases have been report-

ed where the worms migrated to the brain and caused neurologic damage.

Any cat that is exposed to a mosquito runs the risk of developing heartworm disease. Cats ranging in age from 1-17 years have been reported with the disease. It is more commonly diagnosed in outdoor cats, probably due to their increased risk of exposure. It is also seen more often in males than in females. This is probably because males spend more time outside. There is no increased risk in cats with feline leukemia virus infections.

Symptoms

Cats with heartworms can be asymptomatic; they can have a sudden onset of severe signs; or they can have signs of chronic nature. Signs seen in an acute illness include collapse, extremely difficult breathing, convulsions, vomiting, diarrhea, and blindness. It would be unlikely to see all these signs in one animal. Rarely will a healthy cat die suddenly, unless a blood clot migrates to the lungs.

Cats with chronic illnesses caused by heartworms usually exhibit signs of re-

spiratory distress (coughing and difficult breathing) or vomiting. Rarely will the same animal exhibit both signs. The respiratory problems may be transient and often improve temporarily with steroid medications. The vomiting is usually sporadic. The vomitus is either food or foam and is rarely bile stained. Other signs of chronic disease include loss of appetite, lethargy or neurologic problems. Cats with chronic heartworm disease can still die suddenly.

Diagnosis

The diagnostic process begins with a thorough physical examination. Most cats with heartworms have no abnormalities that can be detected on physical examination. Some cats will have harsh lung sounds while others may have an abnormal heart rhythm or murmur.

The tests that your veterinarian will perform will depend on the history of clinical signs you describe and any abnormalities that are detected upon physical examination. A complete blood count (CBC) may be done to look at the type and number of blood cells in circulation. With heartworm disease, the CBC reflects an allergic response. A serum chemistry profile is a blood test that evaluates the animal's liver function, kidney function, and metabolic status. The only abnormality commonly observed in this test is an increase in globulins, a protein that functions in the immune system. Urine tests are usually normal.

Tests that are more diagnostic of heartworm disease include radiographs (x-rays), electrocardiograms (ECG), echocardiograms (ECHO), tracheal wash, Knotts test, and heartworm antibody tests. Radiographs of the chest usually show enlargement of the heart and blunting of the lung arteries. If the radiographs are suggestive of heartworm disease, an angiogram may be performed. This test involves injecting a dye into a vein and then taking a picture of the heart and lungs as the dye passes through the blood vessels.

Perspectives On Cats

*A Newsletter for Cat Fanciers
From The Cornell Feline Health Center*

The ultimate purpose of the Cornell Feline Health Center is to improve the health of cats everywhere, by developing methods to prevent or cure feline diseases, and by providing continuing education to veterinarians and cat owners. All contributions are tax-deductible.

Director: Fredric W. Scott, D.V.M., Ph.D.
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The heartworms can sometimes be seen with this technique. The dye also outlines the blood vessels, clearly demonstrating the damage caused by the heartworms.

If the radiographs or the physical examination reveal evidence of heart disease, your veterinarian may perform an electrocardiogram. This test measures the electrical activity of the heart. With heartworm disease, it can be normal or it may confirm the presence of an enlarged heart. An echocardiogram is a test that can be helpful in assessing the heart function. However, the necessary equipment is very expensive and is usually found only in university teaching hospitals or large referral practices. This machine bounces soundwaves off of the heart and produces a picture of the heart on a television screen. Heartworms can often be seen inside the heart with this technique. One can also measure the size of different parts of the heart and see what effect the heartworms have had on the heart function.

If the physical examination and radiographs show lung changes, your veterinarian may decide to do a tracheal wash to try to determine the cause of these changes. This test involves putting sterile fluid into the lungs and then removing it for analysis. When heartworm disease is present, the fluid usually has many cells characteristic of an allergic response.

A definitive diagnose of the disease requires direct visualization of the microfilaria in the blood or detection of antibodies directed against the worms. A Knotts test is used to concentrate the microfilaria from a blood sample. However, because so many of the microfilaria are removed in the cat's lungs, only 20% of cats with heartworm disease will be diagnosed with this test. The most promising diagnostic test for heartworms in cats is analyzing blood samples for antibodies produced against the heartworm. These tests have successfully diagnosed the dis-

ease in the dog for several years, and when used properly, they seem to work well in the cat.

Treatment

The treatment for cats is the same as for dogs. The adult worms are killed first using an arsenic derivative. This drug can be very toxic to the kidneys and liver of the dog, but seems to be well tolerated by the cat. Although most cats can be treated successfully, some cats will experience complications resulting from the death of the worms. As the worms die, they are fragmented and enter the lungs. Sometimes blood clots form as the worms die. These processes may damage the lungs and result in coughing or respiratory distress. If the damage is very severe, the cat may die. To minimize the risk of lung damage it is absolutely essential that the cat be strictly confined to a cage for 7-10 days after treatment, and be closely observed in a relatively confined environment for an additional 2-3 weeks.

Treatment of adult worms is not always 100% effective, and two treatments may be necessary. If microfilaria are present, as determined by a Knotts test, they are treated 4-6 weeks after the adults are killed. A heartworm antibody test should be repeated 5-7 months after treatment to determine if all the adults have been killed. Cats can be placed on medication to prevent heartworm infection. This decision should be based on the incidence of heartworms in your area and the advice of your veterinarian.

Although heartworm disease in the cat is still an uncommon disease, it should be considered in cats with a history of chronic vomiting or respiratory problems.■

Frank Smith received his D.V.M. degree from Cornell University (1983) and completed his internship in 1984. He is beginning his second year as a resident in small animal internal medicine.

Premature Kitten De

Cheryl St

Late spring and early summer are joyous times for cat breeders. This is when new litters are born to prized queens; and the mewling of little kittens fills the cattery. Unfortunately, for many breeders this happy occasion may suddenly turn into a nightmare when kittens begin to expire for no apparent reason.

This phenomenon is known as kitten mortality complex (KMC). Statistical data collected on 9,517 kittens by the Cornell Feline Health Center showed a kitten mortality rate of 31%, including stillbirths. Catteries experiencing KMC will usually have a higher mortality rate.

KMC is characterized by three main problems: reproductive failure, kitten mortality, and various diseases in the adult. Reproductive failures include lack of conception (evidenced by repeated breedings), fetal resorptions between 4 and 6 weeks of gestation, abortion (usually in the last 2 weeks), stillbirths, and congenital malformations. These malformations have included skull defects, cleft palates, heart defects and umbilical hernias.

Kitten mortality is usually exhibited by the fading kitten syndrome. The kittens either are born weak and die within a few hours or seem healthy and live for days, weeks, or even months but then become depressed and lose their appetite, eventually dying of starvation or secondary infections. Perhaps the most dramatic form of kitten mortality is acute congestive heart failure. These kittens suddenly are unable to breathe, become pale, and die within a few hours. Some kitten mortality is due to feline infectious peritonitis (FIP), usually the dry form as opposed to the more typical effusive (wet) form.

Adult Disease

Some catteries experiencing KMC find that uterine infections in breeding queens is fairly common.

Adult disease associated with KMC includes a mild upper respiratory disease and occasionally acute heart failure (acute congestive cardiomyopathy). The respiratory disease is usually chronic and mild, involving the upper respiratory tract with sneezing as its most common symptom. Watery eyes and noses may also occur, but the cat seldom becomes seriously ill.

Contributing Factors

Although the exact causes of KMC are not known, many feline viruses can cause reproductive failure, fetal malformations, neonatal kitten death, and various other diseases in the adult. These include feline viral rhinotracheitis (FVR), feline calicivirus (FCV), feline panleukopenia virus (FPL), and feline leukemia virus (FeLV). Many catteries experiencing KMC have cats which are coronavirus antibody-positive, and therefore FIP virus (a type of coronavirus) has been incriminated as a causative agent of KMC. Presently, we do not completely understand the relationship between FIP virus and kitten mortality and there is no conclusive evidence that FIP is a main cause of KMC. Most catteries are coronavirus antibody-positive, both those experiencing KMC and those which have a normal kitten mortality rate.

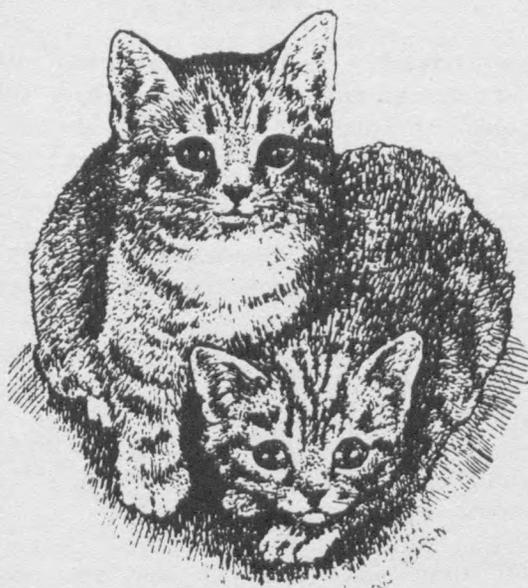
Since the causes of KMC are presently unknown, there are no definitive methods of treatment. The following are recommendations to help decrease premature deaths of valuable kittens.

Problems Attributed to KMC

rt, B.S., M.S.

Preventing Diseases

Kittens should be vaccinated against FVR, FCV, and FPL twice, preferably at 8 and 12-16 weeks of age to provide full protective immunity. The respiratory viruses can still be shed by a fully vaccinated asymptomatic queen, which can then infect susceptible kittens. If the queen has little antibody against these viruses, the



“Kittens should be vaccinated twice against rhinotracheitis, calicivirus and panleukopenia.”

kittens' maternal immunity will quickly wane and they may be unprotected before 8 weeks. If respiratory disease is a problem, the first vaccination should be given earlier, perhaps at 4 or 6 weeks of age, then repeated at 4-week intervals until the kittens are 12 weeks old. Another possibility is to vaccinate the queen before breeding to boost her immune re-

sponse. Pregnant queens should not be vaccinated with modified-live vaccines because the fetus may be infected in utero.

Vaccinations against pneumonitis, a chlamydial infection, should also be considered for cats with respiratory problems.

Any cattery having KMC problems should be tested for feline leukemia virus (FeLV). If cats are found to be positive, a proper course of action must quickly be implemented to either isolate or eliminate these cats. FeLV-negative cats should be vaccinated to protect them against FeLV.

Controlling internal and external parasites will help prevent diseases that can be transmitted by these pests. Blood-sucking parasites (fleas, ticks) and gastrointestinal parasites (tapeworms, roundworms) cause anemia, thereby weakening the animal and making it more susceptible to bacterial or viral infections.

Exposure to Infectious Agents

Cat shows are high-risk exposure areas for infectious diseases. Whenever cats are closely grouped together the stress factor is high. Infectious agents are easily transmitted through the air and by contaminated show cages and clothing. A cat returning from a show is very likely to spread these agents to the other cats in a cattery; and therefore it should be quarantined for 2 weeks, perhaps longer if feasible.

New cats coming into the cattery either as acquisitions or for stud service are another potential source of infectious agents. These cats should be healthy, vaccinated, free of respiratory disease, and tested for FeLV and vaccinated if

FeLV-negative before admission into the cattery.

Animals which have free run of the outdoors should not be allowed to mingle with cattery cats.

Pregnant queens and nursing queens should be completely isolated from other cattery cats. The breeder should wash his/her hands and wear a clean coat or apron before coming into contact with the queen and kittens.

If your kittens are experiencing respiratory problems it may be helpful to remove them shortly after nursing and hand rear them in isolation. This will help prevent the kittens from contracting an infection from their queen. Segregate these litters by age to prevent potential disease carriers from infecting more susceptible kittens.

The general cleanliness of the cattery must be kept optimal. Litter should be changed frequently and animal pens, floors, litter pans, food dishes, etc., should be regularly disinfected with diluted chlorine bleach in a 1:32 ratio (4 ounces of bleach to 1 gallon of water).

Breeding

The effects of inbreeding can be devastating to cats. Breeders must carefully weigh the risk of breeding weak kittens versus the benefit of physical features which may win in the show ring.

Queens should not give birth more than twice a year. Also, uterine and vaginal infections should be treated with the proper antibiotic.

Never administer griseofulvin for ringworm treatment to pregnant queens, especially within the first 3 weeks of pregnancy. During this vulnerable period it can cause grotesque birth defects in kittens.

If a queen has a history of breeding problems and gives birth to weak, sickly kittens, she should not be continually bred. Time and effort should be invested in more promising queens.

Nutrition

Commercial cat foods formulated along National Research Council (NRC) guidelines for growth and maintenance are better balanced nutritionally than most homemade diets. Some foods can be added to the daily diet, provided that 80-85% is comprised of a good commercial product. Raw meats should be avoided as they can harbor parasites.

Summary

KMC is indeed a complex disease. One or more factors may be responsible for an outbreak of the disease in a cattery. Studies conducted by the Cornell Feline Health Center have been unable to isolate one particular infectious agent as the culprit. The best recommendation to prevent KMC from occurring in your cattery is to practice good animal husbandry, which includes limiting stress, avoiding inbreeding, maintaining a vaccination program, quarantining cats after a show, proper nutrition, controlling internal and external parasites, and keeping the environment clean and disinfected.

If your cats or kittens are showing signs of KMC, you should consult with your veterinarian. ■

Cheryl Stoddart (M.S., Cornell '83) is working toward a Ph.D. in veterinary virology, continuing her studies of feline infectious peritonitis.

A special thank you to Victoria Pearson of Millville, NJ for providing the artwork for this article.

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Birmingham Feline Fanciers

The Birmingham Feline Fanciers are sponsoring a summer fellowship at the Cornell Feline Health Center for the next three years. The fellowship provides a stipend for a veterinary student to work 3-months on a feline health research project.

There were 25 candidates for the summer fellowship, representing 11 veterinary colleges throughout the United States. Nancy Dunkle, from Purdue University in Indiana, received the summer fellowship. She will be working on a feline cardiology project under the direction of Dr. Sydney Moise, clinician at the college of veterinary medicine at Cornell.

The fellowship program is unique because the entire funding is provided by a cat club. They have taken an active role in promoting better health care for all cats through the summer fellowship program.

Fauna Foods, Inc.

During February and March Dr. Jane Bicks and Terrence Rodney distributed Cornell

Feline Health Center materials at their exhibit at several cat shows. They also donated the money they received from the sale of cat food samples to the Center.

(This listing does not imply endorsement by the Cornell Feline Health Center of any organization or product.)

Do something today for tomorrow. A contribution to the Cornell Feline Health Center will ensure that new treatments and methods of preventing feline diseases will be developed.

Contributions can be applied to the general donation fund; or towards studies on a particular disease; or for the Camuti Fund (diagnostic service for veterinarians) or Buzz Fuzz Harder Cardiomyopathy Fund. (All contributions are tax-deductible.)

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