

Heartworms (*Dirofilaria immitis*) in Cats

Drs. Foster & Smith Educational Staff

Heartworms were first identified in a cat in the United States in 1922. Since that time, heartworm infections have been diagnosed in all 50 states. The actual number of infected cats and dogs in the United States is unknown. It has been found that the prevalence of heartworm disease in shelter cats is about 10-15% of that in untreated dogs. Heartworm disease is much more difficult to diagnose in cats. It is believed that disease caused by heartworms is more common than that caused by feline leukemia virus (FeLV) or feline immunodeficiency virus (FIV).

What are heartworms?

Heartworms, *Dirofilaria immitis*, belong to the same class of worms as roundworms. In fact, they look a bit like roundworms, but that is where the similarity ends. Heartworms spend their adult life in the right side of the heart and especially the large blood vessels connecting the heart to the lungs.

Heartworms are found in cats, dogs, and ferrets. They also occur in wild animals such as California sea lions, foxes, and wolves. They have rarely been found in people.

How do cats become infected with heartworms?

Adult heartworms produce very tiny larvae called microfilariae. The microfilariae can live for a month in a cat's bloodstream versus two years in dogs. These microfilariae enter a mosquito when it sucks blood from an infected animal. In 10-14 days, the microfilariae develop into larger larvae in the mosquito and migrate to the mosquito's mouth.

When the mosquito bites another animal, the larvae enter the animal's skin. The larvae grow and after about three months finish their migration to the heart, where they grow into adults, sometimes reaching a length of 14 inches. The time from when an animal was bitten by an infected mosquito until adult heartworms develop, mate, and produce microfilariae is about 6-7 months in dogs and 8 months in cats. (Remember this – it is important when we talk about diagnosis.)

Unlike dogs, who can have up to several hundred heartworms in their hearts and vessels, infected cats usually have only 1-4 worms. The worms in cats tend to live only 2-3 years compared to 5-7 years in dogs.

Many times, infected cats will not have microfilariae in their bloodstreams, and if they do, the microfilariae usually live only one month. Microfilariae cannot mature into adult heartworms unless they pass through a mosquito.

What damage do heartworms cause?

In cats, heartworms actually cause more damage to the respiratory system than to the heart. That is why in cats, we now call the disease "Heartworm Associated Respiratory Disease" or "HARD". Immature worms get to the heart and then pass into the blood vessels going to the lungs. Here, most of them die and cause sudden inflammation. Some go on to become mature heartworms. When they die, they also set off acute inflammation.

What are the signs of Heartworm Associated Respiratory Disease in cats and how is it diagnosed?

Many cats with "HARD" will not show signs of disease, even though severe damage may be occurring to their lungs. Other cats will show:

- Coughing
- Difficulty breathing
- Listlessness
- Loss of appetite
- Weight loss
- Vomiting
- Rapid respiratory rate
- Fainting
- Collapse
- Convulsions
- Sudden death

Before any treatment for heartworm infection in a cat is started, it must be verified that the cat actually has an active infection. Because of the difficulty in interpreting blood test results in cats, radiographs (x-rays) and special diagnostic tests of the heart (echocardiography) are often necessary to help confirm the diagnosis.

What tests are available to detect *D. immitis* infection in cats?

Antigen testing

Serologic tests were developed to identify antigens (small protein and

5 Common Feline Heartworm Disease Myths

Only dogs get heartworm disease.
False - cats get infected too.

Only outdoor cats get heartworm disease. False - Indoor cats are also at risk, since mosquitoes can also be found indoors. Preventives should be given to both indoor and outdoor cats.

Heartworm disease affects mainly the heart. False - in cats, it affects mostly the respiratory tract.

Only adult heartworms cause

carbohydrate components) of heartworms in the bloodstream. There are different varieties of this test. One of the most common types is called the ELISA test. Some test kits run one sample at a time and can be done right in your veterinarian's office. Others are designed to test multiple samples in large batches. This batch-type of test is generally performed by outside laboratories to which your veterinarian sends your cat's blood.

problems. False - juvenile worms can cause severe damage to the lungs.

Although the antigen tests were much better than the filter test, we still could not identify all cases of heartworm infection because antigen tests will only be positive if adult female worms are present, since the antigen detected is from the adult female worm's reproductive tract. If the heartworms were not fully mature, or there were only male worms present, the antigen test result in infected animals would be falsely negative. This means the test result is negative when the animal is really infected.

Diagnosis is easy. False - diagnosis in cats is quite difficult. That's one of the reasons prevention is so important.

Antibody testing

Serologic tests have now been developed to detect antibodies (proteins made by the animal's body to fight off the 'invaders') against heartworms. This test will be positive even if only one male worm is present. But it will often be negative if only immature worms are present.

Interpreting test results

It is recommended that both the antigen and antibody test be used when trying to make a diagnosis of heartworm associated respiratory disease. Still, it is very difficult to interpret blood test results for heartworm infection in cats. Both the antigen and antibody test can be negative in heartworm infected cats. A positive antibody test means the cat has been exposed to heartworms - it does not necessarily mean the cat still has heartworms. That is why x-rays or ultrasound (echocardiography) often need to be performed.

What is included in a good heartworm prevention program?

The best program for prevention of heartworm infection includes using preventives, performing heartworm testing as recommended, and reducing exposure to mosquitoes.

Heartworm preventives

Medications used to prevent heartworm infections are called preventives. The first thing to remember is that preventives are NOT used to kill the adult worms. Special drugs called adulticides must be used to kill the adults. These drugs will be discussed in the treatment sections. Some preventives can cause severe problems if given to animals with adult heartworms or microfilariae. Follow the recommendations of your veterinarian and the manufacturer of your preventive in regard to testing prior to giving the preventive.

Every cat, whether indoor or outdoor, should be on a heartworm preventive.

Many veterinarians recommend giving the preventive year-round, even in areas where mosquitoes only occur seasonally. Even if doses are accidentally skipped, preventive products are still beneficial to the pet. If given consistently over a 12-month period, it's possible to actually stop worms from developing into adults. Also, monthly heartworm preventives have activity against intestinal parasites, which inadvertently infect three to six million people every year. These preventives protect pets and people.

If only giving the preventive seasonally, remember they kill the larvae the animal was exposed to in the preceding thirty days. For instance, a monthly preventive given on July 1, will kill larvae the animal acquired from June 1 to July 1. The monthly preventives do NOT work forward in time. A monthly preventive given July 1, will NOT have an effect on larvae the animal acquires later in July.

The heartworm preventives approved for use in cats in the United States are shown in the table below.

Active Ingredient	Example	Dose Given	Minimum age at which preventive can be given	Additional Ingredients	Additional Effects
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Ivermectin	Heartgard®	Monthly; oral	6 weeks	None	Treatment and control of two types of hookworms (<i>Ancylostoma tubaeforme</i> , <i>Ancylostoma braziliense</i>) in cats.
Milbemycin oxime	Interceptor®	Monthly; oral	6 weeks, and weighing at least 1.5 pounds	None	Treatment of one type of hookworm (<i>Ancylostoma tubaeforme</i>) and one type of roundworm (<i>Toxocara cati</i>) in cats.
Selamectin	Revolution®	Monthly; topical	8 weeks	None	Controls fleas and ear mites. Treatment and control of one type of hookworm (<i>Ancylostoma tubaeforme</i>) and one type of roundworm (<i>Toxocara cati</i>) in cats.
Moxidectin	Advantage Multi™ for Cats	Monthly; topical	9 weeks, and weighing at least 2 pounds	Imidacloprid	Kills adult fleas. Treatment of ear mites, one type of hookworm (<i>Ancylostoma</i>

					<i>tubaeforme</i>) and one type of roundworm (<i>Toxocara</i> <i>cati</i>) in cats.
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Testing

Cats should be tested before they are started on a preventive. They should also be tested if they are showing any signs of heartworm associated respiratory disease.

Mosquito control

Reducing the exposure of a pet to mosquitoes can help prevent them from even being exposed to heartworm larvae. For detailed information on mosquito control, see [Mosquito Control and Preventing Diseases They Transmit](#).

How is heartworm infection treated?

The aim of treatment is to control the severity of the damage to the respiratory tract. Anti-inflammatory doses of corticosteroids may be given. Blood testing and x-rays are repeated every 6 months to follow the course of the disease. The cat is placed on a monthly heartworm preventive.

Surgical removal of heartworms from some cats has been performed.

Can humans be infected with heartworms?

Yes, there have been instances of heartworm infection in people. Instead of migrating to the heart, the larvae migrate to the lungs in humans. There the larvae can block vessels causing an infarction. At the site of the infarction, a nodule develops which can be seen on radiographs. Usually, the person has few, if any signs of infection. Surgical removal of the nodule is sometimes necessary.

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