

Heartworm Disease

ABOUT THE DIAGNOSIS

Heartworms are a parasite of dogs and other canine species, such as foxes. Cats can also be affected, although they are more resistant to infection. Very rarely, a few cases have also been reported in people.

Heartworms are transmitted by mosquitoes. Once limited to the southern regions of the United States, heartworms are now found in most areas of the United States, and are well-recognized in Mexico, southern Canada, northern Italy, Japan, Mozambique, and many other regions of the world.

Mosquitoes inject a larval (immature) stage of the heartworm parasite, *Dirofilaria immitis*, into the dog or cat when they feed. The larvae mature into thin, adult worms that are several inches long. Adult heartworms live in the arteries of the lungs (pulmonary arteries) and in the heart. By their physical presence, they cause harm in two ways: they block the normal forward flow of blood, causing an excessive workload on the heart, and they also damage the inner lining of the blood vessels, which gives rise to blood clots that cut off circulation to parts of the lungs. Adult heartworms reproduce and release the next generation of immature larval worms, called microfilaria, into the bloodstream. Mosquitoes feeding on an infected dog pick up microfilaria and in this way they transmit heartworms to yet more animals.

The presence of worms in the heart and lungs (pulmonary arteries) causes damage that is related to the number of worms and the length of time they are present. Blood clots may form, or heartworms may die, forming an embolus (a blockage) that becomes lodged in a smaller artery, cutting off circulation to a part of the lungs. A large embolus can be fatal. Alternatively, but equally devastating, large numbers of worms can progressively obstruct blood flow to the point that heart failure develops.

Cats typically are infected with only a few worms, often only one or two. Damage to the pulmonary arteries is similar to those in dogs. Apart from the small size of cats compared to most dogs (such that one or two worms is a substantial worm burden for a cat), cats appear to be more resistant to heartworms than dogs: heartworms die sooner when they are in a cat than when they are in a dog.

SYMPTOMS: Dogs infected with a few worms may not show any outward signs of infection. More heavily infected dogs will cough and tire easily with exercise. In addition, severe infections may cause weight loss and fluid accumulation in the abdomen because of circulatory disturbances (congestive heart failure).

Heartworm infections in cats may cause coughing or vomiting. Sudden, severe breathing difficulty and death are also possible, as a result of an embolus (clot) to part of the lungs. The symptoms can be identical to those of asthma in cats (including the x-ray appearance of the heart and lungs); therefore, heartworms should be considered and tested for in all cats that have asthma-like symptoms if living in, or having travelled to, a region that is endemic for heartworms.

DIAGNOSIS: Several tests are available to diagnose heartworms in dogs. Examination of a blood sample under a microscope may reveal microfilaria (larval worms), but this older approach fails in a significant portion of dogs with heartworms causing many false

negative results. A certain percentage of infected dogs do not have microfilaria in the blood, so the standard test nowadays is the type that detects antigens (substances secreted by adult heartworms) in a dog's blood. These tests are the diagnostic test of choice for screening for heartworms in dogs: they will detect almost all infections in dogs and are widely available at veterinary clinics.

When a test for heartworms is positive, then it is necessary to stage the heartworm infection. Doing so tells the veterinarian the severity of the dog's heartworm infection, the best treatment choice to use, and the likelihood of success. All dogs with a positive heartworm test result need to have a set of radiographs (x-rays) of the chest. Chest x-rays show changes in the lungs and heart outline, if any are present, that are characteristic of heartworm disease, and they provide an indicator of the severity of the disease. For example, dogs with a heavy heartworm burden and advanced heartworm disease may have dramatic enlargement of the blood vessels in the lungs, and significant pulmonary lesions. These findings are important for allowing the veterinarian to make the best treatment decision. All dogs with a positive heartworm test also need standard laboratory tests (complete blood count, serum biochemistry profile, urinalysis) to assess the function of a dog's liver, kidneys, and other organs in anticipation of treatment.

Additional tests are used on a case-by-case basis, depending on the results of the tests mentioned above. Echocardiography (ultrasound study of the heart) helps determine the extent of damage caused by the heartworms in some very advanced cases and may even allow visualization of the worms inside the heart. This is the most advanced stage of heartworm disease and it generally means that instead of using medications to kill the heartworms, only surgery can eliminate the worms properly.

Detection of heartworms is more difficult in cats. Microfilaria are seldom present, so tests that detect heartworm antigen or antibodies to heartworms are used. The small number of worms usually present in cats means that these tests are not as accurate as those used in dogs. Changes in the lungs and pulmonary arteries can be detected with chest x-rays. Echocardiograms or less commonly angiograms (where dye is injected into the bloodstream prior to an x-ray) may allow visualization of the worms in the heart or pulmonary arteries. In general, blood tests (heartworm antibody test) and echocardiography are the two forms of heartworm screening that work reasonably well in cats.

LIVING WITH THE DIAGNOSIS

Unless they have another medical condition that prevents treatment, all dogs with heartworms should be treated with medication to kill the heartworms (heartworm adulticides)—see below. If treatment is not possible, the dog should at least be placed on monthly heartworm prevention medication to prevent infection with additional worms; since the worms die very slowly (months to years) if adulticide injections are not given, ongoing damage to the heart and lungs is likely, and symptoms of heartworm-related illness, should they occur, are treated as they arise. Cats with heartworm disease are usually not treated with heartworm adulticides because medications used for eliminating adult heartworms are extremely hazardous to cats: about 20–30% of heartworm-infected cats would die during treatment. Therefore, infected cats should immediately begin to receive monthly preventive medication, and

be monitored at home for problems. If breathing difficulty occurs, emergency treatment should be sought. Fortunately, cats are more able to clear heartworm infections on their own (on a scale of several months) than dogs are (takes a few years, which allows ongoing and often fatal damage to occur in the heart).

Perhaps the most important aspect of heartworm infection to remember is that most animals with heartworms have serious, potentially life-threatening complications that can occur as a result, yet they appear perfectly well externally. The lack of symptoms at any given time should not be taken as a reason to postpone or avoid treatment for heartworm disease.

More information is available at an excellent nonprofit, authoritative veterinary website for heartworm disease: www.heartwormsociety.org.

TREATMENT

It is common to begin treatment (especially in mild or moderate, not severe, heartworm infections) with an oral antibiotic, doxycycline, that you need to give your dog at home for 2 or more weeks prior to heartworm adulticide injections. Doing so weakens the worms by killing a bacterium, *Wolbachia*, that lives inside heartworms. Without *Wolbachia*, the worms are much more susceptible to the adulticide injections. Most dogs tolerate doxycycline well, but some dogs develop digestive upset (loss of appetite, vomiting, and/or diarrhea) when taking it. If this is the case, be sure to notify your veterinarian to discuss whether to stop the doxycycline.

Heartworm adulticide injections (melarsomine/Immiticide) are painless and effective, but they must be followed up with excellent home care. Dogs are hospitalized and given a series of injections to slowly kill the adult worms. The medication usually kills the worms over a period of 2 to 4 weeks. If microfilariae are present in the blood, several monthly heartworm preventative medications will also kill the microfilariae. After a dog has received an adulticide injection, it is **critically important** to keep the dog confined and to eliminate ALL exercise for 4 weeks after the injection. The adulticide injection kills the worms slowly; if activity such as running, jumping, or playing is allowed at any time in the 4 weeks following injections to kill heartworms, a large clump of dying heartworms may break free and block the circulation to the lungs. This produces varying degrees of circulatory failure, which causes symptoms ranging from coughing and loss of appetite to, more frequently, sudden death. Therefore, even in the most energetic and healthy-looking dog, it is **essential** to halt all physical activity except three 3- to 5-minute leash walks daily (simply to urinate and defecate) for 4 weeks and then to reintroduce physical activity slowly for the following 2 weeks. Since most heartworm infections require two sets of injections, 4 weeks apart, this means most dogs are kept from any physical activity for 8 weeks from the first injection.

Note that alternative treatment approaches involving ongoing weekly treatment with ivermectin or other medications have been suggested. These options have been considered if adulticide medication is not available, but the slowness of the worm kill (12-18 months or more) means the damage of heartworm disease continues for a year or more. Therefore, such protocols are not routinely recommended and should only be considered if adulticide is not manufactured or available in your region.

If complications such as coughing or labored breathing occur, be sure to notify your veterinarian promptly. Often, these symptoms can be treated very effectively with oral cortisone-like drugs, whereas ignoring the symptoms can trigger a growing degree of inflammation in the lungs and may become a life-threatening complication.

No treatment to kill adult worms is used in cats. The worms will die naturally within a year. Episodes of breathing difficulty or other symptoms are treated with medication should they occur.

Note that these precautions and warnings apply only to treatment in the form of injections that are given to kill adult heartworms. The medication routinely given every month to **prevent** heartworm infection in the first place is extremely safe and carries none of the risks described above.

DOs

- Administer heartworm prevention to your pets as recommended by your veterinarian. In some areas, preventive medication must be given all year; in other areas, treatment is only needed during the summer. Cats and dogs should be on a heartworm prevention program that includes annual blood testing (dogs only), even if medication is given year-round. Realize that heartworm preventatives given regularly on a monthly basis are more than 99% effective.
- For dogs that have developed heartworm disease and have received treatment in the form of injections to kill the adult heartworms, for 4 to 6 weeks after treatment, keep your dog confined and do not allow it to exercise. When not confined to the house or a small pen, the dog should be on a leash. Call your veterinarian immediately if your dog begins to cough or seems not to feel well.
- Realize that although a dog with heartworms generally looks fine externally, the worms are persistent and they can put life-threatening strain on the heart. Heartworms are one instance where a dog's normal outside appearance is misleading compared to the severity of what is going on inside. A heartworm-positive test means treatment is necessary now, before the worms inflict irreversible damage on the heart and lungs.

DON'Ts

- Don't stop heartworm prevention during the winter unless instructed to do so by your veterinarian. Warmer climates require year-round prevention measures.
- Don't assume that having a long hair coat or being indoors most of the time means a pet is protected from mosquitoes and will not get heartworms. Many long-haired dogs and cats become infected with heartworms, and approximately 1/3 of cats with heartworm disease are reported as living 100% indoors.
- Don't interpret a cat's coughing as automatically being due to asthma. Many cats that formerly were thought to have asthma have been found to have heartworms instead (the symptoms are identical, but blood testing and x-rays/ultrasound can help tell the difference).

WHEN TO CALL YOUR VETERINARIAN

- If your dog or cat with heartworm disease has sudden severe breathing difficulty. This is an emergency.
- After treatment (injections) for adult heartworms, if your dog starts to cough or stops eating.

SIGNS TO WATCH FOR

As symptoms that could indicate heartworm disease:

- Dogs: coughing, exercise intolerance, loss of appetite, swollen belly.
- Cats: coughing, vomiting, breathing difficulty.

As symptoms that occur after the adulticide injections, indicating possible problems and the need for a prompt recheck:

- Dogs: pain in the region of the back (some dogs develop inflammation and pain at the injection site 1-7 days after the injection was given).
- Any of the symptoms mentioned in “When to Call,” above.

ROUTINE FOLLOW-UP

- Dogs should be retested for heartworms 3 to 4 months after treatment to confirm that all worms were killed. Occasionally, a second treatment is needed to kill all the worms. Healthy dogs on a prevention program should be tested for heartworms annually or as recommended by your veterinarian.

Other information that may be useful: “How-To” Client Education Sheet:

- How to Care for a Dog after Heartworm Adulticide Treatment

Practice Stamp or Name & Address