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Testing for Heartworm Disease in Dogs

What is heartworm disease? How does a dog become infected?

Heartworm disease is caused by a parasite called *Dirofilaria immitis*, better known as heartworm. The parasites are long, hair-like worms that live in the right ventricle of the heart and the pulmonary artery, which is the large blood vessel that carries blood from the heart to the lungs. Dogs become infected when they are bitten by an infected mosquito that is carrying immature heartworms called **stage 3 larvae (L3)**. The larvae pass from the mosquito into the dog, and move through the tissues of the body, eventually entering the bloodstream and migrating to the right ventricle of the heart. Within the heart, the worms mature into adults, mate, and produce immature worms called **microfilaria**, which circulate in the bloodstream. When the infected dog is bitten by another mosquito, the microfilariae are taken up by the mosquito. Inside the mosquito, the microfilariae develop through three stages of maturation to become infective L3 larvae. The larvae move into the mouth parts of the mosquito where they wait until the next time the mosquito bites a dog. It takes about 5 – 6½ months for the heartworm life cycle to be completed.

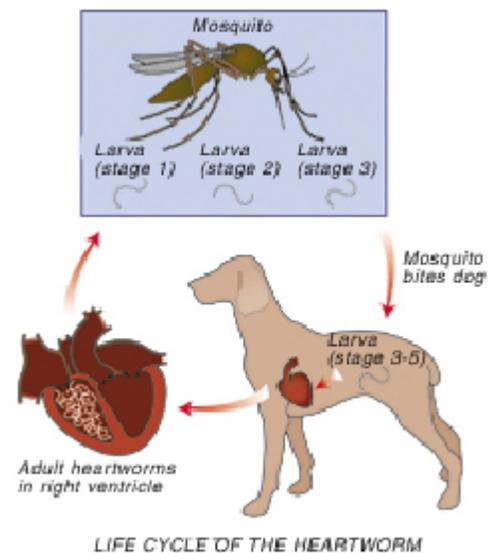
Where is heartworm infection most common?

Heartworm disease is widespread in the United States and is particularly common along the southeastern and gulf coasts, and through the Mississippi River valley. In Canada, heartworm infection is more restricted and is localized to southern Ontario, southern Manitoba, and southern Quebec, with scattered occurrences elsewhere in the country.

The risk of infection is greatest when mosquitoes are actively feeding. This typically requires an average daily temperature of more than 64°F (18°C). In areas that get killing frosts, the risk of heartworm infection is highest in the warmer months (late spring to late fall). By comparison, in subtropical United States, heartworm infection is a year-round risk.

Can infection be spread directly from one dog to another, from dog to cat, or from a dog to a person?

No. Dogs can only get heartworm from an infected mosquito. There is no spread of heartworm infection from dog to dog, dog to cat, or dog to people. However, both cats and people can be infected by heartworm if bitten by an infected mosquito.



What are the clinical signs of heartworm disease?

In the early stages of disease, dogs often have no clinical signs, especially if they are carrying only a small number of worms.

"In advanced disease, dogs develop congestive heart failure."

As the disease progresses, clinical signs become more noticeable and include reluctance to exercise, rapid fatigue with exercise, coughing, and sometimes collapse. In advanced disease, dogs develop congestive heart failure. Dogs in congestive heart failure lose weight, have a poor body condition, breathe rapidly or with difficulty, and develop a build-up of fluid in the abdomen.

How is heartworm disease diagnosed in the dog?

Heartworm is usually diagnosed with a simple blood test. There are two main tests for detecting heartworm infection; one test detects **adult worms** and the other detects **microfilaria**.



Testing for Adult Worms: The American Heartworm Society recommends using the **Heartworm Antigen Test** as the primary method of testing for adult heartworm infection. This test is specific for the adult female worm. Antigen is detectable by 6½ – 7 months after infection and positive results are possible using some tests when there are as few as 1–3 adult females in the heart.

Antigen tests will be falsely negative if:

- the infection has been present for less than 5 months (dog is infected but too soon for adults so there is no antigen present)
- the worms are all male or all immature females (no adult female worms so no antigen present)
- there are very low numbers of worms (level of antigen is too low to detect)
- there are technical difficulties doing the test itself (test should be repeated)

Testing for Microfilaria: Any antigen test that is positive or “weak” positive should be followed up with a test for microfilaria. The presence of microfilaria confirms that mature adult worms are present in the heart and indicates the need for specific treatment to kill microfilaria. The best tests for detecting microfilaria are called **concentration tests**. The preferred test is the **modified Knott's test**, which involves using a centrifuge (a machine that spins the sample very quickly in a small circle) to concentrate the microfilaria; the other common test is the **filter test**, which involves passing the sample through a very fine filter that traps the microfilaria. In both tests the microfilaria are detected and identified using a microscope.

Microfilaria tests may be falsely negative for several reasons including:

- none of the adult worms are mature enough to mate and produce microfilariae
- all the adult worms are of one sex so mating cannot occur
- there are too few microfilaria in the bloodstream to be detected (mating is just beginning, or there too few adults to produce large numbers of microfilariae)

What about the DNA-PCR test?

This test, which detects the DNA of the heartworm, is not yet sensitive enough to screen dogs for heartworm infection. However, if microfilariae are found and there is any doubt about their identity, then the DNA-PCR is helpful to confirm that they are *Dirofilaria immitis* and not another kind of blood parasite.

What other methods are used to detect heartworm infection?

In some infected dogs, the blood tests are negative even though there are heartworms in the heart. If your dog is suspected of having an 'occult' (hidden) heartworm infection, your veterinarian may recommend x-rays or ultrasound to look for changes in the heart and large blood vessels that indicate the presence of heartworm. An ultrasound could also be helpful to actually see adult heartworms.

Do all dogs need to be tested?

No. Puppies less than 6–7 months of age do not need to be tested. Adult worms are not present at this age and both antigen tests and microfilariae tests will be negative.

Is there treatment for heartworm disease?

Treatment usually involves two types of medication: one to kill the adult heartworms and one to kill the microfilariae. Treatment is usually effective although there are cases where small numbers adult heartworms remain after treatment.

There are frequent side effects associated with heartworm treatment due to dead worms being pumped out of the heart into the lungs. Side effects are more common in dogs with large numbers of adult heartworms but all infected dogs are at risk. In order to minimize side effects, *all* dogs undergoing treatment, even if they are not showing signs of illness, must be kept very quiet during the treatment period and for 4 weeks afterwards. Other drugs such as anti-inflammatory medication, anti-histamines, and antibiotics (Doxycycline) may be used to reduce side effects and improve response to treatment. If serious complications arise, hospitalization for further treatment may be needed.

How can I prevent heartworm disease in my dog?

Annual heartworm testing followed by preventive medication is recommended to keep your dog free of heartworm disease. Several excellent preventative products are available to prevent heartworm disease in dogs. Your veterinarian can advise you on which product is most suitable for your pet, and whether year round treatment is necessary. Dogs in subtropical United States are at risk for heartworm year-round, while dogs in Canada, northern United States, and Alaska are most at risk during the warmer months (late Spring to late Fall). Dogs from lower risk areas that travel into high risk areas should be on preventive medication during the travel period regardless of the time of year.

*This client information sheet is based on material written by: Kristiina Ruotsalo, DVM, DVSc, Dip ACVP & Margo S. Tant, BSc, DVM, DVSc
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