

# HEARTWORM DISEASE

An Ounce of Prevention Beats a Pound of Cure

By Norma Bennett Woolf

Once considered a parasite of southern climates, the heartworm (*Dirofilaria immitis*) is now recognized as a major, global pest affecting dogs, cats, wolves, coyotes, foxes, and some other animals. From its discovery in dogs more than a century ago and the documentation in cats in the 1920s, researchers have devised diagnostic tests, preventives and treatments, but the disease has spread to all 50 states. According to the [Heartworm Society](#), the highest infection rates occur in dogs (not maintained on heartworm preventive) within 150 miles of the Atlantic and Gulf coasts and along the Mississippi River and its major tributaries. Other areas with large mosquito populations also have a high rate of infestation.

To jog the concern of clients, veterinary clinics may display a preserved heart infected with heartworm in a jar and hang posters about heartworm life cycles in examining rooms, but seeing is not necessarily believing; although clients can view the infested heart loaded with long, spaghetti-like worms every time they visit, many gamble that their dogs will never be bitten by an infected mosquito.

Heartworm prevention is simple. It involves a blood draw to determine whether the parasite is present and regular dosing with preventive medication. Heartworm infestation is dangerous; untreated dogs die and treated dogs go through weeks of discomfort while the worms are killed and expelled from their bodies.

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## The Parasite

Parasites go through several life stages before emergence as adults and often need at least two hosts to complete the cycle. In heartworms, a mosquito serves as the intermediate host for the larval stage of the worm, also known as the microfilariae. The mosquito ingests the larva when it bites an infected dog and deposits its cargo in an uninfected dog when seeking another blood meal. The microfilariae burrow into the dog and undergo several changes to reach adult form, then travel to the right side of the heart through a vein and await the opportunity to reproduce. Adult heartworms can reach 12 inches in length and can remain in the dog's heart for several years.

Dogs can have some microfilariae in their blood and worms in their lungs without manifesting the disease. Once the number of worms exceeds a certain number based on the size and activity level of the dog, however, the adult worms move to the heart and symptoms begin to occur. Very active dogs may experience symptoms with lower numbers of worms than couch-potato dogs.

The time lag between the initial infestation of microfilariae and reproduction by adult worms living in the heart is six-to-seven months in dogs.

Female heartworms bear live young – thousands of them in a day. These young – the microfilariae – circulate in the bloodstream for as long as three years, waiting to hitch a ride in a bloodsucking mosquito. They undergo changes in the mosquito that prepare them to infect a dog, and they transfer back to the original host species the next time the mosquito bites. The process of change in the mosquito takes about 10 days in warm climates, but can take six weeks in colder temperatures.

The worms grow and multiply, infesting the chambers on the right side of the heart and the arteries in the lungs. They can also lodge in the veins of the liver and the veins entering the heart. The first sign of heartworm infestation may not manifest for a year after infection, and even then the soft cough that increases with exercise may be dismissed as unimportant by the owner. But the cough worsens and the dog may actually faint from exertion; he tires easily, is weak and listless, loses weight and condition, and may cough up blood. Breathing becomes more difficult as the disease progresses. The progression is

traumatic: the dog's quality of life diminishes drastically and he can no longer retrieve a Frisbee or take a long walk in the park without respiratory distress. Congestive heart failure ensues, and the once-active, outgoing pet is in grave danger.

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## **Epidemiology**

Heartworm disease is present on every continent except Antarctica.<sup>(1)</sup> It occurs where these four factors are found:

- a susceptible host population
- a stable reservoir of the disease
- a stable population of vector species
- a climate that supports the parasite's life cycle

Dogs are considered the definitive host <sup>(2)</sup> for the parasite; even though the disease is not transmitted directly from one dog to another, untreated dogs provide a stable reservoir for the disease. Mosquitoes of several different species are the vectors (intermediate host for the developing microfilariae). Development of the microfilariae in the mosquito requires a temperature at or above 80 degrees Fahrenheit for about two weeks. No larval development takes place in the mosquito below 57 degrees F.

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## **Testing**

Heartworms can be detected by blood test. The filtration test finds microfilariae in the blood; the occult test locates adult worms in the heart. Many veterinarians prefer to do both tests as the absence of microfilariae in the blood does not necessarily mean that there are no adult worms in the heart. Both tests are done with a single blood draw, preferably in the early spring before daily temperatures warm above 57 degrees F.

Radiographs (X-rays) can also detect the presence of adult heartworms in the heart and lungs.

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## **Treatment**

If a blood test or the onset of symptoms alert owner and veterinarian to the presence of this devastating parasite, treatment is possible and successful if the disease has not progressed too far. The first step is to evaluate the dog and treat any secondary problems of heart failure or liver or kidney insufficiency so that he can withstand the treatment. The next step is to kill the adult worms with an arsenic compound. Veterinarians now have access to a Immiticide<sup>(3)</sup>, a new compound that has fewer side effects than the previous drug and is safer for dogs with more severe infestations.

The treatment is administered in two doses each day for two days, followed by several weeks of inactivity to give the dog's system a chance to absorb the dead worms. Exertion can cause the dead worms to dislodge, travel to the lungs, and cause death.

At least three-to-four weeks after the administration of the drug to kill the adult worms, further treatment to kill the microfilariae is needed. The dog is dosed daily for a week, then the blood test is repeated. If microfilariae are still present, the dose can be increased. Follow-up studies should be done in a year.

Surgical removal of the adult heartworms is possible and may be indicated in advanced cases with heart involvement.

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## Prevention

Preventive doses come in oral and topical versions and are only available from a veterinarian. Diethylcarbamazine is given daily. Ivermectin (Heartguard<sup>(3)</sup>), Milbmycin (Interceptor<sup>(4)</sup>) and Moxidectin (ProHeart<sup>(5)</sup>) are given monthly. Selamectin (Revolution<sup>(6)</sup>) is a new preventive applied topically. Some of these drugs also kill other parasitic worms, and Revolution also acts against fleas, ticks, and mites.

Moxidectin (ProHeart<sup>®</sup> and ProHeart<sup>®</sup> 6, <sup>(5)</sup>) is a potent preventive compound available in a six month sustained release injection administered by veterinarians or a monthly oral dosage form.

Many veterinarians recommend and many owners use a year-round heartworm prevention program to guard against the occasional mosquito flying about in areas with mild winters. If Fido has already had his yearly check-up, call your veterinarian to schedule a heartworm check. If he's due for yearly vaccination, be sure to include a heartworm check in the visit.

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## Notes

1. **University of Pennsylvania School of Veterinary Medicine** parasitology 4001; course synopsis available on the Internet at [http://cal.vet.upenn.edu/merial/hrtworm/hw\\_3.htm](http://cal.vet.upenn.edu/merial/hrtworm/hw_3.htm)
2. **The American Heartworm Society**, <http://www.heartwormsociety.org/>
3. **Immiticide** and **Heartguard** are registered trademarks of Merial Limited.
4. **Interceptor** is a registered trademark of Novartis Animal Health
5. **ProHeart** is a trademark of Fort Dodge Animal Health
6. **Revolution** is a registered trademark of Pfizer Inc.