



## PESTS AND PARASITES

# The Veterinary Nurse's Role in Heartworm Testing and Treatment

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### Abstract

Heartworm disease is a disorder caused by the parasite *Dirofilaria immitis*. This disease, while potentially fatal, is preventable. A veterinary nurse should be aware of where this disease is most likely to be seen geographically, how these worms are transmitted from mosquitoes to dogs and cats, what happens inside the body after infection occurs, what clinical signs pets may present with, and proper treatment protocols that may be discussed with pet owners. A veterinary nurse's role when managing a patient with heartworm disease is no small feat and should start with prevention. However, if a pet becomes infected, a veterinary nurse should be capable of educating clients and discussing what to expect, assisting veterinarians with diagnostics and staging, monitoring patients, and providing nursing care during treatment.



## Take-Home Points

- Heartworm disease has been found in all 50 U.S. states and is transmitted via mosquitoes.
- Dogs and cats are both at risk for developing heartworm disease and carrying these parasites.
- Signs can vary, and many pets may be subclinical, but a veterinary nurse should be able to assess the risks of exposure and clinical signs.
- The goal of treatment is to reduce clinical signs and eradicate the parasite from the pet.
- There is no effective or approved treatment to eradicate heartworms in feline patients.
- Both canine and feline patients should remain on heartworm prevention after testing positive.
- A veterinary nurse is responsible for the nursing care and monitoring of a patient that is undergoing treatment for heartworm disease.
- Effective, quality education about the disease and treatment expectations—such as the cost and process of treatment—can greatly increase client compliance.

**H**eartworm disease can affect many species, but veterinary nurses working in small animal practice generally see that it affects ferrets, cats, and, most often, dogs. Although heartworm disease can be fatal, it is also a preventable disease. A veterinary nurse working in practice or telehealth can educate and guide pet owners toward using one of the many available preventive options, from semiannual or yearly injections to monthly oral or topical products. Because heartworm disease prevention is easier to access and safer to administer than heartworm disease treatment, the focus with clients should be on preventing the disease. However, this article will focus on treatment versus prevention.

## HEARTWORM LIFE CYCLE

Heartworm disease is caused by the parasitic worm *Dirofilaria immitis* (heartworm) and has been reported in all 50 U.S. states ([bit.ly/3EuFGRk](https://bit.ly/3EuFGRk)).<sup>1-3</sup> Mosquitoes are the intermediate host for *D immitis* and are responsible for carrying the parasite and infecting dogs as well as other animal species.

A mature adult female heartworm will produce microfilariae within its hosts. When a mosquito bites an infected animal, it will pick up these microfilariae with its meal. Over the next 10 to 14 days, the microfilariae will then mature into third-stage larvae (L3), or what are considered “infective larvae.”<sup>3-5</sup> To transmit these to another susceptible animal, the mosquito releases the larvae onto the animal’s skin as it takes a blood meal; the larvae then enter the animal through the bite wound made by the mosquito ([bit.ly/3SiCuxS](https://bit.ly/3SiCuxS)).<sup>4</sup>

Within days, these infective third-stage larvae molt into fourth-stage larvae (L4) inside the infected animal and begin their migration through the animal’s body toward the circulatory system. Once the animal has been infected, it takes the larvae roughly 6 to 7 months to mature into adult heartworms in dogs and 7 to 8 months in cats.<sup>3-5</sup> These worms can grow to be 4 to 12 inches in length, with female worms being longer.<sup>3-5</sup> Adult heartworms can live 2 to 4 years in cats and 5 to 7 years in dogs.<sup>4,5</sup>

Oral and topical heartworm disease preventives (macrocyclic lactones) are effective against microfilariae and third- and fourth-stage larvae for up to 30 days after administration. Parenteral administration is also an option, with a single dose lasting 6 or 12 months, depending on the formulation.<sup>4</sup>

Dogs are considered the natural primary, or definitive, host of this parasite. This means that the parasite can mature, mate, and reproduce inside the dog’s bloodstream, especially the vessels serving the heart and lungs, such as the pulmonary arteries.

## TESTING FOR HEARTWORM INFECTION

Both the American Heartworm Society (AHS) and the Companion Animal Parasite Council (CAPC) recommend yearly testing for canine patients using 2 methods: antigen and microfilaria.<sup>4,5</sup>

**Antigen testing** is highly sensitive to detecting circulating antigens produced by adult female heartworms. Only adult female heartworms are



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detectable with antigen testing because it screens for uterine antigen, which is only produced by female parasites.<sup>6</sup> This test can yield false-negative results if patients have been infected for less than 5 months, if there are solely male or immature heartworms (or only 1 or 2 adult female worms), if there is an insufficient burden of parasites to where antigen levels fall below detection, or in the case of human error.<sup>4</sup>

**Microfilaria testing** shows whether microfilariae are present in a dog's bloodstream. A positive result confirms that a dog is infected with adult heartworms; this is because microfilariae can only be present in a dog if adult heartworms are reproducing inside the dog. A microfilariae test can show positive results no sooner than around 6 months after infection.<sup>4</sup>

In feline patients, testing can be a bit more complicated as cats are less likely to carry adult heartworms.<sup>6</sup> Using an antigen test as well as an antibody test is recommended.<sup>6</sup> Antibody testing for heartworms can be used to detect exposure to heartworm larvae versus adult heartworms; these tests may be positive as early as 2 or 3 months after infection.<sup>6</sup>

Veterinary nurses are the front line when it comes to discussing the frequency and necessity of heartworm testing. In addition to yearly testing, other times to test would be if<sup>4</sup>:

- A pet owner missed a dose of prevention
- A pet owner was late giving a dose of prevention
- There was a known complication with dosing, such as vomiting afterward

If a client is aware of such complications with the dosing, the veterinary nurse should recommend testing 6 months after the missed or expelled dose and educate pet owners that it generally takes about 6 months from

the first infection to yield a positive result. Sometimes a pet owner can overlook a missed dose or may not notice a pet vomiting after the dose, which is why it is still recommended to perform yearly testing.

## CLINICAL SIGNS OF HEARTWORM DISEASE

Sometimes before a heartworm antigen or microfilaria test can be performed on a pet, we rely on our ability to recognize potential clinical signs a pet may be experiencing. Veterinary nurses need to be able to recognize the risks and the potential for infection, as well as these subtle signs. Heartworm disease is progressive if untreated and, as with most diseases, the sooner it is recognized and diagnosed, the higher the chances of a successful outcome for the pet.

Early signs of the disease process can often be vague or even absent. Signs can also vary depending on the heartworm load in a pet, the activity level of that pet, or how well the pet's body can tolerate the worm burden. Often, pet owners and veterinary nurses can note mild changes with an intermittent cough and lethargy after exercise. Over time, as the heartworm burden increases and the pet's body becomes less able to manage the worms' presence, these signs can intensify to chronic coughing, panting or shortness of breath, lethargy, decreased stamina, and even syncope.

What is causing this? As the burden of heartworms increases within the pet, the worms themselves begin to hinder the ability of the body to function properly. The heartworms can obstruct valves from properly moving or obstruct vessels and blood flow, with this subsequently hindering oxygen-carrying capabilities to vital organs such as the heart, lungs, liver, and kidneys.<sup>7</sup>

In severe cases of heavy heartworm burden in dogs, the veterinary team can see what is called caval syndrome. With caval syndrome, there is such a large burden of worms in a single area that it can completely obstruct blood that is flowing back to the heart. This can be fatal and often requires quick action and surgery to remove the obstruction.

## NEXT STEPS AFTER A POSITIVE TEST

If a pet does test positive, the veterinary nurse is able to assist the veterinarian in putting a plan together for what the next steps will be. Often, the veterinary team



needs to see the extent of damage that may be caused by the heartworms within the pet. This often includes performing thoracic radiography to aid in finding changes to the lungs or the heart itself. As veterinary nurses, we want to advocate for the best possible outcome; therefore, ensuring that 3-view thoracic radiographs with proper positioning and collimation are obtained can help the veterinarian or radiologist to see these areas of concern from various angles.

Because changes in the blood's ability to carry oxygen can have negative effects on the liver and kidneys, comprehensive blood screening can be planned and performed as well; this screening includes a complete blood count and comprehensive biochemical profile.<sup>7</sup> Often, veterinary nurses will take a small blood sample and assess for circulating microfilaria (**FIGURE 1**). Another diagnostic tool that can be used is an echocardiogram to visualize and measure the heart and its chambers, while also potentially seeing the heartworms themselves.

## MANAGEMENT GOALS AND OPTIONS

Heartworm treatment can vary per veterinarians' personal guidelines, but many veterinarians follow the treatment recommendations provided by the AHS or CAPC.<sup>4,5</sup> The goal of treatment is to reduce clinical signs of the disease as well as eradicate all life stages of heartworms.<sup>4</sup>

For feline patients, there are currently no approved treatment options to eradicate heartworm stages. Depending on the cat's clinical presentation, supportive

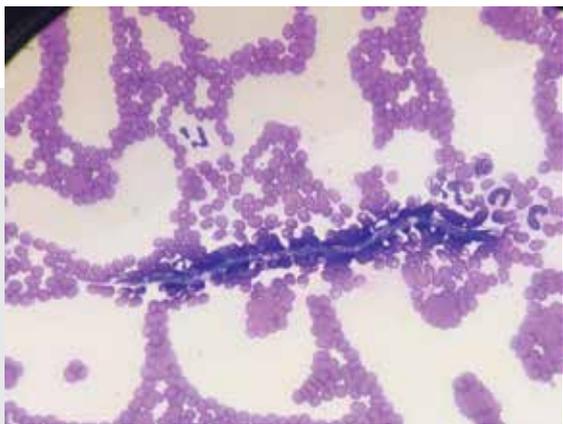
care may be warranted, but if the feline patient is not exhibiting clinical signs, then either starting or continuing heartworm prevention and repeating heartworm antigen and antibody testing every 6 to 12 months are recommended.<sup>8</sup> If clinical signs or radiographic changes are present in a feline patient, a tapering dose of corticosteroids may be utilized.<sup>8</sup>

In canine patients, there is an appropriate treatment option to eradicate heartworms. Current recommendations include administering an adulticide called melarsomine while also continuing or starting heartworm prevention.<sup>4</sup> If a canine patient is experiencing significant outward clinical signs, supportive care and stabilization should be initiated and signs resolved before beginning adulticide therapy. Stabilization could include glucocorticoids, vasodilators, diuretics, and possibly oxygen therapy. Stabilization can often entail extensive nursing care and frequent monitoring of clinical signs and baseline vital signs by the veterinary nurse. If pets are subclinical, treatment is often initiated immediately, typically beginning with the administration of glucocorticoids and an antibiotic such as doxycycline for 4 weeks.<sup>4</sup>

Heartworms have a symbiotic relationship with a rickettsial organism called *Wolbachia*. It is thought that heartworms rely on this organism to reproduce, develop, and ultimately thrive within animals, and doxycycline can be used to reduce the quantity of this organism within the bloodstream.<sup>5,9</sup> If doxycycline can reduce the number of *Wolbachia* organisms within the bloodstream, then the ability for heartworms to survive and reproduce is reduced as well, which can lessen the heartworm burden within the animal.<sup>5,9</sup>

To kill all life stages of heartworms, melarsomine is administered as a deep muscle injection of the lumbar muscles, typically between the L3 and L5 vertebrae.<sup>4</sup> This is a series of 3 injections, beginning around 60 days after initial diagnosis and then again on days 90 and 91.<sup>4</sup> The first 60 days after initial diagnosis are used to stabilize patients with significant clinical signs as well as allowing 4 weeks for doxycycline to eliminate *Wolbachia*.<sup>4</sup> During this initial 60-day period, patients should continue to eliminate existing susceptible larvae as well as be protected against new infection.

Once a canine patient is stable and able to begin adulticide therapy, the veterinary nurse is often responsible for preparing the patient. Preparation can include shaving and cleaning the epaxial lumbar



**FIGURE 1.** Circulating microfilaria in a 6-year-old mixed-breed dog (40× magnification).



muscle, as well as evaluating the pet for reactivity to the preparation or the injection itself.

## PATIENT MONITORING DURING HEARTWORM TREATMENT

Monitoring a patient after receiving melarsomine typically falls under the responsibility of the attending veterinary nurse. A patient that is undergoing heartworm treatment should be monitored for signs of a reaction—to the injection itself or to the effects of the dying parasites. For example, this can include monitoring for:

- Signs of anaphylaxis
- Respiratory changes
- Coughing
- Vomiting
- Diarrhea

If the veterinary nurse notices changes, they should note them in the pet's record and discuss them with the attending veterinarian. The veterinary nurse is the first line of defense, and patients and veterinarians rely on the veterinary nurse to recognize signs of a reaction and indicate changes quickly so that supportive care can be promptly initiated for the patient.

## CLIENT COMMUNICATION AND EDUCATION

Receiving a heartworm-positive diagnosis for a pet can be daunting for some pet owners. They can rely heavily on the veterinary staff for support and guidance. This is where veterinary nurses can shine. Educating pet owners is a role a veterinary nurse can—and should—

### Additional Reading

- American Veterinary Medical Association. Heartworm disease. Accessed November 1, 2022. <https://www.avma.org/resources-tools/pet-owners/petcare/heartworm-disease>
- Atkins CE. Heartworm disease in dogs, cats, and ferrets. Merck Veterinary Manual. Modified October 2022. Accessed February 19, 2023. <https://www.merckvetmanual.com/circulatory-system/heartworm-disease/heartworm-disease-in-dogs,-cats,-and-ferrets>

## BOX 1

### Checklist: Client Education Talking Points

- Prevalence of heartworm disease
- Transmission of heartworm disease
- Life cycle of the heartworm parasite
- Affected species (both dogs and cats of any breed or age)
- Preventive options (including when to start, how often to give to the pet, the importance of continuing for the pet's entire life, and how the preventive works)
- Testing process and frequency (including when and why to test for missed or expelled doses)
- Implications of infection (what happens if a pet develops heartworm disease)
- Treatment options (and why it is better to prevent than treat)

take on. The veterinary nurse can work with the veterinarian to come up with a plan for discussion. After diagnosis, these conversations can even be scheduled as a veterinary nurse consultation to go over:

- What the pet is experiencing within the body
- What damage may be done if the disease is left untreated
- Which signs the pet owner should be aware could occur
- When these signs are concerning and should be assessed by a veterinarian

A veterinarian often assesses and recommends treatment based on how they feel a pet will do with treatment. Pet owners can rely on the knowledge of a veterinary nurse to discuss what is often involved with treatment, especially when it comes to the nursing care the pet may receive afterward. Discuss with pet owners the importance of keeping these patients quiet and on exercise restriction before, during, and even after treatment to ensure proper recovery and limited risk of reaction. This is also an opportunity for the veterinary nurse to share their knowledge with a pet owner about what to expect after treatment—from clinical signs to keeping an eye out for to what to do in case of an emergency.



Often, when given such a heavy and scary diagnosis, pet owners become stressed and are unable to fully comprehend what is being discussed with them, why things are being recommended, and what they can do to help their pets. Utilizing a veterinary nurse to take on the role of discussing these aspects of heartworm disease after a pet owner has been given an opportunity to process the information provided can greatly increase satisfaction, compliance, and overall care for the pet.

Clients may have heard of heartworm disease but may not be familiar with how it is transmitted, how it manifests in their pets, and how to prevent it. Veterinary nurses, along with the rest of the healthcare team, can and should use tools such as prevalence maps, models, and visuals from the AHS and CAPC to help educate pet owners. The more a veterinary nurse can educate a pet owner about what to expect from start to finish, the more compliant pet owners are likely to be (**BOX 1**). This can be achieved by providing handouts, performing veterinary nurse appointments to discuss wellness in pets—including covering heartworm disease—as well as educating clients during the purchase of preventive products.

When creating handouts for clients, the veterinary healthcare team should ensure that the handouts include brief yet important information regarding the disease. This information can include:

- A heartworm incidence map of your area
- A discussion of transmission and life stages of *D immitis*
- An overview of preventive options for pets
- An explanation of heartworm disease testing (along with when and why)
- A synopsis of treatment options for positive pets

## CONCLUSION

From nursing care to client education, heartworm disease involves veterinary nurses. Veterinary nurses are not only integral to helping assess a patient's risk of exposure and recognizing clinical signs in patients presenting to the hospital, but veterinary nurses can also assist with diagnostics and treatment. Understanding the heartworm life cycle, the importance of yearly (or more frequent) testing for heartworms, and treatment goals and options—as well as being able to clearly communicate this information to pet owners—can make veterinary nurses an even more valuable part of the veterinary team. **TVN**

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Jordan graduated from the Veterinary Technician Institute at Bradford School in Columbus, Ohio, in 2008 with an associate degree in veterinary technology. She then moved to South Carolina, passed the VTNE, and became licensed. She worked in general practice before becoming licensed in Georgia in 2015 and moving to a specialty practice. In 2019, she obtained her VTS certification. Jordan has a love for hematologic disorders and specialty nursing care. In her spare time, she is active in outdoor activities with her husband and 2 human children. Her house is even more chaotic with 5 dogs added to the mix.