

Heartworm Disease

Heartworms (*Dirofilaria immitis*) can affect multiple mammals, including dogs, cats and ferrets. While we don't talk as much about heartworm disease in cats, it's primarily because the disease process is totally different between dogs and cats.

Heartworms are carried by mosquitoes, which inject the infective L2 larvae into the dog or cat's muscles when they feed. The larvae then continue to develop (L2 → L3 → L4) and make their way into the bloodstream, ultimately being deposited into the vessels of the heart (L5), especially the pulmonary arteries (between the heart and lung). Maturation of the worms causes the pulmonary arteries to become clogged, causing enlargement of the right side of the heart and blockage of the pulmonary arteries. Associated inflammation causes the cough that we frequently notice with advanced heartworm disease, as well as clogging the kidneys and causing protein leakage. The adult worms produce microfilariae (wriggling baby heartworms), which are then ingested by the mosquito during a blood meal to complete the cycle and start over in a newly-infected carrier.

Cats, unlike dogs, generally suffer from the associated inflammation, resulting in HARD - Heartworm-Associated Respiratory Disease. Cats usually have smaller worm burdens, so they don't usually get the enlarged heart that a dog suffers from. Their symptoms are more like that of asthma, and there is no accepted treatment to kill heartworms in cats, so we treat with steroids, antibiotics (Doxycycline), and heartworm preventives, including Bravecto Plus and Revolution Plus.

Based on bloodwork and radiographs, heartworm disease is classified into one of four stages:

- 1) No to mild symptoms; no significant changes on blood work, urinalysis or radiographs.
- 2) Mild to moderate symptoms (occasional cough and tiredness after exercise); early-mild changes on radiographs, such as the "reverse D" appearance and tortuous pulmonary arterioles. Mild anemia, protein in the urine possible.
- 3) More severe symptoms (sickly appearance, persistent cough, heart failure and trouble breathing); marked right heart enlargement, pulmonary arteries larger than veins. More significant anemia, proteinuria.
- 4) Caval syndrome - heavy worm burden causing blockage of the blood flow, creating severe pressure buildup (ascites, liver congestion). Surgical correction is the only treatment option, which is risky and often fatal in itself.

Failure to treat heartworm disease as early as possible will cause the heart disease to progress, and the worst part is that heart disease is NOT reversible!

You may read about "slow-kill", which is a false claim. This process can be used due to finances or severity of disease. This technique involves monthly Advantage Multi or every-6-month Proheart 6, Prednisone and Doxycycline for 1 month and repeated every 3 months. "Slow-kill" should more appropriately be named "waiting for the worms to die of old age". The heart disease continues to progress until the worms have died off completely (up to 2 years).

Treatment:

The American Heartworm Society (AHS) and FDA only recognize ONE course of treatment for heartworm disease: “fast-kill” Immiticide (Boehringer Ingelheim) or Diroban (Zoetis). The recommended AHS treatment protocol is as follows --

Day 0 (today) - diagnosis of heartworms using an Antigen test, such as SNAP (**\$26**) or lateral slide. Confirmation via microfilaria test (blood drop or Knott’s) and/or repeat test from another source. If confirmed positive, start Doxycycline and Prednisone for 30 days; administer microfilaricidal heartworm prevention (Proheart every 6 months **dependent on size** or Advantage Multi monthly **approx. \$30/month**) - which kills the baby heartworms.

Doxycycline twice daily - an antibiotic that kills Wohlbachia, a bacterium that lives with the heartworm, which makes the worm more sensitive to treatment. Doxycycline also helps promote the antiinflammatory effects on the cough. Side effects include vomiting, diarrhea, and not eating. **Price depends on size**

Prednisone daily - decreases inflammation associated with killing the microfilariae and Wohlbachia, and helps control the cough. Side effects include drinking and peeing more, eating more, weight gain, and panting. **Price depends on size**

Staging - often split up due to finances, done anytime before the adulticidal treatment begins.
Bloodwork and urinalysis, confirmation of Heartworm status - **\$110-125 ZnLabs**
Radiographs (3-view) - **\$110**

Day 60 - First heartworm injection: Immiticide and Diroban (melarsomine) are derived from arsenic and injected into the deep muscles of the back. The gap between diagnosis and treatment allows the “teenagers”, which are not susceptible to these drugs, to become adults and be killed in the treatment. Kills approximately 50% of adult heartworms.
(Body weight / 44 lbs = bottles x \$93/bottle, + 1 night medical boarding/hospitalization).

***Today starts the first day of the 2-month exercise restriction, which will help decrease the risk of throwing clots of dying worms and associated inflammation; complications include bloody cough (hemoptysis), vomiting, diarrhea, kidney failure, heart failure, and death.

Days 90, 91 - Second and third heartworm injections: Same technique as above, but these two increase the kill rate to more than 99% of adult heartworms.
(Body weight / 44 lbs = bottles x 2 days x \$93/bottle, + 2 nights medical boarding/hospitalization)

***Continue exercise restriction for another month.

6-9 Months after the second round of Immiticide - repeat Heartworm and Microfilaria tests. Heat-prep to rule out immune system complexes (False Negative)

Traditionally, for mild cases (stage 1 or 2), we would do a two-injection protocol at days 60 and 61. Newer research has shown that this technique kills only 90% of adult worms, leading to the new 3-split-dose recommendation.