

# HEARTWORM DISEASE

## *What are they and what do they do?*

Heartworms are a parasite that, as the name suggests, live in the heart (and the pulmonary vessels). They are carried by mosquitoes. The mosquitoes have the baby larvae, which are microscopic in size. When the mosquito bites an animal, it injects an anti-coagulant so it can suck blood. It is at this time that the larvae are transmitted to the animal in the skin area. From there, the larvae migrate to the heart and pulmonary vessels. There, they mature into the adults, which are up to 12 inches long. Adults give birth to new larvae that circulate around in the blood. These larvae do not mature in the animal. When the next mosquito bites and sucks blood, the larvae are then picked up. They mature to the infective stage in the mosquito and the cycle begins anew. Adult worms can live 5-7 years in a dog and 2-3 years in a cat. All canidae (including wolves, coyotes) and felidae are susceptible to heartworms, although cats are much less so than dogs.

In the heart, adult heartworms are in the right ventricle. This causes the heart to enlarge to make room for both blood and worms. Enlargement makes the valve edges not meet as well, so some blood can go backwards through the little openings. This increases the pressure in the upper heart and vessels leading to the heart (the body veins) because they are holding both the normal forward going blood, but also the blood that is going backwards. In the heart, the increased pressure makes the heart work harder and can cause further enlargement. Eventually, it will go into failure. To decrease pressure, fluid will leak out of the veins into surrounding tissue in the body and the chest (outside the lungs). This can result in difficulty breathing (because the lungs can't expand in the fluid they are floating in), abdominal enlargement (ascites), jugular vein distention and jugular vein pulsation (normally, only arteries pulse with heartbeats). In some instances, sudden death can occur if all the worms bunch up and completely block all blood flow. If the dog survives long enough, it is possible to run a special surgical instrument down the jugular vein into the heart and remove as many worms as possible to open up the flow.

In the pulmonary arteries, the worms cause irritation of the arterial lining, which causes scarring. The scarring makes the arteries stiffer, which increases blood pressure. Pressure is also increased by having worms blocking flow. Increased pulmonary blood pressure can cause increased pressure in the right ventricle (because it's harder to push the blood out

through the stiff veins), which leads to failure of the heart. Arteries can become blocked completely by worms or partially by clots on the worms. Complete blockage will cause the death of lung tissue the artery normally feeds. Clots can form emboli that clog up smaller arteries. Dead lung tissue can not be used for oxygen transfer, so an animal will be more tired, breathe harder, less able to exercise, and cough (with or without blood). Large areas of lung involved can cause death of the pet.

Cats tend to have very few worms, often only 1 to 3 (versus dogs that may have 20-50+). They tend to be much more into the pulmonary arteries, so signs of heart failure are not as common as respiratory signs (asthma like breathing, coughing) and vomiting.

### ***How are they treated?***

Before treatment, we need to get an idea of how advanced the disease is. Blood tests to check kidney, liver, etc, chest xrays to chest heart and vessel size, and sometimes EKGs if there is a very enlarged heart or abnormal heart rate. These tests tell how us how to proceed: whether we can do traditional treatment regimen, a modified regimen, or delayed or no treatment until the dogs' health is improved.

For dogs, treatment involves killing the adult worms as well as the larvae floating in the blood. Currently, Immiticide is the treatment of choice for adult worms, by injection given one time 2 days in a row, or alternately, one injection, waiting 1 month, and then the 2 injections. It is an arsenic based drug that poisons the worms. It is far safer for the dog than the old arsenicals. Still, treatment can kill the dog as well. 12 inch long worms must break up and decompose. Large worm pieces can cause pulmonary emboli. So, it is imperative that the dog has a strict confinement/ rest period for 4 to 6 weeks post-treatment. Larvae are killed by ivermectin, the drug in one of the heartworm preventatives. Most dogs will be placed on heartworm preventative all during the treatment to avoid getting re-infected during treatment, and then continuing on all year long. Dogs are retested in 4 months. It is possible to still be heartworm positive, as not all worms may die during treatment. A decision will be made whether to retreat or not. If we are unable to treat the dog, we will place him on preventative. This decreases the baby worm burden and stops the dog from being a reservoir for the neighborhood, as well as stopping re-infection.

For cats, we are limited to treating symptoms. They cannot tolerate the arsenical drugs. Steroids to reduce inflammation/ asthma signs, and heart failure medications as needed.

## ***How is it diagnosed?***

For dogs, an antigen test is used. This is testing for microscopic pieces of female worms in the dog's blood. The test kit has antibodies that bind to the antigen and give a positive result. Dogs with only male worms may test negative, despite being positive, but this is rare. The test is about 98% accurate. There are many tests on the market, some in the lab, and some in the office. There are plain heartworm kits, and some that also test for *Ehrlichia*, Lyme, and Anaplasmosis, 3 tick borne diseases. While you can look for the baby larvae on a slide of a blood smear, this is not an accurate test because there may not be enough circulating larvae to see. It takes about 5 months to get from mosquito bite to adult worms, so the test is not done on puppies less than 5 months of age.

For cats, the antigen test may be falsely negative, since they often only have 1 to 3 worms. Either there simply isn't enough antigen to pick up, or the worms are males. The antigen test is used (a positive is definitely positive), but cannot be relied on as the sole test. There is an antibody test as well. This tests for antibodies to the heartworm in the cat's blood. If positive, it means the cat has been exposed to heartworm. It could have had them and the worms died of old age, or the cat could currently have heartworms.

Xrays will show enlarged hearts in the dog, and cats and dogs both will often have larger pulmonary arteries than they should have. There may be lung changes visible as well. In the cat, cardiac ultrasound may be done. Adult heartworms can actually be seen in the heart, if present (not so much in the pulmonary vessels).

## ***How is it prevented?***

For both dogs and cats, many preventatives are on the market.

Oral medications include ivermectin and milbemycin. Ivermectin is sold in several brand names (Heartgard, Iverhart, TriHeart) and may be ivermectin alone, or in combination with pyrantel (for hookworm and roundworm control) or praziquantel (for tapeworm control). Milbemycin (Interceptor) controls heartworm, hookworm and roundworms. Milbemycin mixed with lufenuron (Program) is Sentinel, which will help with flea control. These are chewable products given once monthly to kill any larvae picked up within the last month. The drugs do not stay in the system (except lufenuron, which lasts about 1 month) more than 48 hours.

It is recommended to go all year long, even though we may not have mosquitoes in the winter. This helps the owner to remember to give the pill, if given consistently. Also, intestinal worms are not seasonal and should be controlled all year long. There is some evidence that if an owner misses 1 dose, but then goes back on all year long, there is a hugely reduced chance of becoming heartworm positive even if exposure occurred. With cats, the problem lies in getting them to actually eat the chew tabs consistently. Dogs usually take them quite well.

Topically, there are 2 drugs available. Moxidectin (Advantage Multi) and salamectin (Revolution). These topicals are applied to the skin once monthly to control heartworm, hookworm, roundworm, and fleas. These products do not kill ticks. The drug is absorbed through the skin in as soon as one day for worm control and some stays on the skin for flea control. Washing the animal may decrease flea control, but shouldn't affect worm control unless done right after being applied. More cats use the topicals than orals because of ease of use, but they are more expensive per month.

For dogs, moxidectin also comes as a 6 month injection, called ProHeart. It controls heartworm, hookworm and roundworms. This product is not used in cats because they have more severe injection site reactions than dogs.