

Heartworm in Cats – Symptoms, Diagnosis & Treatment

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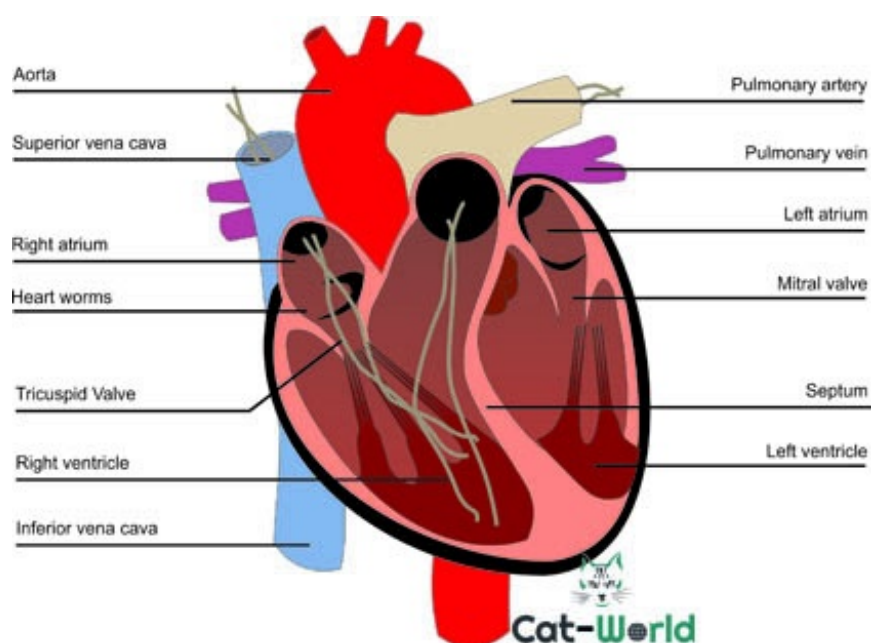
At a glance:

About: *Dirofilaria immitis* are a parasitic worm which lives in the pulmonary arteries, lungs and heart of affected cats.

Transmission: Infection occurs via the mosquito who passes on the microfilaria (baby heartworms) when they feed on the cat.

Symptoms: Include difficulty breathing, coughing, gagging, exercise intolerance, loss of appetite and weight loss.

Treatment: There is no safe treatment to kill heartworms in cats. Most veterinarians monitor your cat closely and offer supportive care. In some cases, surgery may be necessary to remove the worms.



Also known as *dirofilariasis*, heartworm disease (HW) is a serious parasitic infection caused by the nematode *Dirofilaria immitis* which lives in the pulmonary arteries, lungs, and hearts of cats. Heartworms are a type of roundworm, with adult heartworms reaching a length of 12 to 30 cm.

Heartworms are a common parasite in dogs, although cats can also become infected and may develop the disease. While cats may be more resistant to heartworm infection than dogs, cats, in particular, are extremely vulnerable to heartworm and even a small number can cause death.

The definitive host of *D. Immitis* is the dog, however, they can infect wolves, cats, ferrets, and humans. Infection in non-canine species is usually lighter, with fewer worms, however serious and life-threatening consequences can develop.

There is no age or breed predilection, males have been shown to be easier to infect experimentally. Outdoor cats are at greater risk due to their increased exposure to mosquitoes.

Heartworm can be found in temperate and tropical regions of the world in particular Australia, the USA (all 50 states), Southern Europe, South America and Japan. More than 70 species of mosquito are capable of transmitting heartworm.

Transmission:

Microfilaria (baby heartworms) are present in the blood of an infected animal (in most cases, a dog), when a female mosquito feeds on the blood, microfilaria are also ingested, once inside the gut of the mosquito, they undergo further development before migrating to the labium (a part of the mouth) of the mosquito. When the infected mosquito feeds on another host (in this case, your cat), the larvae move from the mouthpart and onto the skin of the cat (or dog), from there, they enter the bloodstream via the bite wound left behind by the mosquito.

The life cycle of heartworms:

Mosquito:

- In an infected animal, the adult heartworms produce their young, known as microfilaria, which swims around the bloodstream. Microfilaria requires an intermediate host in the form of the mosquito. When the mosquito bites an infected animal, it takes up some of these microfilaria circulating in the animal's blood. Once inside the mosquito, if the weather is warm enough, they undergo two molts (L2 and L3), which takes between 7 – 21 days depending on temperature, at this time they become *infective* larvae. When the mosquito feeds on a cat or dog, it injects infective (L3) larvae into the animal.

Cat:

- Once the L3 larvae have made their way inside the cat, they molt a further two times (L4 and L5) which takes approximately 60 days. By this stage, the juvenile worms are 1 – 3 cm long. Once L5 has developed, they migrate through the subcutaneous tissue, penetrating the peripheral veins and migrating to the pulmonary arteries (the blood vessels which carry deoxygenated blood from the heart to the lungs). It takes between 4 – 6 months post infection for juvenile worms to reach the pulmonary artery. At this point in time, a large percentage of juvenile worms die in the pulmonary artery, although it is possible some can survive and develop into adult worms. Worms which do survive typically live within the central part (lumen) of the pulmonary artery. As the heart beats, the worms move, causing damage to the endothelial lining.

Mosquito:

- Adult heartworms produce microfilaria (L1) which circulate the bloodstream (known as *patent infection*) for as long as 2 years waiting for a passing mosquito to take a blood feed and begin the cycle again.

Summary:

- Due to their resistance, only a small number of heartworms infect cats (between 1-3 worms). However, cats do not tolerate heartworm infection as well as dogs and even one or two heartworms can cause death.
- Heartworms live in dogs for around **5-7 years** and in cats for around **2-3 years**. It is uncommon for heartworms in cats to produce microfilaria, due to the low number of worms found in cats.

What damage do heartworms do to cats?

As we have already said, heartworm actually live mostly in the pulmonary arteries causing inflammation of the arteries (*arteritis*). Infected cats are at greater risk than dogs due to their smaller heart and blood vessels, as well as that, they react more severely.

Heartworm associated respiratory disease (HARD) is a term used to describe respiratory disease caused by heartworms. The following can occur during infection leading to damage of the arteries and the lungs.

Damage to the pulmonary arteries:

- The juvenile worms cause changes to the walls of the pulmonary arteries (which go from the heart to the lungs) by causing an acute inflammatory response. Denuding (stripping) of the endothelium (cells which line the walls of the arteries). Macrophages, granulocytes (both types of blood cells) and platelets arrive at the site of endothelial damage, adhering to the exposed layer, there is a proliferation of the myointimal cells (smooth muscle cells of the vessel), producing lesions. As a result of these changes, the arteries become narrower, with pulmonary hypertension developing.
- A large percentage of juvenile worms die within the pulmonary artery upon arrival. As they die and break up they are carried into the smaller pulmonary arterioles and capillary beds where they cause inflammation and can block blood flow which leads to fibrosis (thickening and scarring).

Lung damage:

- This can develop secondary to vascular changes due to plasma (the clear portion of blood) and inflammatory cells leaking from the small vessel walls into the lung parenchyma (the functional parts of the lungs responsible for gas exchange).

Pulmonary embolism:

- A dead adult heartworm can break up and lodge in the pulmonary arteries causing a partial or complete blockage and inciting an inflammatory response. This may be due (in part) to a bacterium known as *Wolbachia* which symbiotically lives in the heartworm. When the heartworm dies, the bacterium are released which can result in the inflammatory response and embolism many cats develop.

In addition to HARD, heartworms can cause the following disorders.

Anaphylactic shock:

- The death of a single heartworm can lead to anaphylactic shock in cats which is a medical emergency.

Aberrant migration:

- In some cases, juvenile heartworms can migrate to other sites such as the eyes, spinal cord, the femoral artery in the hind leg and brain.

Caval syndrome (or Vena Cava Syndrome)

- This is caused when heartworms move from the pulmonary artery to the vena cava which is a large vessel that carries deoxygenated blood to the right-hand side of the heart from the lower body. When heartworms obstruct this vessel, life-threatening consequences occur. Red blood cells are destroyed as they flow through the mass of worms. Liver and kidney dysfunction occur along with reduced cardiac output and in some cases disseminated intravascular coagulation, a rare condition in which systemic coagulation develops forming blood clots throughout the body. There is a high mortality rate with this condition.

Kidney disease:

- Circulating microfilaria in the bloodstream may contribute to the formation of immune complexes (antigen-antibody bound complexes) due to exposure to the bacterium present in the worms. When the kidneys filter the blood containing these immune complexes, the tiny filtering units (known as nephrons) can become damaged.

Right-sided heart failure:

- Narrowing of the pulmonary arteries due to inflammation and vascular lesions leads to pulmonary hypertension which requires the heart to work harder, this can result in heart failure.

Symptoms:

Some cats may display no symptoms of heartworm at all, while others develop serious and life-threatening complications. Some cats will die suddenly having displayed no clinical signs.

Heartworm disease can manifest in many different forms with a wide range of symptoms.

Symptoms of heartworm may be acute (sudden onset), which is life-threatening, or chronic. They typically occur in one of two stages:

1. During the initial migration of the immature heartworms to the pulmonary arteries.
2. When an adult heartworm dies.

Acute:

- Difficulty breathing
- Rapid breathing
- Ascites (fluid build up in the abdomen)
- Sudden death

Chronic:

- Coughing
- Gagging
- Fainting
- Difficulty breathing
- Wheezing

- Anorexia (loss of appetite)
- Intermittent vomiting (which may contain blood)
- Lethargy
- Weight loss

Aberrant migration:

Symptoms of aberrant migration can vary depending on the location. But may include:

- Limping
- Paralysis
- Seizures
- Blindness
- Sudden death

Diagnosis:

Diagnosis of heartworms in cats is often difficult and not always 100% reliable therefore diagnosis usually requires a combination of tests. Your veterinarian will perform a physical examination and listen to the heart and lungs. Increased lung sounds may be heard during the examination.

Antibody test:

This blood test detects antibodies made by the cat, to adult heartworm antigen. This may give false positive results if the cat has had a prior heartworm infection which has cleared up. Also, it is possible for the cat to have had microfilaria in the blood and removed them without them developing into adult worms. Up to 25% of cats with adult heartworm infection are antibody-negative.

Antigen test: Detects the presence of heartworm antigen in the blood. This relies on the cat being infected with an adult female heartworm, so may give false negatives if the cat is infected with male-only or immature heartworms.

Echocardiogram (ultrasound reading of the heart):

To detect the presence of heartworms in the pulmonary artery branches as well as look for caval syndrome and assess the heart and arteries.

Radiography (X-ray):

May detect enlarged pulmonary arteries possibly with ill-defined margins and an enlarged right-hand side of the heart and lung changes.

Microfilarial tests:

This tests for the presence of microfilaria in the blood. Unlike dogs, less than 20% of infected cats will have microfilaria in the blood. This may be due to several reasons. As cats often only have one or two heartworms, they may male only or female only, which would rule out mating of worms producing microfilaria. Also, the cat's immune system may

be attacking and destroying any microfilaria present. Therefore a negative blood test will not rule out the presence of heartworms. Cats with heartworm but no microfilaria in the blood are known to have occult dirofilariasis.

Treatment:

There are no approved adulticide (medications to kill adult heartworms) treatments for cats. Adulticides are themselves dangerous. A single dead worm can be fatal in cats as it can break away and cause a blockage of the pulmonary artery (pulmonary embolism). Heartworms in cats have a shorter lifespan than those in dogs, therefore it is preferable to manage symptoms and use a *wait and see* approach.

If there are no clinical symptoms your vet may decide not to treat the cat and wait for it to clear the parasite in its own time. As already noted, heartworms live for around 2-3 years in cats. If this is the chosen method, your veterinarian will want to monitor your cat every 6-12 months for signs of complications.

Reduce inflammation:

If the cat is displaying symptoms of heartworm disease supportive therapy may be recommended. Corticosteroids (Prednisone) may be given to the cat to reduce the inflammatory response in the lungs, bronchi and pulmonary arteries.

Supportive care:

Cats with severe symptoms may require additional supportive therapy such as a bronchodilator to open the airways, oxygen therapy, and intravenous fluids.

Adulticide treatment:

This *may* be necessary for cats with clinical signs who have not responded to supportive care. Caparsolate or Immiticide are the drugs used and kills the adult worms in cats. Neither has been approved for use in cats and treatment does carry risks.

A dead and decomposing worm can break up into smaller fragments in the circulatory system and lodge in the pulmonary (lung) artery, resulting in a pulmonary embolism (blockage of the artery). Around 1/3rd of cats receiving treatment will face life-threatening complications as a result of the dying worms. Confinement and activity restriction will be necessary for a few weeks after treatment. Either way, if you choose to let nature take its course and hope that the worm lives out its lifespan within the cat, or if you use an adulticide, there are risks. These must be weighed up by your veterinarian before a decision is made. Surgical removal of the worms has been used in some cases.

Antibiotics:

When treating cats for heartworm, your veterinarian may prescribe the antibiotic doxycycline before adulticide treatment. This symbiotic parasite is needed by the heartworm for a number of functions including maturation, reproduction, and infectivity. Administration of doxycycline can enhance the effectiveness of adulticide therapy as well as reducing the immune response to the death of the worms.

Antithrombotic agents:

Such as aspirin can help by reducing vascular lesions as well as reducing pulmonary vasoconstriction and minimising post-adulticidal pulmonary embolism. Only ever administer aspirin under close veterinary supervision as it is highly toxic to cats.

Surgical removal of adult worms:

Some cats who are not responding supportive care and too unwell to receive adulticide treatment may instead have surgery to remove the worms. Your cat will receive a general anesthetic and a catheter is inserted into the jugular vein in the neck, and the worms are carefully removed. A severe and life-threatening shock-like response can develop if a worm is accidentally dissected during removal.

If your veterinarian has decided on a wait and see approach, follow-up x-rays will be necessary every 6-12 months to evaluate the lungs.

Prevention:

All cats should receive heartworm preventative. One study by the American Heartworm Society showed that 25% of cats who tested positive for heartworm were indoor cats, but only 5% of cat guardians regularly administer a heartworm preventative.

There are several effective heartworm preventatives on the market. Many also treat a number of other parasites including intestinal worms and/or cat fleas. These products work by killing the microfilaria and migrating immature worms. These products do NOT kill adult heartworms and are a preventative only. Test cats prior to going on heartworm prevention medication.

Ivermectin not only kills microfilaria but also stops adult worms reproducing and shortens the lifespan of the worms. This has two plusses, it prevents the microfilaria maturing into adult heartworms and also reduces the risks of transmission to other animals.

Heartworm treatments:

Active ingredient	Brand/product	Minimum age
Ivermectin	Heartgard	6 weeks
Milbemycin	Interceptor	6 weeks/over 500g
Selamectin	Revolution	6 weeks
Imidacloprid and Moxidectin	Advantage Multi/Advocate	9 weeks

What age should I start my kitten on heartworm preventative medication?

The American Heartworm Society recommends kittens from eight weeks of age start heartworm preventative medications. It is not necessary to test a kitten due to the 6 – 7 months prepatent period.

What happens if I forget to give my cat preventative medication for heartworm?

- If you have missed a month or less, administer medication as directed. Your veterinarian may recommend heartworm testing 6-7 months later.
- If you have missed more than one month, administer medication as directed. Inform your veterinarian of the missed doses as he may decide to prescribe doxycycline for a month.
- If you have missed more than 6 – 7 months of heartworm preventative medication, your veterinarian will want to test for heartworm.

Other ways to reduce the transmission of heartworm in cats:

Keep cats indoors reduces their exposure to mosquitoes although doesn't completely eliminate the risk. More than 25% of heartworm positive cats in the United States are indoor only cats. All it takes is one mosquito.

Don't leave standing water around your home or garden, as these can be a breeding ground for mosquitoes.

Add screens to doors and windows.

When adopting or fostering cats, dogs or ferrets, check they have had a heartworm test. Of course, this is not possible which again shows just how important it is for cats to be on preventative medication.

Speak to your veterinarian about the periodic testing of cats and dogs in the household for heartworm.

Test your cat for heartworm once a year when he has his annual health check as no preventative is 100% effective.

Can I catch heartworm from my cat?

You can not catch heartworm directly from your cat, but it is possible to become infected via a mosquito bite. Heartworm infections in humans are extremely rare and almost all cases the larvae are unable to develop into adult heartworms. Other pets in the household can also become infected the same way.