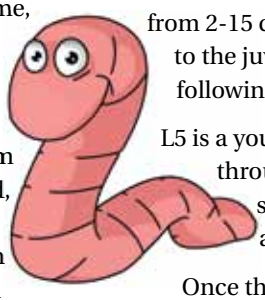
HEART WORMS

NOT AS CUTE AS THEY SOUND!

Heartworm disease is the most serious, common parasite of dogs. It is a silent killer. It is caused by a tiny parasite, *Dirofilaria immitus*, that is injected into the dog's blood stream through a mosquito bite. Virtually 100% of animals exposed to heartworm become infected. This nasty worm completes its lifecycle in the dog, living and breeding within the heart and lungs, wreaking havoc on our pet's cardiovascular system along the way.

Untreated pets will eventually die from heart failure, but many pets will not show clinical signs of disease for many months after becoming infected. By this time, the parasite has firmly taken hold. Heartworm disease is difficult to treat, but is entirely and easily preventible.



It's an unfortunate misconception that heartworm disease in Australia is only present in Queensland, when in fact it is scattered throughout many regions of Australia. It was discovered as far south as South Australia back in 1988. All canine pets in Australia should be on Heartworm prevention.

THE LIFECYCLE OF A HEARTWORM

The key to understanding heartworms and how they affect your pet's health is understanding the worm's lifecycle. Heartworm disease begins with an infected animal which has the circulating worm larvae (called *microfilaria*) in its blood stream. This infected animal is bitten by a mosquito, which then sucks up a few microfilaria along with the blood.

Once inside the mosquito, the larvae undergo a series of two moults – changing from stage 1 to stage 2, and eventually larval stage 3. This third larval stage has the ability to migrate into the mosquito's salivary glands. It also has the ability to burrow into your pet when it is bitten by the infected mozzie.

Once the third larval stage, L3, is inside its host, it will take 6-7 months to go through the remaining two moults and become a sexually mature heartworm, which can be detected in a heartworm test.

The first moult, from l3-l4, takes place quite early on, from 2-15 days after infection.The second moult, from l4 to the juvenile adult stage of L5, takes place within the following 60 days.

L5 is a young adult larva. This stage works its way through the pet's tissues, finally reaching the right side of the heart. This journey generally takes around 90 days.

Once these young adult worms reach the heart they gradually mature, growing in length and size. A mature heartworm can live up to seven years, and reach lengths of around 28 centimetres.

Heartworms can be male of female. The female worms produce young microfilaria and can continue to do this for many years. These young microfilaria are then passed out into the blood stream.

What effect does heartworm disease have on my pet?

Once the adult worms have reached the heart, they continue to grow and multiply. Over a period of time,

many worms may be present in the heart. This resulting mass of intertwined and tangled worms causes a blockage to the flow of blood to and from the right side of the heart. At the same time, the migrating larvae cause a lot of damage and inflammation to the lung tissue.

The signs your pet develops are a consequence of both the damage the worm causes to the arteries in the lungs (the pulmonary arteries), and the mechanical obstruction of blood flow from the number of worms present.

Over time, the heartworm infection causes the blood vessels around the heart and lungs to become dilated and twisted. The arteries become inflamed, as does the tissues of the lungs. Blood clots and aneurysms are common. Fluid starts to accumulate around the vessels and in the lung tissues.

Initially, heartworm infected dogs will start to cough. As the disease progresses and the heart starts to fail, more signs develop. These include exercise intolerance, shortness of breath and pneumonia.

The body's immune system will eventually start to react to the presence of the worms, producing antibodies in an attempt to fight off the disease. These antibodies cause inflammation and tissue damage in other parts of the body – including the eyes, kidneys and the joints.

In some cases the pet may develop a devastating illness called *Caval Syndrome*. This happens when many (usually a hundred or more) worms invade the heart, causing a complete blockage to blood flow. Dogs with Caval Syndrome collapse in shock and usually die, often suddenly and without warning. In these cases, if the disease is diagnosed in time, surgical removal of the worms from the heart and jugular vein can offer a chance (though slim) of survival.

HOW IS HEARTWORM DISEASE DIAGNOSED?

Most cases of heartworm can be diagnosed with a simple blood test. The first test, called a Heartworm Antigen Test, detects the protein shed by the female worm. This test is sensitive enough to detect heartworm burdens of two or more heartworms. The second test is the Modified Knots Test. This test detects the presence of the larvae, or microfilaria, under the microscope.

Occasionally, a dog may have just a single, male worm in the heart. This type of heartworm disease is difficult to diagnose with blood tests. If one of these tests returns a positive result, further testing needs to take place to establish how severely the pet's body has been affected.

The pet will undergo a complete physical exam, full blood chemistry tests and radiographs of the chest.

As a result of these tests, the dog's stage of disease will be identified. The stages are listed below:

Stage 1: Young healthy dog with positive heartworm test but minimal evidence of heartworm disease on radiographs and all other blood tests are normal.

Stage 2: Moderately affected dogs. Some coughing, some shortness of breath, some changes on radiographs, and possible elevated liver and kidney enzymes.

Stage 3: Severely affected dogs. Coughing, shortness of breath, more severe changes visible on radiographs, evidence of liver and kidney disease.

Stage 4: Caval Syndrome: all the above changes are present and the dog is collapsed and is dying. Emergency surgical treatment is the only hope of survival in this instance.

TREATMENT OF HEARTWORM DISEASE

Treatment of heartworm disease can be very complicated and requires full knowledge of which body organs of the pet are affected and what lifecycle stages of the heartworm are present.

Treatment of heartworm disease involves two basic steps.

1 Evaluating and stabilising the patient so it is healthy enough to stand the treatment. Some animals will require treatment of underlying illnesses such as kidney and liver disease, and others may need surgical removal of the worms from the jugular or heart before steps can be taken for killing off the parasite.

2 Elimination of all forms of the heartworm, including the larvae, the microfilaria and the adults.

Adult worms and microfilaria need to be eliminated separately, as no one drug will kill off both.

There are three groups of heartworm in the dog's body which need to be eliminated during treatment.

- The microfilaria (1st and 2nd larval stages), which are the youngest stages of the disease. These swim freely in the blood stream. These need to be killed to stop the dog spreading infection.
- The 3rd and 4th larval stages of the heartworm – these are the migrating larval stages which live in the skin and travel to the tissues of the heart and lungs.
- The 5th larval stage and the adult heartworms, which live inside the heart and pulmonary arteries.

The microfilaria, L3 and L4 stages are killed first, generally using ivermectin once a month for a

period of 2-3 months. After this, the adult worms can be eliminated.

The drug used for killing adult worms is melarsomine dihydrochloride (Immiticide). This drug is given as a series of three intramuscular injections. The first injection is given as an introductory dose to treat some of the worms, and the second and third injections are given a month after the first, 24 hours apart from each other. This protocol is considered the safest in terms of preventing embolism and shock if too many adult worms are killed at once.

This intramuscular injection is painful, so the dog will be prescribed pain relieving medication.Approximately 30% of dogs will have an injection s ite reaction which resolves generally within 4 weeks, but some animals will have a permanent firm lump at the injection site.

After treatment, the patient needs to be strictly confined for a month. This includes no walks and no running around. The reason the resting is so strict is that embolism as a result of killing the adult worms is inevitable. Resting allows the heart to recover and minimises complications due to emboli.

The most critical time for reactions is 7-10 days after the final injection has been administered. Owners need to watch for signs such as shortness of breath, nose bleeds, coughing or a fever. If these signs occur, immediate veterinary attention is required.

HEARTWORM PREVENTION.

Most heartworm preventatives are chemoprophylactic drugs – that is, they are drugs given periodically to kill heartworms that have managed to gain access to the dog's body. Most of these products are administered monthly, with the exception of the long acting injection Proheart, which acts for 12 months.

Chemoprophylactics act by killing the L3 and L4 larval stages that have developed over the previous month.

The major drugs used in heartworm prevention and the products that contain these are listed below:

Ivermectin-based products

Common products on the Australian market include Heartguard, Heartguard-plus.

- Ivermectin was the first ever monthly heartworm preventative, approved in 1987.
- Kills L3 and L4 stages of heartworm inhabiting the pet's skin.
- There is a reach-back effect, meaning that if you miss up to 4 months dosing of the product, restarting the preventative can still curb adult infection in the heart and pulmonary arteries. If this happens, you should have a heartworm test done 6 months later.
- The low dose of Ivermectin in the products is safe for any breed (collies and collie related dogs can have hypersensitivities to Ivermectin at higher doses).
- Dose is important. Do not use large animal preparations as overdose can be fatal.
- In most cases, no reaction of any kind will occur if you give Ivermectin to a heartworm positive dog–so if you accidentally treat your dog without having him tested, and he already has Heartworm, it is unlikely he will die. In fact, giving Ivermectin is the first step in treating heartworm disease. In some cases, however, dogs will go into shock if the worms die too quickly.
- Heartworm positive dogs must be dosed with Ivermectin under veterinary supervision.

Milbemycin Oxime-based products.

Common products in Australia include Sentinel, Interceptor, Panoramis.

These products are also given monthly. They also kill l3 and l4 stages of the heartworm larvae. In addition, the Milbemycin-based

products suppress the female worm's ability to lay eggs.

- kills larvae faster than Ivermectin, and as a result there is an increased likelihood of shock-like reactions in dogs inadvertently given this product if they have heartworm disease.
- Does not have a good reach-back effect. As a result, if several months' doses have been missed, restart with an Ivermectin based product instead.
- There are no breed related sensitivities with Milbemycin-based products.

Selamectin based products.

Common product is Revolution.

- Revolution is a topical product, applied monthly to the skin on the back of the neck.
- Selamectin is a relative of Ivermectin.
- Broadest spectrum of activity against other parasites as well.
- Is safe to use if inadvertently given to heartworm positive dogs, but not as effective at killing later microfilarial stages so not used for treatment of heartworm disease.

Moxidectin based products.

Common products on the Australian market include Advocate and Proheart SR12 Injection.

- Related to Ivermectin and Selamectin
- Advocate is applied to the back of the neck once a month.
- Proheart is used in Australia as an injection given once a year. The product was withdrawn fron the market in the USA due to adverse reactions, but these have not occurred in Australia.
- Safe if inadvertently given to heartworm positive dogs, but is not used in treatment of heartworm infection.
- Proheart injection is given annually in adult dogs, but in growing dogs is given at 3 months, 6 months and 15 months of age, then annually when growth is complete.

Diethylcarbamazine (DEC)

- Major companies no longer produce this drug but generic products are still available.
- Must be given daily as does not kill later stages of larvae, so missing even 2 days means that your dog could become infected.
- Kills microfilaria rapidly, so can be life threatening if given inadvertently in a heartworm positive dog.
- A heartworm test should be done prior to using this drug, and every 6 months while on the drug.

Alternative preventatives?

- There are various herbal and homeopathic preparations available for heartworm prevention, including homeopathic nosodes and herbal products such as wormwood and black walnut.
- Consumers should be aware that there are no studies indicating that these products are effective for heartworm prevention.
- Wormwood and Black walnut are toxic at doses needed to control intestinal parasites.

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