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### ***About Heartworm***

*Ron Hines DVM PhD*

**Heartworm** is a parasitic disease that **is spread by mosquito bites**.

Once a dog is infected, the parasitic worms grow and live inside the dog's heart chambers.

The most common symptoms of this disease are coughing, difficulty in breathing, an aversion to exercise, and congestive heart failure.

Heartworm is very difficult to treat and the sad news is that many dogs don't survive heartworm treatment.

The good news is that heartworm is easily preventable by giving your dog a monthly dose of a heartworm medication available at most vet stores.

*The study of parasites is called parasitology.*

## *The culprit.*



Heartworms are one of the most prevalent and severe parasites found in dogs. Heartworm microfilariae enter the dog through mosquitoes.

In most cases, vets will diagnose a worm infestation by testing your dog's faecal matter.

Most worm infections are treatable, but vets often suggest a monthly worm preventative in order to stave off infestations in the first place.

Heartworms spend the first three months of infection coursing through the host's body before reaching the blood vessels of the lungs where they begin to mature.

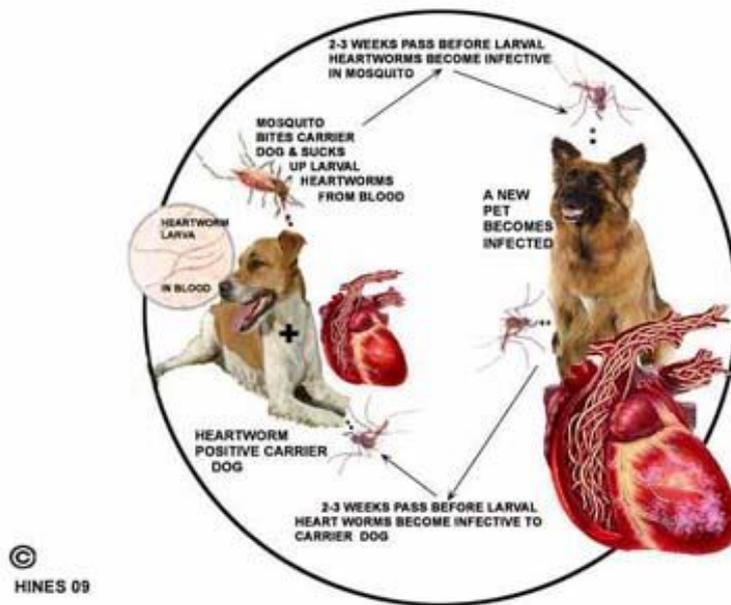
The growing heartworms inhibit the heart's pumping ability and can damage the blood vessels, leading to heart and lung disease.

If worms mate in the host's body and create more microfilariae, the host's body will react, which can cause damage to other organs.

Left untreated, heartworms can lead to death.

If the expectant mother uses a heartworm preventive product normally, she may continue to do so during pregnancy.

All heartworm products available are approved for use in pregnancy and lactation – best to still consult your vet.



To enlarge our image click [here](#)

To learn why your veterinarian cannot get the medications needed to cure your dog of heartworms go [here](#).

For the latest information on Medication-resistant Heartworms please go [here](#)

For Some Non-heartworm causes of coughing in dogs, please go [here](#)

The scientific name for heartworms are "*Dirofilaria immitis*".

These parasites randomly appear more commonly in pet and stray dogs in South Africa they, or their cousins, [Dirofilaria repens](#), are found world-wide where ever mosquitoes are common.

The warmer the climate and the more mosquitoes present, the more likely it is that your pet will catch them.

### **Some facts about heartworms.**

Male heartworms are a few inches long and look like angel hair spaghetti.

The female worms are much larger.

They cause most of the damage heartworms are transferred from dog to dog through the bite of an infected mosquito.

In areas where heartworms are common, a few summers of repeated mosquito bites to dogs not receiving preventative medications can result in enormous numbers of adult worms in the pet's heart.

If not offensive to you, you can view one of those hearts [here](#). After a mosquito sucks larva heartworms up with blood from an infected dog; it rests for a period of time before these larva become infective.

When that mosquito then bites another dog or the same dog, it transfers these microscopic larva as it bites.

That is the only way a pet gets a new heartworm.

During the next 6-7 months, the larval heartworms migrate slowly through the dog's body and arrive at the heart.

There they mature into adult worms.

Heartworm disease is worst in warm areas of the world where mosquitoes are active all year long.

The more mosquito bites your pet gets, the more the chance it will get infected.

So dogs that spend a lot of time outside or in unscreened areas are much more likely to have heartworms than indoor pets.

### **What are the signs of heartworms in my dog?**

Most dogs do not show any signs early in infection.

The first sign of heartworm disease is premature aging.

Dogs with heartworms often grey prematurely about the muzzle and forelegs.

Their coat loses lustre and with time, their activity level decreases.

Owners don't notice this because it occurs so gradually and many write it off as "just getting old".

They just don't have that old "bounce in their step".

This occurs much slower or not at all when a dog only has a few heartworms.

With time, a persistent, dry cough begins.

This cough is most noticeable at night when the house is quite and the dog is resting or in a sitting position.

This cough is due to three things: bronchitis that develops as pieces of dying worms become trapped in the lungs, fluid that accumulates in the lungs as the heart fails and the enlarged damaged heart pressing on the dog's wind pipe.

Later, the dog's tummy assumes a pear-shaped, pot-bellied look as the dog's liver enlarges and fluid accumulates in the abdomen. While these events are occurring, the dog's heart and pulmonary arteries are enlarging due to mechanical obstruction of the worms, inflammation and damage to the heart valves.

### **How do heartworms injure my dog's heart?**

Not only do mature heartworms clog up the arteries leading to the lungs, as the heartworms grow, they irritate the lining of the network of blood vessels that lead from the heart to the lungs.

This irritation partially blocks these arteries and makes the heart work harder to pump blood through the lungs to receive oxygen.

The more heartworms are present, the harder the work becomes.

Eventually, the heart begins to enlarge and fail due to the overwork.

All heartworm tests rely on finding **substances** that only mature heartworms produce or finding larval heartworms (*microfilaria*) produced by adult heartworms in your dog. It takes takes 5-7 months from the day your dog was bitten by an infected mosquito for these substances to appear. So there is no point in asking for these tests if your dog is less than 5-7 months old. If you missed giving heartworm preventative, the same 5-7 months have to pass **before the tests have any value.**

But fortunately, ivermectin-containing products are known to "reach back" a few months destroying baby heartworms - even if you missed giving your dog its monthly pill.[\(ref\)](#)

Occasionally, the results of another blood test, a **radiograph (x-ray) or ultrasound examination** makes veterinarians suspicious of heartworms.

When the vet sees a particular pattern of blood vessels in the dog's lungs, combined with enlargement of the right side of the heart, heartworm disease often comes to mind.

If your veterinarian does an [echocardiographic](#) examination of your dog's heart, the actual heartworms can sometimes be seen.

## How can I get rid of heartworms once my dog has them?

You begin dogs on ivermectin as soon as heartworms are diagnosed. This may kill immature heartworms that have not yet reached the heart as well as most larval heartworms circulating in the dog's blood. But **it will not** immediately cure your dog of the dangerous adult heartworms that are obstructing its heart circulation and damaging its lungs.

Unfortunately, there is only one approved drug available that will do that.

It is called **melarsomine dihydrochloride** and it is marketed as [Immiticide](#) by Merial Pharmaceutical Company.

It contains arsenic.

*As of August of 2011, and sporadically before that, Immiticide became unavailable in the United States.*

*For more information about this crisis, go [here](#).*

*When it returns to the US market, the following paragraphs will again be applicable.*

*For now, your dog will have to be treated with an avermectin (most likely ivermectin).*

*My thoughts on that are in this colour font in a box, farther down this article.*

Immiticide/melasomine can result in numerous side-effects and even an occasional death in advanced heartworm disease.

Before your veterinarian decides to give this medication, he/she will want to know if your dog is strong enough to survive the treatment.

So the vet will run **blood tests to see if your dog's liver and kidneys are still functioning normally**. They will also **x-ray its chest** to see how much heart damage has occurred.

Dogs with heartworms are often **anemic** as well ... based on the test results, your veterinarian may decide it is safer to try to stabilize the dog by addressing some of these side issues before treating the heartworms.

Three Immiticide injections are usually given.

Like a boxer in the ring, the first single injection is an attempt to "*soften up*" the parasites and kill as many as possible, and see how the dog handles the drug.

Immiticide is very irritating, so the needle is inserted deep into the muscles of your dog's back.

After the injection, some of the heartworms will die and begin breaking apart.

The danger now is that there is nowhere for these dying parasites to go, other than downstream into the lungs.

Your dog might also be quite sore and stiff for a few days due to the painful injection.

Try not to touch the sensitive injection area because it hurts; and the dog might even bite you.

Ask your veterinarian for some pain control meds in case your dog needs them.

You will be asked to maintain your dog in strict "bed rest" for a period of time after this injection.

God-willing, everything will go well, your dog will come back to the vet in one month for two additional Immiticide injections, given 24 hours apart.

Strict rest is still very important after the second and third injections. After receiving Immiticide, watch your dog very carefully.

It is common for these dogs to [run a fever](#). It is also common for them to cough, to be

If any of these things occur call your veterinarian immediately.

If anything more serious happens, such as weakness, [difficult breathing](#), bloody cough or bluish gums, put the dog in the car and take him to the Doc immediately.

The first 7 -10 days after heartworm treatment are the most dangerous.

But your dog is really not out of the woods for several weeks more. These side effects are happening because the dead worms are breaking up and being carried into the lungs where they cause a severe inflammation.

With time, the dog's body will absorb them.

The danger is that a big wad of dead worms and clots will plug up a major artery in the lungs (*an [embolism](#)*).

Major embolisms (*emboli*) can be fatal.

The less active your dog is during this period, the less likely a fatal embolism will occur.

Some veterinarians still suggest small amounts of aspirin during this period.

But its use has fallen out of favour with veterinarians who study the disease.

### **How should I care for my dog after it receives the Immiticide injections?**

The most critical time is the first few weeks after the Immiticide injections.

This is the time the dog's body must deal with all the dead heartworms in its circulation.

The most important thing during this period is to keep the dog as still as possible.

This means as little exercise as possible.

The best way to do this is to keep your dog in a cage (*crate*) in a cool, isolated, quiet area.

Take the dog out on a leash frequently enough to relieve itself - but no more.

Because it is common for dogs to run a fever during this period.

Keep the house cool and be sure it gets plenty of water.

### **How risky is this treatment for my dog?**

Here are the factors that determine how risky heartworm treatment will be for your dog :

1) The length of time your dog has been infected.

It takes approximately 7 months from the time an infected mosquito bites your dog until an adult heartworm develops that begins to damage your dog's circulatory system.

This damage occurs over an extended period of time, not right away. So young dogs (*less than 2-3 years old*) and recently infected dogs usually have considerably less circulatory damage - and less risk unless they have overwhelmingly high numbers of heartworms.

2) The amount of heart, liver and kidney damage that has occurred

The degree of elevation in certain [blood tests](#) will tell your veterinarian the extent of any damage to the dog's liver and kidneys. An x-ray of your dog's chest, or perhaps a cardiac ultrasound will show the degree of heart damage, if any.

We always hope that no damage is found.

Any significant damage increases the risks of Immiticide treatment.

3) The number of heartworms present

The damage done is proportional to the number of female worms present.

Dogs with high heartworm numbers are at much greater risk than with an overwhelming, sudden exposure to mosquitoes, the number of heartworms present in your dog likely to be most related to the number of months or years that the dog lived without monthly heartworm preventatives.

Of course, dogs that live indoors in screened homes are at considerably lower risk of mosquito bites.

4) The size of your dog

The diameter of the pulmonary arteries is much larger in big dogs than small dogs.

So small dogs are at a greater risk than large dogs with the same number of heartworms.

However, I see many more cases of heart worm disease in large breeds.

But I associate that with their spending more time out-of-doors.

5) The sex of the heartworms

It is the larger female worms that do most of the damage.

In some infections, the worms are mostly the smaller males.

I know of no chemical test that will tell what sex the worms are. However, a cardiac ultrasound can often see the heartworms and might tell if they are the larger females or smaller males.

### **Is there an alternative treatment for my pet?**

Because of the expense of melarsomine treatment as well as the risks involved, some owners and humane groups decide to simply place heartworm-positive dogs that are not showing symptoms on ivermectin and doxycycline antibiotic.

The hope was that this will weaken and shrivel the heartworms and improve the dog's general condition, while we wait for the heartworms to die naturally.

The normal life span of a heartworm is about 2 years - possibly shorter when the dog receives monthly or twice-a-month ivermectin. Ivermectin does not kill adult heartworms outright like Immiticide does.

Heartworms must not like ivermectin, because they usually stop producing larva (*microfilaria*) as well.

But as long as your dog continues to test positive with a test like the SNAP test, live worms are still present and doing their damage in your dog's heart and lungs.

If your veterinarian has determined that your dog already has significant heart and lung damage, then this form of slow ivermectin/doxycycline treatment is not for you.

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Remember, we don't have Immiticide right now. So your veterinarian is quite likely to attempt the ivermectin/doxycycline/corticosteroid method even if that would not normally be his first choice.

Ivermectin is an [avemectin](#) (*macrocyclic lactone*).

The Heartworm Society recently mailed out their thoughts on how this should be done.

You can read them [here](#).

However, their recommendations ignore some things we all already know about avermectins....

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They are often absorbed best when given with a fatty meal ([ref](#)).

In the case of ivermectin products, they can be 2.6 times better absorbed when taken with a fatty meal. ([ref](#))

Blood levels of ivermectin products are likely to stay high (*therapeutic*) when given more frequently than once a month ([ref](#))

[Moxidectin](#) products are likely to work best of all against adult heartworms (*until Immiticide is again available*) because they stays in the body longer than ivermectin ([ref](#)).

There are two approved forms of moxidectin available ([1](#) & [2](#)).

But I personally feel more comfortable using a form designed to be given orally ([ref](#)). (*That is not an FDA-Approved use for [Cydectin](#), [Equest](#), or [Quest Gel](#) in the United States*)

All moxidectin products can be toxic when given in too high a dose.

There might also be issues in using this product this way in [collie-type](#) dogs.

The amount of body fat that the dog possesses is likely to affect the dynamics of the avermectin in their body ([ref](#)).

Another point is that topically applied products are more subject to failures because they are harder to apply correctly than an oral medication. (*the drug needs to be on the skin, not the hair*)

Discuss these points with your veterinarian before deciding what to do.

Remember, certain breeds are avermectin-sensitive ([ref](#)).

This "slow kill" or "soft kill" method relies allot on the results of a 2008 study.

You can read that study [here](#).

We now also know that different "strains" of heartworms are affected differently by similar concentrations of ivermectin ([ref](#)) .

Something not known in 2008.

This is what was found in the 2008 study in which the dogs received the medications for 9 months:

Group #	What Each Group Of 5 Dogs Received	Percent Reduction
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		In Heartworms After 36 weeks
1	Ivermectin Orally every week for 36 weeks	20.3%
2	Doxycycline (at specific times )	8.7%
3	Ivermectin + doxycycline, orally + 3 Immiticide injections	92.8%
4	3 Immiticide injections	100%
5	Ivermectin + doxycycline, orally	78.3%
6	No Treatment	0%

The number of dogs in the study was small.

And one cannot set hard or fast rules based on a single study.

However a similar 2008 study obtained similar positive results. ([ref](#))

You can see from the results that the most effective treatment was a combination of ivermectin and the antibiotic, [doxycycline](#).

Currently, the Heartworm society recommends that heartworm positive dogs receive 5mg/pound body weight twice a day in addition to their heartworm preventative.

Please read their full recommendations [here](#).

Their suggested doxycycline dose is high.

Not all dogs can handle that high a dose without vomiting but most can.

I know of no reason why the dose cannot be divided further and given more frequently than twice a day as long as the total daily dose remains the same.

New Vet prescribed treatments – ask your vet about Advocate and or Advocate

**Advocate**



## Invermectin

The vet, depending on the case, may determine that ivermectin also be given monthly with Advocate to keep down the parasite load of microfilaria while the dog is killing off the adult parasite load that exists in the body.

This helps to ensure that no further parasites could migrate and eliminates the compounding effects of the parasites.

We have treated cases with or without the use of ivermectin with equally good results.

## What is wolbachia?

Wolbachia is an organism that lives inside of heartworms.

Some veterinarians now believe that Wolbachia is responsible for some of the blood clots and malaise that occur during treatment and that it, in some way, protects the worm.

Because of this, more and more veterinarians are pre-treating dogs with doxycycline, to destroy Wolbachia prior to administering Immiticide.

## What is Caval syndrome?

If a dog is bitten by an unusually high number of infected mosquitoes in a single season, enough heartworms can develop to suddenly plug up the large vein that returns blood to the heart.

This vein is called the vena cava.

These dogs may suddenly collapse and they frequently pass dark brown-coloured urine.

### **Most do not survive.**

A few can be saved by emergency surgery during which a forceps is passed into the heart and vena cava and the worms manually extracted.

Eighty to over one hundred worms can be found in the heart of a 40 pound dog with Caval syndrome.

### **How often should my dog be tested for heartworms?**

If you give your dog once-a-month heartworm preventative according to the instructions on the package, it should not get heartworms. (You can read the controversy over that [here](#)).

### **So why do veterinarians suggest annual heartworm tests?**

There are several reasons why:

- 1) Your dog may have caught heartworms before you began giving the monthly preventative.
- 2) You may have accidentally missed some months.
- 3) Your dog may have spit out the medication.
- 4) Most vet's require a physical examination or heartworm test before a prescription for heartworm medication can be renewed.

### **What if my dog is still positive for heartworms after being treated for the adult parasites?**

Young, female heartworms are the hardest to kill with Immiticide. So some may survive the treatment.

If a follow up blood antigen test is still positive 6 months after the dog was treated, some living worms have survived.

The health of these dogs is usually much improved because the majority of the heartworms are now gone.

It is rarely, if ever, necessary to retreat these dogs that still have a few residual worms 6 months after "adulticide" treatment.

Should you contemplate re-treatment, you have to understand that killing the very last worm will not improve the heart damage that has occurred (*if any*).

I usually suggest that my clients put those dogs on their monthly heartworm preventative (*preferably one that contains moxidectin or selamectin*) along with a year of pulsed (*intermittent*) doxycycline administration.

The best and most thorough recent article on heartworms and their treatment was written in 2009.

Since the writing, discoveries have been made and their preferred treatment medication ([melarsomine dihydrochloride](#)) has become unavailable.

But you can read their excellent article [here](#).

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