

# WHAT IS HEARTWORM AND HOW INFECTION OCCURS

By

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Heartworm disease prevention is a topic most pet owners are aware of, and most use heartworm prevention medications on a regular basis. But while there is an awareness of the problem, most people have very little knowledge of how heartworm is spread and how the preventative medications work. I will try to explain these issues as simply as possible and offer links for those who wish to pursue further information on each issue.

Heartworms are a nematode in the roundworm family. Their clinical name is *dirofilaria immitis* and they are spread by mosquito bites. They have six specific life cycles and they need the mosquito to complete two of them (L2 and L3) to become viable in the dog. When the mosquito bites the dog, some of these microfilaria migrate into the mosquito's saliva and are imbedded in the dog's skin. It is only the female mosquito that bites and spreads the infection. As the microfilaria mature, they will migrate to the blood stream. For a more in depth explanation of this, please see Langsley Russell's excellent article on this:

<http://www.bullovedbulldogs.com/heartworm.htm>

In order for a mosquito to become a carrier of heartworm, they must bite an animal that has already been infected with heartworm. After biting the infected animal, it takes approximately 14 days for the larvae the mosquito is carrying to reach a prepared stage (L3) when it can infect another dog. They pick up the larvae at stage one, and it completes stage 2 and 3 in the mosquito. If the mosquito bites an animal before the larvae reaches stage 3, infection will not occur. A dog will not catch heartworm from a blood transfusion or from nursing an infected mother dog as this important stage is needed inside the mosquito to advance into stage 3.

Stage four of the heartworm is the advancement of this parasite from the skin of the dog into the bloodstream and eventually to the lungs and heart. The final stage is the adult heartworm (L6), in which males can reach a length of six inches and females can be as large as 12 inches. It takes approximately three months from the bite of infestation for the larvae to gain enough maturity to adulthood and six or seven months of age to produce microfilaria that will circulate in the dog's bloodstream.

Symptoms of heartworm disease usually doesn't occur until this last stage, and these may include coughing and labored breathing which can lead to enlarged liver and ascites. Regular blood tests \*may\* show increased eosinophils and basophils.

It takes six months for the cycle of the heartworm to mature in the dog to be able to test for the presence of heartworm microfilaria. Testing before this time will show a negative result. This may fool the owner into thinking their dog does not have heartworms. There is a test available called a Knotts test that tests for microfilaria, but it does not show if adult heartworms are present, so be sure to ask for the Antigen test, which will show the indication of adults as well as their offspring. Only this test will show conclusive evidence of both stages of heartworm in the dog's system.

An interesting and important factor about the time the larvae is evolving in the mosquito is the temperature. The temperature that the mosquito is living in must not go below 57 degrees during this stage. A quote from Langsley Russell's article states: "The importance of temperature: While the larvae are developing in the mosquito, development continues only when the temperature is above 64 degrees F. Further, the temperature MUST remain above 57 degrees Fahrenheit at all times, day and night during the entire mosquito cycle. If at any time during the development into the L3 stage, the temperature drops below 57 F, the development is aborted and must start over. Remember, it is only the L3 larvae which are capable of infesting your dog."

A key factor in determining when your dog would be most likely to become infected with heartworm is the temperature. Once the temperature goes below 57 degrees, there is little likelihood of catching heartworm. Kathleen McDaniel of Citadel Tibetan Mastiffs has made a wonderful chart of the United States, with areas listed with average temperature fluctuations for timing of giving heartworm preventions. She states from a research article on her website that 30 consecutive days are needed for the heartworm larvae to develop to the L3 stage.  
<http://www.citadeltm.com/Heartworm.html>

This chart can be utilized to determine when dogs would be most susceptible to getting heartworm from mosquitoes due to temperature in your particular area. Another great use for this chart is to help determine when you need to give heartworm preventative, when to start and when to begin again. In the case of monthly heartworm prevention, it would be important to start the medication approximately 45 days after the temperature remains above 57 degrees. This would kill the existing microfilaria.

Then in the spring, you could count 45 days from when the temperature remains above 57 degrees, and begin the dosing with Heartgard or Interceptor. This would continue after 45 days until the weather stays BELOW 57 degrees at night. Do not go later than the 45 days indicated for these medications.

## **PREVENTION**

A misconception about heartworm prevention medications is that they 'prevent' heartworm from occurring at all in the body. That is not quite correct. Most types of prevention medications kill existing microfilaria but do not prevent them from entering the body. Let's look at the various types of heartworm prevention available:

Daily: Diethylcarbamazine this is Filaribits. These need to be given daily, as they kill the stage 3 larvae injected by a mosquito. One must not go over 36 hours in dosing this medication, or it will not be effective to kill the larvae, and can cause anaphylactic shock if your dog has been infected during that time. If a day is missed, testing is needed after six months. This medication can not be used if microfilaria is already present in the bloodstream. It is ineffective as prevention if this is the case. Please be aware of liver problems linked to Filaribits Plus (but not plain Filaribits):

<http://www.vetinfo.com/dmedquestions.html>.

"Filaribits Plus (Rx) can cause an idiosyncratic (we don't know why it happens) liver reaction in a small number of dogs. Dobermans seem to react more commonly to this medication than other breeds, too."

Monthly: Ivermectin (Heartguard, Heartguard Plus, Iverhart, Merial and

Verbac) and Milbemycin (Interceptor, Sentinal and Norvartis). This type of preventative kills any existing microfilaria in the bloodstream. So essentially it does not kill the larvae from the mosquito as does the daily type, but waits to be effective for the larvae as they progress to the microfilaria stage.

Please note:

<http://www.vetmed.wsu.edu/announcements/ivermectin/dvm.html>: "Ongoing research is directed at determining if other breeds that have been reported to be sensitive to Ivermectin (Australian Shepherds, Shelties,

Border Collies, and Old English Sheepdogs) have a similar mutation."

Two sites referencing the 45 day range for use of the monthly heartworm preventions include:

"The monthly medications are Heartgard and Interceptor. Heartgard is

Ivermectin and Interceptor is Milbemycin Oxime. These medications work by killing any larvae that have entered the dog up to 45 days ago. They kill L3s, 4s, and 5s. These drugs are given monthly (30 days) for the convenience of giving on the same day each month and also to give you a safety margin. If you forget to give your dog his/her heartworm medication, you have about 15 days to remember to give it and the dog will still be protected. With the daily medication, forgetting for more than a day may result in your dog becoming infected."

And Dr Mike Richards D.V.M. says from <http://www.vetinfo.com/doghw.html>

: "The monthly heartworm preventatives work to kill heartworm larvae that are 45 days or less in age and probably closer to 50 days. Since an every 45 day dose would be hard to remember and provide no leeway for error, the pills are approved for monthly use. We tell clients to give another pill if they are unable to remember if they dosed their pet and we can not help them determine if that happened based on our records (usually we can help in a single dog family but it is harder when several dogs are on the same pills in a household). We just check the dates the medication is sold and count pills from there.

Administering another pill is safe if one was given at the beginning of a month because the medication is not time release. It doesn't last in the body a month it just kills all the heartworm larvae that have accumulated in the last 30 days. It is pretty much completely cleared from the body in 72 hours. Since it takes 6 months for heartworms to develop to the age they can be tested for an immediate heartworm test is not necessary prior to restarting the medication. It is a very good idea to check for heartworms 6 months or so after a lapse in preventative medications."

For those who would like to use the 'least' amount of heartworm prevention as possible, there is a product that is used in Europe called SafeHeart. It is the same as Interceptor (Milbemycin) but offers a lower dose if you don't need the whipworm and hookworm prevention. Just use the Interceptor in this dose:

Safeheart contains 2.3 mg for dogs from 2-50 pounds, and 5.75 mg for dogs 50-125 pounds.

Interceptor contains 2.3 mg for dogs up to 10 pounds, and 5.75 mg for dogs 11-25 pounds. So if your dog weighs more than 50 pounds, give the Interceptor for dogs 11-25 pounds, otherwise use the one for dogs up to 10 pounds.

The actual recommended dosage of milbemycin oxime for heartworm prevention only (not roundworms and other intestinal worms) is 0.05 mg per pound of body weight (0.1 mg per kg) See <http://www.fda.gov/cvm/efoi/section2/140915s060498.html> for more info on SafeHeart.

Lastly, I would like to address a warning on the product called ProHeart. This is an injectable type of heartworm prevention that lasts for six months. There have been many adverse reactions to this drug, and the problem with it is that if your dog does have a reaction, it cannot be taken out of the dog's system. It appears many adverse effects have been reported, including death. For more information on this product, please go to:

<http://bewareofproheart6.freecyberzone.com/>

<http://www.srdogs.com/Pages/news.oct.nov2.html>

<http://concernedvet.netfirms.com/index.html>

[http://www.fda.gov/cvm/index/ade/ade\\_web\\_rpts.pdf](http://www.fda.gov/cvm/index/ade/ade_web_rpts.pdf)

(This is a download that takes some time. You must type in "moxidectin," then "parenteral" and then "dog." Then you will see the ailments and the figures of VOLUNTARILY reported cases. Most people probably don't know they can file such a report with the FDA, and some just do not choose to.)

[http://www.fda.gov/cvm/index/ade/ade\\_additional.htm](http://www.fda.gov/cvm/index/ade/ade_additional.htm).