Preventing Heartworm Infection in Dogs

Wendy Brooks, DVM, DABVP

Date Published: 01/01/2001
Date Reviewed/Revised: 08/07/2019

Additional Resources

Heartworm preventive medications are used to periodically kill larval heartworms that have managed to gain access to the dog's body. At this point, the products available are intended for monthly use, with the exception of Proheart6 which is a biannual injection. This means each time they are given they kill all the heartworm larvae (stage L3 and L4) that have accumulated in the past month. Some products offer the ability to kill older larvae, which helps keep the pet protected in case the heartworm preventive medication is given late. There are many topical and oral choices.

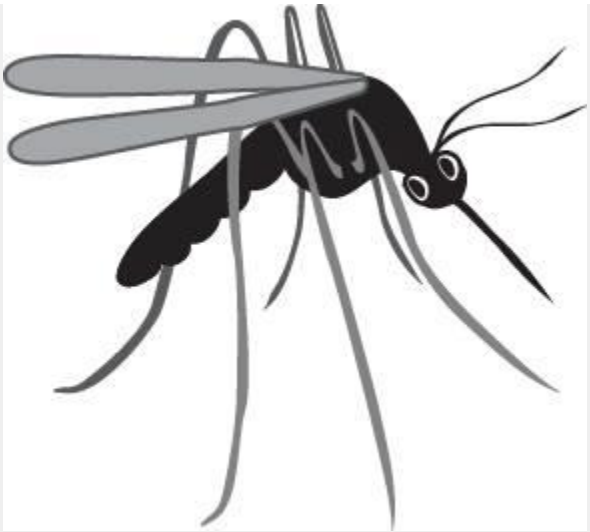

Illustration by VIN.

There are currently many choices, topical, oral and even injectable; plus, while the subject is canine heartworm prevention, many of the products discussed have feline formulations as well. We have organized them here based on their active ingredients:

IVERMECTIN Based Products (Heartgard, Heartgard Plus, Iverhart Plus, Iverhart Max, Tri-Heart Plus, Pet Trust Plus)

MILBEMYCIN Based Products (Sentinel, Sentinal Spectrum, Trifexis, Interceptor, Interceptor Plus, Milbeguard)
SELAMECTIN Based Products (Revolution)
MOXIDECTIN Based Products (Advantage Multi, Proheart6, Proheart12, Coraxis)

Whichever product you use, begin your heartworm season with a heartworm test to be sure your dog is negative and prevention can begin.

Ivermectin-based Products:
HEARTGARD®, HEARTGARD PLUS® made by Merial
IVERHART PLUS®, IVERHART MAX® made by Virbac
TRI-HEART PLUS® made by Merck
PET TRUST PLUS® made by FidoPharm

The approval of ivermectin in 1987 represented a huge breakthrough in heartworm prevention. For the first time, preventive medication could be given once a month instead of daily. These medications use an extremely low dose of ivermectin, which is adequate to kill any L3 and L4 larval stages (baby heartworms) that are inhabiting the pet's skin tissues at the time the medication is given. In other words, infection takes place but is halted every month when the medication is given.

If Given to a Heartworm Positive Dog by Accident

In most cases, no reaction of any kind occurs when an ivermectin-based heartworm preventive is given to a heartworm-positive dog.
In fact, giving an ivermectin-based heartworm preventive to an infected dog is the first step in heartworm infection treatment. Ivermectin kills the developing larval worms (the incoming baby heartworms) and clears the circulating microfilariae (the newborn larvae born to the established adult worms), thus rendering the dog unable to spread its infection and minimizing the number of adult worms to be killed in the second phase of treatment when the adult worms are specifically addressed.

If the larval worms die too quickly, a shock-like circulatory reaction can occur so for this reason the American Heartworm Society recommends that the first dose of ivermectin be given under veterinary supervision. This allows the dog to be observed for several hours following the oral dose in case of trouble. That said, in most cases no reaction of any kind occurs and the larval worms are cleared without event. This does mean, however, that giving this product to a dog with heartworm will kill all circulating microfilariae and the dog will test erroneously heartworm negative by Difil or Knott's testing. (ELISA test kits should still be accurate.) In addition to killing microfilariae, ivermectin will also suppress reproduction in the adult female worms and shorten the overall life span of adult

worms. Ivermectin does not kill adult heartworms (just the immature ones) though, as said, it cuts their life expectancy.

The Reach Back Effect

There is also a phenomenon called the reach back effect. This means that if a dog goes off heartworm preventive medication for a prolonged period (four months was the time tested), re-starting it could still prevent adult heartworm infection in the heart and pulmonary arteries. In the 1988 experiment by Atwell, dogs who went off heartworm preventive for four months and then restarted with ivermectin had 95% fewer adult heartworms than dogs who went without ivermectin, though it should be noted that some heartworms were still able to establish infection. This means that if you skip several doses of ivermectin accidentally, it is still worth picking up where you left off.

Other Parasites Covered

Ivermectin at the heartworm preventive dose is not strong enough to kill common intestinal parasites. Because of this fact, pyrantel pamoate, a dewormer, was added to cover hookworms and roundworms in the original Heartgard product to create HeartgardPlus. As other ivermectin-based products have entered the market, these have also added pyrantel pamoate to extend the spectrum of protection.

Whipworms are not covered by any of the ivermectin-containing products at this time, but in order to remain competitive in the market, manufacturers may pay for treatment for whipworm infections acquired while their product is used. The products containing both ivermectin and pyrantel pamoate are Heartgard Plus®, Iverhart Plus®, Pet Trust Plus®, and Tri-Heart Plus®. Iverhart Max® includes both pyrantel pamoate and praziquantel so as to cover tapeworms as well.

Breed Sensitivity

There are breed-related sensitivities with ivermectin as collie-related breeds have some difficulties, though the low doses used in heartworm prevention are not a problem for any breed.

Use of Large Animal Products

It is neither safe nor legal to obtain large animal ivermectin products for use in dogs for heartworm prevention. An assortment of doses have circulated around on the internet and in other sources advocating the use of highly concentrated ivermectin formulas for heartworm prevention in dogs. These doses are not comparable to the miniscule doses in licensed heartworm preventive products and using them represents an element of gambling. Large animal ivermectin products are vastly more concentrated than those meant for dogs and it becomes problematic to dilute them properly. Even small doses of these products are unnecessarily high and if they are inadvertently given to a sensitive individual, death can result.

For information on these products from their manufacturers visit:

Iverhart
Triheart Plus

Milbemycin Oxime-based Products
INTERCEPTOR® made by Elanco
INTERCEPTOR PLUS® made by Elanco
SENTINEL® made by Virbac
SENTINEL SPECTRUM by Virbac
TRIFEXIS® made by Elanco
MILBEGUARD® made by Ceva

This product is also given monthly, also clears microfilariae (the newborn heartworm), acts by killing all L3s and L4s (the incoming larvae) accumulated in the month prior to administration, and will suppress female worm's ability to reproduce. There are a few important differences to note between this product and the ivermectin-based products, though.

If Given to a Heartworm Positive Dog by Accident
If milbemycin is inadvertantly given to a dog with active heartworm infection, the microfilariae are killed much faster than with the ivermectin products. This might sound like a good thing but in fact it increases the likelihood of the previously mentioned shock-like reaction when all the first stage larvae die all at once. In a dog with a light infection, this might not be important but in a heavily infected dog it is safer not to use milbemycin to clear the microfilariae.
Of course, heartworm preventives are meant to be used in heartworm negative dogs. If these products are used according to their labeled instructions, this issue should never arise. Milbemycin-based preventives are safe and highly effective in preventing heartworms in dogs that are heartworm negative to begin with.

The Reach Back Effect
When milbemycin is given to a dog after a prolonged period without heartworm preventive (the Atwood experiment), the dog can be expected to have 41% fewer heartworms than if heartworm prevention was not resumed. This was not as good a result as with the ivermectin products because ivermectin is better at killing older heartworm larvae. If you find you have skipped several months of heartworm prevention in the middle of heartworm season, you might do better to restart an ivermectin-based product rather than a milbemycin-based product.
Other Parasites Covered
Milbemycin, however, does not require the addition of other dewormers in order to provide a broad spectrum of parasite control. The milbemycin products control roundworms, hookworms, and whipworms without the addition of a second parasiticide. Milbemycin is also available combined with lufenuron for the control of fleas in the form of Sentinel®. Lufenuron is an oral flea sterilizer that prevents any fleas feeding on the dog from laying viable eggs. It is also available as Sentinel Spectrum®, which adds praziquantel to regularly kill any tapeworms the

dog has contracted from its flea infestation. Interceptor Plus combines milbemycin and praziquantel so as to control tapeworms along with all the other worms listed for milbemycin alone.
Milbemycin can also be used to treat demodectic mange. A specific dosing schedule is needed to accomplish this; heartworm preventive doses are not adequate. That said, the isoxazoline class of flea and tick products has largely eclipsed other medications in the treatment of demodectic mange.

There are no breed-related sensitivities for milbemycin.

See more information on Sentinel® from the manufacturer.

See more information on Trifexis from the manufacturer.

Selamectin-based Products:
Revolution made by Zoetis (formerly Pfizer Animal Health)

Ivermectin's entrance onto the anti-parasite warfront represented a culmination in the trend for broader and broader spectrum parasite control. Selamectin is a closely related cousin of ivermectin. It is designed for broad coverage of small animal parasites and will protect dogs not only against heartworm but also against ear mites, sarcoptic mange mites, ticks, and fleas. Cats are protected against heartworm, fleas, ear mites, roundworms, and hookworms. The product is topical, applied monthly and is fully approved for safe use in heartworm infected animals. Selamectin is not as effective at clearing microfilariae as other products and thus is not generally used to treat active heartworm infections.

See more information on Revolution from the manufacturer.

Moxidectin-based Products:

ADVANTAGE MULTI® made by Bayer
PROHEART6® and PROHEART12®made by Zoetis
CORAXIS made by Bayer

Moxidectin is another relative of ivermectin. Four products use moxidectin to prevent heartworm infection: Advantage Multi® which is available for both dogs and cats as a topical, Coraxis® which is available for dogs as a topical, and Proheart6® and Proheart12 which are available for dogs as long-acting injections.

Advantage Multi® combines moxidectin with imidacloprid, the flea-killing ingredient in Advantage®, to create a broad spectrum anti-parasite product for both dogs and cats. Advantage® and Advantage Multi® are made by the same manufacturer (Bayer). Advantage Multi® prevents heartworm infection, kills roundworms, hookworms, and whipworms. The imidacloprid will kill fleas. Advantage Multi® actually carries approval for use in heartworm positive dogs,

meaning that it can be used to kill microfilaria in an active heartworm infection. Coraxis® is a similar product except that it consists only of moxidectin and has no flea-killing properties; it is a topical dewormer and heartworm preventive only. Coraxis® is made only for dogs.

Proheart6® is an injection given once every six months, obviating the need for the owner to remember to use a monthly product. The moxidectin is contained in special microspheres, enabling the drug to last a full six months; with Proheart12, an injection lasts 12 full months. Veterinarians and their technical staff must get a specific certification in order to give the injection. It is not recommended for sick or debilitated dogs nor for dogs positive for heartworm infection. Puppies must be at least 6 months old to receive Proheart6 and at least 12 months old for Proheart12.

See more information on Advantage Multi.

Learn more about Proheart6 made by Zoetis.

For more information about Coraxis from Bayer.

When to Start Giving Heartworm Preventive Each Year?

There is more to transmission than just mosquitoes; it must also be warm enough for a long enough time period to allow the development of microfilariae to infective L3's within the mosquito's body. A simple formula involves counting the degrees above 57°F reached each day. Each degree is called a heartworm development unit and when 234 heartworm development units have accumulated within a 30-day period, conditions have been reached to allow the transmission of L3 heartworm to new hosts. A monthly heartworm pill, chewable, or topical must be given at the end of a month in which 234-heartworm development units has accumulated.The answer to this question is regional. Ask what your regular veterinarian recommends for your area. It may be simplest to just use preventive all year round.

When 30 days pass and 234 heartworm development units have not accumulated, mosquitoes will be dying from the cold before any microfilariae they carry can develop to the infective stage. Monthly heartworm preventive needs not be given after a month under these conditions.

If all this sounds complicated, it is. In addition, most of us have better things to do besides monitoring average weather temperatures. It may be simpler to use the product all year round or go by the recommendations of a veterinarian in the region.

Resistant Heartworms

Strains of heartworm that are resistant to the preventives currently on the market (all those listed above) have been documented in the Mississippi River delta

area. Resistance has emerged because of inappropriate use of preventives (i.e. the "slow kill" treatment of heartworm infection). It is particularly important in this geographic area to treat known heartworm infection definitively and promptly and not to skip doses of preventives. At this time, only this limited area seems affected and not all heartworm strains are resistant. Be sure to include avoiding mosquito contact in the preventive regimen for dogs in this area.

Repelling Mosquitoes

Traditionally heartworm prevention has centered on killing heartworm larvae in the first month of infection. Infection is not prevented per se because the worms actually do transmit into the new host's body but they are killed long before they are able to develop and achieve significance. Indeed, prevention centers on using heartworm preventive products of this nature, as were reviewed above; however, more recently preventing actual mosquito bites has become a goal as well. Use of products that repel mosquitoes in combination with products that kill young heartworms is called the "Double Defense Heartworm Protocol." Research has shown that better prevention is achieved this way. What products repel mosquitoes? Basically, any flea or tick products that contains permethrin will repel flying insects including mosquitoes.