Hookworm Infection, Prevention & Treatment in Dogs

Drs. Foster & Smith Educational Staff

Hookworms (*Ancylostoma* and *Uncinaria*) are one of the most common intestinal parasites of dogs and cats (especially puppies and kittens), and can cause severe disease including anemia and serious diarrhea. Hookworms have either teeth-like structures or cutting plates with which they attach themselves to the wall of the intestine and feed on the animal's blood.

Hookworms can cause a skin disease in humans called cutaneous larval migrans. Infections of the intestines in people can also cause a condition called 'eosinophilic enteritis", resulting in abdominal pain.

The common names of the hookworms and the animals they infect are shown below.

Latin Name	Common Name	Hosts Infected
A. caninum	Canine hookworm	Dog, fox, possibly humans (intestine)
A. braziliense	Canine and feline hookworm	Dog, cat, fox, human (skin)
U. stenocephala	Northern canine hookworm	Dog, cat, fox
A. tubaeforme	Feline hookworm	Cat

Hookworms are found throughout North America, although *A. braziliense* is more common in semitropical and tropical areas, and *U. stenocephala* in the colder north. Their life cycle has an unusual twist – animals can be infected by ingestion of larvae from contaminated soil or water; by eating an infected transport host; through larvae penetrating their skin; and by larvae infecting fetuses or the young in the uterus or through the milk.

What is the life cycle of hookworms?

The adult worms live in the small intestine of their host animal, where they attach themselves and feed on the host's blood. The adults lay eggs that pass out in the feces. In 2-10 days, the eggs hatch and the larvae are released. These larvae are excellent swimmers that travel through raindrops or dew on leaves and vegetation and wait for a suitable host animal to come along. The larvae enter a host either by being ingested or by burrowing through the host's skin.

Through the Skin: Larvae entering through the skin migrate through the bloodstream to the lungs and trachea, and are coughed up and swallowed. They attach themselves to the intestinal wall, mature, mate, and produce eggs, thus completing the life cycle. Some larvae may migrate to muscles, fat, or other tissues and become dormant.

Through Ingestion: Larvae may be ingested through contaminated food or water, from moist surfaces, or through eating transport hosts that have been infected by the larvae. Most larvae that are ingested usually pass down to the intestine where they mature into adults and remain. A few however, may migrate through tissues of the body and ultimately to the trachea where they are coughed up and swallowed. Some larvae will stop their migration midway and encyst in muscles, fat, or other tissues.

Through the Uterus or Milk: Larvae that encyst and lie dormant in the muscle, fat, or other tissues can subsequently migrate to the uterus of a pregnant animal and infect the fetuses. They can also migrate to the mammary glands of a lactating female and infect nursing puppies.

What are the signs and symptoms of a hookworm infection in animals?

Hookworms, especially *A. caninum* can cause severe disease. By feeding on the blood of the host, hookworms can rapidly cause anemia. The mucous

A hookworm produces an

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membranes e.g., gums, will appear pale, the animal will become weak, and sometimes black, tarry stools can be seen. There may be vomiting and diarrhea. Growth in young animals is stunted, and the hair coat may appear dull and dry. In severe infestations, animals may cough or develop pneumonia as the larvae migrate through the lungs. Animals may become emaciated and eventually die from the infection.

anticoagulant in its saliva so the host's blood does not clot at the site the hookworm attaches. If the worm moves from that site to reattach itself at another, the first site may continue to bleed, sometimes seriously.

How do hookworms infect humans and what are the signs of infection?

Hookworm larvae can penetrate the surface of a person's skin (usually through bare feet) and migrate through it, causing a disease called 'cutaneous larva migrans' or 'creeping eruption.' The lesions appear as red lines under the skin and sometimes break open at the skin's surface. These lesions cause severe itching. Usually, the larvae will die in several weeks and the condition will disappear. In severe cases, the larvae may make their way through the skin and enter deeper tissues. This may cause lung disease and painful muscles.

There have been some reports of humans having intestinal infections with canine hookworms.

How is an infestation with hookworms in dogs diagnosed?

Diagnosis is made by finding the eggs in the feces. In very young animals, severe disease may be present before the adult worms have started to lay eggs. Diagnosis must then be made by evaluating the signs of disease.

The eggs of different parasites of horses and deer can easily be confused with hookworm eggs. Sometimes, it is necessary to confine the dog away from any tempting manure or droppings for 24 hours and then repeat the fecal exam. If the eggs are still there, they are most likely hookworm eggs.

The adult worms are small, ½ to ¾ inches long, and are rarely detected in the stool because of their size and ability to firmly attach themselves to the intestinal wall.

How is a hookworm infection treated in dogs?

Most of the wormers that kill roundworms will also kill hookworms (piperazine is one exception). Most wormers only kill the adult worms in the intestine, but not the larvae. That is why two or more treatments are generally recommended. Common wormers are listed below; those that are effective against hookworms have an 'H' in the 'Effective Against' column.

Oral Treatments for Gastrointestinal Parasites in Dogs

Ingredient(s)	Example	Effective Against*	Minimum Age/Weight
diethylcarbamazine	Only compounded products available**	R	8 weeks
piperazine salts	Hartz Advanced Care Liquid Wormer/Sergeants Worm Away	R	6 weeks
ivermectin/pyrantel pamoate	Heartgard Plus** Tri-Heart Plus** Iverhart Plus**	R,**H**	6 weeks
pyrantel pamoate	Drs. Foster & Smith ProWormer-2, Nemex-2	R,**H**	2 weeks
pyrantel pamoate/praziquantel	Virbantel	R,**H**,TT	12 weeks/6 lbs

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milbemycin oxime	Interceptor**	R,**H**,W	4 weeks/2 lbs
milbemycin oxime/lufeneron	Sentinel**	R,**H**,W, F (immature forms only)	4 weeks/2 lbs
imidacloprid/moxidectin	Advantage Multi**	R,**H**,W,F	7 weeks/3 lbs
fenbendazole	Panacur-C, SafeGuard	R,**H**,W,TT	6 weeks
febantel/praziquantel/pyrantel pamoate	Drontal® Plus	R,**H**,W,TT,FT,ET	3 weeks/2 lbs
ivermectin/pyrantel pamoate/praziquantel	Iverhart MAX**	R,**H**,FT,TT	8 weeks
praziquantel	Droncit, D-Worm	TT,FT, ET	4 weeks
epsiprantel	Cestex	TT,FT	7 weeks

*Effective against these parasites:
R = Roundworms
H = Hookworms
W = Whipworms
F = Fleas
TT = Taeniid tapeworms
FT = Flea tapeworms
ET = *Echinococcus granulosus* tapeworms
**Also prevents heartworm

Regular deworming is recommended by the American Association of Veterinary Parasitologists (AAVP), the Centers for Disease Control and Prevention (CDC), and the Companion Animal Parasite Council (CAPC).

Puppies*

- Initiate treatment at 2 weeks; repeat at 4, 6, and 8 weeks of age, and then put on a monthly heartworm preventive that also controls intestinal parasites. Using a year-round heartworm preventive/intestinal parasite combination product decreases the risk of parasites. If not using such a product, worm at 2, 4, 6, and 8 weeks of age and then monthly until 6 months of age.

Nursing Dams

- Treat at the same time as puppies.

Adult Dogs

- If on a year-round heartworm preventive/intestinal parasite combination product, have a fecal test performed 1-2 times per year and treat appropriately. If not on a year-round heartworm preventive/intestinal parasite combination product, have a fecal test performed 2-4 times per year and treat appropriately. Also monitor and eliminate parasites in pet's environment.

Newly Acquired Animals

- Worm immediately, after 2 weeks, and then follow above recommendations.

*** Drs. Foster and Smith suggest that owners of newly acquired puppies should obtain the deworming history of their**

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new pet and contact their veterinarian to determine if additional deworming is needed.

Severely Infected Animals: In addition to deworming, severely infected animals may need supportive care including high-protein diets and iron supplements. In critical cases, blood transfusions may be necessary.

What can be done to prevent hookworm infections in pets, breeding animals, and people?

To prevent hookworm infections, we need to remember how animals become infected – either through contaminated soil or water, transport hosts, or through their mothers.

Treating the Environment: The larvae of hookworms can live several weeks in cool, moist soil, but die rapidly in freezing or hot, dry conditions. Yards and kennels should be cleaned daily. Floors in kennels and dog runs should be impervious, so they are easier to clean. All fecal material should be removed, since organic material will decrease the effectiveness of cleaning solutions. A bleach solution of 3 cups of household bleach to a gallon of cool water should be sprayed or mopped on the area. For your safety and comfort, use the bleach solution in a well-ventilated area. Eye goggles and rubber gloves are also recommended.

Any feces in yards should be picked up on a daily basis. Flaming the surface soil can kill the larvae. Gravel runs are best treated with sodium borate applied at the rate of 10 lbs/100 sq. ft. (Sodium borate will kill vegetation.)

Since mice and other rodents can serve as transport hosts, their control is important. Remember that mouse and rat poisons are poisons for dogs, cats, and other animals as well. If using one of these products, follow the manufacturer's recommendations and prevent access by your pets.

Medical Treatment and Isolation: As with any infection, animals infested with hookworms should be kept separate from other animals until their infection is cleared.

To reduce the possibility that female dogs will infect their puppies, they should be placed on a special deworming program during pregnancy, prescribed by a veterinarian. They should also be treated with a dewormer at the same time as the puppies.

A fecal examination should be performed two to four times during the first year of life (more if the animal is repeatedly positive). Adults should be tested at least one to two times per year. Females should be tested before they are bred. The appropriate deworming schedule for your dog should be developed in consultation with your veterinarian, taking into account factors such as risk of exposure, immune status of family members, etc.

Many heartworm preventives treat or control infections with hookworms and are an important addition to a control program. Look at your heartworm preventive package to see if it is effective against hookworms.

Safeguarding Human Health: To prevent human infection, good hygiene is extremely important. Teach children, especially, to wash their hands after playing and before eating. Do not let children play in areas where dogs or cats may have defecated. Do not allow cats to use sandboxes or the garden as litter boxes. Persons who will have contact with the ground, especially for long periods of time, e.g., plumbers or electricians working in crawl spaces, should place an impervious material between themselves and the ground. (Hookworm infestation in man is sometimes known as 'plumber's itch.') When gardening, wear shoes and gloves.

Sunbathers, especially those lying on wet sand or ground may also be at an increased risk of becoming infected. Animals should not be allowed to defecate on beaches, and people should not walk barefoot through the sand.

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