



## Hookworms

### What are hookworms?

The hookworm (*Ancylostoma caninum*, *Ancylostoma braziliense*) is one of the classical internal parasites of puppies, the others being roundworms, tapeworms, and coccidia. (There are species of hookworms that infect cats but hookworm is much less common in cats)

### What do hookworms do?

The adult hookworm lives in the small intestine of its host. It hangs on to the intestinal wall using its six sharp teeth and unlike other worms that just absorb the digested food through their skin as it passes by; ***the hookworm drinks its host's blood***. The adult worm lives and mates within the host and ultimately, the female worm produces eggs. Hookworm eggs are released into the intestinal contents and passed into the world mixed in with the host's stool.

The egg hatches in the environment and develops eventually to a larval stage which is ready to infect a new host.

### How does my pet get hookworms?

The larva can infect its new host in several ways.

a. One way is to ***penetrate the dog's skin directly through the feet or belly or whatever part of the skin is touching the ground.***

b. Another way for the larva to gain entry to the new host is to be ***present in soil that is licked and swallowed by the host as it cleans itself.***

c. An infected mother dog will have encysted larvae all around her body. Throughout the adult dog's life, some larvae will awaken, break out of their cysts, and complete their migration to the GI tract. The hormones of pregnancy unfortunately serve as little wake-up calls to encysted hookworm larvae, only this time little worms migrate to the unborn puppies and to the mammary gland. ***Some members of the litter will be born infected.***

d. ***Others will become infected by drinking the contaminated milk of their own mother.***

e. ***Others will become infected from the soil of their own nest, which will quickly become contaminated, with the stool of the infected litter.***

It is clear why puppies are at a special risk over adult dogs when it comes to hookworms. Once the larvae are inside the host, they make their way to the intestine where some worms simply stay and mature into adulthood. Other individuals are bolder, tunnel out of the intestine, and migrate to the lung tissue. In the lung, the larvae develop further, then climb up the trachea, get coughed into the throat and swallowed. Once back in the intestine, these larva complete their maturation to adulthood.

Not all the worms that begin this migration complete it. As they emerge from one tissue to move on to the next, some fall into a state of arrest where they go dormant and encyst. These larvae remain inactive but periodically some will emerge and complete their migration.

### **What signs are there that my pet is infected?**

**There may be no signs of a problem, yet the hookworm eggs will be seen in a stool sample when it is checked microscopically. This is called a fecal flotation test.**

In a young puppy that is growing there are extensive needs for new red blood cells to serve not only its maintenance needs but also the needs of its growth. Yet in the hookworm infected puppy this process is being sabotaged by numerous tiny vampires within. The puppy may be effectively bled to death. *Infected puppies are commonly pale, weak, and have long-standing deficiencies. They may or may not have diarrhea.*

### **What Treatments are there for hookworms?**

**Treatment** involves deworming with one of several products: Mebendazole, Fenbendazole, Milbemycin Oxime or Pyrantel pamoate. Deworming should be repeated. These products are not absorbed into the host's body from the GI tract and can only kill the worms living within the GI tract. The point of the second deworming is to kill worms in the process of migration at the time of the first deworming, allowing them an additional month to complete their migration. We currently do not have a deworming strategy effective against the encysted larvae in other areas of the host's body. *The Centers for Disease Control and Prevention recommends automatically deworming puppies for hookworms beginning at age 2 weeks in areas where hookworms are common.*

Simply killing the worms will not be sufficient to save the life of a severely affected puppy. Like any other blood loss, *a transfusion may be needed to*

*keep the puppy alive until it can replace its own lost red blood cells. An iron supplement is frequently needed as well.*

### **What can be done to prevent hookworms?**

We can prevent transmission from the mother, but *daily deworming is required through the second half of pregnancy and into the nursing period*. A regular single deworming will not be effective in protecting the litter. A special protocol using Fenbendazole has been found to be effective in preventing both roundworm and hookworm infection in unborn puppies. Ask your veterinarian about this method if you are contemplating breeding a female dog.

Sanitation of the pet's environment with frequent removal of feces is necessary to decrease the likelihood of reinfection. Cement runs that can be sanitized with Borax at a rate of 10 pounds per 100 square feet are the easiest to keep clean, but other surfaces such as gravel can also be sanitized.

### **Can hookworms affect people or other pets?**

*Hookworms Can Infect Human Beings*. Contaminated soil is an important hookworm source when it comes to a human disease called *Cutaneous Larva Migrans*. Running barefoot through the park or beach may seem pleasant but if the soil has been contaminated with canine fecal matter, the larvae may be waiting to penetrate your skin. Hookworm infection in the skin is intensely itchy but usually treatable. The local restrictions on bringing dogs to local beaches and the strict clean-up laws reflect concern for hookworm (and roundworm) infection in people.

Humans can also become infected by eating improperly washed vegetables, which may harbor contaminated soil. Humans have been found with actual hookworm intestinal infection. This would be a challenging diagnosis as it is not usually expected but the good news is that it is treated fairly easily when it is discovered.

### **How do we know the hookworms are eliminated?**

A repeat stool test is performed a month after treatment, and 6 months later, then annually at a minimum.

Please visit the CDC's hookworm fact sheet at:

[http://www.cdc.gov/ncidod/dpd/parasites/hookworm/factsht\\_hookworm.htm](http://www.cdc.gov/ncidod/dpd/parasites/hookworm/factsht_hookworm.htm)