Roundworms (Toxascaris leonina, Toxocara canis)

Drs. Foster & Smith Educational Staff

Roundworms, often called 'ascarids,' are the most common parasite of the digestive tract in dogs and cats. Most puppies are infested with roundworms and when we look at the life cycle, we will understand why. All of these roundworms are widely distributed in North America. They are of considerable importance in young animals and in kennels. Because they can cause disease in humans, they are also very important to our health as well.

The adult roundworms all live in the small intestine of the host and their eggs look very similar. All the roundworms are prolific and an infested animal can pass millions of eggs in the feces each day. The roundworms differ, however, in their life cycles. These differences are very important when we look at how we can eliminate these parasites from our pets.

Even birds and reptiles can have roundworms, although they are a different genus and species than those found in dogs and cats.

What are the life cycles of the roundworms in dogs and cats?

There are 3 types of roundworms that affect dogs and cats and each has transport hosts.

Roundworm	Primary Host	Transport Host
Toxascaris leonina	Dog, cat, fox, and other wild carnivores	Small rodents
Toxocara canis	Dog, fox	Small rodents
Toxocara cati	Cat	Small rodents, beetles, earthworms

T. leonina: Of the roundworms, *T. leonina* has the simplest life cycle. After an animal ingests infective eggs, the eggs hatch and the larvae mature within the small intestine. The adult female worm lays eggs which are passed in the feces. The eggs become infective after remaining in the environment for at least 3-6 days. Animals become infected if they eat something contaminated with infected feces.

Mice can act as intermediate or transport hosts of *T. leonina*. The rodent ingests the eggs, the eggs hatch, and the larvae migrate through the tissues of the rodent. If a carnivore eats the mouse, the larvae are released in the digestive system of the carnivore and develop into adults in the intestine.

T. canis: Roundworms of the species *T. canis* have a more complicated life cycle and a very effective way of making sure its species will be passed from generation to generation. Let us take a look.

An animal can acquire a *T. canis* infection several ways: ingestion of eggs, ingestion of a transport host, or by larvae entering the animal while in the uterus or through the milk. First let us follow the ingestion of infective eggs.

Most puppies are born infected with *T. canis*.

Ingestion of eggs: After a dog eats the eggs, they hatch, and the larvae enter the wall of the small intestine. The larvae migrate through the circulatory system and either go to the respiratory system or other organs or tissues in the body. If they enter body tissues, they can encyst (become walled off and inactive). They can remain encysted in tissues for months or years. This is the migration most commonly seen in older dogs. In very young puppies, larvae move from the circulation to the respiratory system, are coughed up and swallowed. The larvae mature into adults. The adult worms lay eggs which pass out of the animal in the feces. The eggs need to remain in the environment 10-14 days before they become infective.

Ingestion of transport host: If an animal ingests a transport host having encysted larvae, the larvae are released when the transport host is digested and mature in the intestine.

Larvae through the uterus: A pregnant dog that has *T. canis* encysted larvae in her tissues can pass them to her puppies in two ways. The larvae that were dormant in her tissues can migrate through the uterus and placenta and infect the fetal pup. This is called *in utero* transmission. The larvae enter the lungs of the fetal pup. When the pup is born, the pup will cough up the larvae and they will mature in the pup's intestine. This is why so many puppies have roundworms – they are infected before they are born.

Larvae through the milk: Larvae can also enter the female's mammary tissues. The puppies can become infected through the milk while nursing. The swallowed larvae mature in the pup's intestine. If the larvae are passed out in the pup's feces before

they can mature, they can infect the mother when she licks her pup.

About 4 weeks after a dog eats an infective egg or a puppy with a prenatal infection is born, the adult worm has matured in the animal's intestine and the next generation of eggs is passed.

T. cati: In some ways, the life cycle of *T. cati* is similar to that of *T. canis*. The infective eggs are swallowed. The larvae hatch and penetrate the stomach wall. From there the larvae migrate through the liver, other tissues, and lungs. Some larvae may encyst in the tissues. Larvae that enter the lungs are coughed up and swallowed. The larvae mature in the stomach and small intestine, and the adult female worms start laying eggs.

Unlike *T. canis*, *in utero* infection does not occur with *T. cati*. However, during the perinatal period dormant larvae in the queen can start to migrate and can be passed from the mammary tissues to the young kittens through the milk.

Mice can serve as intermediate hosts for *T. cati* in a manner similar to the other roundworms. Cats can also become infected by eating other transport hosts such as earthworms and beetles.

The table below helps summarize the ways the different roundworms are transmitted.

	Eggs, through Ingestion	**Larvae, through the milk**	**Larvae, across the placenta**	**Larvae, by ingestion of transport or intermediate host**
T. leonina	X			X
T. canis	X	X	X	X
T. cati	X	X		X

Remember, for all roundworms, the eggs need to remain in the environment for days to weeks before they become infective. Larvae encysted in the host's tissues can remain dormant there for the host's lifetime.

How do roundworms cause disease in pets?

In the intestine, roundworms absorb nutrients from what the animal eats, interfere with digestion, and can damage the lining of the intestine. Animals with mild infestations of roundworms may not show any signs of disease. Animals with more severe infestations may be thin, have dull hair coats, and develop a pot-bellied appearance. Some may become anemic and have vomiting, diarrhea, or constipation. Rarely, in severe infestations, the roundworms can cause obstruction of the intestines. A cough may be observed in some animals due to the migration of the larvae through the respiratory system. In young puppies the migration of the *T. canis* larvae in the lungs can cause pneumonia.

How are roundworm infestations in pets diagnosed?

Adult worms are usually 3-4 inches long, although some *T. canis* roundworms can be up to 7 inches. Adults may be seen in the feces or vomit. The worms are round on cross-section (hence the catchy name) and look a bit like spaghetti.

The eggs are identified in the feces. A flotation solution is used to separate the eggs from the rest of the stool, and the resulting sample is examined microscopically. Very slight differences in appearance of the eggs of the three roundworms can allow experienced persons to distinguish between them.

Surprise! Occasionally we will see eggs of *T. cati* in dog stool. How could that happen? The dog has made a raid on the cat's litter box and has eaten cat feces. The eggs pass through the digestive system of the dog and are found in its stool.

An individual *T. canis* female worm can produce 200,000 eggs per day.

How are roundworm infestations in pets treated?

There are many wormers that kill roundworms. Most wormers, however, kill the adult worms but do not affect the migrating or encysted larvae. This is why most manufacturers of wormers advise repeating the worming 2-4 weeks after the first treatment. By that time, most larvae that were migrating during the first treatment have come back to the intestine where they can be killed by the second treatment.

Common wormers are listed below; those that are effective against roundworms have an 'R' 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
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 new pet and contact their veterinarian to determine if additional deworming is needed.**

How can I prevent my pet from becoming reinfected?

Fecal exams can help detect what parasites a pet may have and how the pet should be treated. A fecal examination should be performed at the time the puppies are weaned, 4-8 weeks after the last treatment of an infestation, and before females are bred. A fecal exam should also be performed at a pet's annual exam and up to 3 or more additional times per year depending on the risk of exposure, the parasite control program being used, etc. 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 such as Heartgard Plus and Interceptor treat or control infections with roundworms and are an important addition to a roundworm prevention program. Look at your preventive package to check its efficacy against roundworms.

The eggs of roundworms are extremely resistant to environmental conditions and can remain infective in the soil for months to years. Pets need to be discouraged from ingesting soil or anything contaminated with infective eggs. Because of the zoonotic potential of roundworms, and to protect your pet and others, all sources of infection should be reduced. For a discussion of cleaning the environment, see the section further below.

How do roundworms cause disease in humans?

T. canis and *T. cati* pose a significant health hazard to people. Thousands of people become infected with *Toxocara* in the United States every year. How do people become infected? Humans become infected when they ingest infective eggs from the soil or from their hands or another object. Large numbers of the eggs can accumulate in the soil where dogs and cats are allowed to defecate. The eggs are sticky, and can collect on the hands and under the fingernails of people. Children, and others who may not have good hygiene, are most prone to becoming infected.

Remember, *Toxocara* eggs need to be in the environment approximately two weeks, before becoming infective, so direct contact with an infected animal generally does not result in transmission. However, young animals may continually contaminate their entire litter area, and may even have infective eggs stuck to their coats. Adults and children who handle the mother or the young or who clean the area may be especially at risk.

If a human ingests *Toxocara* eggs, the subsequent larvae can migrate through the person's tissues. This condition is called 'visceral larva migrans.' The larvae most commonly migrate through the liver, lungs, and brain. They can cause severe inflammation and actual mechanical damage to the organs. Signs of this disease include an enlarged liver, intermittent fever, loss of weight and appetite, and a persistent cough. Asthma or pneumonia may develop.

A unique form of this disease is called 'ocular larva migrans.' Larvae migrate through the eyes and can cause vision loss or even blindness. Ocular larva migrans usually occurs in children 7-8 years old, whereas, visceral larva migrans occurs in children ages 1-4 years. The reason for the difference among ages is unknown.

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. Cats should not be allowed to use sandboxes or the garden as litter boxes. Worm your pets as recommended, keep the environment clean, and control rodent populations.

How do I eliminate roundworms from my breeding animals?

A good roundworm control program should be established for all kennels. The main sources of infection are larvae in the females, eggs in the environment, and larvae in the tissues of transport hosts. All of these need to be addressed in a good control program.

Medical Treatment and Isolation: It is very difficult to eliminate encysted larvae from female dogs and cats in an attempt to prevent transmission to their offspring. It requires isolation of animals and repeated treatment of the mothers through multiple generations to prevent reinfection and reduce and finally eliminate larvae in the tissues. Breeders should consult with their veterinarians to determine the best parasite control program for their kennel.

Treating the Environment: Floors in kennels and dog runs should be impervious so they are easier to clean. Roundworm eggs are resistant to almost all disinfectants.

Any feces in yards should be picked up on a daily basis. If soil becomes contaminated, about the only alternative is to remove it and replace it, or turn it over to the depth of 8-12 inches.

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. Pets should be prevented from scavenging and preying on wildlife.