

The Pet Health Care Library

Coccidia

What on Earth are Coccidia?

Coccidia are single-celled organisms that infect the intestine. They are microscopic parasites detectable on routine fecal tests in the same way that worms are, but coccidia are not worms and are not susceptible to deworming medications. They are also not visible to the naked eye. Coccidia infection causes a watery diarrhea that is sometimes bloody; it can be a life-threatening problem, especially to a young or small pet.

Where do Coccidia come from?

Oocysts (pronounced o'o-sists), like those shown above, are passed in stool. In the outside world, the oocysts begin to mature or sporulate. After they have adequately matured, they are infective to any host (dog or cat) that accidentally swallows them.

To be more precise, coccidia come from fecal-contaminated ground. They are swallowed when a pet grooms/licks the dirt off. In some cases, sporulated oocysts are swallowed by mice and then the host is infected after eating the mouse. Coccidia infection is especially common in young animals housed in groups, such as shelters, rescue areas, kennels, etc. This is a common parasite and is not necessarily a sign of poor husbandry.

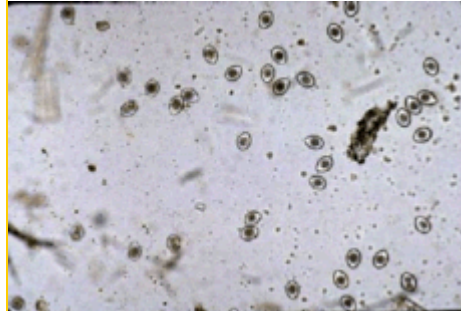
What Happens Inside the Host?

The sporulated oocyst breaks open and releases eight sporozoites. Each of these sporozoites finds an intestinal cell and begins to reproduce inside it. Ultimately, the cell is so full of what are called merozoites at this stage that the cell bursts, releasing merozoites that seek out their own intestinal cells so the process begins again. It is important to note how thousands of intestinal cells can become infected and destroyed as a result of accidentally swallowing a single oocyst.

As the intestinal cells are destroyed in larger and larger numbers, intestinal function is disrupted and a bloody, watery diarrhea results. The fluid loss can be dangerously dehydrating to a young or small pet.

How are Coccidia Detected?

A routine fecal test is a good idea for any new puppy or kitten whether there are signs of diarrhea or not as youngsters are commonly parasitized. This sort of test is also a good idea for any patient with diarrhea and is recommended at least once a year for healthy dogs and cats as a screening test. The above photograph shows coccidia oocysts seen under the microscope in a fecal sample. Coccidia are microscopic and a test such as this is necessary for diagnosis. Small numbers of coccidia can be hard to detect, so just because a fecal sample tests negative, this doesn't mean the pet isn't infected. Sometimes several fecal tests are performed, especially in a young pet with a refractory diarrhea (one that won't go away); parasites may not be evident until later in the course of the condition.



There are many different species of coccidia but for dogs and cats, the most common infections are with coccidia of the genus Isospora (pictured here). The information presented here pertains to Isospora species.

How is Coccidia Treated?

The most common medicines used against coccidia are called coccidiostats. They inhibit coccidial reproduction. Once the numbers stop expanding, it is easier for the patient's immune system to catch up and wipe the infection out. This also means, though, that the time it takes to clear the infection depends on how many coccidia organisms there are and how strong the patient's immune system is. A typical treatment course lasts about a week or two, but it is important to realize that the medication should be given until the diarrhea resolves, plus an extra couple of days. Medication should be given for at least 5 days total. Sometimes courses as long as a month are needed. In dogs and cats, sulfa-based antibiotics are the most commonly used coccidiostats.

The use of sulfa drugs in pregnancy can cause birth defects. Sulfa drug use can also lead to false positive test results for urine glucose.

There is another medication that is worth mentioning called [ponazuril](#), a large animal product. This medication is actually able to curtail a coccidial infection in five doses or less and has been used in thousands of shelter puppies and kittens with no adverse effects. This product would seem to be superior to the usual sulfa drugs, but the problem that keeps it from becoming a mainstream treatment is the fact that it is available only as a paste for horses and must be diluted down to create an appropriate small animal formula. The large volumes of product yielded are not cost effective if only occasional patients are treated for this parasite. Ponazuril is thus most commonly used in kennels, catteries, and animal shelters though one may be pleasantly surprised to find it in stock at a regular veterinary office.

Can People or other Pets Become Infected?

While there are species of coccidia that can infect people ([Toxoplasma](#) and [Cryptosporidium](#), for example), the *Isospora* species of dogs and cats are not infective to people. Other pets may become infected from exposure to infected fecal matter but it is important to note that this is usually an infection of the young (i.e. the immature immune system tends to let the coccidia infection reach large numbers whereas the mature immune system probably will not.) In most cases, the infected new puppy or kitten does not infect the resident adult animal.

The Pet Health Care Library

Fleas: Know your Enemy

Despite numerous technological advances, fleas continue to represent a potentially lethal plague upon our pets. Current products are effective so there is little reason for this; the problem seems to be one of understanding.

There are over 1900 flea species in the world. Pet owners are concerned with only one: *Ctenocephalides felis*, the cat flea. This is the flea that we find on our pets (cats, dogs, rabbits, and other species) in 99.9% of cases and in order to understand how to control the damage caused by this tiny little animal, you should learn all you can about it.

What Kind of Damage Can Fleas Cause?

It would be a grave mistake to think of the flea as simply a nuisance. A heavy flea burden is lethal, especially to smaller or younger animals. The cat flea is not at all selective about its host and has been known to kill dairy calves through heavy infestation. Conditions brought about via flea infestation include:

- Flea Allergic Dermatitis (fleas do not make animals itchy unless there a flea bite allergy)
- Flea Anemia
- Feline Infectious Anemia (a life-threatening blood parasite carried by fleas)
- Cat Scratch Fever/Bartonellosis (does not make the cat sick but the infected cat can make a person sick)
- Common Tapeworm infection (not harmful but cosmetically unappealing)

Fleas can kill pets.

This is so important that we will say it again: Most people have no idea that fleas can kill. On some level, it is obvious that fleas are blood-sucking insects but most people never put it together that enough fleas can cause a slow but still life-threatening blood loss. This is especially a problem for elderly cats who are allowed to go outside. These animals do not groom well and are often debilitated by other diseases. The last thing a geriatric pet needs to worry about is a lethal flea infestation and it is important that these animals be well protected.

Also consider that in about 90% of cases where an owner thinks the pet does not have fleas, a veterinarian finds obvious fleas when a flea comb is used. Despite the TV commercials, the educational pamphlets, the common nature of the parasite, there are still some significant awareness problems and a multitude of misconceptions.

Myths Veterinarians Hear Nearly Every Day

- My pet cannot have fleas because he lives entirely indoors.

Fleas thrive particularly well in the well-regulated temperatures in the home.

- My pet cannot have fleas because if there were any fleas they would be biting (insert name

of a person in the family reportedly sensitive to flea bites). Since this person is not being bitten, there must not be any fleas.

Despite *Ctenocephalides felis*' ability to feed of a wide variety of hosts, this flea definitely does not prefer human blood and won't eat it unless absolutely necessary. A newly emerged adult flea is hungry and may well take a blood meal from the first warm body it finds. An adult flea knocked off its normal host will also be desperate to find a new host and may feed on the nearest warm body it can find. In general, adult fleas regard human blood as a last choice and humans tend not to be bitten unless flea population numbers are high.

- We do not have fleas because we have only hard wood floors.

Fleas love to develop in the cracks between the boards of hard wood floors.

- My pet cannot have fleas because I would see them.

You cannot expect to see fleas as many animals are adept at licking them away. Sometimes all that is seen is the characteristic skin disease.

Fleas are adaptive and their life cycle is always active: eggs are laid, larvae are developing, pupae are growing, etc. The environmental temperature controls how fast this occurs. If you want to eradicate the flea population in a specific home, it is best to attack when numbers are low in the winter. It is a mistake to stop flea control products in the winter as it will be much harder to gain the upper hand in the spring and summer when the populations are rising.

The MORAL OF THE STORY IS THAT FLEAS SHOULD NOT BE UNDERESTIMATED AND IT IS IMPORTANT TO HIT THE FLEA POPULATION WHEN IT IS WEAKEST. HIT THEM HARD!!

The Flea Life Cycle

Learn it, know it, live it. There are four life stages of the flea and it is important to know how to break this life cycle in more than one place. This two-step approach provides the most rapid control and the least resistance to flea control agents in future flea generations.

The Egg

At any given time about one third of the flea population in someone's home is in the egg stage. The adult female flea lays up to 40 eggs daily. The eggs are laid on the host where they fall off to hatch in the environment. Eggs incubate best in high humidity and temperatures of 65 to 80 degrees Fahrenheit. (18.3-26.6 Celsius).

The Larvae

At any given time about 57% of the fleas in someone's home are in the larval stage. Larvae are like little caterpillars crawling around grazing on the flea dirt that is generally in their vicinity. Flea eggs and flea dirt both fall off the host. When the eggs hatch, there is a bounty of food prepared lovingly by all the host's fleas waiting for the hatchlings. This is the stage that picks up tapeworm eggs, which are likely to be in the vicinity, as they graze.

As they get to a certain age and size, a molt occurs. The first larval stage is called the first instar. After the first molt, the larva becomes the second instar. After the third molt, the larva

is called a third instar larva and is capable of spinning a cocoon and pupating.

The time between hatching and pupating (i.e., the time spent in the larval stage) depends on environmental conditions. It can be as short as 9 days.

Note: Larvae are killed at 95 degrees. This means that they must live in some area where they are protected from summer heat. This means the shade of the yard or indoors.

The Pupae

By this life stage most young fleas have been killed off by an assortment of environmental factors. Only 8% make it to the pupal stage but once they have spun cocoons they are nearly invincible. The cocoon is sticky and readily picks up dust and dirt. Inside the developing cocoon, the pupa is turning into the flea that we are familiar with. They are especially protected under carpet, which is why carpet has developed such a reputation as a shelter for fleas.

The pupa can remain dormant in its cocoon for many months, maybe even up to a year as it waits for the right time to emerge.

The Unfed Adult Flea

After the pupa develops, it does not automatically emerge from its cocoon. Instead, it is able to remain in the cocoon until it detects a nearby host. The mature pupa is able to detect the vibrations of an approaching host, carbon dioxide gradients, and sound and light patterns. When the mature pupa feels the time is right, he emerges from the cocoon, hungry and eager to find a host.

A common scenario occurs when a dog is boarded during the owner's vacation. The owner picks up the dog from the boarding kennel and returns home. The mature pupae have been waiting for a host and when the dog enters the home, a huge number of adult fleas emerge at once and attack the dog creating a sudden, heavy infestation. Often the boarding kennel is blamed for giving the dog fleas. What really happened was that the pupae waited to emerge while there was no host present and then they all emerged suddenly when the host arrived.

An unfed flea is able to live for months without a blood meal but during that time it is aggressively using all its powers to locate a host. Once it finds a host, it will never purposely leave the host.

The Fed Flea

After the adult flea finds a host and takes its first blood meal, metabolic changes occur that alter the flea forever. The flea is now called a fed flea and, if separated from its host, will die in only a few weeks without a blood meal. The female flea begins to produce eggs within 24 to 48 hours of her first blood meal and will lay eggs continually until she dies.

The average life span of the adult flea is 4 to 6 weeks, depending on the grooming abilities of the host.

ON AVERAGE, THE TIME PERIOD FROM EGG TO ADULT FLEA IS ABOUT 3 WEEKS.

A Few Words on the Common Tapeworm

There are many species of tapeworm but the one most of us are familiar with is the common

tapeworm, *Dipylidium caninum*. You should be familiar with this species and its life cycle.

Years ago, flea control meant foggers, shampoos, powders, collars, and sprays. While these products are still available, they have fallen largely aside in favor of the next generation products.

The next generation started in 1995 with the introduction of Program, an oral product that could be given once a month to a dog or cat and would sterilize - but not kill - any flea that bit the pet. The following year came Advantage and Frontline, topical products that could efficiently kill fleas for a month following an easy application. From there, Advantage has been modified to control additional parasites such as ticks and heartworm (Advantix, Advantage Multi), Frontline has been supplemented with flea sterilizers (Frontline Plus), and new insecticides (Revolution, Comfortis, Vectra, Promeris, Capstar) have been introduced.

At this point there are so many different products with so many additional effects that it is easiest to review them in table form. [LINK Flea Product Comparison Tables](#)

Is Resistance Futile?

We learned long ago that insecticide use represents a selection factor in a flea population. The resistant individuals survive and pass their genes on to offspring. Eventually a resistant population is produced. We want to avoid creating a population of fleas who laugh at our best insecticides. There are two ways of doing this:

The First Way to Avoid Resistance: Change Products Periodically

This seems simple and even obvious. If you want to make a resistant population, then keep exposing the population to the same insecticide and after enough generations your population will be resistant. If you switch to another insecticide, the group will be totally sensitive to the new insecticide. After a few more generations, change again.

Working against this method is the fact that advertisers encourage people to continue to use a product they like and this is, in fact, what people tend to do. The power of marketing is strong though, technically, it is better in the long run if a household alternates between two flea products each year.

The Second Way to Avoid Resistance: Use a Flea Sterilizer

A group of fleas that survives exposure to Frontline or Advantage cannot pass on their resistance genes if they have been sterilized by a second product. Program interferes with the production of chitin (the hard material making up the insect exoskeleton). The adult flea has already made its chitin but its off-spring need to develop a chitin egg-tooth to escape their eggs after development into larvae. A larva whose mother has had a big drink of lufenuron-laden blood will not be able to hatch.

Another such sterilizer is methoprene (the "plus" in Frontline Plus). Methoprene was developed as an additive to flea sprays and foggers. It is totally non-toxic - it doesn't even kill fleas - and represents a group of insect control agents called insect growth regulators or juvenoids. Methoprene mimics a youth hormone of the flea so that larvae who consume it in flea dirt cannot mature and eggs laid by female fleas who have been topically treated with it cannot develop. Twenty years ago, this compound was a miracle in flea control. For the first time it enabled the life cycle to be broken in two places. Now methoprene is rather old hat but it has been included in Frontline to prevent Frontline resistance. Newer insect growth regulators have been released and are also in use (see flea comparison chart).

Resistance is an important phenomenon and it should not be ignored. You may inadvertently

be promoting resistance without realizing it.

Look for this clue:

- At first the product worked really well but now it must be applied again after 2 to 3 weeks. It doesn't last the whole month anymore.

When someone starts to use the product more frequently in this way, they are increasing the selection pressure and creating resistance more rapidly. What they should do in this situation instead, is add a sterilizer or change to another product.

In conclusion, fleas are here to stay one way or the other. Know as much about this pest as you do about the dogs and cats that it feeds upon. You cannot know too much when it comes to flea control.

Additional Questions

Q: On a given dog or cat, sometimes the fleas look smaller than average. Are these baby fleas?

A: No. Remember the flea life cycle. The fleas you see on a dog or cat are adult fleas. They vary in size depending on the nutrients they got in prior development as well as individual genetic make-up. Adult fleas have an exoskeleton made of chitin, as do all insects. They can't grow bigger than they are.

Q: I put the topical product on the dog 3 weeks ago but now I'm seeing fleas again. Do I need to put more on?

A: No. Remember how these products work. In the first 20 days or so, the topicals reliably kill fleas before they have a chance to bite the host. In the last 10 days, they don't kill as quickly. Seeing fleas does not mean the product isn't working and you definitely should not reapply the product more frequently (they will get resistance). If you don't like seeing any fleas at all in the last 10 days of the topical application, a few Capstar tablets for home use ought to take care of this situation.

Q: Is it OK to save money by getting a large tube of one of the topical products and dividing it up with a syringe into smaller doses?

A: Yes and no, depending on the product. Some products are licensed as insecticides through the EPA and some are licensed as drugs through the FDA. Of those that are drugs, some are over-the-counter and some are prescription. Advantage and Frontline are insecticides and they may not be used in any manner other than the way they are labeled. Larger sizes cannot be broken up into smaller doses legally.

The products that are labeled as drugs include: Program, Revolution, and Capstar. These products can be used with some leeway but only according to the doctor's discretion, so ask your veterinarian.

Q: Why is buying product from the Internet or from the pet supply store some kind of a big deal?

A: With the flea product revolution of 1995, the market for flea products changed from being primarily pet supply store / over-the-counter outlets to primarily directly through veterinarians. The pharmaceutical companies like this arrangement as they feel that their products are now being marketed by trained personnel who can explain best how the product

should be used or not used. The veterinarians also like this arrangement as they have more input regarding what their patients are using. The pet supply stores do not like this arrangement at all as they have lost their market-share. In an effort to gain it back, they have resorted to a number of black market techniques (paying large sums of money to veterinarians to order product for them, going to other countries to buy product and smuggling it back to the U.S. for re-sale, even counterfeiting product). We caution anyone who buys flea products from a black market source. Product purchased through pet supply stores or from an online source that is not a veterinary hospital is not guaranteed by the manufacturer.

Copyright 2011 - 2012 by the Veterinary Information Network, Inc. All rights reserved.

THE PET HEALTH LIBRARY

By Wendy C. Brooks, DVM, DipABVP

Educational Director, VeterinaryPartner.com

Giardia



When stained, the *Giardia* organism appears to have a funny face.

Giardia is the genus of a protozoan parasite that is infectious to both humans and pets all over the world. *Giardia* consists of flagellates, which mean they move by means of several whip-like structures called flagella. They live as a form called a trophozoite, or "troph" for short, in the intestine where they cause diarrhea. In fresh fecal samples, trophozoites can sometimes be captured. They swim around in a jerky fashion characteristic of flagellates and appear as a funny face (the two nuclei form the eyes and median bodies form the mouth).

After a short period of time outside the host's intestine, the trophozoites round up and form cysts, which enable them to survive environmental conditions without a host to protect them. The cyst



can live for many months with two incompletely formed trophozoites inside, ready to infect a new host. Contaminated water is the classical source of a *Giardia* infection.

After it has been swallowed, the cyst shell is digested away freeing the two trophozoites who go forth and attach on the intestinal lining. The troph has a structure called a ventral disc, which is like a suction cup and attaches the organism's body to the intestine. If the troph wants to move to another spot, it lifts itself up and swims to a new spot via its flagella (trophs tend to live in different intestinal areas in different host species, and depends on the host's diet). The troph may round itself up and form a cyst while still inside the host's body. If the host has diarrhea, both trophs and cysts may be shed in the diarrhea; either form can be found in fresh stool.

After infection, it takes 5 to 12 days in dogs or 5 to 16 days in cats for *Giardia* to be found in the host's stool. Diarrhea can precede the shedding of the *Giardia*. Infection is more common in kennel situations where animals are housed in groups.

How Does *Giardia* Cause Diarrhea?

No one is completely sure but infection seems to cause problems with normal intestinal absorption of vitamins and other nutrients. Diarrhea is generally not bloody. Immune-suppressive medications such as corticosteroids can re-activate an old *Giardia* infection.

Diagnosis

In the past, diagnosis was difficult. The stool sample being examined needed to be fresh, plus *Giardia* rarely show up on the usual fecal flotation testing methods used to detect other parasites. Traditionally, a fecal sample is mixed in a salt or sugar solution such that any parasite eggs present will float to the top within 10 to 15 minutes. Some tricks that have been used to facilitate

finding *Giardia* include:

- Being sure to examine a direct smear of the fecal sample in hope of finding swimming trophs.
- Floating the sample in zinc sulfate, a solution that has been found superior in getting *Giardia* cysts to float.
- Staining the sample with some sort of iodine under the microscope to make the *Giardia* show up easier.

What has made *Giardia* testing infinitely easier is the development of a commercial ELISA test kit, which similar in format to home pregnancy test kits. A fecal sample is tested immunologically for *Giardia* proteins. This method has dramatically improved the ability to detect *Giardia* infections and the test can be completed in just a few minutes while the owner waits.

Giardia shed organisms intermittently and may be difficult to detect. Sometimes pets must be retested in order to find an infection.

Treatment

A broad spectrum dewormer called [fenbendazole](#) (Panacur®) seems to be the most reliable treatment at this time. [Metronidazole](#) (Flagyl®) in relatively high doses has been a classical treatment for *Giardia* but studies show it to only be effective in 67% of cases. The high doses required to treat *Giardia* also have been known to result in temporary neurologic side effects or upset stomach. For some resistant cases, both medications are used concurrently. The ELISA test for *Giardia* should go negative within 2 weeks of treatment indicating success.

Because cysts can stick to the fur of the infected patient and be a source for re-infection, the positive animal should be bathed at least once in the course of treatment.

Not all patients with *Giardia* actually have diarrhea but because *Giardia* is the most common intestinal parasite affecting humans in North America, treatment is generally recommended for the pet who tests positive even if no symptoms are seen. The idea is to reduce human exposure.

Environmental Decontamination

The most readily available effective disinfectant is probably bleach diluted 1:32 in water, which in one study required less than one minute of contact to kill *Giardia* cysts. Organic matter such as dirt or stool is protective to the cyst, so on a concrete surface basic cleaning should be effected prior to disinfection. Animals should be thoroughly bathed before being reintroduced into a "clean" area. A properly chlorinated swimming pool should not be able to become contaminated. As for areas with lawn or plants, decontamination will not be possible without killing the plants and allowing the area to dry out in direct sunlight.

A Footnote on Vaccination

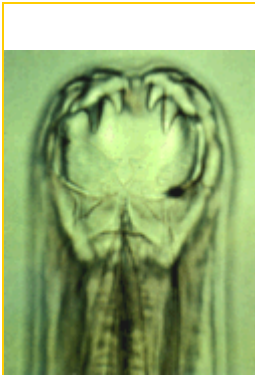
A vaccine against *Giardia* was previously available, not to prevent infection in the vaccinated animal but to reduce the shedding of cysts by the vaccinated patient. In other words, the vaccine was designed to reduce the contamination of a kennel where *Giardia* was expected to be a problem. This would be helpful during an outbreak in a shelter or rescue situation but is not particularly helpful an average owner wants to simply prevent infection. Because of limited usefulness of the vaccine, its manufacture was discontinued in 2009.

The Pet Health Care Library

Hookworms

The hookworm (*Ancylostoma caninum*, *Ancylostoma braziliense*, *Uncinaria stenocephala*) is one of the classical internal parasites of puppies, the others being [roundworms](#), [tapeworms](#), and [coccidia](#). Hookworm infection has several features that are of interest to the caretakers of dogs:

- Hookworms (particularly *Ancylostoma caninum*) suck blood.
- Hookworms can be transmitted to unborn pups.
 - Hookworms can infect humans.

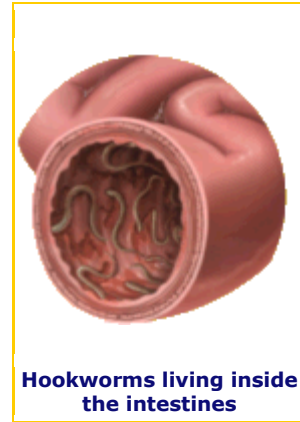


adult hookworm (note teeth)

Before elaborating on these aspects of hookworm infection, it is important to understand the life cycle of the hookworm, encompassing how infection happens, how the parasite lives, etc.

Life Cycle of the Hookworm

The adult hookworm lives in the small intestine of its host. It hangs on to the intestinal wall using its six sharp teeth. Unlike other worms that just absorb the digested food through their skin as it passes by; the hookworm feeds by drinking 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.



Hookworms living inside the intestines

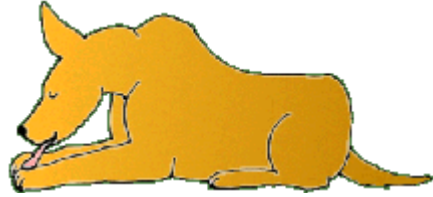


hookworm eggs

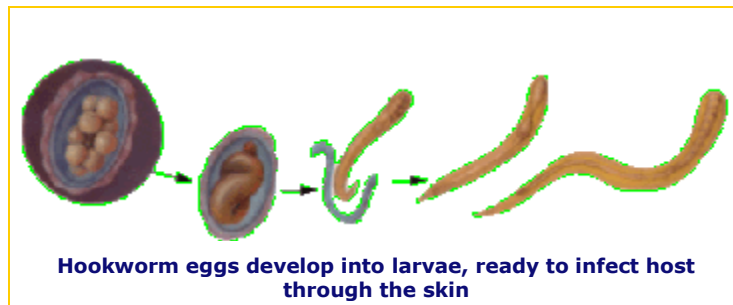


hookworms living in soil

The egg hatches in the environment and develops from a first stage larva (the hatchling) to a second stage larva and finally a third stage larva, which is ready to infect a new host.



The larva can infect its new host in several ways. One way is to penetrate the host's skin directly through the feet or belly or whatever part of the skin is touching the ground. 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.



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 into fourth stage larvae and when they are ready they break out of the lung, climb up the trachea, get coughed into the throat and swallowed. Once back in the intestine, these well-traveled worms will complete their maturation to adulthood, rejoining friends that never left the intestine on a migration.

Not all the worms that begin this treacherous 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 periodically emerging and continuing their migration.

The adult worms live by sucking blood from the intestine. Their eggs are passed by the host into the environment where a new host picks them up. The developing larvae may migrate widely through the new host's body before settling down to complete their maturation.

Now let us return to the points we want to emphasize.

Hookworms Suck Blood

Hookworm infection can be looked at as a natural check in the canine population as it is frequently lethal to young puppies. A young puppy is growing and that includes making enough new blood to serve not only its needs but also the needs of its growth. Growing requires a tremendous red blood cell production from the puppy's bone marrow, 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.

Treatment involves deworming with one of several products: mebendazole (Telmintic®), fenbendazole (Panacur®), or pyrantel pamoate (Nemex®, Drontal®, Strongid T®). Deworming should be repeated in approximately 30 days. 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.

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.

Hookworms are Transmitted to Unborn Pups

Infection of a very young puppy can occur in two ways not addressed in the above description of transmission.



Typically 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.

Pregnancy hormones unfortunately serve as little wake-up calls to encysted hookworm larvae, only this time the little worms migrate to the unborn puppies and to the mammary gland.

Some members of the litter will be born infected. Others will become infected by drinking the contaminated milk of their own mother. If this is not enough to infect the entire litter, 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 risk over adult dogs when it comes to hookworms. The Centers for Disease Control and Prevention recommends automatically deworming puppies for hookworms beginning at age 2 weeks in areas where hookworms are common.

Can We Prevent Transmission from the Mother?

The answer is yes 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 (Panacur®) 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. Female dogs using Proheart6 for heartworm prevention are believed to pass fewer hookworm larvae on to their pups.

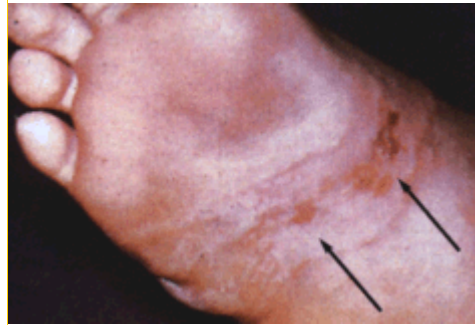
Hookworms Can Infect Human Beings





Cutaneous Larva Migrans (CLM) occurs as red, inflamed lesions in the skin where the larvae of canine hookworms burrow under the skin

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 eager infective 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 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.

Please visit the CDC's hookworm fact sheet at:
http://www.cdc.gov/ncidod/dpd/parasites/hookworm/factsht_hookworm.htm

Decontaminating the Environment

Many people are concerned about how to decontaminate the backyard or property that has housed an infected dog. The good news is that unlike roundworms that are extremely hardy in the environment, hookworm eggs deplete their energy reserves in a few months and die. Further, hookworm eggs do not survive freezing temperatures. If you use bleach to clean an area, the protective coating is removed from the hookworm egg and the egg will become dehydrated and will die. Borates raked into the soil will also kill hookworm eggs but will kill grass and vegetation as well.

Prevention

Most heartworm preventives will also prevent hookworm infection.

Feline Hookworms

There are two species of hookworms in cats: *Ancylostoma tubaeforme* and *Ancylostoma braziliense*, the former being the most aggressive blood sucker. The story is pretty much the same for cats with a few exceptions:

- Kittens cannot be infected before birth nor can they be infected by nursing. Cats are generally infected by larvae invading the skin or by eating an infected prey animal.

- Dogs can become infected by eating an infected vertebrate host and so can cats but there is an important invertebrate can infect a cat: the cockroach. A scuttling bug can be a tempting toy for a cat but eating the cockroach can transmit hookworm larvae.
- The Companion Animal Parasite Control Council recommends deworming kittens beginning at age 3 weeks with pyrantel pamoate.
- There are numerous products approved for the treatment of feline hookworm infection: ivermectin, milbemycin oxime, emodepside (active ingredient in Profender®), selamectin, and moxidectin.

Copyright 2011 - 2012 by the Veterinary Information Network, Inc. All rights reserved.

Permanent Link: <http://www.VeterinaryPartner.com/Content.plx?P=A&A=1530>

The Pet Health Care Library

Roundworms: Dogs & Puppies

Toxocara Canis and *Toxocara Leonina*: Roundworms of Dogs and Puppies



There are two species of roundworms affecting dogs and puppies: *Toxocara canis* and *Toxascaris leonina*. Both are treated with the same medication protocol so when eggs are seen on a fecal flotation exam it may not be necessary to determine which species is present. *T. leonina* can infect both dogs and cats, so identifying this roundworm might be helpful in indicating which pets in the household are at risk for further contagion.

Note: Fresh feces are not infectious.

Toxocara Canis

How Infection Occurs

In dogs, there are four ways by which infection with *Toxocara canis* occurs:

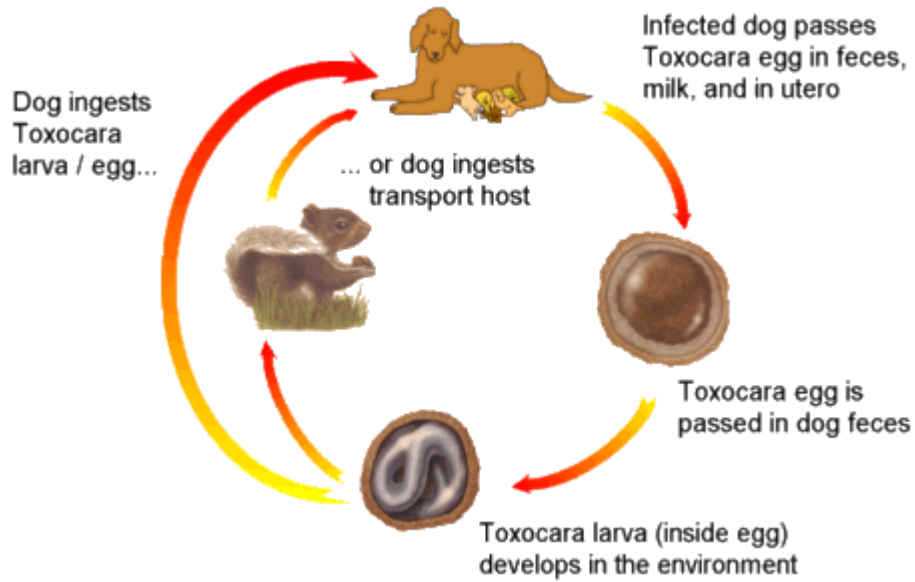
- Consuming infective worm eggs from soil in the environment (generally through normal grooming).
- Nursing from an infected mother dog.
- Consuming a prey animal (usually rodent) that is carrying developing worms.
- During embryonic development when an infected mother dog is pregnant (most puppies are infected this way).

Note: cats cannot be infected with *Toxocara canis*.

Life as a Roundworm

Toxocara canis has one of the most amazing life cycles in the animal kingdom. It is crucial to understand this life cycle if effective treatment is to be pursued.

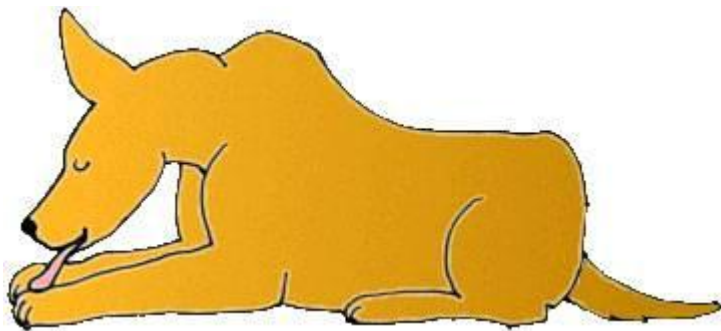




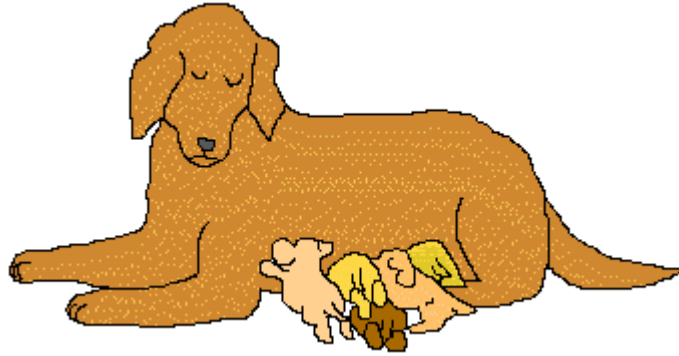
Step One: *Toxocara* eggs are passed in the host's feces.

If a fecal sample is tested, the eggs can be detected but the eggs are too young to infect a new host at this stage; the worm inside must develop for a month or so before it can establish infection. During this time of worm egg development, the feces has melted into the environmental soil and is no longer evident; the worm eggs are loose in the garden (or other environmental) dirt. If environmental conditions are favorable, it takes about a month for the egg to become infective but *Toxocara* eggs are famous for weathering harsh environmental conditions. Eggs can remain infective for months to years.

Note: Fresh feces are not infectious. **Soil contaminated with feces is infectious.**



Step Two: The egg containing what is called a second stage larva is picked up from the dirt by a dog or by some other animal, usually in the course of normal self-grooming. The egg hatches in the new host's intestinal tract and the young worm burrows its way out of the intestinal tract to encyst in the host's other body tissues. If the new host is a dog, the life cycle proceeds. If the new host is a member of another species, the larvae wait encysted until the new host is eaten by a dog.



Step Three: These second stage larvae can remain encysted happily for years. If the host is a dog, the larvae mostly encyst in the host's liver. When the time comes to move on, the larvae excyst and migrate to the host's lungs where they develop into third stage larvae. They burrow into the small airways and travel upward towards the host's throat. A heavy infection can produce a serious pneumonia. When they get to the upper airways, their presence generates coughing. The worms are coughed up into the host's throat where they are swallowed thus entering the intestinal tract for the second time in their development.

If the host is pregnant, the larvae do not migrate to the lung after they excyst; instead they home to the uterus and infect the unborn puppies. The second stage larvae make their way to the puppies' lungs to develop into third stage larvae.

If the host is a nursing mother, second stage larvae can migrate to the mammary gland instead of the lung after excysting. Puppies can be infected by drinking their mother's milk, though, due to the intrauterine cycle described above, the litter would probably already be infected.

Note: When dogs are dewormed with traditional dewormers, this affects only worms in the intestinal tract. It does not affect encysted larvae. It is difficult to prevent mother-to-puppy transmission and routine deworming is not adequate. It is possible to prevent infection in unborn puppies by using a specific daily protocol of fenbendazole (your veterinarian can provide details) or with the new generation product AdvantageMulti® that contains moxidectin.

Step Four: Once back in the intestine, the larvae complete their maturation and begin to mate. The first eggs are laid about one week after the fourth stage larvae have arrived in the intestine and about 4 to 5 weeks after infection has first occurred. From here the cycle repeats.

Why is Infection Bad?

Roundworm infection can have numerous negative effects. It is a common cause of diarrhea in young animals and can cause vomiting as well. Sometimes the worms themselves are vomited up which can be alarming as they can be quite large with females reaching lengths of up to seven inches. The worms consume the host's food and can lead to unthriftiness and a classical "pot-bellied" appearance. Very heavy infections can lead to pneumonia as the worms migrate and, if there are enough worms, the intestine can actually become obstructed.

It should also be noted that human infection by this parasite is especially serious (see below). It is important to minimize the contamination of environmental soil with the feces of infected animals so as to reduce the exposure hazard to both humans and other animals.

How do we Know if our Dog is Infected?

You may not know if your dog is infected, and this is one of the arguments in favor of regular deworming. Regular deworming is especially recommended for dogs that hunt and might consume the flesh of hosts carrying worm larvae. Puppies are frequently simply assumed to be infected and automatically dewormed.

Of course, there are ways to find out if your dog is infected. If a dog or puppy vomits up a worm, there is a good chance this is a roundworm (especially in a puppy). Roundworms are long, white and described as looking like spaghetti. Tapeworms can also be vomited up but these are flat and obviously segmented. If you are not sure what type of worm you are seeing, bring it to your veterinarian's office for identification.



Fecal testing for worm eggs is a must for puppies and a good idea for adult dogs having their annual check up. Obviously, if there are worms, they must be laying eggs in order to be detected, but by and large fecal testing is a reliable method of detection.

How do we get rid of Roundworms?

Numerous deworming products are effective. Some are over the counter and some are prescription. Many flea control and/or heartworm prevention products provide a monthly deworming that is especially helpful in minimizing environmental contamination. Common active ingredients include:

- Febantel (active ingredient in Drontal and Drontal plus)
- Pyrantel pamoate (active ingredient in Strongid, Nemex, Heartgard Plus and others)
- Piperazine (active ingredient in many over the counter products)
- Fenbendazole (active ingredient in Panacur)
- Milbemycin oxime (active ingredient of Interceptor, Sentinel, and Trifexis)
- Moxidectin (active ingredient in AdvantageMulti).

There are two important concepts to keep in mind about deworming. Medications essentially anesthetize the worm so that it lets go of its grip on the host's intestine and passes out with the stool. Once it has been passed, it cannot survive in the environment and dies.

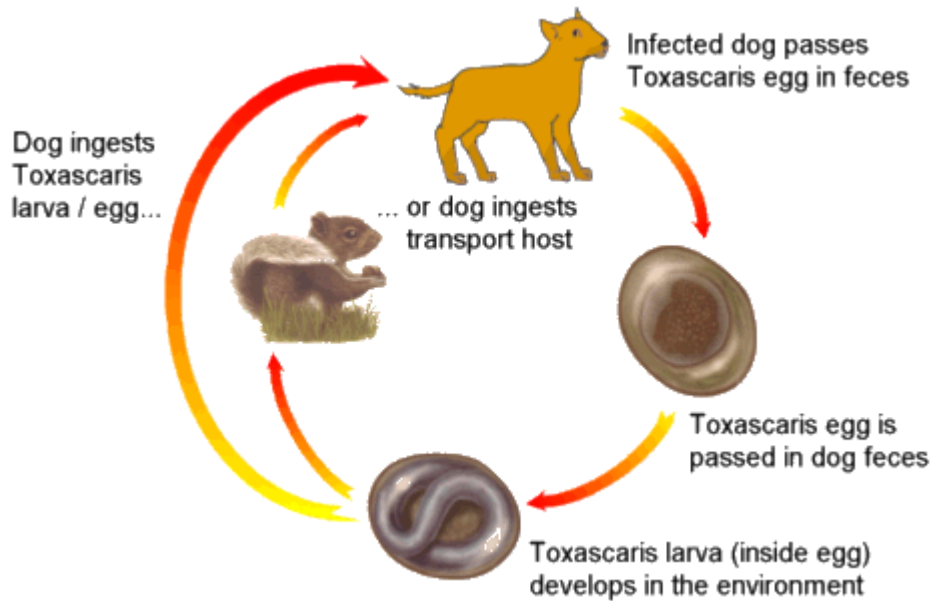
This means that you will likely see the worms when they pass, so be prepared as they can be quite long and may still be alive and moving when you see them.

The other concept stems from the fact that all the larvae in migration cannot be killed by any of these products. After the worms are cleared from the intestine, they will be replaced by new worms completing their migration. This means that a second and sometimes even a third deworming is needed to keep the intestine clear. The follow-up deworming is generally given several weeks following the first deworming to allow for migrating worms to arrive in the intestine where they are vulnerable.

Do not forget your follow-up deworming.

What about *Toxascaris Leonina*?

The life cycle of *Toxascaris leonina* is not nearly as complicated. They do not migrate through the body in the way that *Toxocara* does. Instead, the *Toxascaris* second stage larva is consumed and simply matures in the intestine, a process that takes 2 to 3 months. Like *Toxocara*, *Toxascaris* can infect hosts of other species, though with *Toxascaris* the larvae can develop into third stage larvae in these other hosts while with *Toxocara* larval development is arrested in species other than the dog.



Note: *Toxascaris leonina* can infect both dogs and cats alike.

For More Information

The Companion Animal Parasite Council has an educational site for pet owners on roundworms. See [Pets and Parasites](#) for more information.



See more on [roundworms in cats](#), and on [roundworms in people](#).

Copyright 2012 - 2012 by the Veterinary Information Network, Inc. All rights reserved.

Permanent Link: <http://www.VeterinaryPartner.com/Content.plx?P=A&A=476>

The Pet Health Care Library

Tapeworms (Common tapeworms, *Dipylidium caninum*)

The Common Tapeworm: *Dipylidium caninum*

Biology of the Parasite

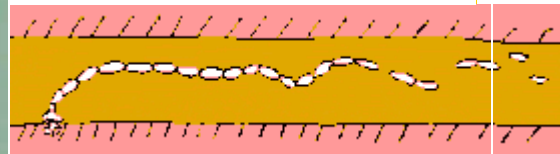
The adult *Dipylidium caninum* lives in the small intestine of dogs or cats. It is hooked onto the intestinal wall by a structure called a rostellum, which is sort of like a hat with hooks on it. The tapeworm also has six rows of teeth it uses to grab on to the intestinal wall. Most people are confused about the size of a tapeworm because they only see its segments, which are small; the entire tapeworm is usually 6 inches or more.



Adult Dipylidium. The segments are easily seen. The thick end is the head where segments drop off.



Head of Dipylidium



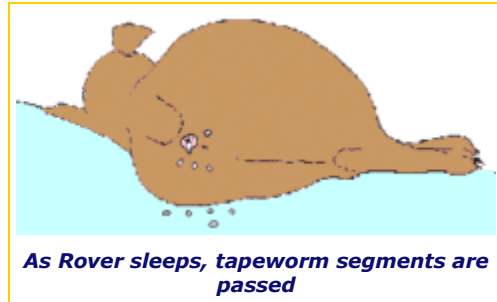
Adult tapeworm segment



Microscopic view of a tapeworm segment

Once docked like a boat to the host's intestinal wall, the tapeworm begins to grow a long tail. The tapeworm's body is basically a head segment to hold on with, a neck, and many tail segments. Each segment making up the tail is like a separate independent body, with an independent digestive system and reproductive tract. The tapeworm absorbs nutrients through its skin as the food being digested by the host flows past it. Older segments are pushed toward the tip of the tail as new segments are produced by the neckpiece. By the time a segment has reached the end of the tail, only the reproductive tract is left. When the segment drops off, it is basically just a sac of tapeworm eggs.

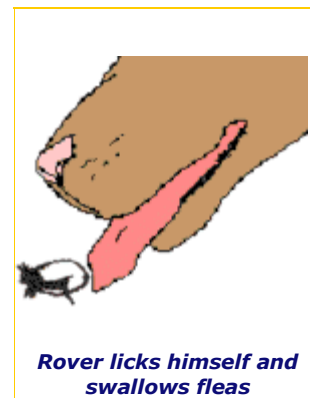
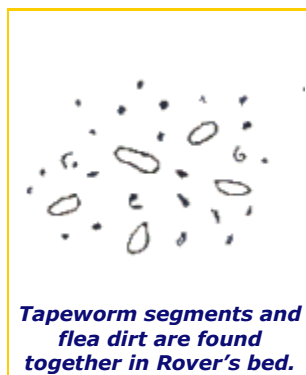




The sac is passed from the host's rectum and out into the world, either on the host's stool or on the host's rear end. The segment is the size of a rice grain and is able to move. Eventually the segment will dry up and look more like a sesame seed. The sac breaks and tapeworm eggs are released. These eggs are not infectious to mammals. The tapeworm must reach a specific stage of development before it can infect a mammal.



Larval fleas are generally hatching in this vicinity and these larvae are busy grazing on organic debris and flea dirt (the black specks of digested blood shed by adult fleas to nourish their larvae). The flea larvae do not pay close attention to what they eat and innocently consume tapeworm eggs.



As the larval flea progresses in its development, the tapeworm inside it is also progressing in development. By the time the flea is an adult, the tapeworm is ready to infect a dog or cat.

The young tapeworm is only infectious to its mammal host at this stage of development. The flea goes about its usual business, namely sucking its host's blood, when to its horror it is licked away by the host and swallowed.

Inside the host's stomach, the flea's body is digested and the young tapeworm is released. It finds a nice spot to attach and the life cycle begins again. It takes 3 weeks from the time the flea is swallowed to the time tapeworm segments appear on the pet's rear end or stool.

Controlling fleas is essential to prevent recurring infections with this species of tapeworm.

See information on [flea control](#).

FAQ

Why is it Called a Tapeworm?

This creature gets its name because its segments and body are very flat and look like a piece of tape.

What do they look like?

Inside a pet, the adult tapeworm can be a half a foot long or more. It is made of small segments, each about the size of a grain of rice. The tapeworm's head hooks onto the pet's intestine with tiny teeth and the worm absorbs nutrients through its skin. Each segment contains a complete set of organs but as new segments grow in at the neck area and older segments progress to the tip of the tail, the organs disintegrate except for the reproductive organs. When the segment drops off from the tail tip, it is only a sac of eggs.

This segment is white and able to move when it is fresh and, at this time, looks like a grain of white rice. As the segment dries, it looks more like a sesame seed.

Where do they Come from?

There is no other way for a pet to get *Dipylidium caninum* except from fleas.

Many people who had thought their pet could not possibly have fleas find out about the infestation this way. The tapeworm segment breaks open, releasing its eggs. A larval flea consumes the egg along with the flea dirt that it normally eats. As the larval flea matures, so does the baby tapeworm. When a grooming dog or cat licks the flea and swallows it, the dead flea is digested in the dog's stomach, releasing the baby tapeworm. The tapeworm is passed to its new home in the dog or cat's small intestine, where it attaches and lives its life.

This parasite does not harm the pet in any way as there are plenty of nutrients passing by to serve both the host and its tapeworm (tapeworms require very little nutrients.) Still, high performance dogs, who need every calorie working for them, may show a decrease in performance because of a tapeworm infection.

There is another type of tapeworm that may be confused with *Dipylidium caninum* and that is the *Taenia* genus of tapeworms. This tapeworm has a segment that looks different and has a different mechanism of infection.

How do you Know if your Pet has them? Why do they Sometimes Fail to Show up in a Fecal Test?

Because the eggs are passed by the pet in packets (segments), they often do not show up on the fecal exam; the packet must break open for the eggs to be seen. Consider that the pet has tapeworms if segments are seen under its tail, around its anus, or on its feces. Segments can be passed in small groups connected to each other, leading the owner to describe a worm that sounds larger than a grain of rice. Tapeworm segments are also quite flat.

Some people will mistake maggots in the stool for tapeworms. Maggots are not seen in freshly passed stool and are not flat.

Can People get them?

Theoretically, yes, people can get them but they must be infected the same way dogs and cats are: by swallowing an infected flea.

How do we Get Rid of Them?

Tapeworms are killed by different medications (one is called praziquantel), which is administered by injection, tablet, or topically. The tapeworm is killed and digested with the pet's food. It is not passed in the stool later.

Why do some Veterinarians Recommend Two Treatments and others only Recommend One Treatment?

Only one treatment is needed to kill the tapeworms in the body; however, many clinics recommend a second injection in three weeks. The reason for the second injection is this: If the owner finds out at the time of their office visit that they need to control fleas to control tapeworms, they will need at least a month or so to control the fleas.

After the first treatment is given, there is no reason why the pet cannot immediately get reinfected. It probably will reinfest itself at some point. By seeing the animal in three weeks and giving another treatment after the fleas are controlled, there is a good chance that the tapeworms will not be back three weeks later. It takes three weeks from the time the pet swallows the tapeworms to the time segments can be seen by the owner.

On the other hand, who knows when the pet will swallow another infected flea? Our recommendation is that a single treatment be administered whenever segments are seen.

If One Pet Has Tapeworm Segments, can it be Assumed that they all Do?

No, just because one pet in the household has swallowed an infected flea does not mean they all have. Our recommendation is to deworm only the pets who have obvious tapeworms.

Why Might a Pet Continue to get Tapeworm Infections?

While many people would like to blame the medication as ineffective, the truth is that there must be an on-going flea population in the pet's environment. The key to eradicating *Dipylidium caninum* is flea control.

Copyright 2010 - 2012 by the Veterinary Information Network, Inc. All rights reserved.

Permanent Link: <http://www.VeterinaryPartner.com/Content.plx?P=A&A=562>

Ticks: Arthropod Parasites

Authored by: Becky Lundgren, DVM

VP Client Information Sheets

Ticks are skin parasites that feed on the blood of their hosts. Ticks like motion, warm temperatures from body heat, and the carbon dioxide exhaled by mammals, which is why they are attracted to such hosts as dogs, cats, rodents, rabbits, cattle, small mammals, etc. The bite itself is not usually painful, but the parasite can transmit diseases and cause tick paralysis, which is why tick control is so important. (Removing the ticks leads to rapid improvement of the paralysis.)

It takes several hours for an attached tick to transmit disease, so owners can usually prevent disease transmission to their pets by following a regular schedule to look for and remove ticks.

Tick Life Cycle

Most types of ticks require three hosts during a two-year lifespan. Each tick stage requires a blood meal before it can reach the next stage. Hard ticks have four life stages: egg, larva, nymph, and adult. Larvae and nymphs must feed before they detach and molt. Adult female ticks can engorge, increasing their weight by more than 100 fold. After detaching, an adult female tick can lay approximately 3,000 eggs.

During the egg-laying stage, ticks lay eggs in secluded areas with dense vegetation. The eggs hatch within two weeks. Some species of ticks lay 100 eggs at a time, others lay 3,000 to 6,000 per batch. Once the eggs hatch, the ticks are in the larval stage, during which time the larvae move into grass and search for their first blood meal. At this stage, they will attach themselves for several days to their first host, usually a bird or rodent, and then fall onto the ground. The nymph stage begins after the first blood meal is completed. Nymphs remain inactive during winter and start moving again in spring. Nymphs find a host, usually a rodent, pet, or human. Nymphs are generally about the size of a freckle. After this blood meal, ticks fall off the host and move into the adult stage. Throughout the autumn, male and female adults find a host, which is again usually a rodent, pet, or human. The adult female feeds for 8 to 12 days. The female mates while still attached to her host. Both ticks fall off, and the males die. The female remains inactive through the winter and in the spring lays her eggs in a secluded place. If adults cannot find a host animal in the fall, they can survive in leaf litter until the spring.

What are the best ways to deal with these blood-sucking parasites?

Environmental Control

Treating the yard and outdoor kennel area, if any, is an important tool in the arsenal against ticks. There are products containing fenvalerate, that can be used to spray the outdoor area. Fenvalerate is not harmful to the environment. During prime tick months in the summer, spraying may be necessary every 1 to 2 weeks.

If ticks are indoors, flea and tick foggers, sprays, or powders can be used. Inside, ticks typically crawl (they don't jump) up and may be in cracks around windows and doors. A one-foot barrier of insecticide, where the carpeting and wall meet, can help with tick control.

Prevent Ticks from Attaching

If your pet goes outside regularly, you can use some type of residual insecticide. Frontline (fipronil) is a liquid applied to the skin between a dog's shoulders that discourages ticks from

staying or implanting. Revolution (selamectin) is labeled for one kind of tick. A permethrin spray can be used on dogs (but not in cats, for whom it can be fatal) as a tick repellent and killer.

If you use a liquid spray treatment, cats and skittish dogs typically prefer a pump bottle because of the noise from aerosol cans. Avoid topical powders if your pet has a respiratory condition. Powders are fairly easy to apply, but they can make a real mess, and they often contain permethrin. Shampoos are useful only for ticks that are already on your pet. An amitraz collar, such as Preventic[®], has some effectiveness against ticks. Like Frontline, amitraz cannot keep all ticks off your pet, but it discourages ticks from implanting or staying on. The collar might be somewhat more water resistant than a residual insecticide, so if your dog likes to swim, the collar might be a better choice. Flea combs can be used to help remove ticks. Wash your pet's bed frequently.

Some people use a topical spray, but don't realize they should not use more than one insecticide or repellent. Doubling the amount of anti-tick product, or using two at once, may cause toxicity problems. DEET, found in many over-the-counter insecticides, is toxic to pets. Any spray insecticide labeled for use on clothing should not be sprayed directly on pets.

Find and Remove the Ticks

The best way to find ticks on your pet is to run your hands over the whole body. Check for ticks every time your pet comes back from an area you know is inhabited by ticks. Ticks attach most frequently around the pet's head, ears, neck, and feet, but are by no means restricted to those areas.

The safest way to remove a tick is to use rubbing alcohol and a pair of tweezers. Dab rubbing alcohol on the tick, and then use the tweezers to take hold of the tick as close to the dog's skin as you can; pull slowly and steadily. Try not to leave the tick's head embedded in the dog's skin. Don't squeeze the tick because it might inject some disease-causing organisms, such as bacteria, viruses, protozoa, or other agents, into the animal during the process. Risk of disease transmission to you, while removing ticks, is low but you should wear gloves if you wish to be perfectly safe. Do not apply hot matches, petroleum jelly, turpentine, nail polish, or just rubbing alcohol alone (the tick must be pulled out after application of alcohol) because these methods do not remove the ticks and they are not safe for your pet.

Once you have removed a live tick, don't dispose of it until you have killed it. Put the tick in alcohol or insecticide to kill it.

Watch for Infection and Diseases

After you pull a tick off, there will be a local area of inflammation that could look red, crusty, or scabby. The tick's attachment causes irritation. The site can get infected; if the pet is scratching at it, it is more apt to get infected. A mild antibiotic, such as over-the-counter triple antibiotic ointment can help, but usually is not necessary. The inflammation should go down within a week. If it stays crusty and inflamed longer than a week, it might have become infected.

Ticks can transmit diseases to pets and humans that the ticks contract from a previous host. Ticks can parasitize many different mammal species, birds, and reptiles. Lyme disease is one that most people have heard about, but ehrlichiosis is a possibility; it is a rickettsial disease, and its progression from an acute to a chronic stage can be prevented by early treatment. Babesiosis causes red blood cell destruction and anemia. Rocky Mountain spotted fever is the most prevalent rickettsial disease in humans.

Although ticks can transmit diseases, they are usually nothing more than a nuisance. The best approach is to prevent them from embedding, and once embedded, to remove them quickly. As long as you stay on top of the situation, your pets should cruise right through the tick season with no problems.

Copyright 2009 - 2012 by the Veterinary Information Network, Inc. All rights reserved.

Permanent Link: <http://www.VeterinaryPartner.com/Content.plx?P=A&A=2311>

Whipworms

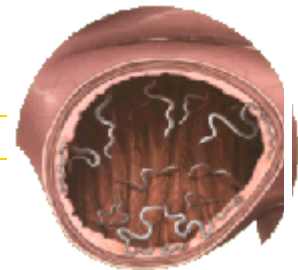
Authored by:

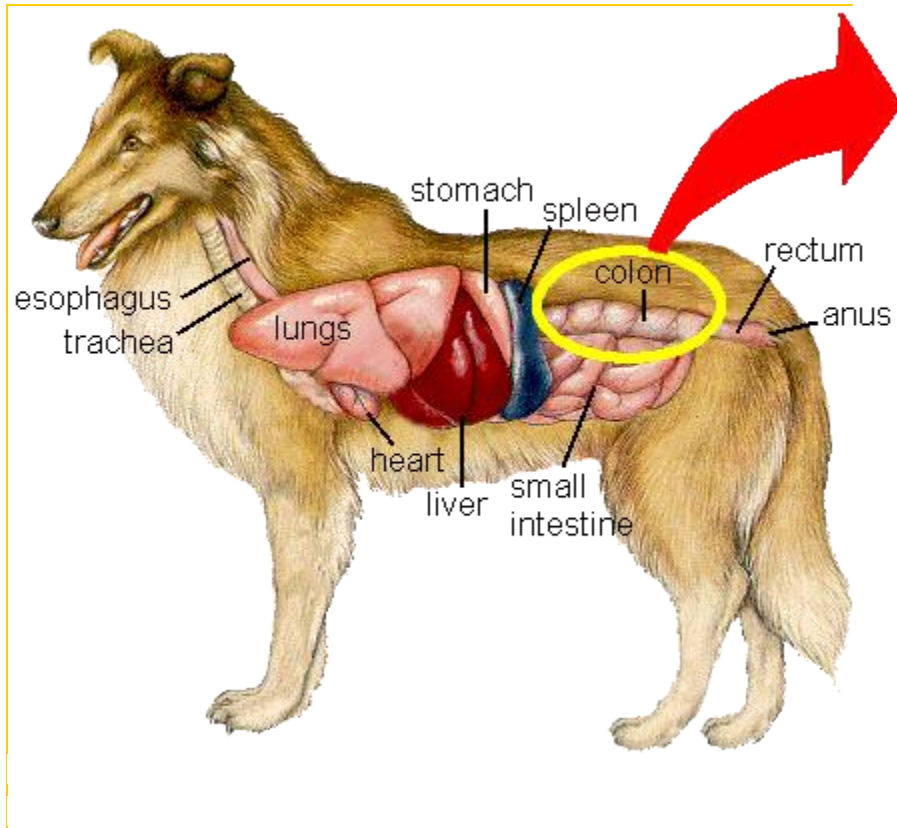
The Pet Health Care Library

(*Trichuris Vulpis* and relatives)



This worm is one of the "big four" intestinal parasites with which our canine friends must contend: [roundworms](#), [tapeworms](#), [hookworms](#), and whipworms. The whipworm that affects dogs (*Trichuris vulpis*) is substantially smaller than the other worms (a mere 30-50 mm in length, about two inches maximum) and is rarely seen as it lives in the cecum (the part of the large intestine where the small and large intestine meet). The head (or more accurately, the digestive end of the worm) is skinny versus its stout tail (or reproductive end), which gives the worm a whip shape, hence the name.





In the host's digestive tract, food passes from mouth to esophagus to stomach to small intestine to large intestine to rectum and then to the outside world. This means the large intestine is one of the last stops for nutrients and by this point in the journey, nutrients have largely been broken down and absorbed. The large intestine, also called the colon, serves to absorb water, store fecal material, and provide a home for a spectacular number of bacteria that are able to digest leftover food. The large intestine is the home of the whipworm. The adult worms bite the tissue of the intestine, actually embedding their heads inside, and suck blood there.

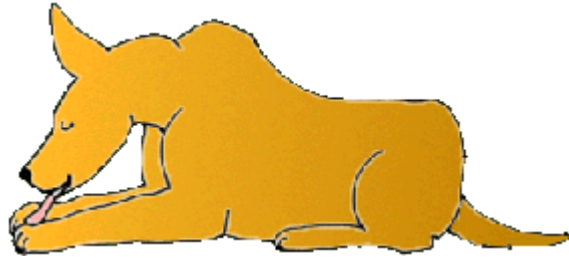


Whipworm egg isolated from a stool sample. Note the characteristic double plug appearance.



Whipworms developing in the soil. Note the characteristic plugs on either end of the egg.

Eggs are laid inside the large intestine and pass with the stool. Once in the outside world, the eggs require about 2 to 4 weeks to form embryos and become capable of infecting a new host. (This means that contaminated soil is the source of infection, not fresh feces.)



The new host is infected by consuming the egg, usually during grooming. The egg hatches in the small intestine releasing a larva. The larva dives into the local glandular tissue and after about a week emerges into the small intestine and is carried downstream into the large intestine with the digested food. Once in the cecum or large intestine, its permanent home, it embeds in the tissue there, and after a total 74 to 87 days from the time the egg was swallowed, the young whipworm is ready to mate.

A few whipworms generally do not pose a problem for the host but if large numbers of worms are embedding themselves in the large intestine tissue, tremendous inflammation can result leading to a bloody, gooeey diarrhea. Usually there is not enough blood loss to be dangerous but the diarrhea readily becomes chronic and hard to control. A second syndrome of infection has emerged but is not well understood, this being symptoms mimicking those of Addison's disease ([hypoadrenocorticism](#)). Here, a waxing and waning weakness with inability to conserve salt ultimately creates a dehydration crisis. The syndrome mimics Addison's disease in every way except that testing for Addison's disease will be negative and deworming yields a complete recovery.

Because female whipworms only periodically lay eggs (whereas other female worms lay eggs continuously), a fecal sample tested may easily be negative for eggs. This makes confirmation of a whipworm infection a challenge. It is common to deworm for whipworms if the symptoms are suggestive of them even if the fecal test is negative. Most common deworming agents do not work on whipworms so something special must be selected. The most common products are [fenbendazole](#) (Panacur®), and febantel (Drontal Plus®). Because of the long maturation cycle of young worms, a second deworming some 75 days or so after the first deworming is needed to fully clear the infection (easy to forget). Often another deworming in between these doses is recommended to further control the whipworm numbers.

More recently, regular [heartworm](#) prevention products have been developed to remove and control whipworms: Sentinel and Interceptor both will cover whipworms and their regular use covers the second deworming as well. Heartgard products do not carry a high enough dose of [ivermectin](#) to kill whipworms, though at other doses ivermectin could be used with appropriate cautions.

Soil contaminated by whipworm eggs is contaminated for years. It is virtually impossible to remove the eggs from the soil or kill them. Happily, however, this is one pet intestinal parasite that is not readily transmissible to humans.



Feline Whipworm Infection

There are species of whipworms that can infect cats: *Trichuris serrata* in North America and *Trichuris campanula* in Europe. Cats are clean animals and fastidious around feces, and they rarely get infected. When they do, worm numbers are so small that symptoms hardly ever occur. Whipworms are more of an interesting incidental finding in cats when whipworm eggs happen to come up on a routine fecal check. In other words, feline whipworm infection is generally not considered to be much of a problem.

Copyright 2011 - 2012 by the Veterinary Information Network, Inc. All rights reserved.

Permanent Link: <http://www.VeterinaryPartner.com/Content.plx?P=A&A=1668>