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## Intestinal worms

In this months newsletter we will be discussing intestinal worms. This subject matter is quite distasteful to some people and if you are a bit queasy about the subject you may want to skip past the article.

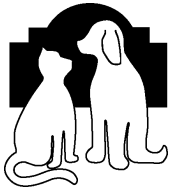
There is a discussion on the major worms, roundworms, hookworms, tapeworms, whipworms, and pinworms. Discussion will be about:

- Overview of the worm
- zoonotic risk (risk to humans)
- Treatment and prevention.

This is an important subject as many worms can cause problems in people and are quite common. 36% of dogs and cats from animal shelters nationwide are infected with worms, and levels from pet stores are equally high.

**Roundworms:** Also called ascarids, these worms affect both dogs and cats. There are three species of roundworm that affect dogs and cats. These are *Toxocara canis*, *Toxocara cati*, and *Toxascaris leonina*. 14% of all dogs nationwide are infected with ascarids. These worms are in so many dogs because of the unique way that they reproduce. While transmission through ingestion of eggs in the grass and feces is common, there is an even more insidious means of transmission—through the mother. Roundworms are swallowed as an egg. The larvae then migrate out of the intestinal tract and go everywhere in the body. Those that end up in the lungs are coughed up and swallowed, where they become adult worms. These worms attach themselves to the intestinal wall and absorb passing nutrients in the bowel. When they reach maturity, they start producing eggs...a whole lot of eggs...several hundred thousand eggs. These eggs are in the feces and are microscopic. They simply wait until a passing animal eats the feces, lick the grass, or dew which has the eggs. The adult worms look somewhat like angel-haired pasta.

For those larvae that don't make it into the lungs, the larvae end up being encysted by the immune system, causing no more problems, so long as the immune system is healthy. While encysted, these larvae are also protected against the common dewormers. But there is a condition of female dogs which causes immune suppression. This condition is called pregnancy. During the



third trimester, the immune system is sufficiently weakened for the pre-existing larvae to escape their cysts and enter the blood stream. Depending on the species, the larvae can pass into the fetus through the placenta (umbilical cord) or the puppy/kitten through the mammary glands and the milk. It is due to this mother-offspring transmission that there are so many cases of worms in dogs. 75-100% of puppies are born with roundworm infection.

Round worm infection can cause a range of symptoms from none, to unthriftiness, pot-bellied appearance, vomiting, and diarrhea. Most infected adult dogs are asymptomatic. Then why are we so concerned? It is because the larvae of roundworms cause disease in people. This disease is called larval migrans.

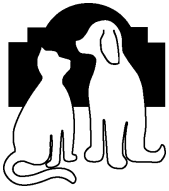
Ingestion of roundworm larvae can cause severe health problems in people, especially children and immuno-compromised individuals. Depending on the species of worm, these larvae can migrate through the skin and other organs, causing pain and/or organ dysfunction. Most cases are asymptomatic, but if every person were tested to see if they had antibodies against roundworms (meaning they had been exposed) it would be surprisingly high, as the CDC found out in a study. Symptoms could include fever, nausea, edema (limb swelling), and even seizing. Especially terrible is when the larvae migrate through the eye, which is called ocular migrans. This can cause blindness, vision loss, and pain. According to the CDC, there are 750 cases of ocular migrans every year.

Now that you are quite nauseated, what can be done to help your pet get over this disease and to prevent human disease?

All puppies should be dewormed starting at 2 weeks of age, and then at 4, 6, and 8 weeks of age. Kittens should be dewormed at 6 weeks of age and then at 8 and 10 weeks of age.

All adult dogs and cats, especially those that go where other dogs and cats frequent should have a fecal analysis every year, so asymptomatic pets can be identified and treated. This helps to prevent human disease. This only detects current infection, so weeks later, if re-infected, eggs can be again laid in the feces. So what do we do to prevent this? Monthly deworming is the answer. Some heartworm preventatives (people don't get heartworm disease) have also incorporated a deworming agent called pyrantel palmoate. This kills any roundworms that are ingested. Heartguard is one such drug. ProHeart, the injectable form of heartworm preventative has not been labeled for use in roundworm elimination, but in our experience, infected dogs who receive the shot are cleared of infection at the time of the shot. This means that dogs receiving the shot are dewormed twice yearly.

The more serious roundworm infection in people comes from a roundworm which has raccoons as its natural host. This worm, called *Baylisascaris procyonis*, is the most common cause of



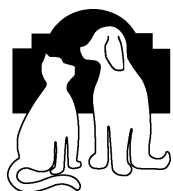
symptomatic larval migrans in animals. It usually causes neurological symptoms, including pain, seizures, dizziness, coma, and death. It can also cause ocular larval migrans. It is estimated between 68-82% of raccoon are infected, and can shed millions of eggs per day in their feces. Raccoons generally use tree bases, logs, stumps, woodpiles, roofs, and decks as a latrine. When swallowed by any animal (bird, wildlife, or person), the larvae migrate extensively all over the body. When the brain is one of those areas of migration, damage occurs. Severity of symptoms depends on size of the larvae and the number of ingested eggs. Like with *Toxocara*, asymptomatic infection is common, but this worm more commonly causes severe symptoms, especially in the young. This worm is especially more of a concern because of the increased exposure of humans to the raccoons' environment. This is due to urban encroachment on wildlife habitat. Also, mature worms are increasingly being found in the intestines of dogs, which can then spread the disease. It is important to keep your home clear of areas raccoons like to defecate and monitor your children carefully in raccoon areas.

**Hookworms:** These are another group of roundworms which infect dogs and cats in their intestinal tract. These worms aren't as innocuous to dogs and cats as ascarids, as they burrow into the intestinal wall and suck blood. Dogs and cats infected can have symptoms ranging from none, to vomiting, diarrhea, which could be black to bloody. Life-threatening anemia can also occur.

These worms have a similar mode of transmission. In puppies and kittens, they come mostly through the mother's milk. In adults, they can be absorbed orally. Like ascarids, an adult female lays thousands of eggs daily. Unlike ascarids however, the larvae of these nasty buggers can migrate through the skin.

Humans contract the larvae through fecal-oral contact, or contact with bare skin to soil or sand (especially when wet) contaminated with the larvae. In the skin, infected individuals get raised linear rashes called "creeping eruption". These are usually self-limited (cure by themselves) but can be severely itchy which can take weeks to resolve. If a bad enough infection occurs, larvae can migrate to deeper tissues and cause problems such as lung lesions which can cause severe respiratory symptoms. Recently, there is some evidence that humans can get worms to infect the small intestines, causing abdominal pain, bleeding, diarrhea, and weight loss in people. These hookworms seemed incapable of reproduction in humans.

Routine puppy and kitten deworming works against hookworms as well as ascarids. Hookworms are also fairly easy to spot on routine fecal samples. Heartguard and other oral heartworm preventatives also eliminate hookworms. ProHeart is approved to kill hookworms at time of the shot as well. Interceptor and Sentinel are not effective against hookworms.



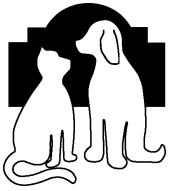
**Tapeworms:** These are segmented flat worms spread through a vector, such as the common flea or infected meat. There are several types of tapeworms that infect humans and animals. These worms are often visible to the naked eye due to the segments passed in the feces.

Echinococcus is a tape worm that has dogs as the direct host, although it causes few problems in them. Dogs (and rarely cats) get the worm by eating infected meat (such as sheep parts which contain cysts). The sheep get the disease through eating contaminated water and vegetation. This disease is of concern due to the severity of disease in people. People contract the disease by direct contact with a dog shedding eggs (especially children), eating undercooked meat, or contaminated water or vegetables. The worm causes hydatid disease, in which the larvae migrate through the blood into the liver, lungs, and other body parts. The worms form large cysts which cause severe inflammation, even death. Luckily, infection in the US is rare (it is more common in Mexico). Control is through hygiene and cooking of meat. Dogs should be prevented from scavenging and eating offal. If eggs are found on a fecal sample, or if exposure is known, a drug called praziquantel can be given. This drug is ineffective on roundworms. It does not prevent re-infection.

Taenia is a worm which is spread by eating infected undercooked meat. The species of worm depends on the species of animal eaten. Symptoms include: unthriftiness, gastrointestinal signs, and even intestinal blockage from large worm loads. Dogs generally get the disease by eating infected rabbits or rodents. Humans can contract the disease through the same means. Prevention is by making sure that all meat is fully cooked, and that proper hygiene is used when handling raw meat. The eggs are identical to echinococcus on a fecal sample. Whole segments are passed in the feces, so they are a type of worm which can be seen with an unaided eye. Praziquantel also kills this worm. It also does not prevent re-infection.

Our main discussion is on the common tapeworm of dogs and cats, called *Dipylidium caninum*. This worm is the most common tapeworm that we see. From this point on, *Dipylidium* tapeworms will just be referred to as tapeworms.

The tapeworm has a very close association with fleas. They are a required part of their lifecycle. The tapeworm egg is eaten by flea larvae in the environment. The egg hatches in the flea larvae into an infective stage. Eventually, the flea larvae mature into an adult flea. When on the pet, the flea is inadvertently swallowed during grooming. The flea is digested and the worm larvae attaches to the small intestine. Then a worm starts growing. The worm grows by creating a new segment at the end of the worm. The worm eats by absorbing nutrients in the bowel. Eventually the end segments mature as egg sacs. These segments detach from the rest of the worm and fall into the intestines and fall or crawl out into the feces or on the anus. These segments, when fresh in the feces or wiggling out of the anus look like little wiggly pieces of rice. As they dry, they take on a sesame



seed type texture. These segments eventually become the food source for flea larvae and the cycle continues.

Tapeworms generally only cause mild symptoms in dogs and cats. The most common is anal itching and scooting. They can cause chronic bowel inflammation, vomiting, and diarrhea. With enough worms, they can cause intestinal blockage.

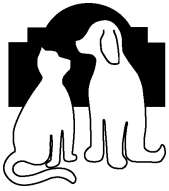
Because fleas are required for infection, seeing tapeworms indicates that your pet has fleas. The segments are not directly transferable to people. Humans, especially children can get tapeworms by swallowing infected fleas.

Tapeworms are killed by a variety of worming agents, but most commonly a drug called praziquantal, which is a pill or injection. The egg packets are sometimes seen on a fecal sample, but visual gross examination is the best way to identify the worm. A monthly preventative is not available. The only way to prevent infection is religious flea control. We recommend monthly Frontline or Advantage to keep the flea population low. Remember, swallowing an infected flea is the only means of infection.

**Whipworms:** Whipworms, of the species *Trichuris vulpis* are among the most resilient of the intestinal worms commonly seen in dogs. These worms, which live in the large intestine are a common source of bowel disease in dogs including diarrhea (which can be bloody-colitis) and weight loss. This worm is NOT transmissible to people. The egg is swallowed from the environment. It then develops into an adult worm in the large intestine. Once mature, which can take three months; eggs are shed in the feces. These eggs are quite resistant to environmental stresses and disinfectants. Only steam sterilization 1% bleach, and direct sunlight kills them. This means that eggs can live for quite some time on the floors and in the grass. Because re-infection is so common, re-treatment is needed. On dogs found to have the egg a fecal analysis, treatment with a medication called Fenbendazole is required for 3 days, then again in 3 weeks, then again in 3 months. The eggs are shed intermittently so multiple fecal samples are required. The only prevention for whipworms is Interceptor (and Sentinel).

**Pinworms:** Dogs and cats are not susceptible to pinworms. They are not infected nor do they carry them. Pinworms are species specific. Humans get pinworms from other humans. Hamsters and horses also have their own pinworms. Transmission is through fecal-oral contact. Self infection is common as the deposition of eggs on the anus by the adult worms is itchy. Children scratch their anuses and then suck their thumbs. The eggs can live in the environment for a long time. Good hygiene and prompt treatment are the ways to prevent this infection.

Intestinal worms are gross. They can also be quite harmful, to humans and pets alike. They are fortunately much less common today due to vigilant deworming of puppies and kittens, annual



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fecal examinations, and prophylactic deworming, like Heartguard, ProHeart, and Interceptor. Because of the lifecycles of these worms, we will always see them and will always need to remain vigilant. Although rarely discussed these little parasites need to be taken seriously to prevent serious illness.

I would like to thank the Merial company for the statistical information found in their zoonosis educational study guide. I would also like to thank Dr. Bruno Chomel, zoonotic disease professor at UC Davis, whose extensive knowledge and expertise gave me the information necessary for this article while in school.