



ZOONOTIC RISKS

Limiting the Zoonotic Risks of Internal Parasites

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Abstract

A zoonosis is a disease or infection that can be transmitted from animals to humans and vice versa. Many parasites can pose a zoonotic risk to people under certain conditions. The 2 most common intestinal parasites of dogs and cats—roundworms and hookworms—are in this category. Prevention of internal parasites typically requires a multimodal approach, and open communication between the veterinary team and the client allows the veterinary nurse to help educate the client on various topics during appointments. By working together, the owner, veterinary nurse, and veterinarian aim to establish a healthy, lifelong bond.



Take-Home Points

- Zoonotic pathogens may be bacterial, viral, or parasitic.
- The zoonotic roundworm species of concern are *Toxocara canis*, *Toxocara cati*, and *Toxascaris leonina*.
- The zoonotic hookworm species of concern are *Ancylostoma caninum*, *Ancylostoma braziliense*, *Ancylostoma tubaeforme*, and *Uncinaria stenocephala*.
- Roundworms can cause visceral larva migrans and ocular larva migrans in humans.
- Hookworms can cause cutaneous larva migrans in humans.
- Prevention of internal parasites requires a multimodal approach, including preventive products, client compliance, and good hygiene habits.

A zoonotic disease, or zoonosis, is a disease or infection that can be transmitted from animals to humans and vice versa. Zoonotic pathogens may be bacterial, viral, or parasitic and can spread from animals to humans through direct or indirect contact, contaminated food or water, or contamination of the surrounding environment.¹

WHO IS AT RISK?

While healthy adult humans can contract a zoonotic disease from a pet, their risk is significantly less compared with that of other groups of people (**BOX 1**). Regardless of their personal risk factors, the preventive measures that an owner should take to ensure their and their pet's best health should be the same.

This is where veterinary nurses play a role. During an appointment, veterinary nurses should have open discussions with clients, including asking open-ended questions. This allows the veterinary nurse to get a better understanding of the client's knowledge about internal parasites and zoonotic disease and to assess the patient's risk factors for parasites. This information can then be relayed to the veterinarian and a tailored preventive plan put into action for the individual pet and owner.

WHICH INTERNAL PARASITES POSE A ZOO NOTIC THREAT?

Many parasites can pose a zoonotic risk to humans in certain conditions. The 2 most common intestinal parasites of dogs and cats—roundworms and hookworms—are in this category. The most prevalent roundworm species of concern in veterinary medicine are *Toxocara canis*, *Toxocara cati*, and *Toxascaris leonina*.

The hookworm species that are most concerning are *Ancylostoma caninum*, *Ancylostoma braziliense*, *Ancylostoma tubaeforme*, and *Uncinaria stenocephala*.^{3,4} Although rare, these parasites have the potential to cause various medical issues in humans, such as anemia, protein deficiencies, iron loss, stunted growth and development, enlarged liver, pneumonia, ocular inflammation, and retinal scarring.^{5,6}

Other internal parasites also have zoonotic potential, the most notable being *Giardia* (*Giardia duodenalis*) and coccidia (*Cystoisospora* species). These are protozoal parasites that cannot be seen with the naked eye, and while serious infections in humans are rare, they are quite prevalent in pets. Approximately 38% of dogs

BOX 1

Groups of People at Higher Risk for Zoonotic Disease^{2,3}

- Adults older than 65 years
- People with weakened immune systems, such as:
 - Those with HIV/AIDS
 - Chemotherapy/radiation patients
 - Those who have congenital immune deficiencies
 - Organ/bone marrow transplant recipients
- Pregnant women
- Children younger than 5 years

AIDS = acquired immunodeficiency syndrome;
HIV = human immunodeficiency virus



and 36% of cats are infected with coccidia, while 15.6% of dogs and 10.3% of cats are infected with *Giardia* annually.^{7,8}

Roundworms

Dogs and cats become infected with roundworms when they ingest larval eggs that have contaminated the environment or eat other vertebrates that have consumed these eggs. The migration of the larval stage is complex. *Toxocara* larvae have to migrate through the liver and lungs, travel up the mucociliary apparatus, and then be swallowed to develop within the small intestine. For *T. canis*, transplacental transmission of larvae to puppies in utero is the primary route of infection (this has not been shown in *T. leonina*). When this happens, the larvae wait in the liver and lungs until the puppies are born. At this point, they resume their migration across the lungs and into the airways. *T. leonina* is different from *Toxocara* species in that larvae do not migrate outside the gastrointestinal tract.

In cats, transmammary transmission of *T. cati* only occurs if the queen is infected while lactating.³

Humans become infected with roundworms by orally ingesting the parasitic eggs. These eggs typically come from infected cat or dog feces that have contaminated the soil in the person's environment or from eating undercooked meat or fish (FIGURE 1). Humans are considered a dead-end host; therefore, when the eggs hatch, the larvae typically do not become infective or encyst within the human body. They can, however, migrate through the liver, lungs, and eyes. This condition is called visceral larva migrans (migration through the internal tissues) and ocular larva migrans (migration to the eye).^{5,9}

Hookworms

Similar to roundworms, hookworms can infect animals and humans through moist, contaminated dirt, sand, or soil that is ingested orally; however, the larvae can

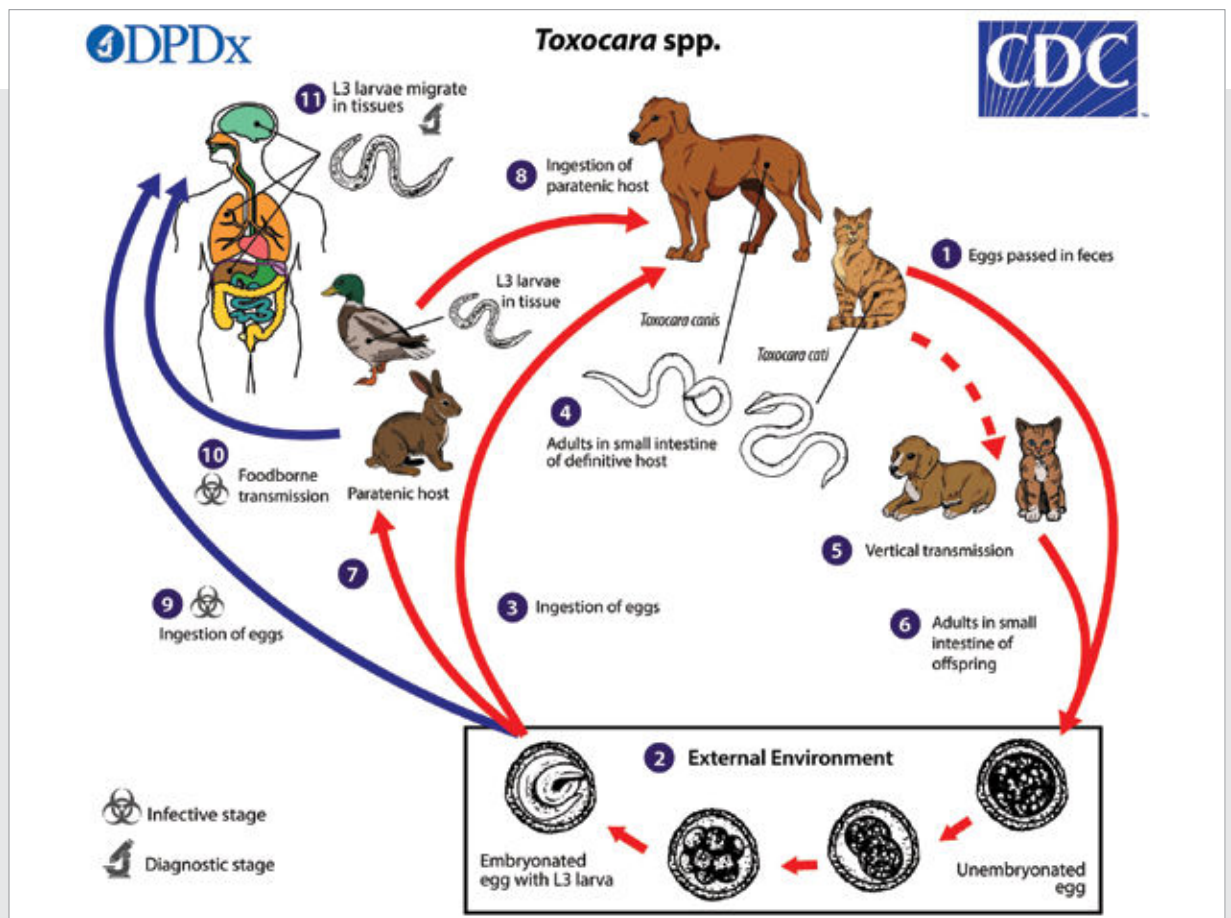


FIGURE 1. Roundworm life cycle and potential for human infection.

Figure 1: cdc.gov/dpdx/toxocarasis/modules/Toxocara_LifeCycle_1g.jpg.
Figure 2: cdc.gov/dpdx/zoonotichookworm/modules/CLM_LifeCycle_1g.jpg.



also penetrate intact skin (**FIGURE 2**). For hookworms, it is the third-stage larvae that are infectious. Development from the egg to the infective stage occurs in approximately 2 to 9 days, depending on the environment's temperature and humidity. Dogs and cats may also become infected by eating cockroaches that contain these larvae.⁴ Ingested larvae travel to the small intestine, where they mature into adult worms. Immature and adult hookworms feed by attaching themselves to the mucosa of the small intestine, digesting the surrounding tissue, injecting anticoagulants into the area, and ingesting the host's blood. They may detach and reattach multiple times. Small bleeding ulcers can form where the worms have fed, and adult worms may live for 4 to 24 months within the small intestine.⁴

In cats, *A. tubaeforme* is not transmitted via nursing; rather, kittens acquire this parasite after birth through environmental contamination. After penetrating the skin, the larvae are carried through the bloodstream

into the lungs, where they migrate up the respiratory tree into the trachea. The larvae are then coughed up and swallowed, where they make their way into the small intestine. Once in the small intestine, they can mature into adult worms and start producing eggs. Eggs can be found in feces 2 to 3 weeks after infection has occurred.⁴

In dogs, transmammary transmission of larvae is the most important route of infection for *A. caninum*. In dogs older than 3 months, the larvae migrate through the lungs and enter the somatic tissue, where they become dormant. This pause in development may also occur in the mucosa of the small intestine. These specific larvae are then activated after the removal of adult worms from the intestine. Activation also occurs during pregnancy, with larvae accumulating in the mammary glands and being secreted in the milk.⁴

In humans, when hookworms migrate through the skin, they can produce a characteristic red, itchy,

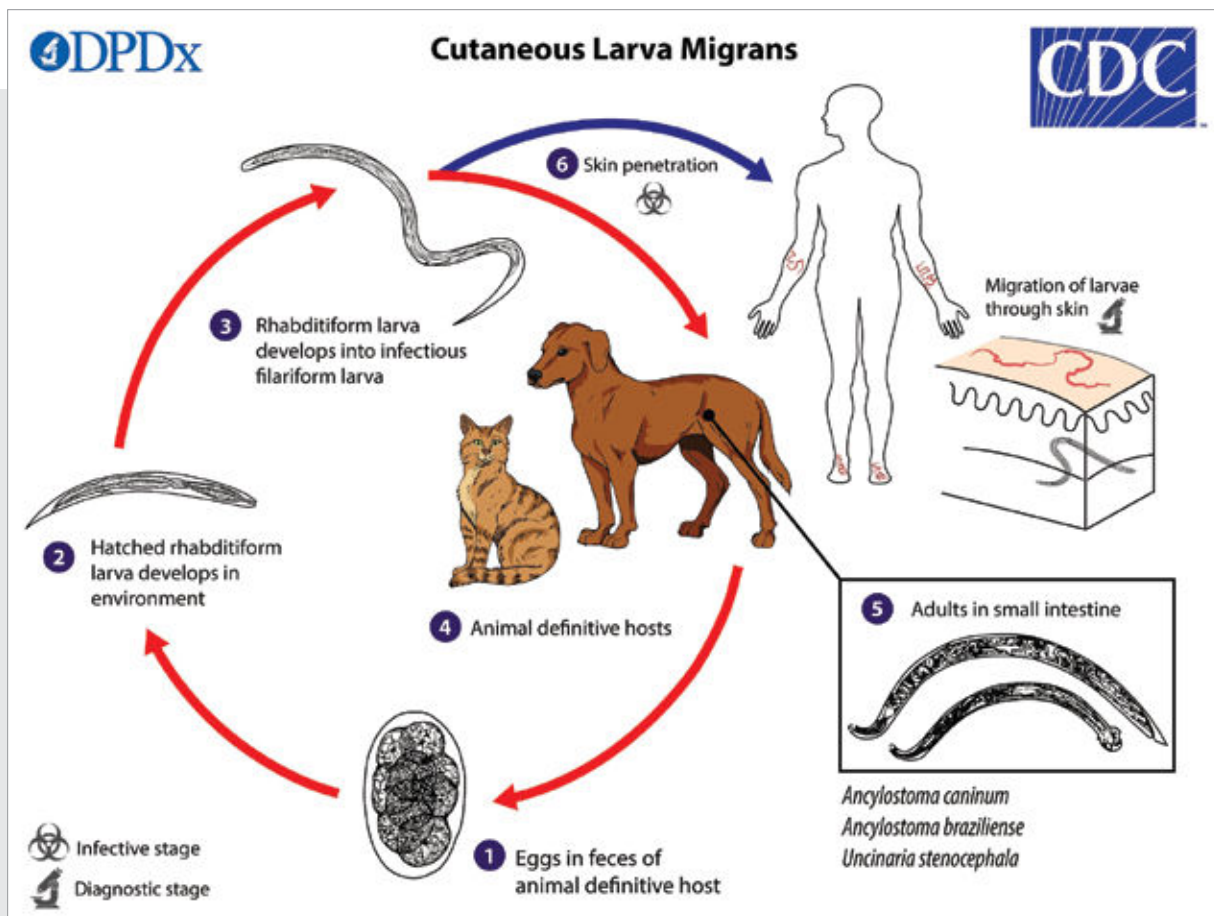


FIGURE 2. Hookworm life cycle and potential for human infection.



It is estimated that an average of 576 million to 740 million people are infected with hookworms each year.⁶



winding tunnel within the tissue. This is called cutaneous larva migrans.⁹ In rare documented cases, these larvae can penetrate into the deeper tissues within the body and partially mature within the intestines, a condition known as hookworm enterocolitis.¹⁰ In some people, they can also cause eosinophilic enteritis.⁴ It is estimated that an average of 576 million to 740 million people are infected with hookworms each year.⁶

HOW CAN ZOO NOTIC INFECTION BE PREVENTED?

Prevention of internal parasites typically requires a multimodal approach that consists of the owner, the veterinary nurse, and the attending veterinarian working together to come up with a preventive plan that fits both the owner's and pet's lifestyle and their financial situation.

Parasite Prevention for Pets

The first step is to protect the pet so that it is not able to contaminate its environment. This lowers the chance for human zoonotic exposure to various internal parasites, as well as exposure of other animals. Many of these measures require owner compliance.

The best preventive measure an owner can take is to have their pet on a routine monthly preventive medication that includes an anthelmintic (dewormer). These medications typically contain multiple drugs to help protect pets from heartworm, flea, tick, and internal parasite infections. These medications should be given not only monthly but also year-round. Year-round protection is important because it helps stop the shedding of eggs into the environment, where the cycle begins.

Owners can also help prevent parasite transmission by making sure that they are aware of how and how often they clean up their pet's stool. Since the life cycle of

hookworms and roundworms starts with eggs in contaminated stool, it is imperative that feces be properly cleaned up and disposed of as soon as possible on a daily basis.

Daily removal of feces from the yard, litter box, house, or any other location will help prevent eggs from remaining in the environment as the fecal material decomposes or is dispersed by other animals. Dog owners should follow leash laws and pick up feces deposited by their dogs during walks, as this can help protect public areas from egg contamination.^{3,4} Owners can also help prevent infection by limiting predatory and scavenging behavior. This can be achieved by keeping cats indoors and dogs confined to a leash or in a fenced yard so as not to ingest other possibly contaminated feces. If possible, dogs should be supervised while outside and their stool cleaned up quickly to prevent coprophagia.

If owners are unable to consistently administer a monthly preventive, the veterinary team should discuss treating adult pets approximately 4 times a year with a broad-spectrum anthelmintic. This should go hand in hand with a fecal flotation diagnostic test to ensure that these pets are parasite-free.^{3,4} Fecal flotation should be done on a semiannual basis.³

Parasite Prevention for Owners

The easiest thing an owner can do to help limit their exposure to these parasites is to practice good hygiene and simply wash their hands well and regularly. Hand washing with soap and water should be performed after cleaning up any stool or handling anything that involves sand, soil, or dirt. Owners should also wear shoes outside as much as possible and keep a close eye on their children's hygiene habits.

If an owner is concerned that they or their child may have contracted a zoonotic internal parasite from their pet, the owner should reach out to their primary healthcare provider for diagnostics and treatment immediately.



SCAN THE QR CODE

for a client handout you can share during physical exams, in the waiting room, or on social media.



COMMUNICATING WITH CLIENTS

Veterinary nurses are the communication bridge between the client and the veterinarian. Open communication between the veterinary team and client allows the veterinary nurse to help educate the client on various topics during appointments. Effective communication is key when developing a trusting relationship between the client and veterinary team.

Since prevention of internal and external parasites is a common topic that is discussed regularly during physical examinations, it is a natural segue to bring up potential zoonotic risk factors. These risks should be discussed during routine annual and semiannual exams to ensure that pet owners have a clear understanding about the types of parasites their pet could potentially contract and transmit.

During these appointments, the veterinary nurse should use open-ended questions; that is, questions that cannot be answered with a simple “yes” or “no.” Instead, the owner will need to provide a more detailed response. Such questioning elicits more information from the owner and gives the veterinary nurse a better understanding of what they need to explain. Throughout this discussion, the veterinary nurse should help the pet owner understand the various signs of parasitic infection and the prevention and treatment options available for various internal parasites.

After the discussion is complete, the veterinary nurse should document the conversation in the patient’s medical record. Documenting client education and communication about zoonotic potential are of extreme importance.

Clients should always call their veterinary healthcare team with any questions or concerns that they may have about their pet’s condition. If a client calls and suspects that their pet may have an internal parasite, it is the veterinary nurse’s job to properly triage the call and address the situation with the veterinarian.

SUMMARY

While the idea of a zoonotic parasite infection can initially seem quite frightening to an owner, veterinary nurses can help comfort, educate, and guide them through their questions and fears.

It is the veterinary nurse’s responsibility to ensure that the pet owner is comfortable and understands the

information being discussed and that owners know that veterinary nurses are there to advocate for their pet and help them prevent zoonoses from happening. By working together, the owner, veterinary nurse, and veterinarian aim to establish a healthy, lifelong bond.

TVN

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Ashley started her veterinary career with Banfield Pet Hospital in 2011. In 2014, she began working at Pebble Creek Animal Hospital in Tampa, Florida, where she is now a senior technician. In 2015, Ashley graduated from Hillsborough Community College with her AS degree in veterinary technology and became a certified veterinary technician. She received her BAS degree in veterinary technology with honors from St. Petersburg College in 2018. Ashley was the inaugural recipient of The Bridge Club's Bright Minds Out of the Box Thinker Award in 2021. She has a passion for continuing education and feline gastrointestinal disease.