A pril is National Heartworm Awareness month, a time for veterinarians to reflect upon and revitalize efforts to protect pets from *Dirofilaria immitis*, a parasite that causes serious and potentially fatal infections and disease. The American Heartworm Society has provided an update of recent advances in our understanding of heartworm in this issue of *Today’s Veterinary Practice*.

Educating pet owners about heartworm also provides an excellent opportunity to discuss many of the other parasites which pose a risk to pets—a risk that consistent use of monthly parasite control products often mitigates.

To the right are 10 images of parasites, which were found on fecal flotations taken from dogs and cats. See if you can match the image to the parasite identifications provided and answer the associated questions on the following pages. Visit the CAPC website (capcvet.org) to learn more about heartworm and other parasites that may infect dogs and cats.

**PARASITE IDENTIFICATION LIST**

1. Ascarids
2. *Ancylostoma caninum*
3. *Trichuris vulpis*
4. *Taenia* species
5. *Dipylidium caninum*
6. *Demodex gatoi*
7. Coccidia (*Cystoisospora* species)
8. *Mesocestoides* species
9. *Eucoleus aerophilus*
10. *Giardia* species
A Several of these eggs were detected on fecal flotation from a dog. What parasite is this, and what treatment can you recommend to eliminate the infection?

B This parasite was found on fecal flotation from a cat with generalized seborrhea and several areas of alopecia. What parasite is this, and do you suspect this finding is related to the skin lesions?

C These eggs were found on fecal flotation from a dog with diarrhea. What parasite is this? Does this infection create any zoonotic risk?

D These eggs were found on fecal flotation of a 1-year-old dog with mild to moderate respiratory disease characterized by exertion-induced coughing. What parasite is this, and what treatment would you suggest?

E These organisms were found on fecal flotation from a kitten with diarrhea. What parasite is this? The owner is pregnant. Is infection with this parasite in a kitten known to present any zoonotic risk?

F These organisms were detected on fecal flotation of a dog with mucoid diarrhea. What parasite is this, and what treatment is most likely to be effective at clearing the infection?

Refer to the Parasite Identification List on the previous page.
These eggs were found on examination of a fecal flotation from a dog. What parasite or parasites do you think the dog may harbor? Do these eggs present any zoonotic risk to people that come in contact with the dog or its feces?

These egg packets were found on routine fecal flotation of a cat at an annual wellness examination. What parasite control is indicated in addition to treatment for this helminth infection?

A cat presents with tapeworm proglottids in the feces. Several of these eggs, most of them with motile structures inside, are found on fecal examination. What parasite is this, and how did the cat most likely become infected?

These eggs were found on fecal flotation of a dog with chronic, occasionally bloody, large bowel diarrhea. Several previous fecal examinations both in clinic and at a reference laboratory had been negative. What parasite is this? Why do you think eggs were not found on previous fecal examinations, and what might have allowed this diagnosis to have been determined earlier in the course of disease?

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Susan Little, DVM, PhD, Diplomate ACVM (Parasitology), is the Director of the National Center for Veterinary Parasitology at Oklahoma State University’s Center for Veterinary Health Sciences, where she serves as Regents Professor and the Krull-Ewing Chair in Veterinary Parasitology. She received her DVM from Virginia Tech.

References

Answers on pages 56 and 58.
1. **Ascarids (G)**
These are ascarid eggs: *Toxocara canis* (left), the common roundworm of dogs and *Baylisascaris procyonis* (right), a raccoon ascarid that occasionally infects dogs. Both parasites are potentially zoonotic, causing visceral and ocular larva migrans (*T. canis*), or a particularly severe form of neurologic disease caused by larval migration in the central nervous system (*B. procyonis*). Eggs shed in fresh feces are not infective; zoonotic infection is associated with ingestion of soil previously contaminated with animal feces. Most monthly parasite control products used to prevent heartworm in dogs are also effective for treating *Toxocara canis*, limiting the risk of zoonotic ascarid infection. Although not labeled, some monthly preventives also have efficacy against raccoon roundworms in dogs.

2. **Ancylostoma caninum (C)**
These are eggs of the common hookworm of dogs, *Ancylostoma caninum*, the most frequently identified nematode in dogs in the United States. Hookworm infection is one of many reasons the Companion Animal Parasite Council recommends dogs be maintained on monthly broad-spectrum parasite control. Hookworms can cause diarrhea, ill-thrift, and anemia in infected dogs. The presence of hookworm larvae in the environment also creates a risk for zoonotic infection. Larvae many penetrate the skin, resulting in cutaneous larva migrans, and, in some people, adult *A. caninum* will develop in the small intestine causing abdominal pain due to the associated eosinophilic enteritis.

3. **Trichuris vulpis (J)**
These are eggs of *Trichuris vulpis*, the common whipworm of dogs, which damages the cecal and colonic mucosa. Eggs of *T. vulpis* are shed intermittently, and clinical disease may develop before eggs are detected in the feces, complicating diagnosis. Whipworm infections are surprisingly common, affecting as many as 10% of unprotected pet dogs in the United States. Underestimations are likely due to the limitations of fecal flotation in detecting eggs on fecal examination. Recently, a fecal ELISA for *T. vulpis* became available, which may further support identification of these infections. Control of whipworms can be supported by the use of monthly heartworm preventives containing milbemycin or moxidectin.

4. **Taenia species (A)**
These are eggs of *Taenia* species—tapeworms dogs acquire from predation or scavenging. *Taenia* species that infect dogs in the United States include *T. pisiformis* from rabbits, *T. hydatigena* from deer, and *T. ovis* from sheep. The eggs are morphologically indistinguishable from those of *Echinococcus* species, zoonotic tapeworms also acquired from predation and common in some regions of the upper midwestern U.S. Preventing dogs from roaming and periodically treating them with praziquantel or epsiprantel is recommended to limit tapeworm infections, particularly zoonotic *Echinococcus* species. Infection with tapeworms is both common and dramatically underestimated. Some monthly heartworm preventives now include praziquantel so that dogs are protected from tapeworm infection each month.

5. **Dipylidium caninum (H)**
This is *Dipylidium caninum*, the flea tapeworm of cats and dogs. Egg packets are occasionally found on fecal flotation, but even when performed using best practice techniques, fecal examination does not reveal eggs in the great majority of infected pets. Treating *D. caninum* infections requires either praziquantel or epsiprantel to eliminate the tapeworms together with careful attention to flea control. Consistent use of flea control on all pets in the household is necessary to bring an infestation under control. Because reinfection commonly occurs, a second dose of anthelmintic is often dispensed for administration 2 weeks later.

6. **Demodex gatoi (B)**
This is *Demodex gatoi*, a cause of demodicosis in cats. Because cats are assiduous groomers, the parasite is often found on fecal flotation of affected cats even when mites cannot be identified on multiple skin scrapings. Unlike *Demodex canis*, which causes localized and generalized demodicosis in dogs, *D. gatoi* infestations are associated with pruritus in cats and appear to be contagious. Treatment of *D. gatoi* can be challenging. Repeated administration of macrocyclic lactones are usually required to achieve resolution.
7. Cystoisospora species (E)
These are oocysts of Cystoisospora felis, the common coccidia of cats. Cystoisospora species are not zoonotic and would not pose any infection risk to the owner. However, kittens may also shed oocysts of Toxoplasma gondii, which is potentially zoonotic. The oocysts of T. gondii are much smaller (10–12 microns) than those of Cystoisospora species (20–40 microns). Recommendations to avoid infection with T. gondii from oocysts shed by cats include not changing cat litter when pregnant or immunocompromised—particularly when a new kitten has recently been acquired—wearing gloves when gardening, and thoroughly washing all produce in clean water.

8. Mesocestoides species (I)
These are eggs of Mesocestoides species, a tapeworm of cats and dogs. The eggs are thick shelled, contain a hexacanth embryo, and are often motile when detected. Intestinal infections with Mesocestoides species are not considered highly pathogenic and are readily treated with praziquantel. However, peritoneal infections caused by asexual replication of tetrathyridial stages in the abdominal cavity can cause vomiting, diarrhea, weight loss, and ascites, and may be difficult to treat. Although rare reports describe the abdominal form in people, infected pets are not a direct source of zoonotic infection.

9. Eucoleus aerophilus (D)
The bipolar plugs and characteristic asymmetrical shape allow identification of these eggs as Eucoleus aerophilus (= Capillaria aerophila), a nematode of the tracheal and bronchial mucosa of foxes that occasionally infects dogs and cats. Infections have been successfully treated with extended courses of macrocyclic lactones or fenbendazole. Routine use of some macrocyclic lactones may protect at-risk dogs from this infection, but studies to evaluate their efficacy are not available.

10. Giardia species (F)
These are cysts of Giardia species, a common cause of diarrhea in dogs and cats. People also develop giardiasis, but the predominant human genogroups are distinct from those of pets, and zoonotic infections are thought uncommon although human genotypes have occasionally been reported in dogs. Recommended treatment for dogs include labeled doses of fenbendazole for 3–5 days or febantel for 3 days. Febendazole is approved for treatment of giardiasis in dogs in Europe and has been shown to be more effective at eliminating Giardia species infection than metronidazole.