Prevalence of Intestinal Parasites in Companion Animals in Ontario and Quebec, Canada, during the Winter Months*

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CLINICAL RELEVANCE

Veterinarians in Ontario and Quebec, Canada, typically prescribe monthly heartworm prophylactic and anthelmintic medications for use during the warm months of the year. In many patients, the use of dewormers is discontinued during the winter because of the perception that intestinal parasite infections and shedding of nematode eggs are unlikely when the weather is cold and the ground is frozen or covered with snow. This study examined fecal samples obtained from 96 shelter dogs and cats during the winter in Ontario and Quebec. Intestinal parasites were identified in 34% of submitted samples. These findings support the recommendation that veterinarians should advise pet owners to continue administration of broad-spectrum parasiticides to companion animals during the winter months.

INTRODUCTION

Intestinal parasites are a common problem in dogs and cats, and several broad-spectrum heartworm-preventive anthelmintics effectively treat and/or control common intestinal parasites, such as Toxocara canis. Unfortunately, use of broad-spectrum parasiticides is not as widespread as it should be to adequately protect pets. Many veterinarians in Ontario and Quebec, Canada, typically limit administration of monthly parasiticides to the warm months of the year, when fleas, heartworms, and other parasites are expected to be a greater threat. However, parasite life cycles are such

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that some parasites can remain infective during the colder months. It is known, for example, that freezing does not seem to affect viability of *Cystoisospora* spp (formerly *Isospora*, which is now used for coccidia restricted to birds) oocysts. Nematode ova shed during the winter remain viable and may become infective in the spring when environmental temperatures rise. Ova shed the preceding season can also survive through the winter and into the next warm season. Egg shedding through the winter could therefore lead to higher levels of environmental contamination. Dogs and cats that receive parasite preventives during the warm months but not through the winter can become reinfected and serve as a source of infection for other pets. A study involving more than 6,400 dogs in the United States showed that some parasites can remain infective during the colder months. It is known, for example, that freezing does not seem to affect viability of *Cystoisospora* spp (formerly *Isospora*, which is now used for coccidia restricted to birds) oocysts. Nematode ova shed during the winter remain viable and may become infective in the spring when environmental temperatures rise. Ova shed the preceding season can also survive through the winter and into the next warm season.

### MATERIALS AND METHODS

A total of 101 fecal samples were obtained from dogs and cats in animal shelters in Ottawa, Ontario, and Montreal, Quebec, Canada, between December 2007 and January 2008. Centrifugation with a concentrated sucrose solution was chosen as the diagnostic technique because centrifugation has been shown to be more accurate than direct examination or simple flotation methods. Each fecal sample was mixed by hand with a wooden tongue depressor to ensure distribution of parasites throughout the sample. One portion of each sample was shipped to the University of Guelph Animal Health Laboratory (Laboratory A) and another portion was shipped to the Auburn University College of Veterinary Medicine Parasitology Laboratory (Laboratory B) for evaluation using a double centrifugal flotation technique with concentrated sucrose solution.

At both laboratories, each fecal sample was evaluated by mixing approximately 5 g of feces with approximately 12 ml of water in a cup. The mixture was then strained through a tea strainer. The fecal debris on the strainer was pressed until dry and then discarded. The strained feces–water mixture was placed in a 15-ml centrifuge tube for centrifugation in a free-swinging bucket-type centrifuge and spun at 301.86 × g (Laboratory A) or 460 × g (Laboratory B) for 5 minutes. The supernatant was discarded, with care taken to prevent loss of the fine material at the top of the sediment layer. The test tube was then filled approximately halfway with a saturated sucrose solution (specific gravity, 1.27). The sediment was mixed with the sucrose solution using an applicator stick. The same mixing procedure was repeated.
after the tube was filled about three-quarters with sucrose solution. The tube was then filled completely with sucrose solution and placed in the centrifuge. Additional sucrose solution was added to create a positive meniscus at the top of the tube. A 22-mm² glass microscope coverslip was placed over the top of the tube. The tube was placed into a swinging bucket centrifuge and spun at 301.86 × g for 5 minutes (Laboratory A) or 132 × g for 10 minutes (Laboratory B). The centrifuge was allowed to stop, and the coverslip was removed from the tube and placed onto a glass microscope slide. The entire coverslip was examined microscopically at 10× magnification. The observation of any parasite ova on the coverslip was recorded, and the species were documented.

## RESULTS

Of the 101 fecal samples submitted for diagnostic testing, 41 were obtained from shelter animals in Montreal and 60 from shelter animals in Ottawa. Five samples were excluded from statistical analysis because of uncertainty of species or incomplete results. *Demodex canis* and *Otodectes cynotis* were each identified once in fecal samples. Because these parasites represent incidental findings and are not indicative of intestinal parasitism, they were included in the statistical calculations as negative results. Results from 96 specimens were included in statistical calculations. Of the samples submitted, 49 (51%) were from dogs and 47 (49%) were from cats. Breed, sex, reproductive status, and age were not identified for any of the animals whose samples were included in the evaluation. Both laboratories found evidence of intestinal parasites in submitted fecal samples (Table 1). Overall, 33 (34%) of the submitted samples were positive for at least one type of parasite in at least one of the two laboratories. Laboratory A identified a total of 30 parasites and Laboratory B identified 36 parasites from submitted samples. The difference in results between the two laboratories was not statistically significant (*P* = 1.00); however, the small sample size for this study limits the effectiveness of some statistical comparisons.

Thirty-nine percent of canine samples and 30% of feline samples were positive for parasites (Figure 1). Protozoan parasites of the *Cystoisospora* spp were the most commonly diagnosed parasites, occurring in 42% of positive canine

<p>| Table 1. Canine and Feline Intestinal Parasites Identified by Two Independent Laboratories from Fecal Samples Obtained from Shelter Animals (<em>n</em> = 96) in Canada |</p>
<table>
<thead>
<tr>
<th>Battleship</th>
<th>No. (%) of Positive Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parasite</strong></td>
<td><strong>Laboratory A</strong></td>
</tr>
<tr>
<td><strong>Canine (<em>n</em> = 49)</strong></td>
<td></td>
</tr>
<tr>
<td>Toxascaris leonina</td>
<td>3 (6.1)</td>
</tr>
<tr>
<td>Toxocara canis</td>
<td>3 (6.1)</td>
</tr>
<tr>
<td>Cystoisospora spp</td>
<td>6 (12.2)</td>
</tr>
<tr>
<td>Alaria spp</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Anyclostoma caninum</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Sarcocystis spp</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>Giardia spp</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>Feline (<em>n</em> = 47)</strong></td>
<td></td>
</tr>
<tr>
<td>Toxocara cati</td>
<td>5 (10.6)</td>
</tr>
<tr>
<td>Cystoisospora spp</td>
<td>6 (12.8)</td>
</tr>
<tr>
<td>Family Capillariidae</td>
<td>3 (6.4)</td>
</tr>
<tr>
<td>(Capillaria spp)</td>
<td></td>
</tr>
<tr>
<td>(Anchotheca spp)</td>
<td>2 (4.2)</td>
</tr>
<tr>
<td>(Eucoleus aerophilus)</td>
<td></td>
</tr>
<tr>
<td><em>Taenia</em> spp</td>
<td>1 (2.1)</td>
</tr>
</tbody>
</table>
samples (16% of total canine fecal samples tested) and 43% of positive feline samples (13% of total feline fecal samples tested). Zoonotic roundworm nematodes (*T. canis* and *Toxocara cati*) were the next most commonly diagnosed parasites in both canine and feline fecal samples, occurring in 26% of positive canine samples (10% of total canine samples tested) and 36% of positive feline samples (11% of total feline samples tested). Four percent of canine samples and 8.5% of feline samples contained combinations of parasites (Figure 2).

**DISCUSSION**

These data suggest that patent nematode and protozoan infections occur in a significant number of untreated companion animals during the winter months in Ontario and Quebec. Although diagnosis was confirmed during the winter, it is not possible to verify when the animals became infected with parasites. Depending on the temperature, infections could have occurred during the winter months. However, nematode ova of *Toxocara* and *Toxascaris* spp can survive in the environment for many years, even when exposed to extreme temperatures.\(^9\) Similarly, *Cystoisospora* oocysts can survive up to 1 year and withstand freezing temperatures.\(^10\) This suggests that dogs and cats could have been infected much earlier.

Of the 96 samples, 33 were positive for parasites. Of these 33 samples, 14 were positive for common intestinal nematodes (*T. canis*, *T. cati*, *Toxascaris leoinea*, *A. caninum*). It is noteworthy that administration of a broad-spectrum heartworm-preventive anthelmintic (effective for treatment and/or control of several common nematodes) could have reduced the number of positive samples by more than 40% if animals had been receiving prophylactic therapy during the winter months.

Estimates of endoparasite prevalence can vary widely, based in part on methodology, location, and the population studied. In the current study, results were based on a single fecal analysis. Intermittent shedding of ova and the likelihood that some infections may have been prepatent at the time of sample collection support the assumption that actual infection rates may be higher.

In this study, 39% of canine samples and 30% of feline samples were positive for enteric parasites. These results agree somewhat with those of a recent survey of 111 fecal samples from pet dogs and cats in the Niagara region of Ontario.\(^11\) In that study, 40% of dogs and 36.6% of cats were found to be infected with intestinal parasites. The distribution of parasites identified, however, differs between the two studies. In the current study, *Toxocara* spp nematodes were identified in approximately 10% of canine and feline fecal samples. In contrast, *Toxocara* spp prevalence rates of 14.2% and 12.2% were reported for dogs and cats, respectively, in the Niagara study.\(^11\) The reasons for this discrepancy may involve several factors, including test methods used, seasonality (sam-
ples in the Niagara study were collected between January and April), and differences in pet populations (most of the pets in the Niagara study were younger than 6 months of age and therefore more likely to be infected than older animals; the ages of the dogs and cats in the current study were not determined).

The prevalence of *Giardia* spp among dogs in the current study was 4%. This result differs from that of a 2004 study of 107 fecal samples collected from dogs in a research facility in Guelph, Ontario. In that study, 11% of dogs were positive for *Giardia* spp. There may be several reasons for this discrepancy. The current study used concentrated sucrose solution for fecal centrifugation. Although concentrated sucrose solution is effective for recovering and identifying many types of parasite eggs, it is not the preferred solution for identifying *Giardia* spp because the solution can destroy or distort *Giardia* cysts and hinder identification. The 2004 study used a *Giardia* antigen test along with zinc sulfate fecal flotation and centrifugation to confirm results. This combination of diagnostic tests would be expected to increase the likelihood of identifying *Giardia* spp in positive samples. Additionally, dogs housed in close quarters, such as kennels or research facilities, can be expected to have increased exposure to enteric parasites. Intermittent shedding of *Giardia* cysts may also confound effective identification and may have been a factor in the current study.

Although some parasites identified in this study, such as *Cystoisospora*, are not thought to pose a zoonotic risk, several others have been identified as having zoonotic potential. *T. canis*, *T. cati*, and *A. caninum* are well-documented zoonotic parasites. Transmission of *Giardia* between humans and animals has been supported by cross-infection studies; however, closer examination of these studies has revealed methodology limitations. Molecular genetic studies have demonstrated genetic diversity among isolates of the same species of *Giardia*, suggesting that these species may be host-specific. It is currently believed that the major source of human infection is water contaminated with human waste.

Unfortunately, the hazard of zoonotic parasite transmission is not well communicated to pet owners in many instances. In a 2007 survey of 545 veterinarians in western Canada, 46% did not actively educate pet owners about the zoonotic risks associated with certain parasite infections. Similarly, a 2007 Companion Animal Parasite Council (CAPC) survey found that only 22% of pet owners were “very concerned” or “extremely concerned” about zoonotic transmission of parasites from their pets even though 80% of respondents indicated an awareness of the risk. In the same survey, 21% of respondents said they
did not remove animal waste from areas such as lawns, dog parks, and sandboxes. These kinds of practices allow parasite ova to remain in the environment as a persistent source of infection for humans and unprotected pets. These survey results suggest that even pet owners who understand the potential for zoonotic transmission of parasites do not tend to accept the occurrence as a serious risk and do not consistently institute measures to reduce the potential for such transmission. Routine prophylactic deworming of pets is an important way to reduce the risks for animals and humans. Failure to effectively deworm pets could lead to increased environmental contamination throughout the year, including during the winter.

The CAPC guidelines note that dogs and cats can be exposed to roundworms, hookworms, tapeworms, and other parasites year-round. The guidelines also report that infective stages of these parasites can be shed into the environment regardless of season or climate. Therefore, CAPC recommends year-round administration of broad-spectrum heartworm preventives with activity against potentially zoonotic parasites. Veterinarians should follow the CAPC guidelines and implement routine deworming protocols for companion animals during the winter months.

Routine evaluation of fecal samples (one or two times annually for adult animals and two to four times during the first year of life) is also recommended.

**CONCLUSION**

The relatively high parasite prevalence rates reported here stress the need for veterinarians and pet owners to increase their use of preventives in dogs and cats, with continued administration throughout the year. Certain geographic locations, such as Ontario and Quebec, Canada, are considered by many to be too cold for parasite transmission to occur outside the narrow window of warm weather during the late spring and summer. The assumption that exposure does not occur during the winter is incorrect and can contribute to pets being inadequately protected from the risks parasites pose to them during cold weather. In addition, parasites with zoonotic potential pose a serious threat to families and should be prevented throughout the year. Owners also need to be made aware of other behaviors that increase the likelihood of parasite transmission, such as failing to remove animal waste. Some consider veterinarians the first line of defense in helping prevent the spread of certain zoonotic diseases. Therefore, public health concerns, including zoonotic transmission of parasites such as *T. canis*, should receive greater focus as veterinarians strive to educate clients about the dangers of intestinal parasitism.

**REFERENCES**

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