

The prevalence of *Trichuris* spp. infection in indoor and outdoor cats on St. Kitts

Jennifer K Ketzis¹, Linda Shell², Sarah Chinault³, Charles Pemberton⁴, Mary Mauldin Pereira¹

¹ Department of Biomedical Sciences, Ross University School of Veterinary Medicine, Basseterre, St. Kitts and Nevis, West Indies

² Department of Clinical Sciences, Ross University School of Veterinary Medicine, Basseterre, St. Kitts and Nevis, West Indies

³ Ross University School of Veterinary Medicine, Basseterre, St. Kitts and Nevis, West Indies

⁴ Diagnostic Laboratory, Ross University School of Veterinary Medicine, Basseterre, St. Kitts and Nevis, West Indies

Abstract

Introduction: The present study was conducted to evaluate the prevalence of *Trichuris* spp. and other intestinal parasitic infections in owned cats on St. Kitts.

Methodology: The feces of 41 non-feral cats (23 indoor only; 18 indoor/outdoor) were examined for the presence of *Trichuris* spp. eggs.

Results: Nine (22%) of the cats were positive for *Trichuris* spp. Prevalence of trichuriasis in indoor cats was 26.0% as compared to 16.7% in outdoor cats. Other parasites identified included *Ancylostoma* spp. (10%; 4 cats), *Toxocara cati* (2%; 1 cat), *Platynosomum* spp. (22%; 9 cats), *Mammomonogamus* spp. (2%; 1 cat) and coccidia (7%; 3 cats).

Conclusion: On St. Kitts, indoor cats are as likely to have parasite infections as outdoor cats. Given the zoonotic potential of some of the identified parasites, periodical anthelmintic treatment should be provided to both indoor and outdoor cats.

Key words: Cats; *Trichuris* spp.; Caribbean; parasite prevalence.

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Introduction

Trichuriasis is a parasitic infection of the colon and cecum in dogs, cats, swine, humans and other animals caused by whipworms (*Trichuris* spp.). *Trichuris trichiura*, the human whipworm, *T. suis*, the pig whipworm, and *T. vulpis*, the dog whipworm, can cause diarrhea and inflammation of the cecum and colon [1-4]. *T. suis* is considered a zoonotic parasite and, while the zoonotic potential of *T. vulpis* is unclear, there is some evidence of an association of *T. vulpis* infection with *Ancylostoma caninum*, which is a zoonotic parasite [3].

In comparison to *T. vulpis*, *T. suis* and *T. trichiura*, much less is known about *Trichuris serrata* and *Trichuris campanula*, the two species of whipworms that can infect cats. Recent studies on the prevalence of parasites in cats in North America, Europe and Australia have shown low prevalence (< 2%) or no presence of *Trichuris* spp. [5-8]. As a result, whipworm infection in cats is not a primary differential diagnosis for cats with diarrhea. Also,

unlike *Trichuris* in dogs, swine and humans, no anthelmintic is registered for the treatment of *Trichuris* spp. in cats.

For Caribbean and South American countries, the prevalence of *Trichuris* spp. infections in cats is believed to be higher [9] than reported elsewhere. On St. Kitts, an island in the West Indies bordered by the Caribbean Sea and the Atlantic Ocean, the prevalence of whipworm infections among non-owned/feral cats was determined to be 71% [10] based on egg identification from fecal samples. During necropsies of 7 cats (feral and non-feral) euthanized for various health issues at Ross University School of Veterinary Medicine (RUSVM), 2 to >120 adult *Trichuris* spp. were recovered from the cecum and colon (Ketzis, unpublished data 2013) and related pathological changes were documented in some of these cats.

This study was conducted to determine the prevalence of *Trichuris* spp. in owned cats on St. Kitts.

Methodology

Cats owned by students, faculty and staff of RUSVM were enrolled in the study. To qualify for the study, each cat had to be owned and resident on St. Kitts for at least 4 months and not treated within the previous 4 months with a product containing an active ingredient known to be efficacious against *Trichuris vulpis* (such as fenbendazole, febantel, milbemycin oxime, moxidectin). Cats treated with endo- and ectoparasiticides with active ingredients not registered for the treatment of *Trichuris vulpis* (e.g., pyrantel pamoate, selamectin) were permitted in the study. Multi-cat households were included in the study, since many households are multi-cat and their inclusion was needed to be reflective of the population.

Each owner completed a brief questionnaire regarding age, breed, sex and origin (born on St. Kitts or imported) of the cat as well as history of anthelmintic treatment and housing (indoor vs outdoors). If the cat had any access to the outdoors, it was classified as an outdoor cat. When the owner did not know the exact date of birth, age was estimated based on how long the cat had been owned. Treatment dates with anthelmintics also were estimated for many of the cats.

Feces were collected by the owner and submitted to the diagnostic laboratory at RUSVM within 3 days of collection. Feces not submitted to the laboratory on the day of collection were stored in a home refrigerator until submission. In the laboratory, feces were stored at 2-8°C and samples were analyzed within 5 days of collection. Two grams of feces were analyzed using a standard double centrifugation procedure and Sheather's sugar solution (spg = 1.27). In one case, due to a very high egg count, a modified McMaster was performed.

Exploratory statistical analyses were performed using a Mann-Whitney test (Minitab 16.2.4) or a Fisher's exact test (<http://vassarstats.net/tab2x2.html>).

Results

The feces of 41 cats from 31 households were analyzed. Eight multi-cat households were included in the study with 2 to 3 cats enrolled from each of these households. Twenty-three cats were indoor only and 18 were permitted outdoor. The majority of the cats, 27 of the 41 (65.8%), were born on St. Kitts; of the remaining 14 cats, 13 were born in the U.S. and one in Ireland. The cats not native to St. Kitts had all been on St. Kitts for at least 7 months, providing sufficient time to be infected with parasites from St. Kitts. The average age of the cats was 52 months. All of the cats were spayed or neutered. Descriptive data for the cats are presented in Table 1.

Eggs of *Trichuris* spp. were seen in the feces of 9 (22%) cats (Table 1). Although more indoor cats than outdoor cats were positive for *Trichuris* spp. infections (26% vs 16.7%), this difference was not statistically significant ($p > 0.05$). There were no statistically significant differences in origin, age and length of ownership for *Trichuris* spp. positive and negative cats. The mean *Trichuris* spp. eggs per gram of feces was 113 (geometric mean 25; range of 2-700).

Twenty of the 41 cats (49%) in the study were infected with parasites. Of the 9 (22%) cats positive for *Trichuris* spp., 5 (56%) had no other parasite infections and 4 (44%) had co-parasite infections: 2 (22%) had *Platynosomum* spp.; 1 (11%) had *Platynosomum* spp., *Ancylostoma* spp. and *Mammomonogamus* spp.; 1 (11%) had coccidia. Eleven (34%) of the 32 cats negative for *Trichuris* spp. were infected with other parasites: 5 (16%) had

Table 1. Descriptive data for *Trichuris* spp. positive and negative cats

		<i>Trichuris</i> spp.		
		All cats (N = 41)	Positive cats (N = 9)	Negative cats (N = 32)
Sex	M	17 [41%]	3 (33%)	14 (44%)
	F	24 [59%]	6 (67%)	18 (56%)
Breed	Domestic short hair	34 (83%)	8 [89%]	26 [81.2%]
	Domestic medium/long hair	3 [7%]	0	3 [9.4%]
	Other	4 [10%]	1 [11%]	3 [9.4%]
Age (months)	Mean (Geometric)	52 (35)	42 (29)	55 (36)
	Range	10-192	12-144	10-192
Environment	Indoor only	23 [56%]	6	17
	Indoor/Outdoor	18 [44%]	3	15
Months owned	Mean (Geometric)	43 (23)	23 (14)	49 (27)
	Range	5-192	5-60	5-192
Origin	St. Kitts	27 [66]	8 [89]	19 [59]
	Imported	14 [34]	1 [11]	13 [41]

Platynosomum spp.; 1 (3%) had *Platynosomum* spp. and *Toxocara cati*; 3 (9%) had *Ancylostoma* spp. and; 2 (6%) had coccidia.

Discussion and conclusion

This is the first study on intestinal helminth infections in owned cats in the Caribbean region. Both indoor and outdoor cats were infected to a high degree with intestinal helminths. The 22% prevalence of *Trichuris* spp. in owned cats found in this study is likely applicable to other Caribbean and South American countries, where high rates of infection have been noted in feral cat populations and case reports.

One potential source of infection for indoor only cats is residual eggs in the environment after the cat was dewormed when first acquired. The number of indoor cats with *Platynosomum* spp. infections might be due to the number of lizards inside of homes on St. Kitts.

While chronic inflammation of the mucosa of the cecum and colon has been associated with *T. vulpis* infections and intussusception [3], to date there are no studies documenting clinical signs or pathology of *Trichuris* spp. infections in cats. With concerns regarding the pathogenicity of *Trichuris* spp. in other hosts, an increased awareness of the potential clinical signs due to *Trichuris* spp. infections is needed. In addition, the zoonotic potential of *Trichuris* spp. in cats should be assessed, given the high prevalence. Since no anthelmintics are registered for the treatment of *Trichuris* spp. infections in cats, attention is needed in regards to the efficacy of routine anthelmintic treatments.

Our study is subject to limitations. First of all, the sample size was relatively low, and differences between characteristics thus did not show statistical significance. In addition, the cats sampled were all owned by one group (RUSVM faculty, staff and students); thus the results might not represent the overall owned cat population on St. Kitts. In addition, the prevalences found are likely to be underestimated since only one fecal sample per cat was analyzed and *Trichuris* spp. can be intermittent shedders.

In conclusion, our study documents a high prevalence of *Trichuris* spp. in owned cats on St. Kitts. Other parasite infections were also documented and the results emphasize the importance of conducting routine fecal examinations on all owned cats regardless of indoor or outdoor housing. Treatment and prevention programs should be tailored to the parasites in a given geographical location with special attention to those of zoonotic potential.

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Authors' contributions

Jennifer K. Ketzis: study design, enrollment of cats; data entry and review; statistical analysis, manuscript; Linda Shell: study design; IRB permission; enrollment of cats; review of manuscript; Sarah Chinault: enrollment of cats; study organization; data entry; Charles Pemberton: fecal analysis; review of manuscript; Mary Mauldin Pereira: enrollment of cats; review of manuscript

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Corresponding author

Jennifer K. Ketzis
Department of Biomedical Sciences, Ross University School of Veterinary Medicine, PO Box 334, Basseterre, St. Kitts and Nevis, West Indies
Phone: +1 732-898-0055
Fax: +1 869-465-1203
Email: jketzis@rossvet.edu.kn

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