

Occurrence of gastrointestinal parasites in dogs and cats domiciliated in Santos, SP, Brazil

Ocorrência de parasitos gastrintestinais em cães e gatos domiciliados em Santos, SP, Brasil

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How to cite: Lima ND, Raimundo DC, Souza VAF, Aguiar JM. Occurrence of gastrointestinal parasites in dogs and cats domiciliated in Santos, SP, Brazil. *Braz J Vet Parasitol* 2021; 30(4): e011721. <https://doi.org/10.1590/S1984-29612021080>

Abstract

Helminths and protozoa are major causes of diseases in domestic animals, and many can also cause infections in humans. Knowledge of intestinal parasitoses affecting domestic animals is important for the implementation of appropriate preventive measures. The objective of this study was to evaluate the occurrence of gastrointestinal parasites in fecal samples of dogs and cats attended at the Veterinary Hospital of the Metropolitan University of Santos, SP, Brazil. We also attempted to determine whether such infection was associated with sex, age, or the presence of diarrhea. We analyzed 100 fecal samples: 85 from dogs and 15 from cats. Among the dogs, 31.8% of the samples were positive, and to 40.0% among the cats. Infection was not associated with sex or age. However, among the dogs, parasitism showed a significant association with the presence of diarrhea ($P = 0.013$). The helminths *Ancylostoma* spp. and the protozoa *Giardia duodenalis* were the most frequent parasites in this research. Although they present unknown species and assemblages, they are parasites with a zoonotic potential of great importance in public health. Therefore, it is essential that pets are properly diagnosed and treated against gastrointestinal parasitic infection to prevent the spread of diseases.

Keywords: Household pets, coproprarasitological tests, endoparasites, pets, zoonosis, seaside region.

Resumo

As enfermidades causadas por helmintos e protozoários representam uma das principais causas de doenças em animais domésticos, e muitos desses parasitos podem causar infecções em seres humanos. O conhecimento das enteroparasitoses que acometem os animais domésticos é de suma importância para que medidas preventivas adequadas sejam implementadas. O objetivo do presente trabalho foi avaliar a frequência de ocorrência de parasitos gastrintestinais em amostras de fezes de cães e gatos atendidos no Hospital Veterinário da Universidade Metropolitana de Santos, bem como sua associação com o sexo, a idade e a presença de diarréia. Do total das amostras de cães analisadas, 31,8% estavam positivas, em relação aos gatos, e 40% apresentaram positividade. Não houve associação entre o sexo e a idade, porém, foi observada associação significativa entre a presença da parasitose e da diarréia ($p=0,013$) entre os cães. O helminto *Ancylostoma* spp. e o protozoário *Giardia duodenalis* foram os mais frequentes na pesquisa. Embora apresentem espécies e "assemblages" desconhecidas, são parasitos de potencial zoonóticos de grande importância em saúde pública. Assim, é essencial que os animais de companhia sejam corretamente diagnosticados e tratados contra infecções parasitárias gastrintestinais para evitar a propagação de doenças.

Palavras-chave: Animais domésticos, testes coproprarasitológicos, endoparasitas, pets, zoonoses, região litorânea.

Received July 9, 2021. Accepted September 8, 2021.

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Introduction

Brazil ranks as the third one in the world in terms of the number of pets, with a population of 141.6 million animals, dogs and cats accounting for 55.1 and 24.7 million, respectively. From 2018 to 2019, the number of cats in Brazilian households increased by 3.0%, and dogs by 1.7% (ABINPET, 2020). In large urban centers, the level of human exposure to various zoonotic agents has been found to strongly correlate with the number of pets (Ferreira et al., 2016).

Gastrointestinal diseases caused by helminths and protozoa are among the most common diseases in dogs and cats with diarrhea, anemia, and dehydration being the most common clinical manifestations (Heilmann et al., 2018). These are important problems from a public health perspective because many of these parasites can also cause disease in humans (Torrico et al., 2008). Besides, helminth eggs and protozoan cysts/oocysts can remain in the soil for long periods, which increases the risk of environmental contamination and therefore of disease transmission (Mello et al., 2011). Thus, the diagnosis of parasitic infections is very important for the implementation of appropriate prophylactical measures to prevent transmission (Kostopoulou et al., 2017).

The helminths most frequently observed in domestic dogs and cats are *Ancylostoma* spp., *Toxocara* spp., *Trichuris vulpis*, *Strongyloides stercoralis* and *Dipylidium caninum*. Additionally, the most common protozoa in such animals are *Giardia duodenalis*, *Cystoisospora* spp., *Sarcocystis* spp., and *Cryptosporidium* spp. (Ferreira et al., 2016; Gennari et al., 2016).

The objective of the present study was to determine the frequency of gastrointestinal parasites in fecal samples obtained from domestic dogs and cats that were attended at the Veterinary Hospital (HOVET) of the Faculty of Veterinary Medicine, Metropolitan University of Santos (UNIMES), Santos, Brazil. We also attempted to determine whether the presence of such parasites was associated with host characteristics such as sex, age, and the presence of diarrhea.

Materials and Methods

The study was carried out in the Parasitology Laboratory of the UNIMES School of Veterinary Medicine between September 2018 to April 2019. The project was approved by the Research Ethics Committee of the University (Reference no. 10712122018).

Animals

The fecal samples from 100 domestic animals—85 dogs and 15 cats—that were attended at the HOVET-UNIMES for different reasons were collected by convenience. The material was kept refrigerated until analysis, which occurred within the first 24 h after collection. Age, sex, and the presence of diarrhea were registered.

Diagnostic techniques

For helminth and protozoan research the diagnosis was made by using three methods for the parasitological examination of fecal samples: flotation in saturated sodium chloride (Willis, 1921); centrifugal flotation in sucrose solution (Ogassawara et al., 1986); and centrifugal sedimentation in water-ether (Sheather, 1923). Under light microscopy, the samples were examined with a 10× objective, and confirmation was obtained with a 40× objective. All of the methods were qualitative, and the results are expressed as the presence or absence of parasites.

Statistical analysis

To characterize the sample, we calculated descriptive statistics, including the relative frequencies of the categorical variables investigated, and the respective 95% confidence intervals for the proportions. Pearson's chi-square test or Fisher's exact test were performed in order to test the association between the positivity for intestinal parasites and the study variables (sex, age, and the presence of diarrhea) at 5% level of significance. All statistical analyses were performed with the aid of the statistical software R, version 4.0.0 (R Core Team, 2021).

Results and Discussion

Among the 85 dogs, 55.3% were females and 44.7% were males; 12 were < 1 year of age, and 73 were ≥ 1 year of age, and diarrhea was observed in 35 of them. Among the 15 cats, there were nine females and six males; three were < 1 year of age, and 12 were ≥ 1 year of age, and diarrhea was observed in four of them.

Of the 85 canine fecal samples evaluated 31.8% were positive for single or mixed infection (Table 1). We identified the helminths *Ancylostoma* spp. and *T. vulpis*, as well as the protozoa *Giardia duodenalis* and *Cystoisospora* spp. in the canine samples. Of the 15 feline fecal samples, 40.0% tested positive for a single infection by *Ancylostoma* spp. (20.0%); by *Giardia duodenalis* (13.3%), and by *Sarcocystis* spp. (6.7%). Previous studies have demonstrated that these gastrointestinal parasites are common in dogs and cats in various regions of Brazil (Funada et al., 2007; Torrico et al., 2008; Gennari et al., 2016).

Ancylostoma spp. was the most common nematode (5.88%) in the present study, which has been reported to be the most prevalent nematode genus in Brazil (Dantas-Torres & Otranto, 2014). In a recent study conducted in the city of São Luís, located in the Brazilian state of Maranhão, Silva et al. (2017) reported high positivity for *Ancylostoma* spp. infection among the 200 dogs (48.5%) and 15 cats (66.7%). In a study carried out by Monteiro et al. (2016), *Ancylostoma* spp. was identified in 67.2% of the 113 positive fecal samples collected from cats in the northeastern region of Brazil. On the other hand, in another study conducted in the metropolitan area of São Paulo, Gennari et al. (2016) identified *Ancylostoma* spp. in only 1.4% of the 502 evaluated cats. This helminth has been reported not only in large urban centers but also in rural areas (Sevá et al., 2018).

Positivity is influenced by dogs and cats age and environmental conditions like temperature, humidity and animal density (Mccarthy & Moore, 2000; Kostopoulou et al., 2017). The soil, in turn, can act as a reservoir for several infectious agents (Mello et al., 2011); however, information regarding the environmental conditions in which the animals live were not evaluated in this study.

Ancylostoma spp. is a nematode of great importance in public health due to the fact that its infectious larvae present in the environment can penetrate the skin of humans and cause a disease known as cutaneous *larva migrans*, which manifests as a progressive migrating serpiginous rash. The most common is the infection by *Ancylostoma brasiliense*, species from dogs and cats, but *A. caninum*, only shed from dog, can also cause the disease (Jelinek et al., 1994).

In the present study, *T. vulpis* eggs were identified in only two samples (2.4%), both in dogs that were coinfecting by *Ancylostoma* spp. Low helminth frequency has also been demonstrated in previous studies (Torrico et al., 2008; Ferreira et al., 2016).

Table 1. Frequency of helminth eggs and protozoan cysts/oocysts in dogs and cats fecal samples.

Hosts	Parasites	Positive samples	
		<i>n</i> (%)	95% CI
Dogs (<i>n</i> = 85)	<i>Ancylostoma</i> spp.	5 (5.88)	0.88-10.88
	<i>Giardia duodenalis</i>	14 (16.47)	8.59-24.36
	<i>Cystoisospora</i> spp.	2 (2.35)	0-5.58
	<i>Ancylostoma</i> spp. + <i>Trichuris vulpis</i>	2 (2.35)	0-5.58
	<i>Ancylostoma</i> spp. + <i>Giardia duodenalis</i>	2 (2.35)	0-5.58
	<i>Ancylostoma</i> spp. + <i>Cystoisospora</i> spp.	2 (2.35)	0-5.58
	Total	27 (31.76)	21.87-41.66
Cats (<i>n</i> = 15)	<i>Ancylostoma</i> spp.	3 (20)	0-52.01
	<i>Giardia duodenalis</i>	2 (13.33)	0-40.53
	<i>Sarcocystis</i> spp.	1 (6.67)	0-26.63
	Total	6 (40)	0.8-79.2

Although rare, *T. vulpis* can also infect humans and cause an uncommon, severe zoonosis with various presentations, ranging from mild, asymptomatic infections to the development of clinical manifestations such as diarrhea, nausea, vomiting, and abdominal pain (Márquez-Navarro et al., 2012).

The most common protozoa observed in the present study was *Giardia duodenalis*, which was identified in 18.8% of the fecal samples collected from dogs and in 13.3% of those collected from cats. That is in agreement with the findings of several previous studies carried out in Brazil (Funada et al., 2007; Torrico et al., 2008; Ferreira et al., 2016). The worldwide prevalence rate of giardiasis in dogs and cats is 15.2% and 12.0%, respectively. However, the prevalence varies depending on the analyzed region, as recently demonstrated in a study conducted in the metropolitan area of São Paulo, where the prevalence of giardiasis among dogs in the city was only 6.9% (Chiebao et al., 2020). Hygiene conditions, together with the practice of parasite control by breeders, veterinarians, and tutor, directly influence the occurrence of the disease (Mohamed et al., 2013).

Giardia duodenalis is an intestinal protozoan that causes acute gastroenteritis in several animal species, including humans. It is one of the most important pathogens that cause diarrheal diseases, not only in low and middle-income countries but also in high-income countries (Mohamed et al., 2013). This parasite can be classified, by molecular studies, with eight different assemblages (A-H) in which some are probably exclusive to certain hosts, while others may infect humans as well as other animals (A and B) (Cacciò et al., 2018).

The protozoa *Cystoisospora* spp. and *Sarcocystis* spp. were also identified in fecal samples of dogs and cats, respectively (Table 1). Various studies have shown that these protozoa are usually present in intestinal infections, although to a lesser extent than *Giardia* spp. (Funada et al., 2007; Katagiri & Oliveira-Sequeira, 2008; Ferreira et al., 2016; Gennari et al., 2016).

Animal immune status changes during his lifetime; therefore, age is an important determining factor for parasitic infections. As a result of one or more exposures, specific immunity can develop over time (Moreau & Chauvin, 2010). Although previous studies of domestic animals have shown an association between the presence of infection and age (Funada et al., 2007; Ferreira et al., 2016; Gennari et al., 2016), we observed no significant association between positivity to gastrointestinal parasites and age or sex (Table 2), despite the absence of data on the different age groups of the animals. However, the age groups presented in our study were the same as those pointed out in the studies mentioned above.

Table 2. Frequency of dogs and cats fecal samples testing positive for parasitic infection by sex, age, and the presence of diarrhea.

Hosts	Parasites	Sex			Age			Diarrhea		
		Male	Female	p	< 1 year	≥1 year	p	Yes	No	p
		n/N	n/N		n/N	n/N		n/N	n/N	
Dogs (n=85)	<i>Ancylostoma</i> spp.	4/38	1/47	0.304*	-	5/73	-	3/31	2/54	0.099*
	<i>Giardia duodenalis</i>	3/38	11/47	0.139	1/12	13/73	0.578*	6/31	8/54	0.702
	<i>Cystoisospora</i> spp.	2/38	-	-	1/12	1/73	0.528*	2/31	2/54	0.928
	<i>Ancylostoma</i> spp. + <i>Trichuris vulpis</i>	1/38	1/47	1.0*	-	2/73	1.0*	2/31	-	-
	<i>Ancylostoma</i> spp. + <i>Giardia duodenalis</i>	1/38	1/47	1.0*	-	2/73	-	2/31	-	-
	<i>Ancylostoma</i> spp. + <i>Cystoisospora</i> spp.	1/38	1/47	1.0*	-	2/73	-	2/31	-	-
	Total	12/38	15/47	0.974	2/12	25/73	0.385*	15/31	12/54	0.013
Cats (n=15)	<i>Ancylostoma</i> spp.	2/6	1/9	0.681*	1/3	2/12	1.0*	2/4	1/11	0.308
	<i>Giardia duodenalis</i>	-	2/9	-	-	2/12	-	-	2/11	-
	<i>Sarcocystis</i> spp.	-	1/9	-	-	1/12	-	1/4	-	-
	Total	2/6	4/9	1.0*	1/3	5/12	1.0*	3/4	3/11	0.286

*Fisher’s exact test.

Most of the dogs evaluated in the present study were over 1 year of age (85.9%), 30.6% of which were found to be parasitized. Ferreira et al. (2016) reported *Ancylostoma* spp. as the most prevalent helminth in dogs over one year of age. In our study, helminths were not found in puppies, only in adult dogs (Table 2). This absence may be associated with several causes, such as less access to the street and the more constant use of dewormers (Gennari et al., 2016), but this information was not obtained in the survey.

The presence of diarrhea was observed in 31 dogs and 48.4% of these tested positive for infection, compared with only 22.2% of 54 that did not have diarrhea. A significant association ($P = 0.013$) was seen between the presence of diarrhea and the positivity for intestinal parasites (Table 2). Several clinical signs may be present in gastrointestinal infections of parasitic origin, although diarrhea is the most common manifestation in infected animals (Heilmann et al., 2018). All the animals that had mixed infections presented diarrhea; this is an important factor that shows less host resilience when there is a great challenge. Resilience is the capability of a host to cope with parasites, without presenting clinical manifestation of disease (Labruna et al., 2006).

Among the cats, the proportion of those testing positive for the infection in our sample was higher in those with diarrhea than in those without it (75.0% vs. 27.3%), although the difference was not significant ($P = 0.286$). It is possible that the lack of a significant association, in this case, was due to the small sample size. Although there is a clear trend toward cats becoming the preferred pet (ABINPET, 2020), dogs are still the most often pets seen at the clinical veterinary practice (Funada et al., 2007; Torrico et al., 2008; Silva et al., 2017).

Information regarding the use of anthelmintics was obtained only from some of the studied animals. Among those who were parasitized only 4 received treatment in the 6 months preceding collection. From these animals, 3 had *Giardia duodenalis* and 1 *Cystoisospora* spp. No cats had been dewormed recently. In cases where the analysis between these factors was possible, no statistical association was observed. Katagiri & Oliveira-Sequeira (2008) also observed no significant difference after stratifying the groups of dogs they evaluated regarding the use of anthelmintics. Furthermore, deworming is recommended throughout the life of dogs and cats in Brazil, but it is very relevant to highlight that some drugs did not show effectiveness against enteric protozoa (Ferreira et al., 2016; Gennari et al., 2016).

Conclusions

Despite the deficiencies identified in the study, as the absence of information related to the previous use of dewormers, environment characteristics where the animal lives and reduced sample size, the present study reveals the occurrence, especially of *Ancylostoma* spp. and *Giardia duodenalis* in fecal samples of the animals evaluated, both agents with potential risk of zoonotic transmission. The results obtained have great epidemiological importance, since there are few reports on the occurrence of endoparasites in animals from the region studied. Therefore, we emphasize the importance of parasitological tests for the correct diagnostics and treatment of parasitic diseases in companion animals.

Acknowledgements

The work was funded by a grant from CNPq (164282/2018-1).

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