



Prevalence of gastrointestinal parasites in domiciled dogs in Manaus, Amazonas, Brazil

Hevila Gabrieli Nascimento de Campos¹, Lívia Mendes Miranda¹, Herbert Sousa Soares^{1*}, Sérgio Santos de Azevedo², Solange Maria Gennari¹

¹Programa de Pós-Graduação em Saúde Única, Faculdade de Medicina Veterinária, Universidade Santo Amaro, São Paulo, SP, Brazil.

²Unidade Acadêmica de Medicina Veterinária, Universidade Federal de Campina Grande, Patos, Paraíba, Brazil.

ABSTRACT

OBJECTIVE

The objective of the present study was to determine the prevalence of gastrointestinal parasites in dogs living in the city of Manaus, Amazonas.

METHODS

Fecal samples from 401 domiciled dogs were collected in the six zones of the municipality and information on the dogs' age, sex and contact with the streets was obtained for subsequent analysis of associations between the presence of parasites and the variables. The feces were preserved in 2.5% potassium dichromate, kept refrigerated and analysed by flotation and centrifuge-sedimentation methods and considered positive when parasitic forms were found in any of the methods used.

RESULTS

The prevalence of dogs positive for one or more parasites was 4% (Confidence Interval - 95% CI = 2.1% - 5.9%) with 16 of the 401 dogs positive. *Giardia duodenalis* was the most prevalent protozoan (1.0%) followed by *Cystoisospora* spp. (0.25%) and *Cryptosporidium* spp. (0.25%). Among helminths, *Ancylostoma* spp. presented a prevalence of 2% and *Toxocara canis* and *Strongyloides stercoralis* of 0.25%.

CONCLUSION

The prevalence of dogs positive for gastrointestinal parasites presented lower values than those observed in other regions of the country, indicating adequate management of dogs domiciled in the municipality. No association was observed between the presence of parasites and the variables studied. The most prevalent parasite was *Ancylostoma* spp. followed by *G. duodenalis*, and complementary molecular studies are important to evaluate the zoonotic potential of this protozoan.

DESCRIPTORS

Coccidia, Giardia spp., Helminths.

Corresponding author:

Herbert Sousa Soares.

Faculdade de Medicina Veterinária, Universidade Santo Amaro, Rua Prof. Enéas de Siqueira Neto, 340, CEP 04829-300, São Paulo, SP, Brasil.

Email: hesoares@prof.unisa.br

ORCID ID: <http://orcid.org/0000-0002-9887-5408>

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INTRODUCTION

Due to the closeness of the human/animal relationship, it is necessary to know and evaluate the impact that this relationship can have on human and animal health. Animals, especially domestic ones, can become a source of infection for important zoonotic agents of parasitic, bacterial and fungal origin¹.

Dogs are, among domestic animals, those that have the greatest interaction with humans. It is estimated that approximately 44.3% of the Brazilian population has one or more dogs living in their homes². However, despite this active participation within the family, some owners carry out inadequate management, making diseases more likely to arise, both in animals and humans¹.

In Brazil, in addition to the high rate of stray dogs, around 30 million¹, there are also basic sanitation problems, such as water supply, sewage, urban cleaning, urban drainage, solid waste and rainwater management, which are quite precarious conditions in some regions, contributing to the emergence of diseases in domestic animals and humans³.

Parasites are the causes of the main diseases that affect the gastrointestinal tract, both in humans and animals, causing diarrhea, dehydration, and weight loss⁴, which tend to reduce the host's immunity causing poor development⁵.

Giardiasis is a disease caused by an intestinal parasite, *Giardia duodenalis* (syn. *Giardia lamblia* or *Giardia intestinalis*). Symptoms depend on the susceptibility of the host and the genotype and virulence of the parasite strain⁴. To understand the zoonotic potential of *G. duodenalis*, it is necessary to carry out molecular methods that characterize genetic differences. To date, eight genetic groups (assemblages) have been identified, two of which (A and B) are found in humans and animals and another six (C to H) are host-specific and not found in humans. In dogs, assemblages C and D are considered species-specific, however assemblages A and B have also been described in this species⁷. Due to the importance of hydric transport of this agent, environments with poor basic sanitation are highly conducive to the spread of the protozoan⁶.

Cryptosporidiosis, a disease caused by the protozoan *Cryptosporidium* spp., is prevalent in several countries and considered neglected by the World Health Organization⁷. *Cryptosporidium* spp. can lead to diarrhea in humans and animals, including dogs. The species that predominantly infect humans are *C. hominis* and *C. parvum* and, in dogs, *C. canis*. However, *C. canis* can infect immunocompromised humans⁸. Also, for the diagnosis of cryptosporidiosis, molecular tools are of great help, allowing the identification of the relationship between the parasite genotype and the infected hosts, providing more accurate information about the zoonotic nature of these parasites⁹.

Among the nematodes that infect dogs, the ascarid, *Toxocara canis*, and the hookworm, *Ancylostoma caninum*, are the etiological agent of Visceral Larva Migrants and Cutaneous Larva Migrants, respectively, are zoonoses that occur widely in Brazil and around the world¹⁰.

Studies on the occurrence of gastrointestinal parasites in dogs in Brazil were carried out in several regions, with the most prevalent nematodes being *A. caninum* and *T. canis* and the protozoa *Giardia* spp., *Cryptosporidium* spp. and *Cystoisospora* spp.^{5, 10, 11, 12, 13, 14}.

Other parasitic agents are also frequently described in dogs, such as *Trichuris vulpis*, *Dipylidium caninum* and *Strongyloides stercoralis*, these parasites also described infecting humans^{5, 15, 16}.

A study by Instituto Trata Brasil¹⁷ describes the North Region as having the most precarious basic sanitation in all region of Brazil, favoring a series of diseases, including parasites. Manaus is the most populous municipality in the state of Amazonas, with 2,219,580 inhabitants and it is estimated that there are 205,771 domiciled dogs in the city, however there is

no information on the number of stray animals¹⁸.

Studies carried out in Manaus, with human gastrointestinal parasites, found, in some regions of the city, 100% positivity for intestinal parasites, 30.7% for helminths and 69.3% for protozoa¹⁹, many infected by *Giardia* and hookworms, responsible by zoonoses.

The objective of the present study was to determine the prevalence of gastrointestinal parasites in domiciled dogs in the city of Manaus.

METHODS

The project was approved by the Ethics Committee on the Use of Animals of the Faculty of Veterinary Medicine of the Santo Amaro University, São Paulo, SP, under number 20/2020.

Collection Location and Estimation of the Number of Samples

The study was conducted in the city of Manaus (3° 6'6.98"S and 60° 1'30"W), capital of the state of Amazonas, Brazil. The municipality comprises approximately 11,401 km² of area and an estimated 2,219,580 inhabitants²⁰. The climate of Manaus is considered tropical humid monsoon²¹, it is located in the central part of the Amazon basin, on the left bank of the Rio Negro, with an average compensated annual temperature of 27°C and relatively high air humidity and an average rainfall of 2300 millimeters annually²².

Based on the estimate that there are 205,771 domiciled dogs in the municipality of Manaus, according to Thrusfield²³, the calculation of the sample number was 384 dogs, however samples were obtained from 401 animals in the present study.

Collections were made in homes, to cover the entire city, which is divided into six zones: North, South, South Center, East, West and Midwest.

Obtaining Samples

The collections were carried out from January to March 2021. These were previously scheduled; the samples were collected by the owners on the scheduled day and a member of the team took the collections and carried out a questionnaire with information about the animal and management. Participants were invited based on forms obtained from veterinary clinics and through recommendations from friends and relatives.

On the same day of collection, the feces were placed in a potassium dichromate solution (2.5%) for conservation and stored under refrigeration (5°C) for subsequent analysis, carried out in April 2021, in the laboratories of the Faculty of Veterinary Medicine of Santo Amaro University, in São Paulo/Brazil.

Copro-parasitological Techniques

The fecal samples were examined using two flotation methods, the method of Willis and Faust²⁴, carried out with 33% zinc sulfate (d = 1.18 g/cm³) and the method of Ogassawara et al.²⁵, carried out with sucrose solution (d = 1.203 g/cm³). The centrifugal-sedimentation technique in water-ether was also carried out according to Ferreira et al.²⁶ The sample was considered positive when parasitic forms were found in any of the techniques performed.

RESULTS

Fecal samples were collected from 401 dogs from the six zones of the municipality with very similar quantities in each area as shown in Table 1.

The total prevalence of positive dogs was 4% (95% CI = 2.1% - 5.9%) with 16 of the 401 animals positive for one or more par-

asites. Among the protozoa found, *G. duodenalis* was the most prevalent (1.0%) followed by *Cystoisospora* spp. and *Cryptosporidium* spp. with a prevalence of 0.25%. Among helminths, *Ancylostoma* spp. presented a prevalence of 2% and *T. canis*

and *S. stercoralis* of 0.25% (Table 1).

No significant association was observed between the presence of gastrointestinal parasites and the variables analyzed ($p > 0.05$).

Table 1. Prevalence of gastrointestinal parasites in samples of domiciled dogs in the city of Manaus, AM, according to the variable studied.

	No. of Samples (%)	<i>Ancylostoma</i> spp (%)	<i>Toxocara canis</i> (%)	<i>Strongyloides stercoralis</i> (%)	<i>Giardia duodenalis</i> (%)	<i>Cystoisospora</i> spp (%)	<i>Cryptosporidium</i> spp (%)
Zone							
North	71 (17,7)	1 (1,4)	0	0	0	0	0
South	67 (16,7)	0	1 (1,4)	1 (1,4)	0	1 (1,4)	1 (1,4)
East	69 (17,2)	1 (1,4)	0	0	2 (2,9)	0	0
West	67 (16,7)	1 (1,4)	0	0	1 (1,4)	0	0
Midwest	64 (15,9)	2 (3,1)	0	0	1 (1,4)	0	0
South Center	63 (15,7)	3 (4,7)	0	0	0	0	0
Sex							
Male	152 (37,9)	2 (1,3)	1 (0,6)	1 (0,6)	0	0	0
Female	249 (62,1)	6 (2,4)	0	0	4 (1,6)	1(0,4)	1(0,4)
Age							
< 12 months	69 (17,2)	4 (5,8)	1 (1,4)	1 (1,4)	1 (1,4)	0	1(1,4)
≥ 12 months	332 (82,7)	4 (1,2)	0	0	3 (0,9)	1(0,3)	0
Streets (access)							
YES	121 (30,1)	4 (3,3)	0	0	1 (0,8)	1 (0,8)	0
NO	280 (69,8)	4(1,4)	1 (0,3)	1 (0,3)	3 (1,1)	0	1 (0,3)
TOTAL	401 (100,0)	8 (2,0)	1 (0,25)	1 (0,25)	4 (1,0)	1 (0,25)	1 (0,25)

DISCUSSION

The dogs used in the present study were all domiciled, so the results represent this category of animals and comparisons with shelter and stray dogs must be made with caution. The prevalence was low for all parasites when compared to values found in domiciled dogs in other regions of the country^{5, 12, 13, 28, 32}. However, the most prevalent helminth and protozoan, *Ancylostoma* spp. and *G. duodenalis*, respectively, were also the most prevalent nematode and protozoan found in other regions of Brazil^{5, 13, 14, 28, 29, 30, 31}.

Parasites of the genus *Ancylostoma* spp., *G. duodenalis* and *Toxocara* spp. are the most relevant parasites in terms of zoonotic potential, however, due to the importance of these parasites and the large area and regional differences of the country, more studies, with human and animal samples, must be carried out using molecular methods, which can help in a better understanding of the epidemiology, especially the protozoan infections^{32, 33, 34}. In the present study, no molecular tests were carried out, therefore it cannot be said that the genotype of *G. duodenalis* found was zoonotic.

Labruna and collaborators¹⁴ carried out one of the few studies on the prevalence of gastrointestinal parasites in dogs living in the northern region of Brazil, in the State of Rondônia. Of the 95 samples examined, the most prevalent parasite was *Ancylostoma* spp. (73.7%), followed by *T. canis* (18.9%), *Giardia* spp. (8.4%) and *C. parvum* (2.1%), however, most dogs in the Rondônia study, despite being domiciled, and roamed the streets freely.

In the city of Manaus there is a single study on the occurrence of gastrointestinal parasites, carried out with samples from 80 stray dogs and 100% were positive for some type of parasite, especially helminths³. In the present study, in addition to the dogs being domiciled, almost 70% of them did not have access to the streets and, when they visited them, they were always accompanied by their owners. During the questionnaire, owners were not asked about the use of anthelmintic or treatments for gastrointestinal parasites, whether preventively or curatively, and it was not possible to evaluate this parameter.

None of the variables studied were associated with infection by the parasites found, probably due to the small number of positive dogs.

CONCLUSION

The prevalence of gastrointestinal parasites in dogs living in the city of Manaus, AM, was low when compared to values found in

other Brazilian cities. However, due to the zoonotic importance of the most prevalent parasites, new studies must be carried out in the municipality, with dogs under different management and with humans, as well as using methodology that allows confirming the zoonotic nature of some of the parasites found.

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