

OCCURRENCE OF INTESTINAL PARASITES IN FECAL SAMPLES OF DOGS AND CATS FROM MINEIROS, GOIÁS

OCORRÊNCIA DE PARASITAS INTESTINAIS EM AMOSTRAS FECAIS DE CÃES E GATOS DE MINEIROS, GOIÁS

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SUMMARY

Gastrointestinal parasites are frequently found in domestic animals, with important role in animal and public health. Among gastrointestinal parasites of dogs and cats *Toxocara* spp. and *Ancylostoma* spp. are reported as the most common parasites found in dogs and cats in the world causing digestive damage, including death, and with great importance in public health causing visceral *larva migrans* and cutaneous *larva migrans* respectively. This study aimed verify the occurrence of gastroenteric parasites in dogs and cats from Mineiros, Goiás, in association with epidemiological aspects. In total, 103 fecal samples (93 from dogs and 10 from cats) from April 2017 to July 2018 were collected by spontaneous defecation and processed for search of eggs and oocysts by the Willis (adapted) technique. *Toxocara* spp. was the most frequent parasite identified in dogs, with 34.41% frequency (32/93 samples), followed by *Ancylostoma* spp. (11.83%, 11/93 samples) and *Cystoisospora* spp. (1.07%, 1/93 samples). Fecal samples from cats, showed a similar result, being *Toxocara* spp. the most frequent parasite (40%, 4/10 samples), followed by *Ancylostoma* spp. (20%, 2/10 samples) and *Cystoisospora* spp. (20%, 2/10 samples). Young animals were 10% more positive for parasites comparing to elderly and adult animals (*odds ratio*=1.1), as well as animals with access outdoors 20% more parasitized (*odds ratio*=1.2). The study showed the most common gastrintesimal parasites of dogs and acts from Mineiros, Goiás.

KEY-WORDS: Gastrointestinal. Helminths. Parasitology. Protozoa. Zoonosis.

RESUMO

Parasitas gastrointestinais são frequentemente encontrados em animais domésticos, com importante papel na saúde pública e animal. Entre os parasitas gastrointestinais de cães e gatos *Toxocara* spp. e *Ancylostoma* spp. são relatados como os parasitas mais comuns encontrados em cães e gatos no mundo causando danos digestivos, incluindo a morte, e com grande importância em saúde pública causando *larva migrans* visceral e *larva migrans* cutânea respectivamente. Este estudo teve como objetivo verificar a ocorrência de parasitas gastroentéricos em cães e gatos de Mineiros, Goiás, e seu impacto na saúde pública. No total, 103 amostras fecais (93 de cães e 10 de gatos) foram coletadas de abril de 2017 a julho de 2018 por defecação espontânea e processadas para a busca de ovos e oocistos pela técnica de Willis (adaptado). *Toxocara* spp. foi o parasita mais frequente identificado em cães, com 34,41% (32/93 amostras), seguido de *Ancylostoma* spp. (11,83%, 11/93 amostras) e *Cystoisospora* spp. (1,07%, 1/93 amostras). Amostras de fezes de gatos apresentaram resultado semelhante, sendo *Toxocara* spp. o parasita mais frequente (40%, 4/10 amostras), seguido por *Ancylostoma* spp. (20%, 2/10 amostras) e *Cystoisospora* spp. (20%, 2/10 amostras). Animais jovens foram 10% mais positivos para parasitas em comparação com animais idosos e adultos (*odds ratio* = 1,1), assim como animais de rua 20% mais parasitados (*odds ratio* = 1,2). O estudo mostrou as parasitoses gastrintestinais mais comuns de cães e atua em Mineiros, Goiás.

PALAVRAS-CHAVE: Gastrointestinal. Helminths. Parasitologia. Protozoário. Zoonoses.

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INTRODUCTION

Gastrointestinal parasites are frequently found in domestic dogs and cats, playing an important role in animal and public health. Initiating in the animals, development delays and severe gastroenteritis, which may progress to death. In humans, some pathogens such as *Ancylostoma* spp., *Toxocara* spp. and *Giardia* spp. (which have zoonotic potential) can cause cutaneous disorders, allergies, diarrhea, weight losses and dehydration (ZAJAC & CONBOY, 2012).

The occurrence of these endoparasites is mainly due to the exacerbated flow of animals in public places, since feces excreted by infected animals contaminate the environment, contributing to the infection of new hosts, whether animals or humans (SANTARÉM et al., 2004; SILVA et al., 2021). Infection can occur either through vertical or horizontal transmission through contaminated food and water in most species, also by the percutaneous route (BOWMAN, 2014; TAYLOR et al., 2017).

Bowman (2014) and Sharif et al. (2007) described *Toxocara* spp. and *Ancylostoma* spp. as the most common canine and feline parasites in regions with a tropical and subtropical climate. In Brazil, several studies describe the occurrence of these parasites in dogs and cats (DANTAS-TORRES & OTRANTO, 2014), with different prevalence, and these analyzes were observed from fecal samples of animals (LEAL et al., 2015; FERREIRA et al., 2016; BRICARELLO et al., 2020; ARRUDA et al., 2021; LIMA et al., 2021), necropsy and identification of helminths through (COELHO et al., 2011; RAMOS et al.,

2013; RAMOS et al., 2015), or even with soil samples from public places, proving levels of environmental contamination (OLIVEIRA et al., 2007; SANTARÉM et al., 2012; BORTOLATTO et al., 2017; MONTEIRO et al., 2018). They are of great importance in public health, causing visceral and cutaneous *larva migrans* in humans. Since susceptible humans and animals are closely linked in everyday life, it is important to know their levels of occurrence. According to Schneider et al. (2011), evidence on zoonoses based on the analysis of the animal/human health interface is fundamental to support new directions to scientific research, treatments and health technologies development, and public policies for the control and prevention of diseases, bases of the "One World, One Health".

The study aimed to identify the frequency of gastrointestinal parasites in dogs and cats from Mineiros, Goiás, to determine which helminths and protozoans are most frequently, and associate with possible epidemiological factors.

MATERIAL AND METHODS

From April 2017 to July 2018 were analyzed canine and feline fecal samples of 103 animals from Mineiros (93 from dogs and 10 from cats), Goiás, Brazil. Samples were collected by spontaneous defecation and immediately processed to search for helminth eggs and protozoan oocysts from the Clinical Laboratory of the University Center of Mineiros (UNIFIMES). The sample size calculation was calculated following the formula:

$$n = \left(\frac{Z_{(1-\alpha)} * \sqrt{p * (1 - p)}}{d} \right)^2 = \left(\frac{1.96 * \sqrt{0.76 * 0.24}}{0,1} \right)^2 \cong 71 \text{ (minimum)}$$

Where n is the sample number; $Z_{(1-\alpha)}$ is the Z value of the standard normal curve for the degree of confidence ($1-\alpha$); p is the estimated proportion of expected results; and d is the desired precision. The value of $Z_{(1-\alpha)}$ was set at 1.96 (for a 95% confidence level). The estimated proportion p was established using data on the maximum gastrointestinal parasites occurrence in dogs from miwestern of Brazil (RAMOS et al., 2015), same region of study area. Finally, for the value of 0.1 for accuracy at the 10% level

After collected, the samples were processed according to the protocol established by Willis (1921), described and adapted by Hoffmann (1987), where they were mixed with sodium chloride hypersaturated solution (NaCl - 35%), filtered in sieve and gauze to remove dirt and subjected to spontaneous fluctuation of eggs and intestinal endoparasite oocysts by density difference. After this procedure, they were analyzed between slide and coverslip in optical microscope (Nikon Eclipse E200) with lugol addition to facilitate the observation of eggs by staining and eggs and oocysts was identified according to Zajac and Conboy (2012).

The level of occurrence was presented in percentages, described by Bush et al. (1997), considering the number of positive animals compared to the number of samples collected. *Odds ratio* was used to compare the

risks of infection, considering the risk factors age and street access. Dogs and cats were classified as young (less than one year), adult (one to seven years) and elderly (older than seven years). Access to the street was questioned to the animal tutors during sample collection.

RESULTS AND DISCUSSION

In total 93 fecal samples were collected from dogs and 10 fecal samples from cats (N=103), and 45 (43.7%) samples were positive to gastrointestinal parasites, and eggs of *Toxocara* spp. and *Ancylostoma* spp., and oocysts of *Cystoisospora* spp., were identified.

Among 93 canine fecal samples, 39 (41.94%) were positive. *Toxocara* spp. was the most frequent parasite 32 (31.41%) of parasitism, followed by 11 (11.83%) for *Ancylostoma* spp. and one (1.07%) for *Cystoisospora* spp. Mixed occurrences were detected in five samples, where *Toxocara* spp. and *Ancylostoma* spp. were identified.

Parasites are found in six samples (60%) of feline fecal samples, being four positive sample for *Toxocara* spp. (40%), two positive samples for *Ancylostoma* spp. (20%), and two positive samples for *Cystoisospora* spp. (20%). Mixed infections were observed in two samples,

being *Toxocara* spp. and *Ancylostoma* spp. in a samples, and *Toxocara* spp. and *Cystoisospora* spp. in other.

Young animals were 10% more likely to be positive for parasites comparing to other ages. Elderly is 14% less likely to become infected. Adults have 32% less

chances of infection. About street access, animals with street access showed 20% more likely to be parasitized and animals without access to the street, presents 18% less chances of being infected with parasites. *Odds ratio* of the risk factors is showed in Table 1.

Table 1 - Risk factors (*odds ratio*) of gastrointestinal parasites infection in canine and feline fecal samples from Mineiros municipality, Goiás, from April 2017 to July 2018.

Risk Factors	Odds ratio
Age	
Young	1.1
Adults	0.68
Elderly	0.86
Street Access	
Yes	1.2
No	0.82

Similar occurrences of infected animals by gastrointestinal parasites were observed in Ribeirão Preto (41.7%) (CAPUANO & ROCHA, 2006), Campo Grande (56.8%) (ARAÚJO et al., 1999), and Cuiabá (60.96% positive results for cats and 76% for dogs) (RAMOS et al., 2013; RAMOS et al., 2015). However, many factors can interfere with the fluctuation of the occurrence, so there are very different percentages, depending on the location and the period.

Belonging to the Ascaridae family, the parasite of the genus *Toxocara* spp is one of the largest nematodes that parasitize the small intestine of mammals, causing toxocarariasis in animals and visceral *larva migrans* (BOWMAN, 2014) which is an anthrozoosis first described in 1907 in Cambridge in a study performed on dogs autopsies (LEIPER, 1907). Eggs eliminated through infected animals waste are very resistant to moisture and survive at temperatures from 10 to 45°C and can persist in the environment for five years (MARTINS, 2019). In Goiás, data on the occurrence of *larva migrans* in humans are lacking, however, a study evaluating anti-*Toxocara canis* antibodies in 1,131 patients in Goiânia municipality in 2009 showed a seroprevalence of 18.9% (SANTOS et al. 2009). This demonstrates that the occurrence of these parasites in animals, associated with the lack of population information and surveillance policies with proper dissemination of data, are factors that together bring potential risk to the human population.

Toxocara eggs eliminated through feces containing L2 at ideal temperatures become infective after four weeks. Once ingested, L2 hatch in the small intestine, travel through the bloodstream to the lungs, where it becomes L3 and return through trachea to the intestine for its last two seedlings to adulthood. This form of infection occurs regularly in animals up to three months old (BOWMAN, 2014). Considering that the most frequent parasite was *Toxocara* spp. in the period and in the studied area, this justifies the greater risk of infection in younger animals, since the most abundant parasite affects this age group. Young animals still forming immune system, unable to respond to infections properly, suffer the most when parasitized, and can be infected by the

transplacental or transmammary transmission. However, older animals can also be affected, especially when elderly or immunosuppressed (RAMÍREZ-BARRIOS et al., 2004).

Clinical signs are most commonly seen in puppies, in which adult worms begin to cause discomfort and increased abdominal volume, moans, opaque hair, vomiting and diarrhea (SHERDING & JOHNSON, 2008). Human infection occurs accidentally through the helminth in its still larval stage or from embryonated parasite eggs through ingestion when present in contaminated, raw, poorly sanitized or undercooked food. The parasite migrates through the body causing an inflammatory reaction. Clinical signs depend on the host immune response, ranging from asymptomatic to more severe cases (PAWLOWSKI, 2001).

In animals after percutaneous or oral infection, larvae can migrate through the bloodstream to the lungs, bronchi and trachea, where they become L4. They are then swallowed and move to the small intestine, where it transforms into adults (BOWMAN, 2014). Each worm as an adult extract about 0.1 ml of blood a day from its host, and in massive infections, animals quickly develop intense anemia. Parasitized animals suffer from weight loss, dehydration and may become depressed and may even die (RIBEIRO, 2004).

Ancylostoma spp cause cutaneous *larva migrans* (CLM) or ancylostomiasis, popularly known as the "hookworm infection", is an anthrozoosis distributed mostly in tropical and subtropical countries, as well as the Midwest of Brazil (SANTARÉM et al., 2004). The *Ancylostoma* spp. genus has a high biotic potential (200-6000 eggs) and active larval infection capacity (L3), which can be found in the small intestine of dogs and cats. In addition, eggs can hatch in just five days under optimal conditions and develop rapidly to L3 in tropical areas with sandy soils, where temperatures can be found between 25 °C and 30 °C (BOWMAN, 2014), climate completely compatible with the city of Mineiros in the Midwestern of Brazil.

CLM is generally related to people who have had contact with sand, especially children who, in addition to

exposing the skin to possible infection, can also ingest eggs through soil contamination (NUNES et al., 2000). After skin penetration, the larvae migrate through the subcutaneous tissue, causing itching and rashes because of the inflammatory reaction.

Cystoisospora protozoa have a wide variety of hosts (TAYLOR et al., 2017). The most common clinical signs affecting infected animals are mild diarrhea, rarely presenting hemorrhage, and in more advanced cases, vomiting and dehydration (VASCONCELOS et al., 2008). The environment is contaminated through the excretion of feces from infected hosts containing unsporulated oocysts, where at appropriate temperature, humidity and oxygenation, they sporulate and become infective. After sporulation, the oocyst presents two sporocysts containing four sporozoites each (TAYLOR et al., 2017). Martins (2019) reported that ingestion of infected food, water or even rodents are the main means of infection to new hosts. The presence of oocysts of these protozoa in the feces of dogs and cats from Mineiros, demonstrate that there is a risk of these animals becoming sick from the infection of this pathogen, mainly puppies, which according to Rodrigues & Menezes (2003), get sick more easily by this parasitism. In addition, the fact that some animals have access to the street facilitates the transmission consequently.

Isosporosis is also a zoonosis, which usually affects immunosuppressed patients, the elderly and children. The observed clinical manifestations are directly linked to the immune system. Intense diarrhea and dehydration are the most common symptoms. Parasitosis may evolve into a chronic infestation, characterizing a syndrome of intestinal poor absorption (VASCONCELOS et al., 2008; PEREIRA et al., 2009).

CONCLUSION

The occurrence of gastrointestinal parasites in animals, mainly domestic, is of great importance in both animal and human health. The findings in the research point to *Toxocara* spp. and *Ancylostoma* spp. as the most common species in the city of Mineiros, Goiás. The result presented occurrence of zoonotic species, showing the need to develop control programs to reduce the occurrence of helminths and protozoa in animals, since the presence of these parasites cause significant delay in their development, especially in young ages, and also exposure of these zoonotic agents to humans in Mineiros, Goiás, Brazil.

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