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*)

ABSTRACT

Gastrointestinal parasites are frequently found in domestic animals, with important role in animal and public health. This study aimed verify the occurrence of gastroenteric parasites in dogs and cats from Mineiros, Brazil, and impact in public health. 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 *Isospora* 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 *Isospora* 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). *Toxocara* spp. and *Ancylostoma* spp. are reported as the most common parasites found in dogs and cats in the world caunsing digestive damage, including death, and with great importance in public health. Effective animal parasite control programs, in addition to the importance of health education, are evident needs according to study data.

Keywords: Gastrointestinal. Helminths. Parasitology. Protozoa. Zoonosis.

RESUMO

Parasitas gastrointestinais são freqüentemente encontrados em animais domésticos, com importante papel na saúde pública e animal. Este estudo teve como objetivo verificar a ocorrência de parasitas gastroentéricos em cães e gatos de Mineiros, Brasil, 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 Isospora 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 Isospora 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). Toxocara spp. e Ancylostoma spp. São relatados como os parasitas mais comuns encontrados em cães e gatos no mundo, causando danos digestivos, inclusive fatais, e com grande importância na saúde pública. Programas eficazes de controle de parasitas animais, além da importância da educação em saúde, são necessidades óbvias de acordo com os dados do estudo.

Palavras-chave: Gastrointestinal.. Helmintos. Parasitologia. Protozoário. Zoonoses.

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, they 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). Infection can occur either through vertical or horizontal transmission through contaminated food and water in most species, also by the pericutaneous route (BOWMAN, 2014).

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. 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.

The study aims to identify the frequency of gastrointestinal parasites in dogs and cats from Mineiros, Goiás, to determine which helminths and protozoans are most frequently.

MATERIALS AND METHODS

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

$$n = \left(\frac{Z_{(1-\alpha)*}\sqrt{p*(1-p)}}{d}\right)^2 = \left(\frac{1.96*\sqrt{0.76*0{,}24}}{0{,}1}\right)^2 \cong 71\ (minimum)$$

Where n is the sample number; $Z_{(1-\alpha)}$ is the *Z value* of the standard normal curve for the degree of confidence *(1-α)*; 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 d 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 dirts 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 (Nikkon 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 will be presented in percentages, described by Bush et al. (1997), considering the number of positive animals compared to the number of samples collected. *Odds ratio* will be used to compare the risks of infection, considering the risk factors age and street access.

RESULTS AND DISCUSSION

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

Among 93 canine fecal samples, 41.94% (39 samples) were positive. *Toxocara* spp. was the most frequent parasite 31.41% (32 samples) of parasitism, followed by 11.83% (11 samples) for *Ancylostoma* spp. and 1.07% (1 samples) for *Isospora* spp. Mixed occurrences were detected in five samples, where *Toxocara* spp. and *Ancylostoma* spp. were identified. (Figure1).

Parasites were found in 60% (6 samples) of feline fecal samples, being frequencies 40% (4 samples) *Toxocara* spp., 20% (2 samples) *Ancylostoma* spp., and 20% (2 samples) *Isospora* spp.. Mixed infections were observed in two samples, being *Toxocara* spp. and *Ancylostoma* spp. in a samples, and *Toxocara* spp. and *Isospora* spp. in other.

Dogs and cats were classified as young (less than one year), adult (one to seven years) and elderly (older than seven years). Young animals were 10% more likely to be positive for parasites comparing to other ages (*odds ratio*=1.1). For the elderly, the ratio is 0.86, which is

14% less likely to become infected. In adults, the result is 0.68, that is, they have 32% less chances of infection.

Abous street access, animals with street access showed most chance to parasite infection, where the *odds ratio* was 1.2, 20% more likely to be parasitized. Animals without access to the street, presents 18% less chances of being infected with parasites (*odds ratio*=0.82).

Similar occurrences os infected animals by gastrointestinal parasites was observed in Ribeirão Preto (41.7%) (CAPUANO & ROCHA, 2006), Campo Grande (56.8%) (ARAÚJO et al., 1999), and Cuiabá (60.96% positive results for felines and 76% for canines) (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 anthropozoonosis 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 45ºC and can persist in the environment for five years (MARTINS, 2019).

Woodruff et al. (1981) describe that desiccation and sunlight are factors that decrease the infectious capacity of the parasite. These factors are clearly observed in the areas of this study, which suffer from low humidity, high temperatures and the occurrence of fires, especially during dry season. During the rainy season, on the other hand, Cerrado region has very high humidity, so it is an environment that is advantageous during rain and disadvantageous during drought. However, it is noteworthy that the presence of wandering animals and urban areas that provide microclimates for the development of eggs with the infecting larva keeps the occurrence of this parasite among animals (CAPUANO & ROCHA, 2006).

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).

Ancylostoma spp. cause cutaneous *larva migrans* (CLM) or ancylostomiasis, popularly known as the "hookworm infection", is an anthropozoonosis 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.

In animals after pericutaneous 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).

Isospora protozoa have a wide variety of hosts (TAYLOR et al., 2007). 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., 2007). Martins (2019) reported that ingestion of infected food, water or even rodents are the main means of infection to new hosts.

By passing through the digestive tract, sporulated oocysts release sporozoites into the intestinal lumen, which enter the enterocytes, where they begin their endogenous development. The parasite then begins its proliferative phase within the cells, asexually, through successive meiosis, where there is formation of schizonts containing merozoites. The invaded intestinal cells rupture under pressure, releasing the merozoites, where the sexual phase begins, forming male and female gametes, thus forming the oocyst by the union of these gametes (MARTINS, 2019). In mild infections, the intestinal mucosa suffers only a decrease in local absorption. On the other hand, in more severe infections, where schizonts develop deep in the mucosa, severe lumen destruction occurs, causing hemorrhage (TAYLOR et al., 2007).

In general, the most affected animals by isosporosis are the pups, which usually acquire the infection through contact with the mother's waste or infected contactants. The clinical signs in these pups develop faster and more severely because they still have an immature immune system. In adult animals, the disease usually has no symptoms (RODRIGUES & MENEZES, 2003).

The parasite, when installed in the intestinal mucosa, causes ulcerations that can lead to blood loss and worsening of the disease, making room for secondary infections by opportunistic bacteria. It can also cause intestinal perforation, consequently triggering peritonitis and septicemia (TESSEROLLI et al., 2005).

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).

The risk of infection in humans is high in the study area considering that the three species found have zoonotic potential, and in general sanitary education measures are necessary. Especially considering that pets and wandering animals contribute significantly to environmental contamination through their wastes deposited in urban areas (ENGBAEK et al., 1984).

CONCLUSIONS

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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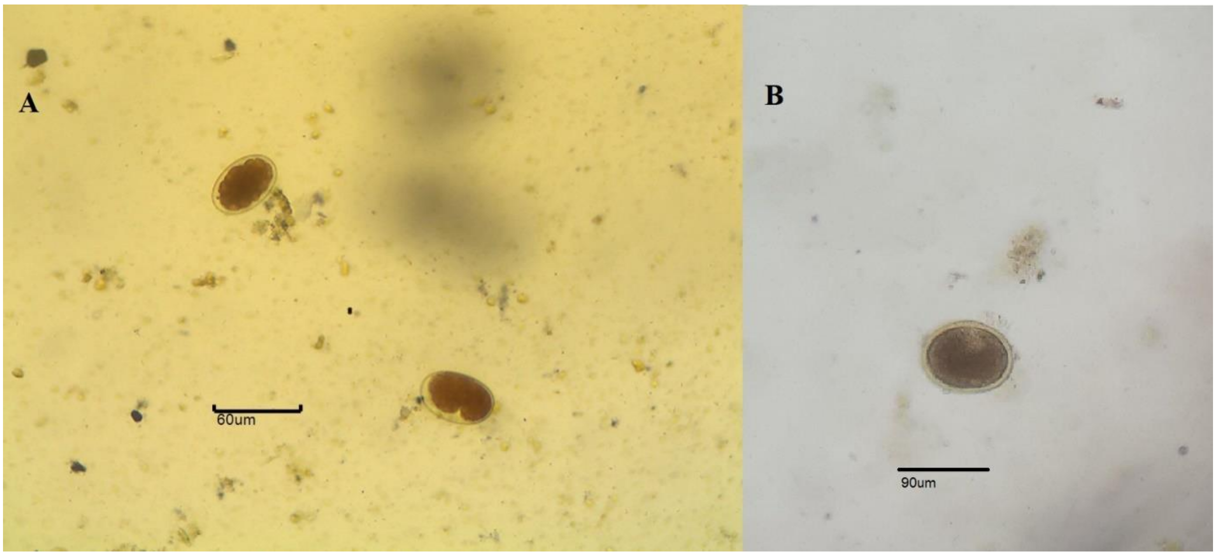

Figure 1. Helminth eggs identified in fecal samples of dogs and cats from Mineiros, Brazil, from April 2017 to July 2018 under optical microscopy (scale bar in figure). A) Eggs of *Ancylostoma* spp.; B) Egg of *Toxocara* spp.