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Identification of Parasite Eggs with Zoonotic Potential in Public Places in the Amazon (Jacareacanga – Pará)

Identificação de Ovos de Parasitas com Potencial Zoonótico em Locais Públicos na Amazônia (Jacareacanga - Pará)

Edeniza dos Santos Santiago[a]; Daniel da Silva Santos[a]; Welligton Conceição da Silva[b]; Helder Ribeiro Batista[c]; Raimundo Nonato Colares Camargo Júnior[da]

[a]Médico Veterinária. PA, Brasil.
[b]Universidade Federal do Rural da Amazônia, Programa de Pós-Graduação Stricto Sensu em Reprodução Animal. PA, Brasil.
[c]Centro Universitário da Amazônia. PA, Brasil.
[d]Instituto Federal de Educação, Ciência e Tecnologia do Pará. PA, Brasil.
*E-mail: welligton.medvet@gmail.com

Abstract

Zoonotic parasites are commonly identified in environments that favor their development and will allow them to complete their life cycle, directly influenced by climatic conditions and, consequently, affecting human health. This study aimed to identify eggs of parasites with zoonotic potential in dogs' feces in public squares and streets in the urban area of a municipality in the eastern Amazon, Brazil. The samples were collected from January 22nd to February 22nd, 2020, obtaining a total of 118 dogs' feces, in 5 different neighborhoods, mainly in public squares and streets of the municipality of Jacareacanga, Southwest of Pará. Holffman's technique was used to investigate the presence of parasite eggs. Statistical analyzes were performed using the R Studio software version 1.3.1093 at 5% significance by the chi-square test of adherence and *Post-Hoc* fdr test, to compare pairs of categories. As a result, it was possible to identify that there were differences ($p < 0.05$) among the parasites found, and the the majority was *Ancylostoma* (80%), followed by *Strongyloides* (10%), *Toxocara canis* (3.33%), Trichuris vulpis (3.33%) and Ascaris Lumbrigoides (3.33%). Therefore, it is concluded that a technique used was effective to identify zoonotic parasite eggs and that among those that were identified, *Ancylostoma canis* deserves to be highlighted. Thus, the need for intervention is evident in order to reduce the contamination of the studied environment concomitant with the effective animals devermination .

Keywords: Hookworms. Strongyloides. Toxocara.

Resumo

Os parasitas zoonóticos são comumente identificados em ambientes que favorecem o seu desenvolvimento e lhes permitem completar o ciclo de vida, influenciados diretamente pelas condições climáticas e por consequência podendo afetar a saúde humana. O objetivo neste estudo foi identificar parasitas com potencial zoonótico em fezes de cães em praças públicas e nas ruas da área urbana da Amazônia. O estudo ocorreu em Jacareacanga, Sudoeste do Pará, Brasil. As amostras foram coletadas no período de 22 de janeiro a 22 de fevereiro de 2020, obtendo-se um total de 118 amostras de fezes caninas, em 5 bairros diferentes, principalmente em praças públicas e nas ruas do município de Jacareacanga, Sudoeste do Pará. Utilizou-se a técnica de Holffman para investigar a presença de ovos de parasitas. As análises estatísticas foram realizadas no programa R Studio versão 1.3.1093 a 5 % de significância pelo teste qui-quadrado de aderência e test Post-Hoc fdr (Benjamini & Hochberg -1995) para comparar os pares de categorias. Como resultados, foi possível identificar que houve diferenças ($p<0,05$) entre os parasitas encontrados, sendo que a maioria eram Ancylostoma (80%), seguido por Strongyloides (10%), Toxocara canis (3,33%), Trichuris vulpis (3,33%) e Ascaris Lumbrigoides (3,33%). Portanto, conclui-se que a técnica utilizada foi eficaz para identificar ovos de parasitas zoonóticos e que dentre os que foram identificados, merece destaque o Ancylostoma canis. Assim, fica evidente a necessidade de intervenção a fim de reduzir a contaminação do ambiente estudado concomitante com a desverminação efetiva dos animais.

Palavras-chave: *Ancilostomídeos. Strongyloides. Toxocara. Amazônia.*

1 Introduction

According to IBGE data (2015), the number of domestic animals in Brazilian homes exceeds that of children, and the sum of dogs and cats is 74.2 million, compared to 45 million children. There are different types of parasites diagnosed in dogs, mainly nematodes and protozoa such as *Toxocara, Ancylostoma, Trichuris, Giardia, Entameba histolitica and Strongyloides* (SCHANTZ, 1991; ROBERTSON *et al.,* 2000; DUNN *et al.,* 2002).

The main means of transmission of intestinal parasites occurs through water contamination, however, food also stands out as a potential means of transmission, mainly due to poor human beings' hygiene, who do not usually wash contaminated food, in the vast majority of cases these are collected directly from the soil with contaminated feces and end up being ingested (SANTOS *et al.,* 2018).

Furthermore, according to Andrade Junior, Araújo and Medeiros (2015) soil is a transmission route for nematodes such as *Ancylostoma* spp. and *Toxocara* spp., which are housed in the sand and grass, especially in environments where these animals have free movement, such as parks, squares and beaches, environments which are commonly frequented by children and adults, who walk barefoot on the streets, pavements, vacant lots and public squares and usually carry their hands dirty with sand to their mouths.

Parasites are commonly identified in environments

that favor their development and enable them to complete the life cycle, directly influenced by climatic conditions, with an emphasis on humidity and temperature, favoring embryogenesis and the survival of transmission forms such as eggs, larvae and cysts, thus, humans can show symptoms or be asymptomatic, thus becoming little targeted by public health, contributing to the worsening of the clinical condition (GOMES *et al.,* 2010).

Different groups of parasitic zoonoses are reported in the scientific literature, even though they do not have high mortality rates in humans, but they can trigger physiological changes, causing allergic processes, diarrhea, anemia, high cost for diagnosis and treatment, leading to significant economic losses, with a sharp decline in productivity (SCHANTZ, 1991).

Parasitic diseases can infect people and animals of any age, affecting humans, especially children, who have diarrhea, anemia and nutrient deficiency, interfering with physical growth and cognitive development and in adolescents, adults and elderly individuals the damage causes intestinal obstructions, malnutrition, anemia, diarrhea and food malabsorption, negatively influencing people's quality of life (SANTOS *et al.,* 2017).

This study aimed to identify eggs of parasites with zoonotic potential in dogs' feces in public squares and streets in the urban area of a municipality in the eastern Amazon, Brazil.

2 Materials and Methods

2.1 Site

The study was carried out in a municipality in the eastern Amazon, namely, Jacareacanga; located in the southwest of Pará, Brazil.

Samples were collected in the public places of five different neighborhoods, which were chosen because they are considered of high circulation by the population.

2.2 Sample collection

The material chosen to investigate the presence of eggs parasite was dogs' feces. The samples were collected in random order, during 30 consecutive days, from January 22nd, 2020 to March 2020, from which a total of 118 samples were obtained.

The division of samples by neighborhoods was not considered, but the total of samples as a whole. Therefore, the number of samples was established according to the total of feces found in public places, on the different days of collection.

Feces were collected with the aid of spatulas and placed in sterile collecting pots, previously identified. Immediately afterwards, the jars were placed in coolers with recyclable ice packs and sent to the laboratory.

2.3 Technique used

Corollary to the chosen material, the technique of Holffman *et al.* (1934) was used to investigate the presence of parasite eggs. This type of coproparasitological study enables the parasites detection at different stages of their development, with spontaneous sedimentation being one of its principles. It is a qualitative and low sensitivity technique that aims to diagnose intestinal parasites, allowing the concentration of eggs, cysts, oocysts and larvae of numerous species through a fecal sample. Spontaneous sedimentation was chosen as the investigation method due to its low cost and broad spectrum for identifying parasitic species. Afterwards, the samples were evaluated in a binocular microscope (Olympus CX 21®) through 40X objectives.

2.4 Statistical analysis

To calculate the prevalence, the total number of samples evaluated in the different neighborhoods was considered, compared to the total number of positive samples, that is, those which identified the presence of the parasite.

$$P = \frac{Number\ of\ positive\ samples}{Total\ samples\ studied}$$

Samples that presented eggs of parasites with zoonotic potential were considered positive for the coproparasitological diagnosis technique.

Each type of parasite was compared in relation to the total number of positive samples and, subsequently, among themselves, in order to observe the frequency of occurrence of each type in the sample of the population studied and also the distribution of this frequency among the different types found.

After data collection, these were organized, summarized and tabulated in Microsoft Excel® 2017 spreadsheets, in order to be presented in percentage data.

Statistical analysis was performed using the R Studio software version 1.3.1093 with 5% significance by the chi-square adherence test and the Post-Hoc fdr test (BENJAMINI; HOCHBERG, 1995) to compare pairs of categories.

3 Results and Discussion

Of the total of 118 samples, 48 of them (40.68%) were positive, of these, 6 (12.5%) had more than one parasite egg, in addition, in 70 (59.32%) samples there was no evidence of the presence of parasites eggs. Of the total 48 samples containing parasites, 18 of them (37.5%) were not zoonotic parasites and, therefore, were not considered for evaluation within this study. The prevalence of positive samples was (30/118) 0.25%.

Of the total samples evaluated, it was found that the genus *Ancylostoma caninum* was the most abundant, totaling 24 (80%); the other information is contained in Table 1. In this context, corroborating this study, Chagas *et al.* (2019)

evaluated the feces of dogs belonging to different districts and municipalities, at the time the presence of ancylostoma was diagnosed in 63.81% of the animals evaluated. Barros *et al.* (2018) conducted a study in Rio de Janeiro on public roads and found the presence of *Ancylostoma* spp. in 79.1% of the samples evaluated.

When comparing the diagnosed parasites, it was found that there were differences ($p<0.05$) between the parasite *Ancylostoma caninus* and the others identified, as shown in Table 1.

Table 1 - Relation of parasites with zoonotic potentials found, with frequency and percentage data, January 22, 2020

Gender	Frequency	Percentage (%)
Ancylostoma caninus	24[a]	80
Strongyloides	3[b]	10
Toxocara canis	1[b]	3,33
Trichuris vulpis	1[b]	3,33
Ascaris lumbricoides	1[b]	3,33
Total	30	100

Note: a, b different letters mean statistical differences ($p < 0.05$).
Source: Resource data.

With similar results, Ferraz *et al.* (2019), Ferraz *et al.* (2018) and Antunes *et al.* (2020) also found that the nematode *Ancylostoma* was the most observed parasite, totaling 54.57%, 55.4% and 56.99%, respectively, of the analyzed stool samples. On the other hand, with inferior results compared to the present study, Tesserelli *et al.* (2005) diagnosed the presence of this parasite in 31.45% of the samples. With different results from the present study, Andrade and Sá (2016) reported the presence of only 3.45% of *Ancylostoma caninus* in the evaluated samples, with the parasite *Giardia* sp. being the most found with 10.35%.

The presence of *Ancylostoma caninus* on a larger scale in the evaluated samples may be related to inadequate management associated with the environmental conditions where the animals are raised. When dogs are diagnosed with *Ancylostoma caninus*, they must receive therapeutic treatment in order to eliminate the presence of the nematode, as parasitized dogs can contaminate environments frequented by a large number of people, such as beaches and public squares, and larvae can parasitize children and adults (FARIAS *et al.,* 2013).

The genus Strongyloides was observed in 3 (10%). This nematode is widely distributed throughout the territory, affecting animals and humans (BENINCASA *et al.,* 2007). With lower results, Filho *et al.* (2008) and Rosales and Malheiros (2017) found the presence of this nematode in 6.7% and 9.60 of the samples. Scaini *et al.* (2003) reported values lower than those of the present study, with a total of 3.0% of the analyses.

In this study, it was possible to verify the presence of *Toxocara canis* in 3.33% of the samples. Similar results were reported by Junior *et al.* (2015) who diagnosed positive samples in 3.3%, Jenkins *et al.* (2014); Ferraz *et al.* (2019); Johnson *et al.* (2015) and Antunes *et al.* (2020) described results superior to those of the present study, with a total of infected samples of 21.2%, 11%, 5.8% and 4.15% respectively. On the other hand, in a study carried out in Florianópolis, Santa Catarina, Bricarello *et al.* (2018) showed the presence of this nematode in less than 1% of the samples, presenting, therefore, lower results than in this study.

The gender *Trichuris vulpis* was identified in 3.33% of the samples. With results superior to those of the present study, Savilla *et al.* (2011), Barros *et al.* (2018), Chagas *et al.* (2019) and Antunes *et al.* (2020) diagnosed the parasite in 7.8%, 20.70%, 20.8% and 10.88% of the samples evaluated, in West Virginea, the United States, and in Brazil, specifically, in Pelotas, Rio Grande do South, Valença and Rio de Janeiro, respectively.

Ascaris lumbricoides in the present study was evidenced in 3.33% of the samples; this parasite is commonly diagnosed in different regions of the Brazilian territory (TEIXEIRA *et al.* 2018).

3 Conclusion

Based on the results, it is concluded that the spontaneous sedimentation technique was adequate to identify eggs of parasites with zoonotic potential and that the presence of these, with an emphasis on *Ancylostoma canis*, refers to the imminent risk of parasitosis by helminths both in the animal population and, therefore, in humans.

Thus, the need for intervention is evident in order to reduce the contamination of the studied environment concomitant with the effective animals devermination.

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