

Investigations

High Frequency of Enteroparasite Infection in Dogs (*Canis familiaris*) in Urban Regions of Espírito Santo, Brazil

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Abstract: The objective of this study was to perform examinations of canine fecal samples collected in the urban region, focusing on enteroparasitological diseases, common zoonosis that have their risk of transmission increased due to the growing number of stray dogs in these areas. One hundred and twenty fecal samples of stray dogs were collected from various locations of the studied region and processed by the method of Mollay Willis and Hoffman. Fifty local residents were interviewed, using a semi-structured questionnaire containing questions concerning personal hygiene, stray dogs as a risk factor and parasitological diseases knowledge. Parasitological contamination was observed in 75.9% of the samples; the main parasite was *Ancylostoma* spp. (72.5%), followed by *Toxocara* spp. (8.3%). In 24.1% of the samples, less relevant or non-important zoonosis helminths were found. Of those interviewed, only three (6%) were aware of the risk of parasitic contamination by dog feces. The high rate of dogs with infection by enteroparasites along with a lack of knowledge of the population about these infections represents a high risk of zoonosis and zoonanthroponosis.

Keywords: Dogs, Enteroparasite, *Ancylostoma*, *Toxocara*, Zoonosis

Introduction

Human exposure to zoonotic agents is enhanced by the following factors: (1) the growing number of pets in society, especially in large cities (Gennari *et al.*, 1999); (2) human hygiene behavior; (3) the increasing interaction of humans and canines; and (4) cultural preferences and inadequate sanitation (Macpherson, 2005). In this context, Fraga *et al.* (2007) mentioned that the increased contact of children, especially preschoolers, with pets, as well as their habits of poor hygiene, are some of the factors that can facilitate the transmission of many zoonotic agents. Thus, in the context of epidemiology, stray dogs have an important impact in environmental contamination. The fact that these dogs do not receive adequate antiparasitic treatment and the fact that they circulate easily in various areas favors the spread of gastrointestinal helminth parasites infections (Palmer *et al.*, 2007).

Among these helminths are *Ancylostoma* spp. and *Toxocara* spp., geohelminths that cause “cutaneous larva migrans” and “visceral and ocular larva migrans”

(Peruca *et al.*, 2009). Such helminths infections are known to occur frequently in large cities, especially when in contact with people attending parks, squares and gardens (Leite *et al.*, 2007). However, studies that can determine the occurrence of geohelminths presented in public recreation places are still insufficient. Moreover, although not a frequent cause of death in humans, such zoonosis causes considered expenses in diagnosis and treatment, as well as economic losses of productivity (Munhoz *et al.*, 1990).

Thereby, to the best of our knowledge, the effective control of geohelminths represents a challenge to the public health system, making health and hygiene education an important measure to oppose this scenario (Heukelbach and Oliveira, 2003). With that in mind, the purpose of this study was to analyze the occurrence of intestinal helminths in the feces of stray dogs from the urban area of the city of Vila Velha, Espírito Santo, Brazil.

The area selected for this study is located in Region 5 of the township of Vila Velha, in a geographical area of 770,614.60 square meters. This district has the highest

canine population in the city, with more than 1,200 dogs registered to be vaccinated in 2009, according to the Campaign of Pet Rabies vaccination data provided by the Center for Zoonosis Control of Vila Velha-ES. Another important feature that this area presents is the residents' habit of keeping their dogs semi domiciled, leaving them part time in the streets (data provided by the Center for Zoonosis Control of Vila Velha-ES).

One hundred and twenty fecal samples of stray dogs were collected from different environment locations in public places of the neighborhood of Ulysses Guimarães, in the urban area of Vila Velha, ES, from between the months of February 2011 to August 2011. The public locations were chosen by the number of canines nearby. The inclusion criteria for the study were feces of stray or semi domiciled dogs, not including the animals in the study, therefore, not performing any invasive methods. Feces were collected in sterile identified containers after defecation and kept refrigerated for laboratory diagnosis. The fecal examination was performed in the laboratory of Veterinary Parasitology of the University of Vila Velha (UVV). The techniques used for the examinations were the Mollay-Willis (Willis, 1921) and Hoffman (Hoffmann *et al.*, 1939) methods. The material was identified according to their morphological characteristics.

Fifty residents of the neighborhood of Ulysses Guimarães in the urban region of Vila Velha, ES, were interviewed by their permission during the month of November 2011, by their signature in the consent and approval form of the Ethics Committee (CEP-UVV 44/2010). We used a questionnaire to identify the residents' basic notions of the risk of parasitic contamination by dog feces, basic care and hygiene of dogs, among other personal hygiene matters.

Fecal samples (n=120) were collected, of which 91 (75.9%) were positive for one or more enteroparasite species, 60 (50%) with a single infection and 31 (25.9%) with associated parasitic agents. Of the samples, 29 (24.1%) showed no contamination by enteroparasite. The most commonly found parasite in the contaminated samples (87) was *Ancylostoma* spp. (72.5%). *Toxocara* spp. was found in 10 samples (8.3%). Less relevant or non-important zoonotic infections of other parasite genera were observed in 29 samples (24.1%).

Even with the methodological differences between many studies that conduct parasitological surveys in Brazil, the genus *Ancylostoma* has always been reported frequently in dogs from the country, including the present study. Studies conducted in several Brazilian cities, such as Aracaju-SE (Ferreira *et al.*, 2009), Itapema-SC (Gennari *et al.*, 1999), São Paulo-SP (Oliveira-Sequeira *et al.*, 2002), Curitiba-PR (Leite *et al.*, 2007), Goiânia-GO (Alves *et al.*, 2005) and Monte Negro-RO (Labruna *et al.*, 2006) have also found

Ancylostoma spp. and *Toxocara* spp. in their results. A similar outcome was also reported by (Blazius *et al.*, 2005; Da Silva *et al.*, 2007), reporting the prevalence of 70.9 and 69.6% of Ancylostomidae, respectively and the prevalence of 14.5 and 15%, of Toxocaridae, respectively.

Aiming the collection of information relating zoonotic risk to unaware dog owners, the sampling through surveys in this study consisted of 50 respondents. Of this total, 28 (58%) were dog owners and 22 (44%) had no animals. Only 3 (6%) respondents expressed knowledge about the risk of parasitic contamination by dog feces and another 3 (6%) respondents has a misconception that dogs do not transmit any diseases to humans. Significant differences were found in the results of studies from various cities due to different habits and cultures throughout the country.

Dos Santos *et al.* (2007) conducted a study in João Pessoa where 80.9% of the respondents considered that canine feces are a vehicle of disease transmission, a much higher percentage compared to the founding of this presented study (6%). This difference was also noted in a study in Pelotas, performed by Xavier (2006), which showed that 16.4% of dog owners had knowledge about the disease provoked by parasites and the risks of its transmission through contaminated dog feces. In the same study, 52.1% said that they had knowledge of the risk of human transmission through contaminated dog feces, but did not know what diseases were related. 26% did not know anything about risk of contamination or diseases from contaminated dog feces.

Less than half of the dog owners (46.4%) respondents in this study reported that their dogs were domiciled; the majority (53.6%) admitted that their dogs were semi domiciled. In addition, 60% of the dog owners admitted that they did not vermifugate their semi domiciled dogs. Among the 12 owners who did not vermifugate their animals, seven (58.3%) admitted that children have contact in the yard where their dogs were kept and, also, that these children had the habit of walking barefoot and/or do not frequently wash their hands before meals and/or after playing in the sand/yard. Xavier (2006) reported a percentage of 76.2% of dog owners who vermifugated their pet (against 23.8% who did not vermifugate), a much higher percentage than found in the present study (57.1% who vermifugated against 42.9% who did not vermifugate). Our results also differ from the habit and culture of dog owners found in the study of Biondo (2010) in the city of Antonina, PR, where 26% of 758 dog owners had semi domiciled dogs (53.6% in the present study).

The high rate of geohelminths infections in the stray dogs evaluated, coupled with the respondents' lack of awareness of the risk of parasitic contamination by dog feces, shows the potential risk of transmission of zoonotic diseases that the local residents are exposed, either directly or indirectly, considering the wide circulation of these animals in the neighborhood. The results of this study

suggest the need for prophylactic measures to reduce the risks of exposure, both in animals and humans.

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Author's Contributions

Roberta Bastos Costa, Gisele Pereira Valdetaro and Racire Sampaio Silva: Collection of samples, writing.

Betânia Barreiro Santos: Parasitological diagnosis.

Kalline Pereira Aroeira: Design and supervision of the study.

Célio Siman Mafra Nunes, Denise Coutinho Endringer and Dominik Lenz: Statistical data analysis, writing.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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