Revista Brasileira de Parasitologia Veterinária
ISSN: 0103-846X
zacariascbpv@fcav.unesp.br
Colégio Brasileiro de Parasitologia Veterinária
Brasil

Gallina, Tiago; Machado Pereira da Silva, Maria Antonieta; Laitano Dias de Castro, Luciana; Welter Wendt, Emília; Marreiro Villela, Marcos; Aires Berne, Maria Elisabeth
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Revista Brasileira de Parasitologia Veterinária, vol. 20, núm. 2, abril-junio, 2011, pp. 176-177
Colégio Brasileiro de Parasitologia Veterinária
Jaboticabal, Brasil

Research Note

Rev. Bras. Parasitol. Vet., Jaboticabal, v. 20, n. 2, p. 176-177, abr.-jun. 2011
ISSN 0103-846X (impresso) / ISSN 1984-2961 (eletrônico)

Presence of eggs of *Toxocara* spp. and hookworms in a student environment in Rio Grande do Sul, Brazil

Presença de ovos de *Toxocara* spp. e ancilostomatídeos em ambiente estudantil do Rio Grande do Sul, Brasil

Tiago Gallina[1]*; Maria Antonieta Machado Pereira da Silva[1]; Luciana Laitano Dias de Castro[1]; Emília Welter Wendt[1]; Marcos Marreiro Villela[1]; Maria Elisabeth Aires Berne[1]

[1]Departamento de Microbiologia e Parasitologia, Instituto de Biologia, Universidade Federal de Pelotas – UFPel

Received August 24, 2010
Accepted November 5, 2010

Abstract

Environmental contamination by parasite forms was studied on a university campus in the municipality of Pelotas, Rio Grande do Sul. Soil samples were analyzed using the modified Caldwell & Caldwell technique to identify parasite forms. Nematode eggs were detected in 62% of the samples. Among the parasites detected, eggs of *Toxocara* spp. and Ancylostomatidae were the most prevalent parasites in the studied area throughout the study period. The results demonstrated that there is significant environmental contamination, thereby representing a risk of zoonotic infection for humans frequenting the study area.

Keywords: Visceral larva *migrans*, environmental contamination, helminths.

Resumo

A contaminação ambiental por formas parasitárias foi estudada na área do campus universitário no município de Pelotas, Rio Grande do Sul. Amostras de solo foram analisadas para identificação de formas parasitárias e a presença de ovos de nematóides foi verificada em 62% das amostras. Entre os parasitos observados destacam-se a presença de ovos de *Toxocara* spp. e de ancilostomatídeos em todo período estudado. Os resultados demonstram que há contaminação ambiental significativa, o que representa risco de infecção zoonótica aos humanos que frequentam a região estudada.

Palavras-chave: Larva *migrans* visceral, contaminação ambiental, helmintos.

Helminthoses are considered to be health hazards for both humans and animals, since the hosts may often become debilitated and present severe consequences. However, such diseases are generally neglected, even in developing countries like Brazil (CHIEFFI; FERREIRA, 2008; MASCARINI-SERRA et al., 2010). Another type of parasitism occurs accidently, especially when humans participate by mistake in parasite cycles that affect domestic animals, such as dogs and cats, thus giving rise to what is classified as a parasitic zoonosis. The presence of stray dogs with access to leisure areas increases the risk of human infections, particularly for children, given that dogs play the role of the definitive host for some species of helminths that may produce significant illnesses (SCAINI et al., 2003) such as visceral larva *migrans*, caused by *Toxocara canis* or *T. cati* (SCHANTZ, 1991) and cutaneous larva *migrans*, caused by *Ancylostoma braziliense* and *A. caninum* (NUNES et al., 2000).

*Corresponding author: Tiago Gallina
Departamento de Microbiologia e Parasitologia, Instituto de Biologia, Universidade Federal de Pelotas – UFPel, Campus Capão do Leão s/n, CP 354, CEP 96001-970, Capão do Leão - RS, Brazil;
e-mail: tiagogallina@gmail.com

Investigations on soil contamination by parasites in public places constitute an important part of public health studies because of the possibility of zoonosis transmission (SILVA et al., 2009). Thus, the aim of the present study was to investigate occurrences of parasite forms in soil samples collected from a student environment in the South of the State of Rio Grande do Sul.

This study was conducted during the four seasons of the year 2009, in leisure areas on the campus of the Federal University of Pelotas (UFPel, Capão do Leão, Rio Grande do Sul), in an area where a municipal elementary school is also located. Around 12,000 people pass through these areas every day, and most of them are students.

Ten of the places most frequented by students during their leisure time were chosen for carrying out the analyses. Four field excursions were made to collect soil samples, one in each season of the year. On each occasion, five soil samples weighing 600 g each were collected from the perimeters of these preestablished sites. Thus, over the course of the year, 20 samples were taken from each of the 10 sites, totaling 200 samples, i.e. 50 samples per season of the year. Each of the samples was analyzed in quintuplicate. The material was packed in plastic bags, properly identified, and kept

Table 1. Frequency of soil samples positive for parasite eggs, diagnosed in 2009, in a student environment in the Southern region of the State of Rio Grande do Sul.

No. of positive samples / Season of the year	Summer		Autumn		Winter		Spring		Total	
Toxocara spp.	24 (50)	48%	17 (50)	34%	17 (50)	34%	34 (50)	68%	92 (200)	46%
Hookworms	20 (50)	40%	14 (50)	28%	18 (50)	36%	24 (50)	48%	76 (200)	38%
Negative samples	19 (50)	38%	23 (50)	46%	26 (50)	52%	8 (50)	16%	76 (200)	38%

under refrigeration at the parasitology laboratory of the Institute of Biology at UFPel, until it was processed.

To analyze the material, the Caldwell and Caldwell technique as modified by Pessoa and Martins (1988) was used. This consisted of homogenizing each six-gram soil sample in 10 mL of 4% sodium hypochlorite, diluted to 30%, followed by filtration through gauze. The material was centrifuged at 700 g for 2 minutes; the supernatant was discarded and the remainder was resuspended using 10 mL of sodium dichromate solution (1.35 $mg.dL^{-1}$). Next, this sample was centrifuged at 500 g for 3 minutes, and the final volume was then made up with sodium dichromate until an upper meniscus had formed. A cover slip was placed over this and left for 15 minutes, and the samples were then analyzed.

Out of the 200 samples collected during the four seasons of the year, 124 (62%) contained at least one parasite form *Toxocara* spp. and hookworms (Table 1) were the parasites most frequently observed. In 25.5% of the samples, different nematodes with the capacity to infect humans through accidental ingestion or through percutaneous penetration were present. With regard to the different seasons, the greatest incidence of parasites was found in the spring. Nematode eggs presented greater resistance against desiccation: this is an adaptive resistance mechanism to cope with conditions of extreme dehydration, which may explain their presence throughout the year (GAMBOA, 2005; MANDARINO-PEREIRA et al., 2010).

It was observed over the course of the investigation that the population of stray dogs circulating every day in all the areas evaluated was high. The constant presence of eggs of *Toxocara* spp. and hookworms in the soil, which are parasites that both have zoonotic potential, indicates that the dogs frequenting these areas will present parasite infection and that consequently there is a risk that the human population may become accidentally infected. This finding is concordant with diagnoses made in other localities in the Americas (HOTEZ; WILKINS, 2009; BOWMAN et al., 2010). Human infection due to *Toxocara* is probably common, and it can be calculated that it must affect millions of individuals in the Americas, although its relevance is underestimated. In addition to environmental contamination, it is emphasized that viable eggs of *T. canis* have also been diagnosed in the fur of the perianal region of dogs in Brazil (AMARAL et al., 2010).

The results from this study demonstrated the existence of high levels of soil contamination due to the feces of domesticated animals in the student environments investigated, with helminths eggs present at all the sites and in all the seasons of the year. This confirmation of the presence of parasites of medical importance in student environments in Southern Brazil serves as a warning, and makes it possible to apply sanitation policies to the risks to which the population is exposed.

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