

BRIEF COMMUNICATION

INTESTINAL PARASITES INSIDE PUBLIC RESTROOMS AND BUSES FROM THE CITY OF UBERLÂNDIA, MINAS GERAIS, BRAZIL

Clarissa A. BORGES, Julia M. COSTA-CRUZ & Fabiana M. de PAULA

SUMMARY

The objective of this study was to describe the occurrence of intestinal parasites inside public restrooms and buses from a Brazilian city. Sample material was obtained using a transparent adhesive tape. Thirty two public restrooms were investigated and two (6.25%) were contaminated with helminth eggs (*Ascaris lumbricoides* and *Enterobius vermicularis*). Of the sixteen different bus lines, three (18.7%) were found to harbor eggs of *E. vermicularis*. Public restrooms and buses can be an important source of parasite transmission and sanitary education could be improved by using these points.

KEYWORDS: Public restroom contamination; Bus contamination; Intestinal parasites; Brazil.

Enteroparasites are a serious public health problem in developing countries and they are directly related to precarious sanitation¹⁴. The transmissible stages (eggs, larvae, cysts and oocysts) can be found in the environment, either in soil, water or food, as a consequence of direct or indirect contamination with human or animal feces². The prevalence of soil-transmitted helminthes (*A. lumbricoides*, the hookworms *Ancylostoma duodenale* and *Necator americanus*, *Trichuris trichiura* and *Strongyloides stercoralis*), provides useful information about the extent of the public health problem, and are being used to guide the growing efforts to control disease. To reduce the prevalence of these parasites, it is necessary to improve social economic conditions and provide better basic sanitation. Sanitary education along with changes in cultural habits is also a relevant factor¹². The contamination of bathroom installations can promote the dissemination of enteroparasites^{1,5,9}. In this sense, public transport vehicles are also an important source of infection^{7,10,11}.

The objective of this study was to determine the occurrence of intestinal parasites in public restrooms and buses in the city of Uberlândia, Minas Gerais, during the period from August to November, 2007.

The research was conducted in the urban area of Uberlândia (18° 91' 86" S and 48° 27' 72" W), Minas Gerais, in the southeast region of Brazil. Uberlândia has a population of 608,369⁴, with 97.6% living in the urban area. The city offers 100% treated water and more than 90% sewage treatment.

Thirty-two public restrooms were examined in thirteen locations: one

bus station, five urban bus terminals, six public squares, and one public park. In each place, one female restroom and one male restroom were investigated, except for the public park, where four female restrooms and four male restrooms were evaluated. Inside the restrooms, a total of 192 samples were collected from door latches, toilet seats, which were divided into four quadrants (front, rear, right and left rim) and flush cords¹.

In Uberlândia, the public transport system is composed of 16 different bus lines that start from downtown and reach different regions of the city. One bus from each line was analyzed and the samples were collected from the turnstile, support bars (front and rear), seats (front and rear), and stop cords (front and rear), providing a total of 112 samples.

Samples were collected once in each place using transparent adhesive tape attached length-wise to a blade according to GRAHAM⁶. The Graham method was chosen because it is practical, has high sensitivity and it is capable of detecting more eggs per slide³. The blades were placed in a container and processed at the Parasitology Laboratory of the Biomedical Institute of Science of the Federal University of Uberlândia. The blades were analyzed by two examiners using standard microscopes at x100 and x400. Statistical analysis was performed using the Binomial Test to compare the positivity between restrooms and buses. Results were considered significant when $p < 0.05$.

Two public restrooms (6.25%), both from a public park, were observed to be contaminated with helminth eggs (Table 1). The public park samples identified two male restrooms as positive, both in the toilet

Table 1
Distribution and positivity of samples collected inside public restrooms in Uberlândia city, from August to November, 2007

Users	Bus station		Urban bus terminals		Public squares		Public Park		Total	
	N	+ / %	N	+ / %	N	+ / %	N	+ / %	N	+ / %
Female	1	0/0	5	0/0	6	0/0	4	0/0	16	0/0
Male	1	0/0	5	0/0	6	0/0	4	2/50.0	16	2/12.5
Total	2	0/0	10	0/0	12	0/0	8	2/25.0	32	2/6.25

N = number of restrooms analyzed in each local; + = positivity; % = positivity percentage.

seats, the first was positive for *Ascaris lumbricoides* (quadrant: rear), and the second was positive for *Enterobius vermicularis* (quadrant: right rim). One *Entamoeba coli* cyst was also observed in the female restroom of a public square. There was no statistically significant difference between the positivity from the female and male public restrooms ($p = 0.5$). The occurrence of the parasites (6.25%) observed in the restrooms was lower than that reported by AIDAR-SOBRINHO *et al.*¹ who detected 9.1% positivity among samples from public restrooms in Sorocaba, São Paulo, Brazil. On the other hand, the prevalence of contamination in a pre-school restroom in Sorocaba reported by COELHO *et al.*⁵ was only 4.9%. The difference may be due to the ages of the different users.

Three buses were positive (18.7%) for *E. vermicularis*, one bus (6.25%) in the front seat, another (6.25%) in the rear seat and another (6.25%) at the turnstile. Two buses yielded two larvae each, although they could not be identified due to inadequate morphology. One *E. coli* cyst was encountered in one bus. There was no statistically significant difference between the positivity from public restrooms and buses ($p = 0.314$).

E. vermicularis was the most prevalent helminth in public restrooms and buses, possibly due to the substances present on the egg skin, which increases adhesion to other surfaces. The peculiar biology of this parasite contributes to create a contamination foci around the infected person. *E. vermicularis* has multiple transmission modes (anus to finger to mouth, food, dust, retrograde from anus to intestine) and prolonged egg viability (14 days). Unlike geohelminths, it can reproduce in humans without passing through an intermediary soil phase. Thus, it can be readily transmitted from person to person. In institutions, transmission is further facilitated by communal living and the residents' difficulties in maintaining good personal hygiene, including elementary hand washing⁸. *E. vermicularis* (6.8%) and *A. lumbricoides* (8%) were even isolated from a currency note, which act as environmental vehicles for the transmission of pathogenic parasites¹³.

A. lumbricoides eggs found in the park restroom, apparently with complete morphology, represent another possibility of contamination. The type of external membrane of the eggs provides adherence to surfaces. A similar study has found *A. lumbricoides* to be predominant in Elementary schools' restrooms, due to an elevated incidence of ascariasis in that population⁵. The occurrence of ascariasis is greatest where warm temperature and high humidity allow the eggs to embryonate throughout the year. Overpopulation, poor sanitation and inadequate sewage disposal play a key role in the maintenance and propagation of ascariasis.

Human health risks are dependent on the source of the pathogens, the treatment applied and the exposure routes. We concluded that public restrooms and buses can be an important source of parasite transmission and sanitary education could be improved by using these points.

RESUMO

Parasitas intestinais no interior de sanitários públicos e ônibus na cidade de Uberlândia, Minas Gerais, Brasil

O objetivo do presente estudo foi descrever a ocorrência de parasitas intestinais em sanitários públicos e ônibus de uma cidade do Brasil. As amostras foram obtidas utilizando-se fita adesiva transparente. Trinta e dois sanitários públicos foram investigados e dois (6,25%) estavam contaminados com ovos de helmintos (*Ascaris lumbricoides* e *Enterobius vermicularis*). Das 16 diferentes linhas de ônibus, três (18,7%) foram positivas para ovos de *E. vermicularis*. Sanitários públicos e ônibus podem ser uma importante via de transmissão de parasitas e a educação sanitária pode ser aperfeiçoada por meio do uso destes pontos.

ACKNOWLEDGEMENTS

To Maria das Graças Marçal for laboratorial support.

REFERENCES

1. AIDAR SOBRINHO, T.; COELHO, L.M.P.S.; OLIVEIRA, S.M. *et al.* - Estudo da frequência de ovos de helmintos intestinais em sanitários de uso público de Sorocaba, SP. *Rev. Soc. bras. Med. trop.*, 28: 33-37, 1995.
2. BASUALDO, J.A.; CÓRDOBA, M.A.; DE LUCA M.M. *et al.* - Intestinal parasitoses and environmental factors in a rural population of Argentina, 2002-2003. *Rev. Inst. Med. trop. S. Paulo*, 49: 251-255, 2007.
3. BELTRÁN, M.F.; HARA, T. & TELLO, R.C. - Evaluación de los métodos de Graham y pin tape en el diagnóstico de *Enterobius vermicularis*. *Rev. peru. Med. exp. Salud publ.*, 22: 76-78, 2005.
4. BRASIL. Instituto Brasileiro de Geografia e Estatísticas (IBGE) - Censo demográfico 2000: resultados do universo. <http://www.ibge.nt/home/estatistica/populacao/censo2000>. Accessed: 28 June 2007.
5. COELHO, L.M.P.S.; AIDAR SOBRINHO, T.; OLIVEIRA, S.M. *et al.* - Ovos e larvas de helmintos nos sanitários de pré-escolas municipais de Sorocaba, SP, e suas frequências nas fezes das crianças. *Rev. Soc. bras. Med. trop.*, 32: 647-652, 1999.
6. GRAHAM, C.F. - A device for the diagnosis of *Enterobius vermicularis*. *Amer. J. trop. Med.*, 21: 159-161, 1941.

7. JUSTINO, C.M.; PEREIRA, F.L.; SILVA SEGUNDO, G.R. *et al.* - Exposição alérgica em veículos privados de passeio e de transporte escolar em Uberlândia, MG. **Rev. bras. Alergia Imunopat.**, **28**: 94-98, 2005.
8. LOHIYA, G.S.; TAN-FIGUEROA, L.; CRINELLA, F.M. & LOHIYA, S. - Epidemiology and control of enterobiasis in a developmental center. **West J. Med.**, **172**: 305-308, 2000.
9. MORETTI, I.G.; CHIEFFI, P.P.; NAKAGAWA, E.; GOMES, A.C. & FOIZER, A.C.M. - Contribuição ao estudo da história natural de enteroparasitoses em uma comunidade fechada. I. Prevalência de enteroparasitas em uma comunidade fechada. **Rev. Soc. bras. Med. trop.**, **8**: 41-44, 1974.
10. PEREIRA, F.L.; SILVA, D.A.O.; SOPELETE, M.C.; SUNG, S.S. & TAKETOMI, E.A. - Mite and cat allergen exposure in Brazilian public transport vehicles. **Ann. Allergy Asthma Immunol.**, **93**: 179-184, 2004.
11. TAKETOMI, E.A.; JUSTINO, C.M.; PEREIRA, F.L. *et al.* - Taxis but not private cars are mite allergen reservoirs in Brazil. **J. investig. Allergol. clin. Immunol.**, **16**: 34-36, 2006.
12. TAVARES-DIAS, M. & GRANDINI, A.A. - Prevalência e aspectos epidemiológicos de enteroparasitoses na população de São José da Bela Vista, São Paulo. **Rev. Soc. bras. Med. trop.**, **32**: 63-65, 1999.
13. UNEKE, C.J. & OGBU, O. - Potential for parasite and bacteria transmission by paper currency in Nigeria. **J. environ. Hlth**, **69**: 54-60, 2007
14. WANI, S.A.; AHMAD, F.; ZARGAR, A.S. *et al.* - Prevalence of intestinal parasites and associated risk factors among school children in Srinagar City, Kashmir, India. **J. Parasit.**, **93**: 1541-1543, 2007.

Received: 5 December 2008

Accepted: 18 June 2009