

Rev. Inst. Med. trop. S. Paulo  
49(4):247-249, July-August, 2007

## BRIEF COMMUNICATION

### SEROEPIDEMIOLOGICAL ASPECTS OF HUMAN *Strongyloides stercoralis* INFECTIONS IN CHILE

Rubén MERCADO(1,2), Maria Isabel JERICIC(3), Sergio ALCAYAGA(4), Fabiana M. de PAULA(5), Marlene T. UETA(5) & Julia M. COSTA-CRUZ(6)

#### SUMMARY

To determine the frequency of *Strongyloides stercoralis* antibodies by means of the enzyme linked immunosorbent assay (ELISA) in Chile, in 2001-2003, 675 blood samples of patients of two psychiatric hospitals and 172 of healthy individuals (doctors, nurses and paramedicals) of these institutions, and 1,200 serum samples of blood donors of Northern region (Arica and Antofagasta), Central region (Valparaiso and Santiago) and Southern region (La Union) were collected. ELISA showed positivity of 12.1% in psychiatric hospitalized patients, none (0%) in the health personnel and 0.25% in blood donors ( $p < 0.05$ ). Only in blood donors of Arica (1%) and La Union (0.5%) the ELISA test was positive suggesting that strongyloidiasis is focalized in determinate zones of the country. In Chile, human infections by *S. stercoralis* are endemic with very low frequency in apparently healthy individuals and high prevalence in risk groups such as the mentally ill hospitalized patients.

**KEYWORDS:** *Strongyloides stercoralis*; Seroepidemiology; Strongyloidiasis; Chile.

Human infection by the nematode *Strongyloides stercoralis* is especially endemic throughout tropical and warm temperate regions of the world<sup>3,11</sup>. In other geographical zones or in industrialized countries, strongyloidiasis still represent a clinical-epidemiological problem focalized in institutions for the mentally ill patients<sup>10</sup>. Scarce epidemiological information about strongyloidiasis in Latin-American countries is available. Epidemiological studies in selected studied populations of Brazil, Peru, Colombia and Venezuela showed frequency of 13.0%<sup>14</sup>, 8.7%<sup>20</sup>, 2.3%<sup>8</sup> and 1.4%<sup>7</sup> respectively. In Chile, in 1983, a mortal case of disseminated strongyloidiasis in a hospitalized psychiatric 53 year-old man was reported<sup>17</sup>. Enteroparasitic infections surveys carried out in psychiatric hospitalized patients of the V geopolitical region of Chile in 1985 and 1990 showed percentages of *S. stercoralis* infections of 11.6 (57/490)<sup>5</sup> and 7.0 (16/229)<sup>9</sup> respectively. In 2000, in a psychiatric hospital of Santiago, Chile it was observed that 20 patients presented elevated blood eosinophiles count. Coproparasitological examination of seven stool samples of each patient permits the detection of larvae of *S. stercoralis* in four of them<sup>15</sup>.

The laboratory diagnosis of strongyloidiasis by using commonly stool examination methods such as formol-ethyl acetate techniques - routinely used in Chile - is considered of low sensitivity, so the identification of *S. stercoralis* infected individuals is difficult<sup>4</sup>. Immunodiagnosis of *S. stercoralis* infection has been attempted with several serological tests. Enzyme linked immunosorbent assay (ELISA)

permits the detection of serum specific IgG<sup>1</sup>, and can be used as an epidemiological tool to determine the prevalence of strongyloidiasis in a given region or population<sup>18,19,20</sup>. In Chile, ELISA test to detect *S. stercoralis* serum antibodies against an alkaline protein extract of the filariform larvae of *S. venezuelensis* was standardized<sup>16</sup>.

The objective of this communication is to describe some epidemiological aspects of the infections caused by *S. stercoralis* in two psychiatric institutions of Chile, including the total population of the interned patients and the health personnel of the referred institution. Also, we determined the percentage of positive ELISA test in blood donors of three different geographical regions of Chile: north, central and south to compare it frequency with the observed in the hospitalized psychiatric patients.

A total of 2047 serum samples were collected from Chile individuals, during 2001-2003. In hospital 1 (from the V geopolitical region of Chile) blood samples were taken from 343 patients. According to sex 231 (67.3%) were men and 112 (32.7%) women. Ninety five health personnel (physicians, nurses and paramedical individuals) were studied. In hospital 2 (from Santiago, Metropolitan region) 332 bloods samples were taken, 224 from men (67.5%) and 108 from women (32.5%) psychiatric patients. Health personnel studied in this institution were 77. Serum samples of blood donors were obtained from the northern cities of Arica (n = 200) and from Antofagasta (n = 200),

(1) Unidad Docente de Parasitología, Facultad de Medicina, Universidad de Chile.

(2) Graduate Program in Parasitology at Instituto de Biologia, Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil.

(3) Laboratorio de Referencia de Parasitología, Instituto de Salud Pública de Chile.

(4) Unidad de Epidemiología, Servicio de Salud Metropolitano Sur, Chile.

(5) Departamento de Parasitologia, Instituto de Biologia, UNICAMP, Campinas, SP, Brasil.

(6) Laboratorio de Parasitologia, Instituto de Ciencias Biomédicas, Universidade Federal de Uberlândia, Uberlândia, MG, Brasil.

**Correspondence to:** Julia Maria Costa-Cruz, Laboratorio de Parasitologia, Instituto de Ciencias Biomédicas, Universidade Federal de Uberlândia, Av. Pará 1720, 38400-902 Uberlândia, MG, Brasil. Fax: +55.34.3218-2332. E mail: [costacruz@ufu.br](mailto:costacruz@ufu.br)

from the central region cities of Valparaiso (n = 100) and Santiago (n = 500) and from the semi-rural southern city of La Union (n = 200). All biological samples were obtained under ethical protocol for epidemiological studies approved by the health institutions involved.

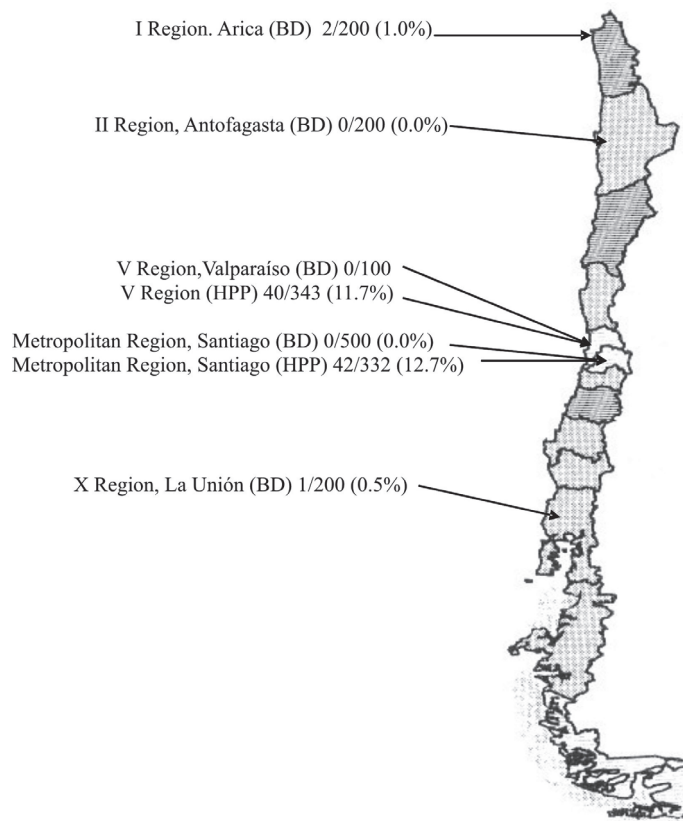
ELISA was performed as we previously described<sup>16</sup> using a filariform larval alkaline extract of *Strongyloides venezuelensis* and a cut-off value of 0.33 OD. Statistical significance of frequency values observed was determined by using the program STATCALC of EPIINFO 6.0. Results were considered significant at  $p < 0.05$ .

Figure 1 shows the seropositivity results for *S. stercoralis* antibodies in hospitalized psychiatric patients and blood donors of the different regions studied. In blood donors a positive ELISA was observed in two serum samples in Arica city (1.0%) and in one in La Union city (0.5%). Positive frequency observed in a total of 1,200 of these serum samples was 0.25% and among 675 psychiatric patients was 12.1% ( $p < 0.05$ ). Table 1 shows the seroprevalence of *S. stercoralis* infections according to sex and age detected by means of ELISA in psychiatric patients from hospital 1 of the V geopolitical region and hospital 2 of the Metropolitan region of Chile. A total of 40/343 patients interned in the hospital 1 presented an ELISA positive test (11.7%). By sex, 7.1% of the women studied and 13.9% of the men were positive. This difference was statistically significant ( $p < 0.05$ ). The most frequent age group affected was those of 21 to 39 year-old in both sexes. Similar results were observed in the hospital 2. A total of 42/332 (12.7%) of the patients presented ELISA positive. By sex, 6.5% of women and 15.6% of men had specific antibodies. This difference was statistically significant ( $p < 0.05$ ). No positive ELISA test was observed in the health personnel of both Hospitals.

In immunocompetent individuals most infections by *S. stercoralis* are chronic, however, in some situations hyperinfection or disseminated infection has been found usually associated with host immunosuppression<sup>2,12,13</sup>. CONWAY *et al.*<sup>4</sup> considered that there is a typically persistent infection by *S. stercoralis* over decades in a small fraction of the population of endemic regions.

In Chile, our results of the seroepidemiology of *S. stercoralis*

infections in blood donors of different cities showed that the prevalence of antibodies was 0.25%, suggesting that strongyloidiasis frequency is very low and occurred in determinate geographic areas. Comparison of prevalence percentages observed in hospitalized psychiatric patients (11.7 - 12.7%) and in blood donors (0.25%) indicates that the transmission of *S. stercoralis* in Chile is facilitated in the closed environment of the



**Fig. 1** - Map of Chile showing percentages of ELISA positive for *Strongyloides stercoralis* antibodies in hospitalized psychiatric patients (HPP) and blood donors (BD) of the different regions studied.

**Table 1**

Seroprevalence of *Strongyloides stercoralis* infections, according to sex and age, detected by means of ELISA in psychiatric patients from hospital 1 of the V geopolitical region and hospital 2 of the Metropolitan region of Chile

Age groups (years)	Men		Women		Total
	No./positive (%)		No./positive (%)		
	Hospital 1	Hospital 2	Hospital 1	Hospital 2	No./positive (%)
21-29	20/5(25.0)	11/1(9.1)	7/1(14.3)	4/0(0.0)	42/7(16.7)
30-39	36/8(22.2)	53/8(15.1)	26/4(15.4)	21/0(0.0)	136/20(14.7)
40-49	54/7(13.0)	68/9(13.2)	31/3(9.7)	27/2(7.4)	180/21(11.7)
50-59	58/6(10.3)	45/7(15.6)	21/0 (0.0)	19/1(5.3)	143/14(9.8)
60-69	34/5(14.7)	24/4(16.7)	11/0(0.0)	21/3(14.3)	90/12(13.3)
70-79	25/1(4.0)	18/2(11.1)	12/0(0.0)	12/1(8.3)	67/4(6.0)
80-89	2/0(0.0)	4/3(75.0)	3/0(0.0)	3/0(0.0)	12/3(25.0)
> 90	2/0(0.0)	1/1(100)	1/0(0.0)	1/0(0.0)	5/1(20.0)
<b>Total</b>	<b>231/32(13.9)</b>	<b>224/35(15.6)</b>	<b>112/8(7.1)</b>	<b>108/7(6.5)</b>	<b>675/82(12.1)</b>

psychiatric institution. Geophagy and coprophagy frequently observed among mentally affected or retarded patients probably play important roles in the acquisition and spread of the infection. COSTA-CRUZ *et al.*<sup>6</sup> alerted that strongyloidiasis is not only associated with barefoot walking of individuals but with handled soils with unprotected hands and drinking unfiltered waters. Studies performed by CORNEJO *et al.*<sup>5</sup> and GARIBALDI *et al.*<sup>9</sup> by using formalin-ether techniques to detect larvae of *S. stercoralis* in the same hospital showed frequencies of 11.6% (57/490) and 7.0% (16/229) respectively. These prevalence rates were similar to those determined in this study using ELISA. *S. stercoralis* infections are difficult to control in closed institutions, maintaining high frequencies along at least 20 years. In this study of hospitalized mentally ill patients, we observed that ELISA test was a very useful tool to determining the seroepidemiology of infections by *S. stercoralis*, contributing to define the transmission patterns, which are valuable basic information to apply control measures, such as chemotherapy and improvement of sanitary conditions.

In Chile, human infections by *S. stercoralis* are endemic with very low frequency in apparently healthy individuals and high prevalence in risk groups such as the mentally ill hospitalized patients.

## RESUMO

### Aspectos soroepidemiológicos da infecção humana por *Strongyloides stercoralis* no Chile

Entre os anos de 2001-2003 foram coletadas amostras de sangue de 675 pacientes de dois hospitais psiquiátricos da região central do Chile, 172 de indivíduos sadios (médicos, enfermeiros e paramédicos) destas instituições e 1200 de doadores de sangue de cidades das regiões norte (Arica e Antofagasta), central (Valparaíso e Santiago) e sul (La Union) para determinar a frequência de anticorpos anti *Strongyloides stercoralis* mediante a reação de *enzyme linked immunosorbent assay* (ELISA). Foram observadas soropositividade de 12.1% em pacientes de hospitais psiquiátricos e de 0,25% em doadores de sangue ( $p < 0.05$ ). Todas as amostras dos indivíduos sadios foram não reagentes. Entre os doadores de sangue a soropositividade ocorreu somente nos indivíduos de Arica (1,0%) e La Union (0,5%) sugerindo que a estrogiloidíase poderia estar localizada em determinadas áreas geográficas do país. Conclui-se que no Chile as infecções por *S. stercoralis* seriam endêmicas, de baixa frequência e afetando especialmente grupos de risco como os pacientes psiquiátricos.

## REFERENCES

1. ATKINS, N.S.; CONWAY, D.J.; LINDO, J.F.; BAILEY, J.W. & BUNDY, D.A.P. - L3 antigen-specific antibody isotype responses in human strongyloidiasis: correlations with larval output. **Paras. Immunol.**, 21: 517-526, 1999.
2. CARVALHO, E.M. & DA FONSECA PORTO, A. - Epidemiological and clinical interaction between HTLV-1 and *Strongyloides stercoralis*. **Paras. Immunol.**, 26: 487-497, 2004.
3. CONCHA, R.; HARRINGTON Jr., W. & ROGERS, A.I. - Intestinal strongyloidiasis: recognition, management, and determinants of outcome. **J. clin. Gastroent.**, 39: 203-211, 2005.
4. CONWAY, D.J.; LINDO, J.F.; ROBINSON, R.D. & BUNDY, D.A.P. - Towards effective control of *Strongyloides stercoralis*. **Parasit. today**, 11: 420-424, 1995.
5. CORNEJO, J.; ARIAS, B.; SUBIABRE, V.; QUIJADA, M. & SCHENONE, H. - Estudio epidemiológico de protozoosis y helmintiasis intestinales en 490 pacientes crónicos del Hospital Psiquiátrico de Putaendo, V Región, Chile. **Bol. chil. Parasit.**, 40: 91-93, 1985.
6. COSTA-CRUZ, J.M.; MACHADO, E.R. & CAMPOS, D.M.B. - Seroepidemiological study of human strongyloidiasis with blood samples collected on filter paper, in Abadia dos Dourados (Minas Gerais, Brazil). **Rev. Inst. Med. trop. S. Paulo**, 40: 329-331, 1998.
7. DEVERA, R.; CERMENO, J.R.; BLANCO, V. *et al.* - Prevalencia de blastocystosis y otras parasitosis intestinales en una comunidad rural del Estado de Anzoátegui, Venezuela. **Parasit. latinoamer.**, 58: 95-100, 2003.
8. GALLEGO, M.L.; GÓMEZ-MARÍN, J.E.; TORRES, E. & LORA, F. - Prevalencia de *Entamoeba histolytica* en asentamientos temporales post-terremoto de la ciudad de Armenia. **Infectio** (Colombia), 7: 190-194, 2003.
9. GARIBALDI, R.; MUNOZ, N.; NEIRA, P.; SUBERCASEAUX, B. & VILLALÓN, L. - Entero y ectoparasitos en la V Región, Chile. Estudio en el Hospital Psiquiátrico de Putaendo. **Bol. chil. Parasit.**, 45: 83-85, 1990.
10. GATTI, S.; LOPES, R.; CEVINI, C. *et al.* - Intestinal parasitic infections in an institution for the mentally retarded. **Ann. trop. Med. Parasit.**, 94: 453-460, 2000.
11. GENTA, R.M. - Global prevalence of strongyloidiasis: critical review with epidemiologic insights into the prevention of disseminated disease. **Rev. infect. Dis.**, 11: 755-767, 1989.
12. KEISER, P.B. & NUTMAN, T.B. - *Strongyloides stercoralis* in the immunocompromised population. **Clin. Microbiol. Rev.**, 17: 208-217, 2004.
13. LAM, C.S.; TONG, M.K.; CHAN, K.M. & SIU, Y.P. - Disseminated strongyloidiasis: a retrospective study of clinical course and outcome. **Europ. J. clin. Microbiol. infect. Dis.**, 25: 14-18, 2006.
14. MACHADO, E.R. & COSTA-CRUZ, J.M. - *Strongyloides stercoralis* and other enteroparasites in children at Uberlândia city, state of Minas Gerais, Brazil. **Mem. Inst. Oswaldo Cruz**, 93: 161-164, 1998.
15. MERCADO, R.; JERICIC, M.I. & UETA, M.T. - Infecciones por *Strongyloides stercoralis* en Chile. **Bol. chil. Parasit.**, 57: 72-75, 2001.
16. MERCADO, R.; JERICIC, M.I.; TORRES, P. *et al.* - Inmunodiagnóstico de las infecciones por *Strongyloides stercoralis* en Chile usando la técnica de ELISA. **Rev. méd. Chile**, 130: 1358-1364, 2002.
17. ODDO, D. & DUARTE, I. - Síndrome de mala absorción por *Strongyloides stercoralis*. Caso de autopsia. **Rev. méd. Chile**, 111: 443-446, 1983.
18. SATO, Y.; KOBAYASHI, J. & SHIROMA, Y. - Serodiagnosis of strongyloidiasis. The application and significance. **Rev. Inst. Med. trop. S. Paulo**, 37: 35-41, 1995.
19. SPEARE, R. & DURRHEIM, D.N. - *Strongyloides* serology - useful for diagnosis and management of strongyloidiasis in rural Indigenous populations, but important gaps in knowledge remain. **Rural remote Hlth**, 4: 264, 2004.
20. YORI, P.P.; KOSEK, M.; GILMAN, R.H. *et al.* - Seroepidemiology of strongyloidiasis in the Peruvian Amazon. **Amer. J. trop. Med. Hyg.**, 74: 97-102, 2006.

Received: 29 May 2006

Accepted: 14 December 2006