

## BRIEF COMMUNICATION

### *Toxocara* SEROPREVALENCE IN CHILDREN FROM A SUBTROPICAL CITY IN ARGENTINA

José Mario ALONSO(1), María V. I. BOJANICH(2), Miryam CHAMORRO (1) & Jorge O. GORODNER(1)

---

#### SUMMARY

Most studies from Argentina have focused on toxocariasis as an environmental problem of big cities, and there are no available data about children infection from small or middle-sized cities. In order to assess the prevalence of anti-*Toxocara* antibodies in infantile population, 206 children from Resistencia, of both sexes, aged 1-14 years old were studied by Elisa testing with E/S *T. canis* L<sub>2</sub> antigens. Hematological parameters and immunoglobulin levels were determined; five days' stool samples were studied and epidemiological data were obtained by means of a questionnaire to parents. Results showed that 73% of the children had one or more dogs living at home, 57% reported geophagia and 37.9% were positive for *Toxocara* serology, but there was no significant difference in prevalence neither for boys and girls, nor concerning age. An increased risk of infection was observed in age groups 5-6 and 7-8 for boys, and in age groups 3-4 and 5-6 for girls.

**KEYWORDS:** Toxocariasis; *Toxocara canis*; Visceral larva migrans; Seroprevalence

---

Human toxocariasis is probably one of the most widely spread zoonotic nematode infection. *Toxocara* eggs acquired by hand-to-mouth contact hatch in the stomach and the larvae migrate through human soft tissues leading to visceral larva migrans (VLM) or ocular larva migrans (OLM)<sup>8</sup>. As the parasite does not develop in man until adulthood, the examination of fecal specimens is not helpful; thus the diagnosis of toxocariasis as well as the assessment of its importance in population, can only be achieved through serological tests. In developed countries, VLM has been referred to as the second most common type of helminthic infection; in developing countries, although other helminthiasis are highly prevalent, human toxocariasis is likely to be also very frequent<sup>14</sup>.

Most of the studies from Argentina have focused on toxocariasis as an environmental problem of big cities<sup>13,15</sup>; there are few reports about human infection, particularly in children, and there are no available data from small or middle-sized cities where urban contamination presents different characteristics from those in big ones, due to the particular relationship that its inhabitants establish with the surrounding environment<sup>5</sup>. All these circumstances have led us to assess the prevalence of anti-*Toxocara* antibodies in a middle-sized subtropical city's infantile population in Argentina.

A survey was carried out in Resistencia, a city located in the northeast of Argentina (27°10' S, 58°58' W, and at 53 m above sea level), and characterized by a subtropical climate with hot and humid summers and moderately mild and dry winters (average annual temperature of 20.5 °C; mean annual rainfall of 1350 mm). The city has more than 350,000

inhabitants and people live predominantly in individual houses with front gardens, backyards, and wide sidewalks with a narrow paved area, the rest being bare ground or partially covered by grass. Only 20% of the urban area has paved streets, about 70% of the families own dogs and stray dogs are quite frequent. The population studied was children in apparent good health, belonging to medium-low and low socio-economic levels, in age group 1-14 years old, attending six Primary Health centers. The program was first considered and approved by the Ethics Committee of the responsible institution. Medical staff and parents were informed in writing about the survey prior to sampling, and those parents who accepted to include their children were requested to be present at sampling time and to fill in a simple questionnaire with personal and epidemiological data (ownership of dogs, their presence inside the house, use of public playgrounds by children, geophagia, etc.).

Blood samples were taken from a total of 206 children (118 male-88 female) selected at random (1 out of 5). Anti-*Toxocara* IgG antibodies were investigated with a commercial Elisa test (LMD, TC 1, Alexon-Trend Inc., Ramsey, Mn-USA) employing excretory/secretory *Toxocara canis* L<sub>2</sub> larval antigen<sup>3</sup>, with the following performance characteristics: sensitivity: 86%, specificity: 98% and a positive predictive value of 91% on the sera dilution employed. All serum samples were tested in duplicate at dilution 1:100 and strong positive, weak positive (cut-off value) and negative controls were included in each run. According to the manufacturer's instructions, serum with optical densities higher or lower than cut-off value (plus 1 SD) were considered positive or negative for *Toxocara* Ig G antibodies.

---

(1) Instituto de Medicina Regional, Universidad Nacional del Nordeste, Resistencia, Argentina.

(2) Becaria de Iniciación, Secretaría General de Ciencia y Técnica, Universidad Nac. del Nordeste, Argentina.

**Correspondence to:** José M. Alonso, Instituto de Medicina Regional, Universidad Nacional del Nordeste, Av. Las Heras 727, 3500-Resistencia, Argentina. E-mail: jalonso@bib.unne.edu.ar.

Total levels of Ig A, Ig G and Ig M were measured by radial immunodiffusion method in all sera, while total Ig E levels were only determined in *Toxocara* positive sera by an Elisa test employing commercial kits (Enzymun-test Ig E, Boehringer-Mannheim Lab., Germany). White blood cells count, leukocyte differential count, hemoglobin dosage and hematocrit were also determined. Five days' stool samples were collected and studied by Carles-Barthelemy concentration method and Willis flotation technique. Statistical analysis was carried out using EPI-Info software- version 6, and the level of significance used was  $p=0.05$ .

Of the 206 children studied, 150 (73%) had one or more dogs living at home, and geophagia was reported to occur in 57% of the children. Seventy eight out of 206 children (37.9%) had anti-*Toxocara* antibodies, but there was no significant difference in the prevalence neither for boys (40.7%) and girls (34.1%) (Odds ratio = 1.33;  $p = 0.3$ ), nor concerning age. An increased risk of infection was observed in age groups 5-6 and 7-8 for boys (O.R.= 4.0;  $p=0.05$ ) and in age groups 3-4 and 5-6 for girls (O.R.= 5.19;  $p=0.01$ ) (Table 1). There was no significant difference in hematological parameters either in immunoglobulins levels between *Toxocara* positive and negative children; very high values of total Ig E and of eosinophilia were found in positive children, but those are common findings in VLM<sup>11</sup>. Stool examinations revealed that 68% of the children had intestinal parasitic infections, mainly by protozoa. Only 5 children had helminths, one *Toxocara* positive child had *Strongyloides stercoralis*, and four *Toxocara* negative children had *Ascaris lumbricoides*, Hookworm and *Strongyloides stercoralis*.

**Table 1**

Anti-*Toxocara* antibodies in children from Resistencia (Argentina), according to age and gender

Age group (years)	Male	Female	TOTAL	
			N	%
0-2	7/27	5/24	12/51	23.5
3-4	14/36	6/23	20/59	33.9
5-6	6/18	11/17	17/35	48.6
7-8	10/15	3/13	13/28	46.4
9-10	6/13	4/7	10/20	50.0
11-12	4/5	0/2	4/7	57.1
13-14	1/4	1/2	2/6	33.3
TOTAL	48/118	30/88	78/206	37.9

Our results show a high prevalence of anti-*Toxocara* Ig G antibodies in children living in Resistencia; similar results were reported by FARROUGE *et al.*<sup>6</sup> in a randomized sample of children from Buenos Aires, but we found an increase in the risk to acquire infection between 3 and 8 year-old, which coincides with the initiation of children's education. No other seroepidemiological survey could be found on Argentine infantile population. Data from literature indicate similar seroprevalence for other Latin American countries. DI SACCO *et al.*<sup>4</sup> reported 34.6% infection among Bolivian children younger than 17 years old, AGUDELO *et al.*<sup>1</sup> reported a prevalence of 47.5% in the general population of Bogotá, with higher percentages among people under 20

years of age, FELIX PIFANO *et al.*<sup>7</sup> found 66.6% prevalence in 2-7 year-old children from Caracas, and CHIEFFI *et al.*<sup>2</sup> reported 13.09% positivity in children aged less than 15 year-old from Santos (Brasil).

Although *Toxocara* antigens have been reported to cross-react with antigens of other helminths, the use of Elisa tests based upon excretory-secretory antigens has resulted in greatly increased specificity<sup>12</sup>. According to our results of fecal examinations, unspecificity would not be expected to be very relevant in our case. Moreover, it has already been described in a previous report that helminthic infections are not frequent in our pediatric population<sup>10</sup>.

The high prevalence found for *Toxocara* serology could be the result of various factors, but doubtless the most important are the urban and social characteristics of Resistencia, a city with an extended area without paved streets and lacking daily cleaning, with 20.5% of its population having unsatisfied basic needs, and with a high proportion of families with dogs living at home. It is well known that when dogs are present, the potential for household contamination with *Toxocara* eggs is high<sup>9</sup>. Likewise, the play habits of our children contribute in the same sense: because of the climate and the conditions of the houses in poor neighborhoods, most of our children play in close contact with soil since early ages. For all these reasons we understand that our results are consistent for an infantile population of low socio-economic level from a subtropical Latin American city. Future studies about soil contamination should be done to better assess the magnitude of the problem, and community education programs should be developed to promote the social concept of a responsible pet ownership.

## RESUMEN

### Prevalencia de anticuerpos anti *Toxocara* en niños de una ciudad subtropical de Argentina

La mayoría de los estudios realizados en Argentina, han enfocado a la Toxocariosis como un problema medioambiental propio de las grandes ciudades y no existen datos acerca de esta infección entre los niños de ciudades medianas o pequeñas. A fin de determinar la prevalencia de anticuerpos anti-*Toxocara* en la población infantil de la ciudad de Resistencia, se estudiaron 206 niños de ambos sexos, con edades comprendidas entre los 1-14 años, mediante el test de Elisa, empleando antígenos E/S de larva L<sub>2</sub> de *Toxocara canis*. También se evaluaron los niveles de inmunoglobulinas séricas y los parámetros hematológicos; se efectuaron análisis coproparasitológico seriados en heces de 5 días y se recolectó información epidemiológica mediante cuestionario a los padres. Los resultados obtenidos señalan que el 73% de los niños tenían uno o mas perros viviendo en la casa, que el 57% tenían antecedentes de geofagia y que el 37.9% tenían serología positiva para *Toxocara*, aunque no hubo diferencias estadísticamente significativas entre varones y mujeres ni con la edad. Un mayor riesgo de contraer la infección se observó entre los grupos etarios 5-6 y 7-8 de varones y 3-4 y 5-6 de mujeres.

## ACKNOWLEDGMENT

We thank Dr. Miria Galván for her help in statistical analysis. This study was partially funded by grant PI-254 from the Secretaría General de Ciencia y Técnica of Universidad Nacional del Nordeste, Argentina.

## REFERENCES

1. AGUDELO, C.; VILLAREAL, E.; CACERES E. *et al.* – Human and dogs *Toxocara canis* infection in a poor neighborhood in Bogotá. **Mem. Inst. Oswaldo Cruz**, **85**: 75-78, 1990.
2. CHIEFFI, P.P.; UEDA, M.; CAMARGO, E.D. *et al.* – Visceral larva migrans: a seroepidemiological survey in five municipalities of São Paulo state, Brazil. **Rev. Inst. Med. trop. S. Paulo**, **32**: 204-210, 1990.
3. DE SAVIGNY, D.H.; VOLLER, A. & WOODRUFF, A.W. – Toxocariasis: serological diagnosis by enzyme immunoassay. **J. clin. Path.**, **32**: 284-288, 1979.
4. DI SACCO, B.; BARTOLONI, A.; GUGLIELMETTI, P. *et al.* – Seroprevalence of *Toxocara canis* antibodies in a South American population (Bolivia). **Parassitologia**, **36(suppl.1)**: 49, 1994.
5. DUMENIGO, B. & GALVEZ, D. – Contaminación de suelos en la ciudad de La Habana con huevos de *Toxocara canis*. **Rev. cuba. Med. trop.**, **47**: 178-180, 1995.
6. FARROUGE, R.; RODMAN, N.; ARCHELLI, S. & GUARDIS, M. – Investigación de anticuerpos Ig G anti-*Toxocara canis* en pacientes pediátricos muestreados al azar. In: JORNADAS RIOPLATENSES DE MICROBIOLOGÍA, 3., Buenos Aires, 1997. **Abstract**. p. A-23.
7. FELIX PIFANO C., F.; ORIHUELA, A.R.; DELGADO, O. *et al.* – La Toxocariasis humana en Venezuela, especialmente en el valle de Caracas. **Gac. méd. Caracas**, **96**: 31-41, 1988.
8. GILLESPIE, S.H. – Migrating worms. In: GILLESPIE, S.H. & HAWKEY, P.M., ed. **Medical Parasitology. A practical approach**. New York, IRL Press at Oxford University Press, 1995. p.177-182.
9. GLICKMAN, L.T. & SCHANTZ, P.M. – Epidemiology and pathogenesis of zoonotic toxocariasis. **Epidem. Rev.**, **3**: 230-250, 1981.
10. GUILLERON, D.C.; ALONSO, J.M.; PICON, D. *et al.* – Estudio coproparasitológico en escolares de la ciudad de Resistencia. **Arch. argent. Pediat.**, **82**: 224-226, 1984.
11. LAMBERTUCCI, J.R. – Hyperimmunoglobulinemia E, parasitic diseases and staphylococcal infection. **Rev. Soc. bras. Med. trop.**, **29**: 407-410, 1996.
12. LYNCH, N.R.; WILKES, L.K.; HODGEN, A.N. & TURNER, K.J. – Specificity of *Toxocara* ELISA in tropical population. **Paras. Immunol.**, **10**: 323-337, 1988.
13. SAREDI, N.G. – Epidemiología de la toxocariosis en la ciudad de Buenos Aires. **Parasit. al Día**, **19**: 19, 1995.
14. SCHANTZ, P.M. – *Toxocara* larva migrans now. **Amer. J. trop. Med. Hyg.**, **41(suppl.)**: 21-34, 1989.
15. SOMMERFELD, Y.; DEGREGORIO, D.; BARRERA, M. & GALLO, O. – Presencia de huevos de *Toxocara spp.* en paseos públicos de la ciudad de Buenos Aires. **Rev. Med. vet. (B. Aires)**, **73**: 71-73, 1992.

Received: 14 December 1999

Accepted: 10 April 2000