

## BRIEF COMMUNICATION

# PREVALENCE OF IgG ANTIBODIES SPECIFIC TO *Toxoplasma gondii* AMONG BLOOD DONORS IN RECIFE, NORTHEAST BRAZIL

Raquel A.L. COELHO(1), Masashi KOBAYASHI(2) & Luiz B. CARVALHO Jr.(1)

### SUMMARY

A serological survey of *Toxoplasma gondii* infection in blood donors was carried out in order to identify seroprevalence in Recife, Brazil. Sera from 160 individuals (119 male and 41 female) were evaluated by using a *Toxoplasma* IgG-antibody enzyme immunoassay (Denka Seiken Co., LTD., Tokyo, Japan). The seropositive percentual for males (79.0%) showed to be higher ( $p \leq 0.05$ ) than for females (63.4%). This percentage increases with age, ranging from 18.2% to 92.6% for individuals aging under 20 and 40-50 years old, respectively. For women of childbearing age (18-40 years) it was found a prevalence of 51.6%.

**KEYWORDS:** Toxoplasmosis; Seroepidemiology; Human; Recife, Brazil.

Toxoplasmosis is a disease caused by the ubiquitous protozoan parasite *Toxoplasma gondii*<sup>5</sup>. Most *T. gondii* infections among humans occur by ingestion of tissue cysts from infected meat or oocysts from soil, or by congenital transmission through the placenta<sup>3,10</sup>. According to NETO *et al.*<sup>14</sup>, Brazil presents the highest prevalence of congenital toxoplasmosis reported so far. Blood samples (140,914) from all over the country were tested for IgM-class antibodies and 47 cases confirmed. This finding suggests a prevalence of 1 per 3,000 births.

Although toxoplasmosis is a worldwide dispersed infection, seropositivity levels vary widely among different regions of the globe<sup>7</sup>. The prevalence rates change according to socio-cultural habits, geographic factors, climate and transmission route, and typically rise with age<sup>4,7</sup>. In Brazil, prevalence studies have been carried out, mainly in the Amazon and southeast regions during the 70-80's. Seroprevalence ranged from 40-80%, with increasing levels according to age, low socioeconomic status, rural dwelling and raw meat cooking practices<sup>16</sup>.

Serological surveys indicate that about 80% of all primary infections are asymptomatic, due to the immune system effectiveness, but variable levels of the disease can affect immunocompromised individuals<sup>4</sup>. The epidemic of Acquired Immune Deficiency Syndrome (AIDS) has created an expanding population of susceptible individuals. Usually, people suffering from both AIDS and toxoplasmosis have been exposed to the *Toxoplasma* parasite earlier in life and the HIV infection simply allowed the *Toxoplasma* parasite to grow unchecked. The concomitant occurrences should be considered by public health policies especially in those

countries with high toxoplasmosis prevalence where AIDS is concurrent with economic and public health problems<sup>15</sup>.

GUIMARÃES<sup>9</sup> estimated the annual incidence of reported AIDS-associated opportunistic infections among AIDS cases at the national level in Brazil from 1980 through May 1999. The overall cumulative incidence rates/100 reported AIDS cases were: candidiasis - 59, tuberculosis - 26, *Pneumocystis carinii* pneumonia - 23, neurotoxoplasmosis - 15, Kaposi sarcoma - 5, cryptococcal meningitis - 4 and protozoa infections - 4.

In 2000, Recife occupied the 11<sup>th</sup> position in number of AIDS cases reported (211) and 56<sup>th</sup> in number of cases/100,000 inhabitants (22,8) among Brazilian cities<sup>13</sup>, whereas the whole country presented a total of 15,012 cases and 9,0 cases/100,000 inhabitants in the same year.

The association of toxoplasmosis versus AIDS and the position of Recife in AIDS cases in Brazil was a strong reason to investigate the prevalence of IgG antibodies specific to *Toxoplasma gondii* in blood donors in Recife. These individuals usually living in the urban area are representative of those at risk from HIV/AIDS infection.

A solid phase enzyme immunoassay (EIA) for qualitative IgG detection was used in this study (*Toxoplasma* IgG-EIA<sup>TM</sup>, Denka Seiken Co., LTD., Tokyo, Japan)<sup>11</sup>. The instructions provided by the manufacturer were strictly followed. The optical density (**a**) established for each serum was divided by the mean value (**b** equal to 0.149) of a

(1) Laboratório de Imunopatologia Keizo Asami and Departamento de Bioquímica, Universidade Federal de Pernambuco, Recife, PE, Brasil.

(2) Department of Parasitology, School of Medicine, Chiba University, Japan.

**Correspondence to:** Luiz B. Carvalho Jr. Laboratório de Imunopatologia Keizo Asami, Universidade Federal de Pernambuco, Cidade Universitária, 50670-420 Recife, PE, Brasil. Email: lbj@hotlink.com.br

standard triplicate. Values of  $a/b \geq 1.0$  were considered positive. Statistical analyses were performed using Origin® software, version 6.0.

Sera from blood donors were kindly provided by HEMOPE (Fundação de Hematologia e Hemoterapia de Pernambuco), a Brazilian reference center in hematology and hemotherapy, localized in the State of Pernambuco. The group consisted of 160 donors living in the urban area (Recife) of which 119 (74.4%) were men and 41 (25.6%) women, with ages ranging from 18 to 56 years.

Prevalence of 75% (n = 120) was found among the total number of donors. This result is within the range of general seropositivity expected for Brazil (40-80%), as indicated by REY & RAMALHO<sup>16</sup>. Other studies in different Brazilian municipalities, using various laboratory methods and sometimes targeting specific populations, also show comparable results<sup>4,7,16,17</sup>.

Table 1 shows the prevalence of IgG antibodies specific to *Toxoplasma gondii* according to the sex of the blood donors. Usually it is not possible to detect a significant difference on the incidence of toxoplasmosis between sexes<sup>2,7,10</sup>, but there are also studies pointing either to higher incidence for males<sup>6,12</sup> or for females<sup>1,8</sup>. Our results showed a seropositive percentage for males (79.0%) somewhat higher ( $p \leq 0.05$ ) than for females (63.4%).

**Table 1**

Toxoplasmosis seroprevalence (IgG) among blood donors in Recife, Pernambuco, Brazil, 2001

Sex	Seroprevalence				Total	
	Positive n (%)	Negative n (%)			n (%)	
Male	94 (79.0)	25 (21.0)			119 (100.0)	
Female	26 (63.4)	15 (36.6)			41 (100.0)	
Total	120 (75.0)	40 (25.0)			160 (100.0)	

$\chi^2 = 3.9462$ ;  $p \leq 0.05$ ; The distribution is significant.

The distribution of toxoplasmosis seroprevalence according to age ranges is presented on Table 2. As suggested by other authors<sup>2,7,10,16,17</sup>, this percentage increases with age, reaching 90% for individuals over 40 years old.

**Table 2**

Distribution of toxoplasmosis seroprevalence (IgG) according to age groups among blood donors in Recife, Pernambuco, Brazil, 2001

Age Groups	Seroprevalence				Total	
	Positive n (%)	Negative n (%)			n (%)	
<20 years	02 (18.2)	09 (81.8)			11 (100.0)	
20<30 years	57 (74.0)	20 (26.0)			77 (100.0)	
30<40 years	33 (78.6)	09 (21.4)			42 (100.0)	
40<50 years	25 (92.6)	02 (7.4)			27 (100.0)	
>50 years	02 (66.7)	01 (33.3)			03 (100.0)	
Total	119 (74.4)	41 (25.6)			160 (100.0)	

$\chi^2 = 23.4132$ ;  $p \leq 0.001$ ; The distribution is significant.

For women of childbearing age (18-40 years) we found a prevalence of 51.6%. This result is comparable to that published by GARCIA *et al.*<sup>7</sup>, who found a seroprevalence of 70% for women of 16-40 years from the municipality of Jaguapitã, Paraná, Brazil. This could indicate that about half the women at childbearing age in Recife is/was infected and might be immunized against toxoplasmosis, reducing the risk of congenital infection.

## RESUMO

### Prevalência de anticorpos IgG específicos anti *Toxoplasma gondii* em doadores de sangue no Recife, nordeste do Brasil

Estudo epidemiológico de infecção por *Toxoplasma gondii* em doadores de sangue foi realizado com vistas ao estabelecimento da soroprevalência em Recife. Soro de 160 indivíduos (119 masculinos e 41 femininos) foram analisados mediante o emprego de ensaio imunoenzimático para a detecção de anticorpos IgG anti-*Toxoplasma* (Denka Seiken Co., LTD., Tokyo, Japan). O percentual de soropositivos para os indivíduos do sexo masculino (79,0%) foi maior ( $p \leq 0,005$ ) do que para os do feminino (63,4%). Esta soropositividade aumentou com a idade, variando de 18,2% para os indivíduos menores de 20 anos até 92,6% para aqueles entre 40 e 50 anos de idade. Para as mulheres na idade fértil (18-40 anos) foi encontrada prevalência de 51,6%.

## ACKNOWLEDGMENTS

This work was financially supported by CNPq/CTPETRO (grant number 463655/001) and JICA. Authors are thanked to Dr. Paula Loureiro from HEMOPE for the sera of blood donors.

## REFERENCES

1. ABDEL-HAMEED, A.A. - Sero-epidemiology of toxoplasmosis in Gezira, Sudan. **J. trop. Med. Hyg.**, 94: 329-332, 1991.
2. ARAÚJO, I.F.; SANT'ANA, B. & HYAKUTAKE, S. - Prevalência de anticorpos anti-*Toxoplasma gondii* em doadores de sangue de Natal (RN). **Rev. Farm. Bioquím. Univ. S. Paulo**, 13: 417-425, 1975.
3. BEAZLEY, D.M. & EGERMAN, R.S. - Toxoplasmosis. **Semin. Perinatol.**, 22: 332-338, 1998.
4. CANTOS, G.A.; PRANDO, M.D.; SIQUEIRA, M.V. & TEIXEIRA, R.M. - Toxoplasmosis: ocorrência de anticorpos anti-*Toxoplasma gondii* e diagnóstico. **Rev. Ass. méd. bras.**, 46: 335-341, 2000.
5. DUNN, I.J. & PALMER, P.E.S. - Toxoplasmosis. **Semin. Roentgenol.**, 33: 81-85, 1998.
6. EXCLER, J.L.; PRETAI, E.; POZZETO, B.; CHARPIN, B. & GARIN, J.P. - Sero-epidemiological survey for toxoplasmosis in Burundi. **Trop. Med. Parasit.**, 39: 139-141, 1988.
7. GARCIA, J.L.; NAVARRO, I.T.; OGAWA, L.; DE OLIVEIRA, R.C. & KOBILKA, E. - Soroprevalência, epidemiologia e avaliação ocular da toxoplasmosis humana na zona rural de Jaguapitã (Paraná), Brasil. **Rev. panamer. Salud publ.**, 6: 157-163, 1999.
8. GOLDSMITH, R.S.; KAGAN, I.G.; ZARATE, R.; RAYES-GONZALES, M.A. & CEDENO-FERREIRA, J. - Low toxoplasma antibody prevalence and serologic surveys of humans in southern Mexico. **Arch. Invest. med. (Méx.)**, 22: 63-73, 1991.

9. GUIMARÃES, M.D.C. - Estudo temporal das doenças associadas à AIDS no Brasil, 1980-1999. **Cadern. Saúde públ. (Rio de J.)**, 16 (suppl. 1): 21-36, 2000.
10. JONES, J.L.; KRUSZON-MORAN, D.; WILSON, M. *et al.* - *Toxoplasma gondii* infection in the United States: seroprevalence and risk factors. **Amer. J. Epidem.**, 154: 357-365, 2001.
11. KOBAYASHI, M.; MALAGUEÑO, E.; SANTANA, J.V.; PEREZ, E.P. & YANO A. - Prevalence of Toxoplasmosis in children in northeastern Brazil. **Jap. J. trop. Med. Hyg.**, 30: 305-310, 2002.
12. KONISHI, E. & TAKAHASHI, J. - Some epidemiological aspects of *Toxoplasma* infections in a population of farmers in Japan. **Int. J. Epidem.**, 16: 277-281, 1987.
13. MINISTÉRIO DA SAÚDE. **Bol. Epidem. AIDS**. 14(2), 14<sup>a</sup> a 26<sup>a</sup> Semanas Epidemiológicas, abril a junho de 2001. Disponível em: [www.aids.gov.br/final](http://www.aids.gov.br/final).
14. NETO, E.C.; ANELE, E.; RUBIM, R. *et al.* - High prevalence of congenital toxoplasmosis in Brazil estimated in a 3-year prospective neonatal screening study. **Int. J. Epidem.**, 29: 941-947, 2000.
15. PASSOS, L.N.; ARAUJO FILHO, O.F. & ANDRADE Jr., H.F. - *Toxoplasma* encephalitis in AIDS patients in São Paulo during 1988 and 1991. A comparative retrospective analysis. **Rev. Inst. Med. trop. S. Paulo**, 42: 141-145, 2000.
16. REY, L.C. & RAMALHO, L.C. - Seroprevalence of toxoplasmosis in Fortaleza, Ceará, Brazil. **Rev. Inst. Med. trop. S. Paulo**, 41: 171-174, 1999.
17. SILVEIRA, C.; BELFORT Jr., R.; MUCCIOLI, C. *et al.* - A follow-up study of *Toxoplasma gondii* infection in southern Brazil. **Amer. J. Ophthalm.**, 131: 351-354, 2001.

Received: 21 February 2002

Accepted: 08 August 2003