

# CATS AND DOGS AS RISK FACTORS FOR PREGNANT WOMEN ON *Toxoplasma gondii* INFECTION AT THE REGION OF ARAGUARINA IN THE STATE OF TOCANTINS, BRAZIL\*

Elvio Machado da Rocha<sup>1+</sup>, Arnaldo Alves Nunes<sup>2</sup>, Walter Flausino<sup>3</sup>, Myrian Nydes Monteiro da Rocha<sup>4</sup>, Wilson Jacinto Silva de Souza<sup>5</sup> and Carlos Wilson Gomes Lopes<sup>6</sup>

**ABSTRACT.** da Rocha E.M., Nunes A.A., Flausino W., da Rocha M.N.M., de Souza W.J.S. & Lopes C.W.G. **Cats and dogs as risk factors for pregnant women on *Toxoplasma gondii* infection at the Region of Araguarina in the State of Tocantins, Brazil.** [Fatores de risco associados a gatos e cães e a positividade de gestantes ao *Toxoplasma gondii* na região de Araguarina no estado do Tocantins, Brasil]. *Revista Brasileira de Medicina Veterinária*, 34(2):79-82, 2012. Faculdade de Medicina, Instituto Tocantinense Presidente Antônio Carlos, Av. Filadélfia, 600, Setor Oeste, Araguaína, TO 77800-000, Brasil. E-mail: elviomachado@yahoo.com.br

*Toxoplasma gondii*, etiological agent of toxoplasmosis, has the cat as the definitive host and, human being and others vertebrate hosts as intermediated hosts, the range of this parasite can determined by its low specificity and different forms of transmission. This disease is associated severe systemic, neurological and congenital lesions, mainly acquired in the first trimester of pregnancy. At the Araguarina in the State of Goiás, the risk factor is associated to the presence of cats ( $p<0.0001$ ) and dogs ( $p<0.0001$ ) in relationship with the frequency of seropositivity pregnant human (57.32%). There is an evidence of the hole of cats and dogs as the main source of infection for pregnant women that get in contact with sporulated oocysts shed by cats and/or acquired from dogs by xenosmophilia.

**KEY WORDS.** Toxoplasmosis, companion animals, IFAT, pregnancy, risk factors, cats, dogs.

**RESUMO.** *Toxoplasma gondii*, agente etiológico da toxoplasmose, tem o gato como hospedeiro definitivo e o homem e outros animais como hospedeiros intermediários. A grande dispersão deste parasita pode ser determinada pela baixa especificidade e as inúmeras formas de transmissão. Esta doença pode apresentar graves lesões sistêmicas, neurológicas e congênitas. Na região de Araguarina no estado de Goiás, os fatores de risco das gestantes soropositivas para *T. gondii* (57,32%) estão associados com a presença de gatos ( $p<0,0001$ ) e de cães ( $p<0,0001$ ), onde há evidências de contaminação através de oo-

cistos esporulados eliminados nas fezes pelos gatos e/ou adquirindo-os de cães por xenosmofilia.

**PALAVRAS-CHAVE.** Toxoplasmosse, animais de companhia, RIFI, gravidez, fatores de risco, gatos e cães.

## INTRODUCTION

*Toxoplasma gondii* is an obligate intracellular coccidian, has optional heteroxenous life cycle and may be able to infect virtually all warm-blooded animals around the world, including men, becoming thus an important zoonosis, both for medicine and veterinary medicine, because it can cause miscar-

\* Received on April 3, 2011.

Accepted for publication on January 17, 2012.

<sup>1</sup> Médico-veterinário, Médico, Dr.CsVs. Faculdade de Medicina, Instituto Tocantinense Presidente Antônio Carlos, Av. Filadélfia, 600, Setor Oeste, Araguaína TO 77800-000, Brasil. <sup>+</sup>Author for corespondence. E-mail: elviomachado@yahoo.com.br

<sup>2</sup> Médico. Hospital e Materinidade Dom Orione, Rua Dom Orione, 100, Araguaína, TO 77803-010. E-mail: arnaldondr@yahoo.com.br

<sup>3</sup> Biólogo, PhD. Departamento de Parasitologia Animal (DPA), Instituto de Veterinária (IV), Universidade Federal Rural do Rio de Janeiro (UFRRJ), Seropédica, RJ 23890-000, Brasil. E-mail: flausino@ufrj.br - CNPq fellowship.

<sup>4</sup> Advogada, MSc, FM. ITPAC, Av. Filadélfia, 568, Setor Oeste, Araguaina, TO 77816-540, Brasil. E-mail: miriannides@bol.com.br

<sup>5</sup> Médico, Dr.Med.Vet.Parasitol.Vet. Pavilhão Leônidas Deane, Instituto Oswaldo Cruz/Fiocruz, Av. Brasil 4365, Manguinhos, RJ 21040-360, Brasil.

<sup>6</sup> Médico-veterinário, PhD. DPA, IV, UFRRJ, Seropédica, RJ. E-mail: lopescwg@ufrj.br - CNPq fellowship.

riage or birth defects in vertebrate hosts, including human beings (Tenter et al. 2000, Dubey 2010).

It can be observed in various tissues of vertebrates (Frenkel 1972, Miller et al. 1972), except in red blood cells of mammals, their forms can still be found in body fluids such as saliva, milk, urine and peritoneal transudate. On the other hand, can develop all phases of their life cycle in cells of the intestinal mucosa of cats (Dubey 1986, Frenkel 1986, Jewell et al. 1972) and its final phase, the oocysts eliminated with the feces.

The wide dispersal of this parasite can be determined by low specificity and the many forms of transmission. Among the forms already studied are the ingestion of raw or undercooked (Hug et al. 2007), containing the protozoan cysts, and ingestion of oocysts found in feces of cats and other felines where transmission of infection is dependent on the degree and frequency of exposure to these factors (Almond 1995, Etheredge et al. 2004, Frenkel & Dubey 1972, Spalding et al. 2005). Beside these factors it can be included as a means of infection from oocysts found in the dogs (Etheredge et al. 2004, Frenkel & Parker 1996, Lindsay et al. 1997).

Toxoplasmosis, in turn, presents itself as a cosmopolitan infection, with the possibility of epidemic outbreaks occur. It is estimated that about 20 to 90% of the adult population, depending on the region, has already had contact with the respective parasite (Galvan-Ramirez et al. 1998).

## MATERIALS AND METHODS

### Origin of the studied material

Araguariña is the hub city of the 6th Administrative Region of the State of Tocantins. Consists of 15 Municipalities, this region makes a total of more than 12 thousand square kilometers and a population of more than 280 000 inhabitants. The climate is hot and humid, with rainy seasons and dry well-defined, high rainfall and relative humidity above 80%.

### Collection of samples

Blood samples totaling 874 were collected for convenience in the Municipal Hospital Araguariña, Tocantins state during a period of 12 months. Prior to collecting a blood epidemiological form was filled with personal data of the pregnant woman, seeing if there was the presence of animals in residence, mainly dogs and cats. The collection took place by venipuncture with disposable syringe; BD brand will be phased 10mL of each mother and

placed in test tubes at admission in the field of obstetrics. Blood samples were numbered in ascending order, and centrifuged at 3000 rpm for 15 minutes. Sera obtained from these samples were then placed in tubes of 2 mL *Eppendorf*, numbered the same way cited above, recorded in log book itself and stored in freezer at 200C until the time to be analyzed for the presence of IgG and IgM antibodies against *T. gondii* was used for this in their analysis were used for indirect immunofluorescence test for toxoplasmosis (IFAT-IgG - IgM), according to Coutinho et al. (1970), with some modifications.

### Laboratory examination

In the laboratory of Institute Oswaldo Cruz, Rio de Janeiro, RJ, the slides were coated with *T. gondii* C strain, positive and negative sera were used as controls, and conjugated anti-gammaglobulin anti-IgG and anti-IgM labeled with fluorescein isothiocyanate (Sigma-Chemical, USA), as the cutoff dilution of 1:64 was used in accordance to Costa et al. (1977). The reading was performed using a fluorescence microscope Olympus BX41 with a 40X objective and was only considered positive when the tachyzoites showed total peripheral fluorescence of at least 50%. In all sera positive in 1:64 dilution, sequential dilutions were made to determine the antibody titer.

### Statistical Analysis

Data analysis was performed using the SPSS (Statistical Package for Social Sciences) version 13, which were calculated measures of central tendency 2 tests with their risks (RR) and coefficient of variation, and the Statistical tests were performed with 5.0% as margin of error and RR intervals were obtained with 95.0% confidence.

## RESULTS AND DISCUSSION

It was possible to evaluate that 57.32% of 874 pregnant women ( $n = 501$ ) had antibodies against *T. gondii* IgG, serum considered positive, while 42.68% ( $n = 373$ ) sera were negative. As negative results were considered non-reactive samples or serum reactivity  $< 1:64$  (Table 1).

Although there is no significance for the presence of pets can be seen that there is much risk of transmission (RR) by the presence of the cat, the definitive host of *T. gondii* by sheddings oocysts in their feces and dog that can serve as host as transport oocysts (Table 2).

Table 1. Serology for *Toxoplasma gondii* in pregnant women attended by SUS at the Araguarina Municipal Hospital.

Results of IgG	Número	%
No reagent	177	20,25
1/16	196	22,43
1/64	375	42,91
1/256	100	11,44
1/1024	20	2,29
1/4096	6	0,69
TOTAL	874	100,0

Table 2. Participation of pets and their relationship of positivity for *Toxoplasma gondii* in pregnant women attended by SUS at the Araguarina Municipal Hospital, Tocantins

Variables	Pregnant		$\chi^2$ <sup>a</sup>	Value of p	Relative risk (RR)	Confidence interval (95%) <sup>b</sup>
	Positive	Negative				
Cats	Positive	290	34	216.47	0.0001	2.335 2.087-2.612
	Negative	212	341			
Dogs	Positive	255	68	96.04	0.0001	1.766 1.584 -1.969
	Negative	245	303			

<sup>a</sup>Yates' correction.<sup>b</sup>Katz' approach.

The observed in pregnant women in the region of Araguarina was 57.32% positive serum (IgG) for *T. gondii*, consistent with the range indicated for Latin America from 50 to 60% in people aged 20 to 30 years (Frenkel 1986). This differs from the frequency of positivity found by Spalding et al. (2005) of 25.5%, and those of Gonzalez-Morales et al. (1992) which is 29.1%. The percentage of serum found negative of 42.68% was observed close to 54.3% in Nigeria (Olusi et al. 1996) may represent high risk for infection in future pregnancies cousin.

Cats are considered as definitive hosts of *T. gondii*, with the result of their epidemiological importance (Albuquerque et al. 2005). They live in direct relationship with humans, both in rural and/or urban areas where oocysts shedding by them are spreading in the environment by wind, rain and surface water (Buxton 1990) which determining the survey of *T. gondii* in pregnant women at the region of Araguarina as the great importance where the presence of the cat was highly significant ( $p < 0.001$ ).

Transmission to humans, through contact with dogs that had their hair contaminated with oocysts deposited in the soil. From the results found at this region, there was a significance between the presence of dogs and pregnant women, however it can be seen that there is risk of contamination of women who became pregnant where in Araguarina not rule out the possibility of xenosmophilia ( $p < 0.0001$ ) where dogs can acquire, carry and pass oocysts of *T. gondii* usually found in places, where they take

a sand bath in places where the cat has defecated previously (Sanchez et al. 1989, Frenkel & Parker 1996, Lindsay et al. 1997, Garcia et al. 1999, Etheredge et al. 2004). Thus, the hands stroking the animal may be contaminated with oocysts maintained by static in the dog and then putting their hands to mouth or food to be ingested.

## CONCLUSIONS

The frequency of seropositive pregnant women (IgG) was significant, revealing the presence of anti-*T. gondii*, where the presence of cat and / or dog ( $p < 0.0001$ ) indicated that there is a high possibility of transmission for pregnant women at this region.

## REFERENCES

- Albuquerque G.R., Munhoz A.D., Flausino W., Silva R.T., Almeida C.R.R., Medeiros S.M. & Lopes C.W.G. Prevalência de anticorpos anti-*Toxoplasma gondii* em bovinos leiteiros do vale do Paraíba Sul Fluminense, Estado do Rio de Janeiro. *Rev. Bras. Parasitol. Vet.*, 14:125-128, 2005.
- Amendoeira M.R.R. Mecanismos de transmissão da toxoplasmose. *Anais Acad. Nac. Med.*, 155:224-225, 1995.
- Buxton D. Ovine toxoplasmosis: a review. *J. Royal Soc. Med.*, 83:509-511, 1990.
- Costa A.J., Araujo F.G., Costa, J.O., Lima J.D. & Nascimento E. Experimental infection of bovines with oocysts of *Toxoplasma gondii*. *J. Parasitol.*, 63:212-218, 1977.
- Coutinho S.G., Andrade C.M., Malvar G.S. & Ferreira L.F. Análise comparativa entre as sensibilidades da reação indireta de anticorpos fluorescentes e da reação de Sabin-Feldman na pesquisa de anticorpos séricos para a toxoplasmose. *Rev. Soc. Bras. Med. Trop.*, 4:315-325, 1970.
- Dubey J.P. *Toxoplasmosis of animals and humans*. 2<sup>nd</sup> ed. CRC Press, Boca Raton, 2010. 313p.
- Dubey J.P. Toxoplasmosis. *J. Am. Vet. Med. Assoc.*, 189:166-170, 1986.
- Etheredge G.D., Michael G., Muehlemann M.P. & Frenkel J.K. The roles of cats and dogs in the transmission of *Toxoplasma* infection in Kuna and Embera Children in Eastern Panama. *Rev. Panamer. Salud Pub.*, 16:176-186, 2004.
- Frenkel J.K. & Parker B.B. An apparent role of dogs in the transmission of *Toxoplasma gondii*. The probable importance of xenosmophilia. *Ann. N. Y. Acad. Sci.*, 791:402-407, 1996.
- Frenkel J.K. La inmunidad em la toxoplasmosis. *Bol. Ofic. Sanit. Panamer.*, 100:283-299, 1986.
- Frenkel J.K. Toxoplasmosis. Mecanismos de infección, laboratorio diagnosis and manangement. *Current Top. Pathol.*, 54:28-75, 1972.
- Frenkel J.K. & Dubey P.J. Toxoplasmosis and its prevention in cats and man. *J. Infec. Dis.*, 126:664-673, 1972.
- Frenkel J.K., Hassanein K.M., Hassanein R.S., Brown E., Thulliez P. & Quintero-Nunez R. Transmission of *Toxoplasma gondii* in Panama City, Panama: a five - year prospective cohort study of childrens, cats, rodents, birds and soil. *Am. J. Trop. Med. Hyg.*, 53:458-468, 1995.

- Galván-Ramírez M. de la L., Guillén-Vargas C., Saavedra-Durán R. & Islas-Rodríguez A. Analysis for *Toxoplasma gondii* antigens with sera from toxoplasmosis patients. *Rev. Soc. Bras. Med. Trop.*, 31:271-277, 1998.
- Garcia J.L., Navarro I.T., Ogawa, L. & de Oliveira R.C. Soro prevalência do *Toxoplasma gondii*, em suínos, bovinos, ovinos e eqüinos, e sua correlação com humanos, felinos e caninos, oriundos de propriedades rurais do norte do Paraná-Brasil. *Cienc. Rur.*, 29:91-97, 1999.
- Gonzalez-Morales T., Bacallo-Galleste J. & Garcia C.A. Prevalência de anticuerpos anti-*Toxoplasma gondii* en uma población de mujeres embarazadas em Cuba. *Gac. Med. Mex.*, 131:499-503, 1992.
- Hung C.C., Fan C.K., Su K.E., Sung F.C., Chiu H.Y., Gil V., Ferreira M. da C. dos R., de Carvalho J.M., Cruz C., Lin Y.K., Tseng L.F., Sao K.Y., Chang W.C., Lan H.S. & Chou S.H. Serological screening and toxoplasmosis exposure factors among pregnant women in the Democratic Republic of São Tomé and Príncipe. *Trans. Royal Soc. Trop. Med. Hyg.* 101:134-139, 2007.
- Jewell M.L., Frenkel J.K., Johnson K.M., Reed V. & Ruiz A. A development of *Toxoplasma* oocysts in neotropical feline. *Am. J. Trop. Med. Hyg.*, 21:512-517, 1972.
- Lindsay D.S., Dubey J.P., Butler J.M. & Blagburn B.L. Mechanical transmission of *Toxoplasma gondii* oocysts by dogs. *Vet. Parasitol.*, 73:27-33, 1997.
- Miller N.I., Frenkel J.K. & Dubey J.P. Oral infections with *Toxoplasma* cysts and oocysts in felines, other mammals, and in birds. *J. Parasitol.*, 58:928-937, 1972.
- Olusi T., Grob U. & Ajay J. High incidence of toxoplasmosis during pregnancy in Nigéria. *Scand. J. Infec. Dis.*, 28:645-646, 1996.
- Sánchez RM., Hernandez M.S. & Carvajales A.F. Aspectos seroepidemiológicos de la toxoplasmosis en 2 municipios de la provincia de Ciego de Ávila. *Rev. Cub. Med. Trop.*, 41:214-225, 1989.
- Spalding S.M., Amendoeira M.R.R., Klein C.H. & Ribeiro L.C. Sorological screening and toxoplasmosis exposure factors among pregnant women in south Brazil. *Rev. Soc. Bras. Med. Trop.*, 38:173-177, 2005.
- Tenter A.M., Heckereth A.R. & Weiss L.M. *Toxoplasma gondii*: from animals to humans. *Int. J. Parasitol.*, 30:1217-1258, 2000.