

# Serum anti-*Toxoplasma gondii* antibodies in *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae), in the municipality of Pelotas, RS, Brazil\*

## Anticorpos séricos anti-*Toxoplasma gondii* em pardais, *Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae), do município de Pelotas, RS, Brasil

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### ABSTRACT

The objective of this study was to detect the presence of anti-*Toxoplasma gondii* antibodies in serum samples from 100 house sparrows (*Passer domesticus* Linnaeus, 1758) that were caught in the municipality of Pelotas, Rio Grande do Sul, Brazil. The modified agglutination test (MAT) was used to investigate anti-*T. gondii* antibodies and samples with a cut-off dilution > 5 were considered positive. Among the 100 serum samples analyzed, 80 (80%) were reactive. These results demonstrate that *P. domesticus* may play an important role in the epidemiological chain of *T. gondii*, since it is widely distributed throughout Brazil, and may act as a source of infection to domestic and wild felids.

**Keywords:** Toxoplasmosis. Birds. Epidemiology. Public health. Urban environment.

### RESUMO

O objetivo deste estudo foi detectar a presença de anticorpos anti-*Toxoplasma gondii* em amostras de soro de 100 pardais (*Passer domesticus* Linnaeus, 1758) capturados na área urbana do município de Pelotas, Rio Grande do Sul, Brasil. Para a pesquisa de anticorpos anti-*T. gondii* foi utilizado o teste de aglutinação modificado (MAT) e foram consideradas positivas as amostras que apresentaram título > 5. Das 100 amostras de soro analisadas, 80 (80%) foram reagentes. Esses resultados demonstram que *P. domesticus*, por ser amplamente distribuído em todo país, pode desempenhar um papel importante na cadeia epidemiológica de *T. gondii*, podendo atuar como fonte de infecção para felinos domésticos e silvestres.

**Palavras-chave:** Toxoplasmose. Aves. Epidemiologia. Saúde pública. Ambiente urbano.

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The coccidian *Toxoplasma gondii* (Nicolle & Manceaux, 1909) is an obligate intracellular parasite widely distributed worldwide (Tenter et al., 2000). It is the etiological agent for

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toxoplasmosis, which is an important protozoan infection to both veterinarian and public health causing serious consequences for the health of homeothermic animals and humans (Santos et al., 2015). Felids are responsible for environmental contamination because they are the only hosts that can excrete the oocysts, the highly resistant stage of the parasite in the environment, in their feces after ingesting the parasite (Dubey, 1995; Elmore et al., 2010).

Birds are important intermediate hosts for *T. gondii*, since they act as the source of infections for domestic and semi-domestic cats and/or free-living felids. Birds that constantly feed on the ground, such as chickens, pigeons, and house sparrows, may be good environmental contamination indicators/sentinels, since they are constantly exposed to ingestion of *T. gondii* oocysts (Waap et al., 2008; Gennari et al., 2014).

*Passer domesticus* (Linnaeus, 1758) (Passeriformes: Passeridae) is a terricolous non-migratory bird that adapts easily to agricultural, urban, and suburban environments. It takes advantage of anthropic activities by occupying places with buildings that are suitable for its shelter and for nesting (Major et al., 2004). House sparrows originated from Eurasia and northern Africa and were intentionally introduced into the Americas (Global Invasive Species Database, 2015). Today, they present dispersion throughout Brazilian territory (Sick, 1997).

Different species of Passeriformes, especially house sparrows, are commonly predated by felids (Churcher & Lawton, 1987), which makes them essential for maintenance of the biological cycle of *T. gondii* and for the epidemiology of toxoplasmosis (Andrade et al., 2016). House sparrows from northeast Brazil were confirmed as intermediate hosts of *T. gondii*, reinforcing the potential importance of these birds on the transmission of the parasite to cats and other animals that may predate house sparrows (Gondim et al., 2010). In this context, the objective of this study was to detect the presence of anti-*T. gondii* antibodies among house sparrows in an urban area of the municipality of Pelotas, Rio Grande do Sul, southern Brazil (31°45'55.44"S and 52°20'15.32"W).

Using mist nets (mesh of 30 mm), 100 specimens of *P. domesticus* were caught in 13 places, used as a dormitory by the specie (public squares, gardens of private property and vacant lands) in the urban area of the municipality of Pelotas, Rio Grande do Sul, Brazil, between March 2016 and February 2018. Catching, transportation and euthanasia of the birds were done under a license granted by the Chico Mendes Institute of Biology and Conservation (ICMBio nº. 51118-3) and were approved by the Ethics Committee

in Animal Experimentation of the Federal University of Pelotas (UFPel) (CEEA/UFPel nº. 4915).

After the birds were caught, they were transported in suitable cages to the Parasitology Laboratory (UFPel), where they were subjected to euthanasia through managed inhalational anesthesia, as prescribed by Resolution nº. 1000/2012 of the Federal Council of Veterinary Medicine of Brazil (Conselho Federal de Medicina Veterinária, 2012). After sedation, blood sampling was performed on the birds individually. The blood collection was performed by cardiac puncture. The collected blood samples were then centrifuged (2500 rpm for 10 min), and the serum from these samples was subsequently aliquoted, identified, and frozen at -20 °C until processing for serological tests.

The samples were sent to the Department of Preventive Veterinary Medicine, Faculty of Veterinary Medicine, University of São Paulo, São Paulo, Brazil, where they were analyzed by modified agglutination test (MAT), to investigate anti-*T. gondii* antibodies. The MAT was performed as described by Dubey & Desmonts (1987), with 1:5 as the cut-off point (Dubey et al., 2016). Positive samples were tested at base-two serial dilutions until reaching the last positive dilution. Positive and negative chicken controls serum were included in each test.

Among the 100 serum samples analyzed, 80 (80%) reacted to *T. gondii*, with a titre of 5 in two samples, 10 in six samples, 20 in 21 samples, 40 in 29 samples, 80 in 13 samples, 160 in eight samples and 320 in one sample. In all 13 locations, at least one bird was positive for *T. gondii* (Table 1).

In comparison with similar studies on *P. domesticus*, the occurrence of *T. gondii* antibodies among house sparrows in this urban area in southern Brazil was relatively high, reaching 80% (80/100). In Europe, Uterák et al. (1992), using the Sabin-Feldman dye test, found an occurrence of 0.5% (10/1907) among house sparrows in the Czech Republic. In Poland and in the Czech Republic, Literák et al. (1997) demonstrated the presence of anti-*T. gondii* antibodies, by means of the indirect fluorescent antibody test (IFAT), in 12.3% (28/227) of the house sparrows and 4.9% (2/41) of the Eurasian tree sparrow (*Passer montanus* Linnaeus, 1758) tested. In Lanzhou, northwest China, Cong et al. (2013) obtained a prevalence of 12.46% (39/313) by MAT. In Brazil, by means of the indirect hemagglutination test (HAI), antibodies against *T. gondii* were found in 1.02% (3/293) of the house sparrows tested in the states of Bahia and Pernambuco (Gondim et al., 2010), and in 60.3% (91/151) of the house sparrows that were caught on poultry farms in Pernambuco, also using HAI (Vilela et al., 2011).

Table 1 – Detection of anti-*Toxoplasma gondii* antibodies in house sparrows (*Passer domesticus*, Linnaeus, 1758) (Passeriformes: Passeridae) collected from 13 locations in the urban area of Pelotas, Rio Grande do Sul, Brazil

Capture locations	n° of house sparrows		Occurrence (%)
	Sampled	Positives	
1	9	7	77.7
2	3	3	100
3	16	16	100
4	7	4	57.1
5	3	1	33.3
6	4	4	100
7	14	11	78.5
8	11	9	81.8
9	8	3	37.5
10	16	13	81.25
11	5	5	100
12	1	1	100
13	3	3	100
<b>Total</b>	<b>100</b>	<b>80</b>	<b>80.0</b>

The variation in the rate of occurrence between these different studies needs to be evaluated carefully because of the different techniques and cut-off points that were used in the studies. According to Dubey (2010), the MAT is one of the most sensitive tests for detecting anti-*T. gondii* antibodies in human and animal serum (Dubey et al., 2016). Moreover, because there is no need for specific species of antibodies, it is very convenient for making the diagnosis in non-domestic hosts, such as house sparrows, for which no commercialized specific antibodies are available.

Literák et al. (1999) infected house sparrows with *T. gondii* and observed a peak of antibodies at 7 weeks post-infection (p.i.) and a reduction of the antibody titers at 12 weeks p.i. This observation, associated with the relatively high occurrence of positive birds found in the present study, increases the importance of this species in the region.

There are no data regarding seropositivity rates for *T. gondii* among domestic and semi-domestic cats and/or

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of free-living felids in the region of the present study. However, in terms of ground contamination in public squares in housing complexes in the city of Pelotas, there is a study that found oocysts of this protozoan in 33.3% (13/39) of the squares sampled (Tavares et al., 2008). It is also known that 18.18% (20/110) of the dogs that were taken for attention at the UFPel Veterinary Hospital, were HAI seropositive for *T. gondii* (Faria Santos et al., 2012), and Santos et al. (2015) found that 84.3% (91/108) of the cats in the municipality have free access to the streets. These data, associated with the findings of the present study, indicate that house sparrows may serve as a source of *T. gondii* infection for other animals, including felids and canids. These birds are potential reservoirs and good indicators for *T. gondii* transmission.

## Conflict of Interest

The authors state that they have no conflicts of interest to declare.

## Ethics Statement

License granted by the Chico Mendes Institute of Biology and Conservation (ICMBio n°. 51118-3) and were approved by the Ethics Committee in Animal Experimentation of the Federal University of Pelotas (UFPel) (CEEA/UFPel n°. 4915).

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