



SHORT NOTE [NOTA CORTA]

PRESENCIA DE ANTICUERPOS DE *Toxoplasma gondii* EN CERDOS Y GATOS DE TRASPATIO EN UNA REGIÓN ENDÉMICA TROPICAL DE MÉXICO

[THE OCCURRENCE OF *Toxoplasma gondii* ANTIBODIES IN BACKYARD PIGS AND CATS FROM AN ENDEMIC TROPICAL AREA OF MEXICO]

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SUMMARY

In Mexico, backyard animal production system is an important source of food for domestic consumption as in many other developing countries and is characterized by a virtually nonexistent sanitary management. With the objective to evaluate the prevalence and risk factors associated with antibodies against *T. gondii* in pigs and cats from an endemic area in the Mexican tropics, a cross-sectional study was performed in 30 backyard pigs and 50 cats. Pigs and cats were blood sampled and tested by an indirect IgG ELISA to detect antibodies against *T. gondii*. Seropositivity rate in cats were of 100 % (50/50) and were identified a 75 % (23/30) of positives pigs. Results indicate a very high level of circulation of the agent in the area and a high risk of pigs to become infected. It is concluded that cats and pigs maintained under backyard had high seroprevalence to *T. gondii*. It is necessary implement sanitary measures in the management of backyard to avoid transmission to people consuming pork meat from backyard systems.

Key words: Pigs; cats; *Toxoplasma gondii*; ELISA; backyard.

RESUMEN

En México al igual que otros países en desarrollo, la producción animal de traspatio es una fuente importante de alimento para el autoconsumo y se caracteriza por la virtual ausencia de manejo sanitario. Con el objetivo de evaluar la prevalencia y los factores de riesgo asociados con la presencia de anticuerpos a *T. gondii* en cerdos y gatos en un área endémica del trópico mexicano se realizó un estudio en 30 cerdos de traspatio y 50 gatos. Se tomaron muestras de sangre de los cerdos y gatos y se analizaron mediante una prueba indirecta IgG ELISA para detectar anticuerpos a *T. gondii*. La tasa de seropositividad en gatos fue de 100% (50/50) y se identificaron 75% (23/30) de los cerdos como positivos. Los resultados indican una alta tasa de circulación del agente y un alto riesgo de los cerdos de ser infectados. Se concluye que los cerdos y gatos mantenidos en traspatio tienen una alta seroprevalencia a *T. gondii*. Es necesario implementar medidas sanitarias en el manejo de sistema de traspatio para evitar la transmisión a las personas que consumen la carne producida en estos sistemas.

Palabras clave: Porcinos; gatos; *Toxoplasma gondii*; Elisa; traspatio.

INTRODUCTION

Toxoplasmosis is an infectious disease caused by the parasite protozoan *Toxoplasma gondii*. It is wide world distributed in several species including humans

(Dubey *et al.*, 2009). The cycle of *T. gondii* is of two types: one enteroepitelial that takes place exclusively in felines and the extraintestinal that takes place in non-enteric tissues in the feline and several intermediate hosts (Dubey and Frenkel, 1973). Cats

are the definitive hosts of *T. gondii* and when infected by the first time, they may excrete oocysts in their feces polluting the environment. The transmission of the parasite to humans is influenced by the potential contamination of various food sources, and also by the individual behaviour of consumers in different ethnic groups and geographical areas (Tenter, 2009). However, consumption of meat is a common route of Toxoplasma infection in most of human population, even if direct contact with cats is avoided (Jiménez-Coello *et al.*, 2011). Food animals including pigs, sheep, and goats have the highest rate of toxoplasma tissue cysts in comparison with other animals.

Backyard animal production system is an important source of food for domestic consumption in many developing countries. In Mexico, over 75% of rural smallholders keep animals (Berdugo and Franco, 1991). Backyard animal production is characterized by a virtually nonexistent sanitary management. Cats are common companion backyard animals in rural Mexico; under these conditions, cats are free roaming and they stay at different household during the day. Rural cats are not spayed resulting in a high and constant reproduction rate, therefore a large proportion of kittens are available all year round. Since cat and pig breeding are common in the Mexican tropics, and since the contaminated pig is one of the sources of human infection, this study was performed to evaluate the prevalence and risk factors associated with antibodies against *T. gondii* in pigs and cats from an endemic area in the Mexican tropic.

MATERIALS AND METHODS

Animals and study area

The study was performed in a rural community (Molas) in the state of Yucatan, Mexico (20°49' and 20°48' N latitude, and 89°37' and 89°38' W longitude) within the ecological reserve "Cuxtal" in a subtropical forest. A multistage sampling technique was designed to randomly visit 156 households from the 379 reported (INEGI 2001). A total of 30 backyard pigs and 50 cats living in the households were blood sampled.

Blood sample collection

Blood samples from pig were collected by puncturing the anterior cava vein whereas in cats blood was taken from the jugular vein; samples were deposited in a vacutainer® tube (without anticoagulant) and serum obtained by the centrifugation (3500 g during 5 min). Serum samples were stored at -20 °C until further indirect ELISA assay.

Indirect IgG ELISA test

The presence of specific IgG antibodies against *T. gondii* was determined separately by the use of indirect ELISA tests (Human-GmbH, Wiesbaden, GER). The technique used was adapted to that described by Figueroa-Castillo *et al.* (2006), using anti-IgG (cat or pig respectively) antibodies labeled with horseradish peroxidase (HRP) (Santa Cruz Inc., CA USA) on 96 well plate coated with tachyzoites of *T. gondii* as previously described by Ortega-Pacheco *et al.* (2011). Serum samples were diluted to a ratio of 1:100 in phosphate-buffered saline (PBS, pH 7.2). The secondary goat anti-IgG cat antibody HRP labeled and a goat anti- IgG pig also marked with HRP (Santa Cruz Inc, CA USA) were used respectively at a dilution of 1:5000. Serum from cats and pigs showing high anti-IgG antibodies titer by ELISA (1:1024) and positive results to PCR against *T. gondii* were used as positive controls, and pooled sera (one pool for each specie) from 10 healthy animals (cats and pigs respectively) previously tested by triplicate with ELISA IgM, IgG (antibodies) and PCR (antigen), were used as negative controls. On the basis of the indirect ELISA results, subjects were diagnosed as either positive/negative for specific IgG antibodies to *T. gondii*. The optical density (OD) was measured in a spectrophotometer at 450 nm (Bio-Rad 680, Bio-Rad Laboratories, Inc, USA®) and was used to compute the percent positivity (PP) using the formula: Mean OD (sample or negative control) divided by the mean OD value positive control multiplied by 100. Percent positivity of 15% or above was considered as positive (Ortega-Pacheco *et al.*, 2011). The prevalence rate for pigs and cats were calculated (Segura-Correa and Honhold, 2000).

RESULTS

From the 50 evaluated cats, 100 % of them showed IgG specific antibodies against *T. gondii* and 76% of the sampled pigs (23/30) were also seropositive.

DISCUSSION

The prevalence in pigs from this study was higher than backyard scavenging pigs of Zimbabwe (35.7%); in these study, *T. gondii* in pigs from the backyard system was higher than pigs maintained in large and small-scale commercial farms that practice good hygiene (19.75%) (Hove *et al.*, 2005). Pigs from Ossabaw Island were identified with very low prevalence of antibodies against *T. gondii* (0.9%) attributed to the virtual absence of cats in the Island (Dubey *et al.*, 1997). When *T. gondii* prevalence found in this study is compared with previously assayed samples of fattening pigs from commercial farms in the same area where Jimenez-Coello *et al.*

(2010) reported 80.6%, pigs from fattening farms are more likely to become infected than pigs maintained under backyard conditions. Differences in the rate of infection in backyard pigs compared to those raised under farm conditions, suggest that in commercial farms the food is maintained for longer periods increasing the risk of contamination with oocysts eliminated by cats and that carnivorousness by consuming rodents is occurring as reported in other commercial pig systems (Van Der Giessen *et al.*, 2007). In contrast, in the backyard production system the source of food comes from leftovers, broken corn and small amounts of commercial food stored for very short periods of time, so the risk to become polluted by oocysts by this route is reduced. Even with the lower probability, the level of infection in the studied population is high and is considered an important source implicated in the transmission of the infection to humans. Contact with oocytes from cat feces may be the most probably route of infections of backyard pigs.

Backyard cats in rural conditions of Mexico are very common and are characterized by non existing preventive medicine and low or non existing population control measures. Owners in small rural communities in Mexico, rarely feed cats so the main food sources comes from their hunting habits or leftovers from different activities like the processing of poultry meat, in order to survive and reproduction may reach its maximum; therefore, a large proportion of kittens are produced all year round. The presence of anti IgG specific antibodies against *T. gondii* in all the rural cats from this study is a consequence of the early contact with the protozoan directly from their infected dams or by hunting intermediary hosts, probably resulting in a high rate of oocyst liberation.

It is concluded that cats and pigs in the studied area had high seroprevalence to *T. gondii*. There is a lack of information about toxoplasmosis in backyard pigs raised in Mexico; it was showed that even when rural cats are all infected, the proportion of infected pigs is lower than in commercial fattening pig farms from the same region demonstrating the existence of several routes of infection. However, since toxoplasmosis is endemic in the studied area and a high proportion of backyard pigs are infected, people consuming this meat should be informed to avoid eating raw or undercooked pork in order to prevent the acquisition or re-infection with *T. gondii*.

Acknowledgments

We gratefully acknowledge to PROMEP (2008-103.5/12.58) for the financial support to the research.

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Submitted August 30, 2011– Accepted June 01, 2012
Revised received January 29, 2013