

Serosurvey on Toxoplasmosis in Outdoor Pig Production Systems of the Southern Region of Brazil

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Key words

Swine – *Toxoplasma gondii* – Animal husbandry method – Brazil.

Summary

Pigs out to pasture on a large scale is a fairly new occurrence in Brazil, but it represents an area of growing interest. Antibodies to *Toxoplasma gondii* were found in 86.08% of 115 pigs. According to the modified agglutination test, the following antibody titers were found: 1:50 (3.47%), 1:100 (6.08%), 1:200 (9.56%), 1:400 (6.95%), 1:800 (6.95%), 1:1600 (6.95%) and 1:3200 (55.65%). The environment fecal contamination by cats or by consumption of infected rodents is probably the most significant source of toxoplasmosis in outdoor-reared pigs. The economic toxoplasmosis impact of outdoor pig production systems, as well as its public health importance, should be assessed. The present results suggest that toxoplasmosis is common in pigs reared outdoors in the region. Health authorities should increase their monitoring and control activities in order to decrease the risk of toxoplasmic infections, especially among pregnant women. This is the first report on *T. gondii* infection in pigs reared according to the outdoor pig production system in Brazil.

INTRODUCTION

In Brazil, outdoor pig production usually refers to the sow herd pasturing outdoors and to piglets, until these are weaned and moved indoors, according to the traditional systems. Having a large number of sows pasturing outdoors is fairly new in Brazil,

but it has become an area of growing interest. *Toxoplasma gondii* is a protozoan parasite which is currently found in domestic livestock. The determinative host for the parasite is the cat, which shelters *T. gondii* oocysts in its feces. Swine may be directly infected through the ingestion of oocyst-contaminated feed, water, and soil, or by the consumption of infected rodents (4). *T. gondii* infection in food-producing animals is a public health potential problem, because the infection can be transmitted to human beings through the handling and consumption of raw or undercooked meat containing *T. gondii* bradyzoites encysted in muscle tissues (9). Among human beings, clinical toxoplasmosis is mostly developed by immunocompromised individuals and fetuses (6). In this region, prevalence of ocular toxoplasmosis among the population is over 30-time higher than that of previous estimates under the same conditions elsewhere (7).

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■ MATERIALS AND METHODS

Location of farms

The farms were located in the north of Rio Grande do Sul State (Carazinho, Floriano Peixoto, Palmeiras das Missões, São José do Ouro) and in the west of Santa Catarina State (Concórdia, Formosa do Sul, Ipumirim, Quilombo, Saudades), in Brazil (figure 1). In this region, many typical Brazilian species of the Atlantic Forest are to be found, including small wild felines. The state of Santa Catarina has the largest native forest of all the southern Brazilian territory.

Animals

Serum samples were taken from 115 pigs (103 sows and 12 boars) out of 13 outdoor pig production systems from Santa Catarina and Rio Grande do Sul States, and were examined in order to study the cross-reacting antibodies to *T. gondii*, using the modified agglutination test (MAT).

Diagnosis

For blood collection, serum vacutainer tubes were used. Sera were separated as soon as possible into 1-2 ml aliquots and frozen (-20°C) before screening for *T. gondii* antibodies. Sera were transported frozen and analyzed by MAT (3) for antibodies to *T. gondii* at Embrapa Swine and Poultry National Research Centre, Concordia, Santa Catarina State, Brazil, using formalin-fixed whole tachyzoites and 2-mercaptoethanol as previously described (3).



Figure 1: Location of farms in the north of Rio Grande do Sul State (Carazinho, Floriano Peixoto, Palmeiras das Missões, São José do Ouro) and in the west of Santa Catarina State (Concórdia, Formosa do Sul, Ipumirim, Quilombo, Saudades counties), Brazil.

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The agglutination was made in U-bottom-96-well microtiter plates. A positive control was included in each plate. The control had a titer of 1:200, and two-fold dilutions from 1:25 to 1:3200 were used. The plates were covered with sealing tape and incubated at 37°C overnight. A blue button at the bottom of the well was considered negative and a clear button was read as positive. Sera with unequivocal results at 1:25 dilution were reexamined in 1:10, 1:20 and 1:40 dilutions. Positive controls were included in each test. MAT detected only IgG specific antibodies to *T. gondii* because the mercaptoethanol used in this test destroyed nonspecific IgM antibodies that cross-reacted with *T. gondii* antigen (5). MAT was provided by Dr J.P. Dubey from the Parasite Biology and Epidemiology Laboratory, Beltsville Agricultural Research Center, Beltsville, USA.

■ RESULTS AND DISCUSSION

Antibodies to *T. gondii* were found in 86.08% of 115 pigs. The antibody titers were 1:50 (3.47%), 1:100 (6.08%), 1:200 (9.56%), 1:400 (6.95%), 1:800 (6.95%), 1:1600 (6.95%) and 1:3200 (55.65%), according to MAT. According to Assadi-Rad et al. (1), sows kept outdoors were likely to be 23 times more seropositive than sows kept indoors. According to Davies et al. (2), a total of 13 out of 2238 samples (0.58%) had positive antibodies to *T. gondii*, using the modified agglutination test. Out of these, 12 were from 63 pigs sampled on a farm where pigs ready for slaughtering were put out to pasture. Only one out of 1752 (0.057%) samples from pigs submitted to total confinement systems was seropositive.

According to Smith et al. (8), the prevalence in sows totally and continuously confined was lower than that in sows which were not totally and continuously confined. These results suggested that the prevalence of *T. gondii* antibodies in swine increased with age, and that the prevalence in swine could be reduced by total confinement. This study clearly showed the environmental infection pressure and illustrated the importance of housing and management to establish low infection rates. Also in the present study, the high population of cats used in the region for rat control, as well as the presence of wild felines suggested that the environment fecal contamination or contamination by the consumption of infected rodents might be the most significant source of toxoplasmosis in outdoor-reared pigs. The economic impact of toxoplasmosis in outdoor pig production systems, as well as its public health importance need to be assessed.

The present results suggest that toxoplasmosis is common in the region's outdoor-reared pigs, and health authorities should increase their monitoring and control activities in order to decrease the risk of toxoplastic infections, especially in pregnant women.

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Résumé

Silva R.A.M.S., Bonassi C., Dalla Costa O.A., Morés N. Enquête séro-épidémiologique sur la toxoplasmose dans les systèmes de production porcine de plein air dans la région du sud du Brésil

L'élevage des porcs à grande échelle en plein air est un phénomène nouveau au Brésil, mais c'est un secteur d'intérêt croissant. Des anticorps spécifiques contre *Toxoplasma gondii* ont été trouvés chez 86,08 p. 100 des 115 porcs examinés. En utilisant le test d'agglutination modifié, les titres en anticorps suivants ont été relevés : 1:50 (3,47 p. 100), 1:100 (6,08 p. 100), 1:200 (9,56 p. 100), 1:400 (6,95 p. 100), 1:800 (6,95 p. 100), 1:1600 (6,95 p. 100) et 1:3200 (55,65 p. 100). La contamination fécale de l'environnement par des chats ou par la consommation de rongeurs infectés est l'origine la plus probable de la toxoplasmose chez les porcs élevés en plein air. Les résultats indiquent que la toxoplasmose est fréquente chez les porcs élevés à l'air libre dans la région. Les services de santé devraient intensifier leur surveillance ainsi que les contrôles sanitaires afin de réduire le risque de toxoplasmoses en particulier chez les femmes enceintes. Ceci est le premier rapport d'une infection à *T. gondii* chez des porcs élevés dans un système de production en plein air au Brésil.

Mots-clés : Porcin – *Toxoplasma gondii* – Méthode d'élevage – Brésil.

Resumen

Silva R.A.M.S., Bonassi C., Dalla Costa O.A., Morés N. Encuesta seroepidemiológica sobre la toxoplasmosis en los sistemas de producción porcina al aire libre en la región sur de Brasil

La cría de cerdos a gran escala al aire libre es un fenómeno nuevo en Brasil, pero es un sector de interés creciente. Se encontraron anticuerpos específicos contra *Toxoplasma gondii* en el 86,08% de los 115 cerdos examinados. Mediante la prueba de aglutinación modificada, se obtuvieron los siguientes títulos de anticuerpos: 1:50 (3,47%), 1:100 (6,08%), 1:200 (9,56%), 1:400 (6,95%), 1:800 (6,95%), 1:1600 (6,95%) y 1:3200 (55,65%). La contaminación fecal del medio ambiente, por gatos o por el consumo de roedores infectados, es la causa más probable de la toxoplasmosis en los cerdos criados al aire libre. Los resultados indican que la toxoplasmosis es frecuente en los cerdos criados al aire libre en la región. Los servicios de salud deberían reforzar la vigilancia y los controles sanitarios para reducir el riesgo de toxoplasmosis, en particular en mujeres embarazadas. Este es el primer informe de una infección por *T. gondii* en cerdos criados en un sistema de producción al aire libre en Brasil.

Palabras clave : Cerdo – *Toxoplasma gondii* – Método de crianza – Brasil.