

Toxoplasmosis in outdoor pig production systems

Toxoplasmosis in outdoor pig production systems

Serosurvey on toxoplasmosis in outdoor pig production systems in the southern region of Brazil

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.

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).

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, Concórdia, Santa Catarina State, Brazil, using formalin-fixed whole tachyzoites and 2-mercapthoethanol as previously described (3). 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 mercapthoethanol 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.

References

1. ASSADI-RAD A.M., NEW J.C., PATTON S., 1995. Risk factors associated with transmission of *Toxoplasma gondii* to sows kept in different management systems in Tennessee. *Vet. Parasitol.*, 57: 289-297.
2. DAVIES P.R., MORROW W.E., DEEN J., GAMBLE H.R., PATTON S., 1998. Seroprevalence of *Toxoplasma gondii* and *Trichinella spiralis* in finishing swine raised in different production systems in North Carolina, USA. *Prev. vet. Med.*, 36: 67-77.
3. DUBEY J.P., DESMOND G., 1987 Serological responses of equids fed *Toxoplasma gondii* oocysts. *Equine Vet. J.*, 19: 337-343.
4. DUBEY J.P., 1990. Status of toxoplasmosis in pigs in the United States. *J. Am. vet. Med. Assoc.*, 196: 270-274.
5. DUBEY J.P., 1997. Validation of the specificity of the modified agglutination test for toxoplasmosis in pigs. *Vet. Parasitol.*, 71: 307-310.
6. FRENKEL J.K., 1990. Diagnosis, incidence, and prevention of congenital toxoplasmosis. *Am. J. Dis. Child.*, 144: 956-995.
7. GLASNER P.D., SILVEIR A.C., KRUSZON-MORAN D., MARTINS M.C., BURNIER M. JR, SILVEIRA S., CAMARGO M.E., NUSSENBLATT R.B., KASLOW R.A., BELFORT R. JR, 1992. An unusually high prevalence of ocular toxoplasmosis in Southern Brazil. *Am. J. Ophthalmol.*, 114: 136-144.
8. SMITH K.E., ZIMMERMAN J.J., PATTON S., BERAN G.W., HILL H.T., 1992. The epidemiology of toxoplasmosis on Iowa swine farms with an emphasis on the roles of free-living mammals. *Vet. Parasitol.*, 42: 199-211.
9. WEIGEL R.M., DUBEY J.P., SIEGEL A.M., KITRON U.D., MANNELLI
10. A., MITCHELL M.A., MATEUS-PINILLA N.E., THULLIEZ P., SHEN S.K., KWOK O.C., 1995. Risk factors for transmission of *Toxoplasma gondii* on swine farms in Illinois. *J. Parasitol.*, 81: 736-741.



Yes