

Seroprevalence of *Toxoplasma gondii* Infection in Slaughter Pigs in Sichuan, China

¹F.F. Shu, ¹D.Y. Wu, ²Z.Y. Zhou, ¹R.Q. Lv, ¹J.F. Yang, ²K. Nie, ¹G. Duan and ¹F.C. Zou

¹College of Animal Science and Technology,

Yunnan Agricultural University, 650201 Kunming, Yunnan Province, P. R. China

²Department of Veterinary Medicine, Southwest University, Rongchang Campus,
402460 Chongqing, P. R. China

Abstract: The seroprevalence of *Toxoplasma gondii* infection in slaughter pigs in Sichuan province, Southwestern China was investigated between May and November, 2010. A total of 803 serum samples from slaughter pigs were collected from seven different counties in Sichuan province and assayed for *T. gondii* antibodies by Indirect Haemagglutination (IHA) test using a commercially available kit. The overall seroprevalence was 29.51% (237/803), ranging from 9.3-37.91% among different sampling regions. The results of the present survey indicated that the seroprevalence of *T. gondii* infection in slaughter pigs in Sichuan province is relatively high and consumption of pork may be a risk factor for human infection with *T. gondii*. Therefore, improved integrated strategies for the control of the parasite should be implemented to reduce the prevalence levels in the surveyed areas.

Key words: *Toxoplasma gondii*, toxoplasmosis, slaughter pig, Indirect Haemagglutination (IHA) test, seroprevalence, Sichuan province, China

INTRODUCTION

Toxoplasma gondii infection is widely prevalent in humans and other animals worldwide (Dubey and Beattie, 1988; Dubey, 2009). Human beings can be infected by ingestion of undercooked or raw meat containing tissue cysts, consuming food or drink contaminated with oocysts from the environment (Montoya and Liesenfeld, 2004; Dubey, 2004). Infected pigs meat is considered an important source of *T. gondii* infection in humans and animals in many countries. Sichuan province is the largest producer of pigs in China and the pork production accounted for 10% of the national total output in recent years. However, little is known of the prevalence of *T. gondii* infection in the slaughter pigs in this province. Pigs are not tested for *T. gondii* infection at slaughter in China including Sichuan province. Therefore, *T. gondii* infected pork can enter the market for human consumption. It was reported that *T. gondii* IgG antibodies in pregnant women and newborn infant were 34.14 and 32.12%, respectively in Chengdu, the capital of Sichuan province (Sun *et al.*, 1995) and the seroprevalence of *T. gondii* in butcher was 14.07% in Pujiang county of Sichuan province (Liao *et al.*, 1993). Therefore, the objective of the present survey was to examine the seroprevalence of *T. gondii* infection in slaughter pigs in Sichuan province. The results would

provide the fundamental data for the execution of prevention and control of *T. gondii* infection in humans and other animals in this province.

MATERIALS AND METHODS

The sampled counties: The counties selected for serum sample collection includes Pengxi, Ziyang, Neijiang, Zizhong, zigong, Guang'an, Suining counties (Table 1) which are the major suppliers of pork to Sichuan province and the neighboring regions.

Blood samples: A total of 803 blood samples were collected from the slaughter pigs, approximately 5 mL of blood from each pig was collected. The blood samples were transported to the laboratory, centrifuged (3000 rpm) for 5 min and serum was collected and stored at -20°C until assayed for antibodies to *T. gondii*.

Serological assay: Antibodies to *T. gondii* were detected in sera by an Indirect Hemagglutination (IHA) test using a commercially available kit (Veterinary Research Institute, Jiangsu Academy of Agricultural Sciences, Nanjing, China) according to the manufacturer's instructions. In brief, sera were added to 96-well V bottomed polystyrene plates and diluted in 1:16, 1:32, 1:64, 1:128, 1:256, 1:512 and 1:1024. The plates were shaken gently for 2 min and then

Table 1: Seroprevalence of *Toxoplasma gondii* infection in slaughter pigs in Sichuan province by Indirect Hemagglutination test

Regions	No. examined samples	No. of different titer distribution					No. positive samples	Prevalence (%)
		1:64	1:128	1:256	1:512	1:1024		
Guang'an	43	1	1	1	0	1	4	9.30
Neijiang	153	10	10	11	11	16	58	37.91
Pengxi	107	10	4	2	4	12	32	29.90
Suining	101	2	6	5	0	1	14	13.86
Zigong	42	1	2	0	0	3	6	14.28
Ziyang	194	9	9	10	9	25	62	31.96
Zizhong	163	16	9	7	13	16	61	37.42
Total	803	49	41	35	38	74	237	29.51

incubated at 37°C for 2 h without shaking. The test was considered positive when a layer of agglutinated erythrocytes was observed in wells at dilutions of 1:64 or higher and positive and negative controls were included in each test.

Data analysis: Statistical analysis of *T. gondii* prevalence in different counties was performed by Chi-square (χ^2) test with Microsoft® excel, 2003. The differences were considered statistically significant when $p < 0.05$.

RESULTS AND DISCUSSION

Among 803 serum sample from slaughter pigs, 234 (29.51%) were seropositive for antibodies to *T. gondii* and the prevalence ranged from 9.3% (Guang'an) to 37.91% (Neijiang) and the difference was significantly different among different counties ($p < 0.05$). The antibody titers were 1:64 in 49 (20.94%) pigs, 1:128 in 41 (17.52%) pigs, 1:256 in 35 (14.96%) pigs, 1:512 in 38 (16.24%) pigs and 1:1024 in 74 (31.62%) pigs, respectively (Table 1). The data indicated that high antibody levels were most frequent at 1:1024. IHA method is the national standard technique (GB/T 18448.2-2008) in China for detection of seroprevalence of *T. gondii* infection in animals, most surveys including the present study used IHA test at a cut-off titer of 1:64. The present survey showed a higher seroprevalence of *T. gondii* in slaughter pigs compared with other surveys in neighboring provinces such as in Shanxi (2.34%) (Yu *et al.*, 2000), Gansu (10.29%) (Liu *et al.*, 2010), Qinghai (12%) (Chao and Guo, 2008), Yunnan (11.11%) (Zou *et al.*, 2009) but slightly lower than in Guizhou (33.28%) (Ou *et al.*, 2003). The likely reasons for differences in prevalences among different provinces could be many such as difference in the protection and management of stray cats (which are the important final host for *T. gondii*) as well as difference in the management and animal welfare for pigs.

CONCLUSION

In this study, the results of the present survey indicated that the seroprevalence of *T. gondii* infection in slaughter pigs in Sichuan province is relatively high and consumption of pork may be a risk factor for human infection with *T. gondii* in this province. Therefore, improved integrated strategies for the control of the parasite should be implemented to reduce the prevalence levels in the surveyed areas.

ACKNOWLEDGEMENTS

Project support was provided in part by the special fund for Agro-scientific Research in the Public Interest (Grant no. 200803017) and the Yunnan provincial program for introducing high-level scientists (2009CII25).

REFERENCES

Chao, X.Y. and Q.H. Guo, 2008. Seroprevalence of swine toxoplasmosis in Ledu, Qinghai province. *Chin. J. Vet. Med.*, 5: 40-40.

Dubey, J.P. and C.P. Beattie, 1988. *Toxoplasmosis of Animals and Man*. CRC Press, Boca Raton, FL, pp: 1-220.

Dubey, J.P., 2004. Toxoplasmosis-a waterborne zoonosis. *Vet. Parasitol.*, 126: 57-72.

Dubey, J.P., 2009. *Toxoplasmosis* in pigs-The last 20 years. *Vet. Parasitol.*, 164: 89-103.

Liao, Q.P., Z.W. Liu, D.M. Yin and J.P. Dubey, 1993. Investigation of *Toxoplasma gondii* infection in humans in Pujiang of Sichuan province. *West China Med. J.*, 3: 275-277.

Liu, J.Q., L. Zhang and T. Yuan, 2010. Seroepidemiological survey and analysis for Toxoplasmosis of pigs. *Vet. Orientation*, 4: 25-27.

Montoya, J.G. and O. Liesenfeld, 2004. Toxoplasmosis. *Lancet*, 363: 1935-1958.

Ou, X.Y., Z.K. Long, Y.H. Peng, D.X. Qian and W.B. Long, 2003. Epidemiological investigation of swine toxoplasmosis in Sanhui county, Guizhou province. *Chin. J. Vet. Parasitol.*, 11: 37-37.

Sun, R.G., Z.L. Liu and D.C. Wang, 1995. The prevalence of Toxoplasma infection among pregnant women and their newborn infants in Chengdu. *Zhonghua Liu Xing Bing Xue Za Zhi.*, 2: 98-100.

Yu, S.K., Q. Lin, Y.Q. Liu and X.Y. Wang, 2000. Serological investigation of swine toxoplasmosis in Yangling district of Shaanxi. *Prog. Vet. Med.*, 21: 57-59.

Zou, F.C., X.T. Sun, Y.J. Xie, B. Li, G.H. Zhao, G. Duan and X.Q. Zhu, 2009. Seroprevalence of *Toxoplasma gondii* in pigs in Southwestern China. *Parasitol. Int.*, 58: 306-307.