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Seroprevalence of *Toxoplasma gondii* Infection in People Working on Pig Farms in Longyan City, Southeastern China

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Abstract: The objective of the present study was to estimate the seroprevalence *Toxoplasma gondii* infection in people working on pig farms in Longyan city, the People's Republic of China. A total of 212 human serum samples were collected from different farms and assayed for *T. gondii* antibodies (IgG) by Enzyme-Linked Immunosorbent Serologic Assay (ELISA). The results showed that the over all seroprevalence of *T. gondii* IgG in people working on pig farms with *T. gondii* IgG was 12.26% (26/212) with the farm managers having the highest prevalence (23.53%, 4/17) which was followed by the pig breeders (11.54%, 21/182) and the farmers (7.69%, 1/13). The present study demonstrated that the prevalence of *T. gondii* infection in people working on pig farms is high. Therefore, people working in pig farms need to be informed of the infection risk with *T. gondii*. Integrated control strategies and measures should be implemented to prevent and control *T. gondii* infection in both humans and animals in these pig farms.

Key words: Seroprevalence, *Toxoplasma gondii*, toxoplasmosis, infection, China, Enzyme-Linked Immunosorbent Serologic Assay (ELISA)

INTRODUCTION

Toxoplasma gondii is able to infect and invade multiple cell types of all warm-blooded animals with a worldwide distribution (Tenter *et al*., 2000). Usually, *T. gondii* infection does not cause clinical signs in healthy humans and animals but *T. gondii* infection in pregnant women can result in fetal diseases with severe problems including abortion, encephalitis, mental retardation and blindness (Montoya and Liesenfeld, 2004). Infection of AIDS patients and other immunocompromised patients with *T. gondii* can cause death (Montoya and Liesenfeld, 2004).

Humans can be infected by consuming undercooked or raw meat (e.g., pork, lamb) containing tachyzoites or bradyzoites or through food, water or unwashed vegetables contaminated with oocysts excreted by cats (Schlundt *et al*., 2004). The serological prevalence of *T. gondii* in humans, especially in pregnant women has been reported in many countries indicating a common high exposure to *T. gondii* (Jeannel *et al*., 1988; Punda-Polic *et al*., 2000; Alvarado-Esquivel *et al*., 2006; Xu *et al*., 2005; Liu *et al*., 2009).

However, little is known of the seroprevalence *T. gondii* infection in people working on the pig farms though the prevalence of *T. gondii* in pigs were high (Hejlicek *et al*., 1997; Suarez-Aranda *et al*., 2000; Kuang, 2002; Ma *et al*., 2003; Saavedra and Ortega, 2004; Klun *et al*., 2006; Jiang *et al*., 2007a, b; Dubey and Jones, 2008; Huang *et al*., 2010). Hence, the objective of the present study was to examine the seroprevalence of *T. gondii* infection in people working on the pig farms in

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Longyan city, southeastern China. The results would provide base-line data for the prevention and control of *T. gondii* infection in humans working on pig farms.

MATERIALS AND METHODS

Serum samples: A total of 212 blood samples from humans of different occupations in different pig farms in Longyan city were collected. Serum samples were obtained by centrifugation at 3,000 g for 10 min and stored at -20°C until analysis by Enzyme-Linked-Immunosorbent Serologic Assay (ELISA).

Detection reagents: Antibodies (IgG) to *T. gondii* were determined using a commercially marketed ELISA kit purchased from Zhuhai S.E.Z. Haitai Biological Pharmaceuticais Co., Ltd, Zhuhai, China.

Detection procedure: The detection procedure followed the manufacturer's instructions. In brief, the test serum (1:100 dilution) was added to each well in the coated plate (provided by the Kit) and incubated for 30 min at 37°C. After additional washing with Washing Solution, the 50 μL peroxidase-conjugated anti-human Immunoglobulin G (IgG) was added to the wells with incubation at 37°C for 30 min followed by three washings with Washing Solution.

The color reactions were developed with adding 50 μL substrate and 50 μL reagent at 37°C for 10 min and then the reaction was stopped with adding Stopping Solution. OD450 nm-values were measured and ratios (OD450 nm value of serum sample/OD450 nm value of negative control) were calculated after correction for the OD450 nm value of the blank. The test serum samples were considered as positive when the ratio ≥2.1.

The statistical analysis of *T. gondii* prevalence in people of different occupations, ages and sexes were performed by χ^2-test with Excel (Microsoft® Excel 2003). The differences were considered statistically significant when $p<0.05$.

RESULTS AND DISCUSSION

The survey of people from different pig farms in Longyan city by ELISA showed that the seroprevalence with *T. gondii* IgG was 12.26% (26/212). The farm managers had the highest prevalence (23.53%, 4/17) which was followed by the pig breeders (11.54%, 21/182) and the farmers (7.69%, 1/13) had the lowest prevalence (Table 1). There was no statistically significant difference in the prevalence of *T. gondii* in people of different ages and sexes (Table 2 and 3). The prevalence (12.26%) of *T. gondii* IgG in people working on pig farms in Longyan city, China is higher than that reported for the animal feeders (6.54%) and veterinarians (10.89%) in Wuhan (Yu *et al*., 2007). This seroprevalence is also higher than that in the pregnant women and pet owners in some of the previous investigations (4.5-10.46%) (Lai *et al*., 1993; Zhang and Li, 2005; Wu and Yang, 2005; Wu, 2004; Liu *et al*., 2009).

Table 1: Prevalence of *Toxoplasma gondii* IgG in people of different occupations working on pig farms in Longyan city, southeastern China by Enzyme-Linked-Immunosorbent Serologic Assay (ELISA)

Occupation	Examined No.	Positive No.	Prevalence (%)
Farmer	13	1	7.69
Manager	17	4	23.53
Pig feeder	182	21	11.54
Total	212	26	12.26

$\chi^2 = 16.66$, $p = 0.0002<0.01$

Table 2: Prevalence of *Toxoplasma gondii* IgG in people of different ages in Longyan city, southeastern China by Enzyme-Linked-Immunosorbent Serologic Assay (ELISA)

Age	Examined No.	Positive No.	Prevalence (%)
0-19	6	2	33.33
20-39	98	11	11.22
40	108	13	12.04
Total	212	26	12.26

$\chi^2 = 2.26$, $p = 0.32>0.05$

Table 3: Prevalence of *T. gondii* IgG in people of different sexes in Longyan city, southeastern China by Enzyme-Linked-Immunosorbent Serologic Assay (ELISA)

Sex	Examined No	Positive No.	Prevalence (%)
Male	145	18	12.41
Female	67	8	11.94
Total	212	26	12.26

$\chi^2 = 0.0086$, $p = 0.93>0.05$

Among the people working on the pig farms, the managers had the highest IgG prevalence (23.53%), this could be due to that the farm managers need to be veterinarians in addition to being managers in their pig farms and hence have many more ospportunities to contact with animals. The pig feeders in the farms are often temporary workers and their jobs are changed quite often in China. The prevalence of the farmers is lowest because the farmers are the bosses of the pig farms in China and usually they have limited opportunities to feed the pigs or manage their farms.

CONCLUSION

The results of the present investigation indicated that prevalence of *T. gondii* infection in people working on the pig farms in Longyan city, southeastern China is high, in particular in farm managers. Therefore, integrated and improved control strategies and measures should be implemented to prevent and control *T. gondii* infection in both humans and animals in these farms.

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