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Asian Journal of Animal and Veterinary Advances



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## The Seroprevalence of Ovine Toxoplasmosis in Fars Province, Southern Iran

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**Abstract:** This study determines the prevalence of ovine toxoplasmosis in Shiraz, Southern Iran. From April 2004 to May 2005, serum samples of 603 sheep were randomly collected in 18 Cities of Fars Province, Southern Iran and tested for toxoplasmosis using Indirect Fluorescent Antibody Technique (IFAT). The prevalence of toxoplasmosis was 26.5%, while the rate of seropositivities in 1/100, 1/200, 1/400 and 1/800 dilutions were 17.7, 2.8, 4.3 and 1.7%, respectively. The highest prevalence was in Abadeh (56.7%) and Nourabad (44.3%) cities and the lowest was determined Arsanjan (4.2%) whereas no infection was determined in Fasa. Considering the high prevalence of toxoplasmosis in sheep in our region, control measures need to be undertaken to prevent transmission of the infection to other animals and man by health and veterinary authorities. Therefore, it seems that standardization of techniques, hygienic standards in sheep breeding especially in cities with more migrating domestic animals and environmental health education for veterinary personnel are required to prevent human infection.

**Key words:** Toxoplasma, sheep, prevalence, IFAT, Southern Iran

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### INTRODUCTION

*Toxoplasma gondii* is a worldwide obligate intracellular protozoan parasite in man and warm-blooded animals. Transmission to man happens by ingestion of *T. gondii* oocysts shed into the environment by cats, or by consuming meat of infected animals. Under normal immune conditions, *T. gondii* infection is frequently asymptomatic, but in immunocompromised individuals, e.g., AIDS, the parasites can become widely disseminated, resulting into severe toxoplasmosis and encephalitis. Primary infections acquired during pregnancy may also cause severe damages to the fetus, manifested as mental retardation, seizures, blindness and death (Ajioka and Soldati, 2007). *Toxoplasma gondii* is a protozoan that in man and animals can cause congenital abnormalities, abortion (Smith and Reduck, 2000) death of fetus, chorioretinitis, hydrocephaly, microcephaly and jaundice which leads to severe economical losses (Joynson and Wreghitt, 2001). It has mild flu like symptoms in immunocompetent humans, but the disease is severe in immunocompromised persons such as HIV positive ones, 23% of which were reported to develop toxoplasmic encephalitis (Oksenhendler *et al.*,

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1994). Using Indirect Fluorescent Antibody Technique (IFAT), human seropositivity in Northern and Southern parts of Iran was reported to be 55 and 29%, respectively with a seroprevalence of 51.8% for all parts of Iran (Ghorbani *et al.*, 1978; Sedaghat *et al.*, 1978; Assmar *et al.*, 1997). The disease occurs mostly through ingestion of undercooked meat or by the oocyst excreted by an infected cat as a definitive host (Dubey, 1998). Infected lambs were reported as one of the most important sources of *T. gondii* worldwide (Jacobs *et al.*, 1960). The worldwide prevalence of anti-*T. gondii* antibodies in sheep was reported up to 89% (Tenter *et al.*, 2000). Since, sheep breeding is the most common source of meat in Fars Province, Southern Iran and considering that infected lambs can be sources of human infection and due to economic losses of ovine abortion and the public importance of the disease, this study was performed to determine the prevalence of *T. gondii* among sheep in Southern Iran.

## MATERIALS AND METHODS

During 2004-2005 using a cluster random sampling method, a total of 603 blood samples were provided from reared sheep in 18 cities of Fars Province in Southern Iran Fig. 1. The IFAT cut off point for *T. gondii* was considered as 1:100 diluted in PBS (0.1 M phosphate, 0.33 M NaCl, pH = 7.2) for preliminary screening (Esteban-Redondo *et al.*, 1999). The positive samples were serially diluted

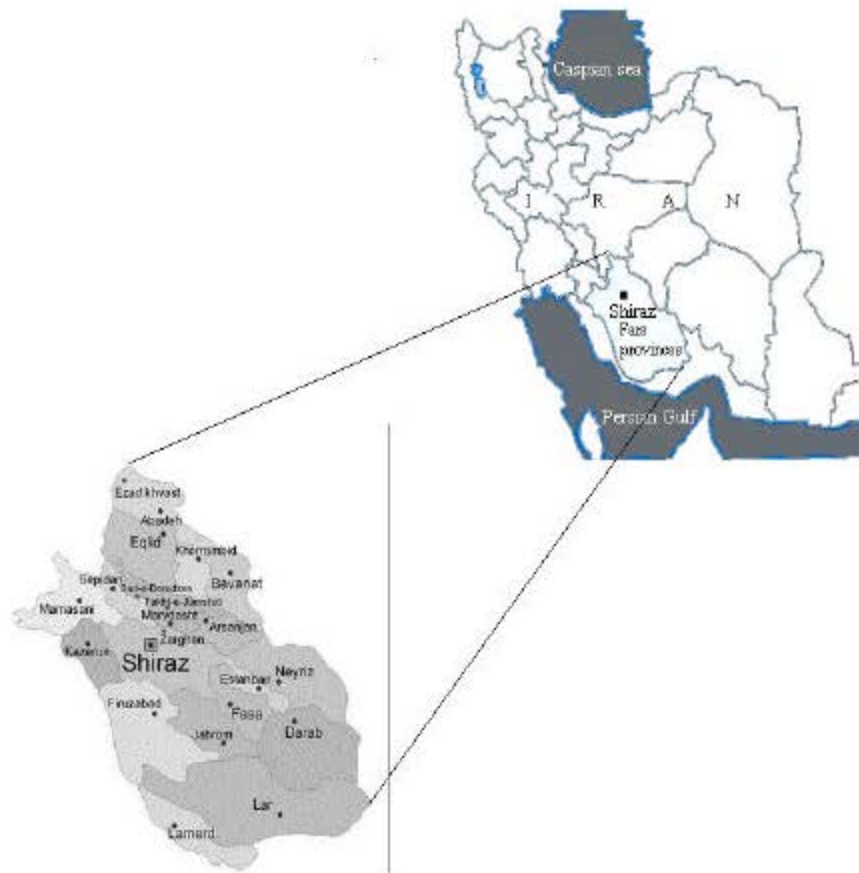


Fig. 1: A sketch map of Iran, showing the location of towns in Fars Province, Southern Iran

up to 1:800 to obtain the real titer of IgG antibody. RH strain tachyzoite of *T. gondii* was used as antigen (Pasteur Institute, Tehran, Iran) to be fixed on wells of immunofluorescent slides. Ten microliters of each diluted serum was placed on each well and incubated in a humidified chamber at 37°C for 30 min. Slides were washed in PBS (two times, 7 min), dried and then were incubated for 30 min at 37°C with rabbit anti-sheep IgG conjugate (Bethyl Co.), diluted 1:250 in PBS. Evans Blue also diluted 1:10000 in this solution. Slides were washed and air-dried. A drop of glycerol buffer was added on to each slide and then was covered with a cover-slip. Finally, the samples were observed under the immunofluorescent microscope (Zeiss, HBO 50). The results were analyzed by SPSS software using Chi-square test and a p-value <0.05 was considered statistically significant.

## RESULTS AND DISCUSSION

The prevalence of toxoplasmosis in sheep in Southern Iran was 26.5%. In titers of 1:100, 1:200, 1:400 and 1:800, 17.7, 2.8, 4.3 and 1.7% were positive for infection, respectively (Table 1). The rate of infection from 18 cities was shown in Table 2: the highest prevalence was in Abadeh (56.7%,  $p = 0.01$ ) and Nourabad (44.3%,  $p = 0.01$ ) cities and the lowest was determined Arsanjan (4.2%) whereas no infection was determined in Fasa.

The sources of infection for humans worldwide greatly vary with differences in culture, ethnicity, geographical region and food habits. Food animals such as pigs, sheep and goats have a higher frequency of tissue cysts compared to other animals (Tenter *et al.*, 2000). Present study demonstrated a seroprevalence of 26.5% in sheep that is close to results of some studies from Spain, Italy and Morocco (28.4, 23.1 and 27.6%, respectively) (Masala *et al.*, 2003; Pereira-Bueno *et al.*, 2004; Sawadogo *et al.*, 2005). Also, the prevalence was markedly high in humid regions such as France (Cabannes *et al.*, 1997), Serbia (Klun *et al.*, 2006) and Austria (Edelhofer and Aspöck, 1996) as the rates were 92, 84.5 and 66%, respectively. The prevalence in Turkey (Altinas *et al.*,

Table 1: The titers of toxoplasmosis in sheep in Southern Iran

Titer	Number	Percent
<1/100	443	73.50
1/100	107	17.70
1/200	17	2.80
1/400	26	4.30
≥1/800	10	1.70

Table 2: The rate of toxoplasmosis infection in sheep in Southern Iran

City	Number	Positive	Infection (%)
Fasa	33	0	0.00
Arsanjan	25	1	4.00
Neyriz	30	5	16.70
Marvdasht	30	5	16.70
Kazerun	30	6	20.00
Estahban	29	6	20.70
Khorrambid	73	18	24.70
Lar	40	8	25.00
Shiraz	26	6	23.10
Jahrom	30	8	26.70
Sepidan	30	8	26.70
Lamerd	27	8	29.60
Firuzabad	30	9	30.00
Bavanat	29	9	31.00
Darab	20	7	35.00
Eqlid	30	12	40.00
Nourabad (Mamasani)	61	27	44.30
Abadeh	30	17	56.70

1997), Saudi Arabia (El-Metenawy, 2000) and Pakistan (Zaki, 1995) as our neighbor countries were 40, 3 and 3%, respectively. Furthermore, the rate of infection from other parts of Iran was reported 24.5% (Hashemi-Fesharki, 1996), 25.5% in Central Iran (Chegini *et al.*, 1999) and 14% in South Western parts of the country (Hoghooghi-Rad and Afraa, 1993). Several factors such as management and hygienic standards in breeding livestock, density of cats and environmental conditions are effective on the acquisition of *T. gondii* oocysts (Tenter *et al.*, 2000). Humidity and temperate favor the oocyst survival. Moreover, the high levels of congenital transmission and potential survival of infected lambs in sheep were demonstrated previously (Duncanson *et al.*, 2001), suggesting that vertical transmission may play an important role in maintenance of the parasite in natural populations of sheep without requiring for ingestion of oocysts excreted by cats. Fars Province in Southern Iran is characterized by dry weather and sub-Saharan environment and an average annual rainfall not over than 350 mm. However, other characters such as temperature and altitude in these areas have wide range. The majority of sheep in Fars Province are raised by migrating nomads that move to distant summer and winter quarters (more than 600 km away) in search of food for their animals. Abadeh in Northern areas and Nourabad in Southern localities with the highest prevalence have the highest nomadic population and Fasa in eastern parts and Arsanjan in Western regions with the lowest prevalence have the lowest nomadic population that explains the difference. Based on cultural and food habits in this area, tissue cysts of *T. gondii* in meat and viscera of sheep must be considered important sources of infection in human. Masala *et al.* (2003) indicated that *T. gondii* infection plays an important role in ovine abortion in Italy and livestock toxoplasmosis should be economically considered important (Masala *et al.*, 2003). This fact explains 4.7 billions \$ loss due to sheep abortion in Uruguay (Freyre *et al.*, 1997).

Therefore, standardization of techniques, hygienic standards in sheep breeding especially in cities with more migrating domestic animals and environmental health education for veterinary personnel are required to prevent human infection.

#### ACKNOWLEDGMENTS

The authors would like to thank Shiraz University of Medical Sciences for financial support and the Center for Development of Clinical Studies of Shiraz University of Medical Sciences for typing of manuscript.

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