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The Seroprevalence of Bovine Toxoplasmosis in Fars Province, Southern Iran

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Abstract: This study evaluates the seroprevalence of bovine toxoplasmosis in Fars province, Southern Iran. From March 2004 to April 2005, 588 bovine serum samples were randomly provided from 15 cattle slaughterhouse of 15 cities and towns in Fars province, Southern Iran that were divided into 5 districts including the central, Northern, Southern, Eastern and Western parts. Indirect Fluorescent Antibody Test (IFAT) was used to determine the antibody titer. The seroprevalence of toxoplasmosis was 20.24% (119 cattle) while the rate of seropositivity in 1/16, 1/32, 1/64 and 1/128 dilutions were 15.31% (90), 3.74% (22), 0.85% (5) and 0.34% (2), respectively. The highest prevalence was in Eastern (23.33%) and Central parts (22.73%) and the lowest (2.33%) was noticed in Northern region of the province. The highest prevalence (37.5%) was observed in Mamasani. However, the lowest prevalence (zero) was found in Abadeh, Marvdasht, Arsanjan and Firouzabad cities. So, control measures such as environmental health education of veterinary personnel and standardization of techniques and hygiene in bovine breeding seem necessary to prevent transmission of the infection to human.

Key words: Prevalence, bovine, toxoplasmosis, Southern Iran

INTRODUCTION

Toxoplasma gondii as a member of the phylum Apicomplexa, order Coccidia is an obligate intracellular protozoan parasite (Rorman *et al.*, 2006) infecting man and a wide range of warm-blooded animals (Dubey, 2004; Sharif *et al.*, 2007). The prevalence of toxoplasmosis varies in various species depending on several factors including social-cultural habits, the epidemic area and climatic and geographical factors (Clementino *et al.*, 2007; Jittapalpong *et al.*, 2007).

Maternal toxoplasmosis during early pregnancy of human may result into death of fetus or lead to chorioretinitis, hydrocephaly, microcephaly and jaundice in neonates (Joynson and Wreghitt, 2001). However, *T. gondii* generates severe economical losses in animals by

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abortion, fetal malformation, pre-term deliveries and stillbirths (Malik *et al.*, 1990). Acquired toxoplasmosis has mild flu like symptoms in immunocompetent humans, but the disease is severe in immunocompromised persons and 23% of HIV-positive patients will develop toxoplasmic encephalitis (Oksenhendler *et al.*, 1994).

The prevalence of disease in Fars province, Southern Iran was reported 26.5% in sheep (Asgari *et al.*, 2009), 14.02% in goat (Asgari *et al.*, 2007) and 36.1% in chicken (Asgari *et al.*, 2006). Human seropositivity in Northern and Southern parts of Iran using indirect fluorescent antibody technique was shown to be 55 and 29% respectively and a seroprevalence of 51.8% was demonstrated for all regions of Iran (Ghorbani *et al.*, 1978; Sedaghat *et al.*, 1978; Assmar *et al.*, 1997). Infections in man happens due to ingestion of oocysts from the feces of contaminated cats and/or dogs (Clementino *et al.*, 2007; Jittapalapong *et al.*, 2007) and by ingesting raw or under-cooked meat containing tissue cysts too (Garcia *et al.*, 2006; Gilot-Fromont *et al.*, 2009). However, the infection in cattle does not usually cause clinical symptoms as they have a high natural resistance to the parasite (Dubey and Thulliez, 1994).

Question: In introduction: Human seropositivity in Northern higher than Southern parts of Iran, but in the abstract of this experiment→The highest prevalence was in Eastern (23.33%) and central parts (22.73%) and the lowest (2.33%) was noticed in Northern region. What is the reason of this pattern?

It seems that there is a misunderstanding of the reports from different regions of the country and the Fars province while by adding the province, it was clarified.

The worldwide prevalence of anti-*T. gondii* antibodies in cattle were reported from nil to 92% by different methods and using different cut off points (Tenter *et al.*, 2000). Since cattle breeding is common in Fars province, Southern Iran and considering that contaminated beef may be one of the sources of human infection (Dubey and Thulliez, 1994) and economical losses due to the abortion; this study was performed to determine the prevalence of bovine toxoplasmosis in different cities of Fars province, Southern Iran.

MATERIALS AND METHODS

From March 2004 to April 2005, 588 bovine serum samples were randomly provided from 15 cattle slaughterhouse of 15 cities and towns in Fars province, Southern Iran that were divided into 5 districts including the Central, Northern, Southern, Eastern and Western parts (Fig. 1).

The sera were conserved in -20°C. To search for anti-*Toxoplasma gondii* antibodies, IFAT was performed (Camargo, 1964).

The cut off of IFAT for *T. gondii* was considered 1:16 dilution (Dubey and Beattie, 1988). The sera were diluted 1:16 in PBS (0.1 M phosphate, 0.33 M NaCl, pH 7.2) for preliminary screening and the positive samples were serially diluted up to 1:128 to obtain the real titer of IgG antibody. RH strain tachyzoites of *T. gondii* were used as antigen (Pasteur Institute, Tehran, Iran), fixed on wells of immunofluorescent slides. Ten microliter of each diluted serum was placed on the well of the slides and incubated in a humidified chamber at 37°C for 30 min. Slides were washed in PBS (two times, 7 min), dried and were incubated for 30 min at 37°C using Rabbit anti-Bovine IgG conjugate (Bethyl Co., diluted as 1:250 and Evans Blue solution were diluted as 1:10000). Slides were washed and were air dried. A drop of glycerol buffer was added and each slide 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 (Version 11, Chicago, IL, USA) using Chi-Square test and a $p < 0.05$ was considered statistically significant (Everitt, 1992).



Fig. 1: A sketch map of Iran, showing the location of Fasa town, in Fars province, Southern Iran

RESULTS AND DISCUSSION

Using the IFAT, from 588 tested samples, anti-IgG prevalence of toxoplasmosis among cattle was 20.24% (119 cattle) in Fars province, Southern Iran while the rate of seropositivity in 1/16, 1/32, 1/64 and 1/128 dilutions were 15.31% (90), 3.74% (22), 0.85% (5) and 0.34% (2), respectively. The highest frequency of infection was seen in central parts (22.73%; $\alpha = 0.05$, $p = 0.0185$) and the lowest in Northern localities (2.33%; $\alpha = 0.05$, $p = 0.0024$) (Table 1). The highest prevalence (37.5%) was observed in Mamasani. However, the lowest prevalence (zero) was found in Abadeh, Marvdasht, Arsanjan and Firouzabad cities (Table 2).

The source of infection for man varies worldwide greatly. Food animals such as pigs, sheep and goats were shown to have the highest frequency of infection to tissue cysts in comparison to cattle (Tenter *et al.*, 2000). Using polymerase chain reaction, revealed the presence of *T. gondii* in 1 out of 4 beef samples in UK (Aspinall *et al.*, 2002).

In present study, the seroprevalence of *T. gondii* in bovines was 20.24%. The current literature presents values range from 0 to 92% for the presence of anti-*T. gondii* antibodies in cattle (Tenter *et al.*, 2000). Hashemi-Fesharki (1996) tested 2000 sera of cows by latex agglutination test in different parts of Iran and found no positive reaction in these sera, but the rate of infection in buffaloes of Iran was reported 8.8% (Navidpour and Hoghooghi-rad, 1998).

The prevalence of infections was reported 71, 66, 25 and 2% in Brazil (Santos *et al.*, 2009), Turkey (Inci *et al.*, 1999), Pakistan (Zaki, 1995) and Saudi Arabia (El-Metenavwy, 2000), respectively. The rate of toxoplasmosis in our study is close to some studies (Diakou *et al.*, 2005; El-Ridi *et al.*, 1990; Hejlíèek and Literák, 1992) who found 20, 21 and 22% of *T. gondii* infection in cattle in Greece, Egypt and Czech, respectively. However the prevalence is markedly less than the values detected in humid zones of Italy (Avezza *et al.*, 1993), Serbia

Table 1: The rate of bovine *Toxoplasma* infection in different districts of Fars province, Southern Iran

Districts	No.	Positive	Infection (%)
Center	440	99	22.50
North	43	1	2.33
South	33	6	18.18
East	30	7	23.33
West	42	6	14.24
Total	588	119	20.24

Table 2: The rate of toxoplasmosis infection of cattle in different cities of Fars province

City	No.	Seropositive	Infection (%)
Mamasani	8	3	37.50
Lamerd	13	4	30.70
Darab	10	3	30.00
Fasa	10	3	30.00
Zarghan	92	22	23.90
Shiraz	338	77	22.80
Lar	10	2	20.00
Kazerun	10	1	10.00
Neyriz	10	1	10.00
Khorrambid	10	1	10.00
Sepidan	24	2	8.30
Abadeh	24	0	0.00
Marvdasht	10	0	0.00
Arsanjan	9	0	0.00
Firuzabad	10	0	0.00
Total	588	119	20.24

(Klun *et al.*, 2006) and France (Cabannes *et al.*, 1997) where 92, 76.3 and 69% of *T. gondii* infection in cattle were reported, respectively. Lower prevalence in cattle when compared to other animals such as goat and sheep may be due to differences in susceptibility to *T. gondii* and differences in management methods (Pita Gondim *et al.*, 1999). Furthermore, *T. gondii* was not recovered from mice inoculated with steer's tissue receiving oocysts of the parasite orally but was recovered by bioassays in cats (Dubey and Thulliez, 1994). As cattle were resistant to forming tissue cyst and tachyzoites, they should not be exposed to immune system of contaminated cattle. The use of pepsin and acid in the procedures of mice inoculation may destroy tachyzoites while the ingestion of tachyzoite is considered a source of cat infection (Dubey, 2005). Many factors such as management and hygienic standards in livestock breeding, density of cat population and environmental conditions are effective on acquisition of *T. gondii* oocysts (Tenter *et al.*, 2000). Humidity and warm temperature favor the oocyst survival. Fars province is situated in Southern, Iran where has dry and sub-Saharan environment with an average annual rainfall not more than 350 mm. However, other climatic characters such as temperature and altitude in these areas have wide range. For example, the climate of northern parts where has a lowest rate of infection is dry and is cold while the condition in central parts where has the highest prevalence is temperate. On the other hand, Masala *et al.* (2003) indicated that *T. gondii* infection plays an important role in ovine and caprine abortion in Italy. Thus, livestock toxoplasmosis should be economically considered important. This fact explains 4.7 billions \$ loss due to sheep abortion in Uruguay (Freyre *et al.*, 1997).

Based on cultural and food habits in this area, tissue cysts of *T. gondii* in meat and viscera of cattle must be considered as a source of infection in human. Considering the above mentioned findings, hygienic standards in cattle breeding, education of environmental health personnel and standardization of preparation and handling techniques are required to prevent human infection.

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