SEROPREVALENCE OF SHEEP TOXOPLASMOSIS IN NORTH OF IRAN

S. Akhoundi¹, M. R. Youssefi²

¹Faculty of Veterinary Medicine, Babol-Branch, Islamic Azad University, Iran
²Department of Veterinary Parasitology, Babol-Branch, Islamic Azad University, Babol, Iran

ABSTRACT
Toxoplasma gondii is cosmopolitan protozoa infecting many warm-blooded animals including sheep. The aim of this study was to determine the prevalence of antibodies to T. gondii from sheep using Indirect Fluorescent Antibody method (IFA) in Golestan Province, north of Iran. Sera samples of 764 sheep (650 female and 114 male) were obtained from Golestan Province, north of Iran in 2013. The sera were examined for T. gondii antibody (IgG) by IFA, an antibody titer of 1:100 or higher considered as positive. The statistical analysis was performed by chi-square test and logistic regressions were used to analyze the influence of all examined factor (age and sex) on seroprevalence of toxoplasmosis. The antibody titers in positive animals ranged from 1:100-1:1600. The overall seroprevalence of T. gondii antibodies in examined sera of sheep was 28.2%. The prevalence of T. gondii antibodies in female sheep (29.5%) was higher than male (21%) sheep. With increase in years of age, prevalence of toxoplasmosis raised. No statistically significant difference was observed between male & female sheep and there was relationship between seropositivity and age. High level of Toxoplasma infection in examined sheep showed a widespread exposure to T. gondii in Golestan Province and revealed high risk of acquiring toxoplasmosis by consumption of raw and undercooked meat of sheep in human population of this region.

Key words: Sero-Prevalence, Toxoplasma gondii, sheep, Golestan, Iran

INTRODUCTION
Toxoplasmosis is a zoonotic infection which is considered as an important public health concern for human and also imposes considerable economical losses in veterinary field and animal husbandry. Toxoplasma gondii, the causative agent of toxoplasmosis is an obligate intra-cellular protozoan, which is a cosmopolitan parasite (1, 2).

Felids play a major role in epidemiology of this zoonotic disease as final hosts and the parasite can infect a wide variety of warm blooded vertebrates as an intermediate host such as humans and livestock particularly sheep and goats (3, 4). Historically, Hartley et al 1954 and Feldman, Miller 1956 described toxoplasmosis in sheep and goat (5). Sheep become infected by ingesting of sporulated oocysts from food or water sources (6).

Sheep is an important livestock species, especially in developing countries and their products [meat and milk] are used in various parts of the world. Since toxoplasmosis in sheep lead to fetal death, mummification, abortion and neonatal death it causes severe economical losses in the sheep farming industry (7).

Toxoplasmosis in humans occurs either by ingesting sporulated oocysts [from vegetables, fruits, water sources or accidentally] or tissue cysts from uncooked meat. It is estimated that one third of the world population has antibodies against this parasite (8). It is suggested that drinking unboiled, unpasteurized contaminated sheep milk causes toxoplasmosis in humans (9, 10).

Sheep is widely used in Iran for several reasons including meat, milk and dairy products as well as breeding. Hence, sheep products are important sources for T. gondii due to transmission to human. Therefore, the current study was designed to evaluate the seroprevalence of Toxoplasma infection in sheep using IFA method in Golestan Province, north-east of Iran.
MATERIAL AND METHODS
SAMPLE COLLECTION
A total of 764 sheep (650 female and 114 male) ranged from one to five years old were collected from Golestan Province, north-east of Iran from April to September 2013. Blood samples were taken from sheep by vein puncture of the jugular vein in tubes without anticoagulant. Sera were harvested following the centrifugation of clotted blood, which were stored at −20°C until assayed.

STUDY AREA
Golestan Province (36°83′93″N 54°44′44″E) is located in the north-east of the country south of the Caspian Sea. It covers an area of 20,380 km² and its population is composed by 1,617,087 inhabitants. Golestan Province enjoys mild weather and a temperate climate most of the year. Geographically, it is divided into two sections: The plains and the mountains of the Alborz range.

SEROLOGICAL EXAMINATION
Antibody against T. gondii were examined using Indirect Fluorescent Antibody assay (IFA). Antigen of T.gondii Rh strain was prepared by Pasteur Institute of Iran. Antigen conjugated were purchased from Hakimi Company (Tehran, Iran) and is diluted 1:100. Prevalence of infection rate of sheep ranges from 3% in Pakistan to 95.7% in Turkey. Besides, the average of Toxoplasma infection rate of sheep in world is 31% which is in agreement with finding of present study (2, 11).

Table 1. Prevalence of T. gondii antibody and the IFA test titers in examined sheep, Golestan province, Iran.

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>No. examined</th>
<th>No. positive</th>
<th>No. (%) positive</th>
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<tbody>
<tr>
<td>1</td>
<td>188</td>
<td>28 (14.8%)</td>
<td>66 (32.6%)</td>
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<tr>
<td>2</td>
<td>202</td>
<td>66 (32.6%)</td>
<td>66 (32.6%)</td>
</tr>
<tr>
<td>3</td>
<td>184</td>
<td>52 (28.2%)</td>
<td>62 (33.7%)</td>
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<tr>
<td>4</td>
<td>160</td>
<td>100 (87.5%)</td>
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<tr>
<td>5&lt;</td>
<td>30</td>
<td>8 (26.6%)</td>
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<tr>
<td>Total</td>
<td>764</td>
<td>216 (28.2%)</td>
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Table 2. Prevalence of T. gondii antibody in different age groups of examined sheep, Golestan province, Iran.

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DISCUSSION
In the current survey, the overall prevalence of T. gondii in sheep was 28.2%. The worldwide prevalence of infection rate of sheep ranges from 3% in Pakistan to 95.7% in Turkey. Besides, the average of Toxoplasma infection rate of sheep in world is 31% which is in agreement with finding of present study (2, 11).

The results of this work are in agreement with Youssefi indicated 31.2% of sheep in Babol, North of Iran (12), Bahrieni shown 24.7% of specimens were seropositive for T. gondii in Kerman region, south eastern Iran (13), Ghazaei also reported seropositivity of 31% in sheep in Ardabil. Shiraf reported 35% of sheep revealed antibody against Toxoplasman in Mazandaran province (14). In Kerman Province 35.9% of specimens were infected.
with *T. gondii* (15). In Iran, the highest prevalence rate for toxoplasmosis was recorded 95% in Mazandaran province, northern Iran whereas the lowest prevalence rate were 5.2% in northeast of Iran, khorasan province (16).

In two studies in our neighbor countries in Pakistani and Iraq 44.13% and 36.36% were infected with *T. gondii* (17). Of the total tested sera in Brazil and in Serbia 29.4% and 84.5% were positive for anti-*T. gondii* specific IgG (18, 19).

Toxoplasmosis is an important cause of abortion and stillbirth in sheep on a worldwide basis that leads to considerable economical losses in veterinary field (20). In present study, 50 (31.2%) out of 160 aborted ovine were seropositive for *T. gondii* which revealed probable significant role of this parasite in sheep aborting. In the current study IFA test was used to assay *Toxoplasma* infection in samples. This test for the first time was introduced in 1992 and considered more reliable test rather than other serological diagnostic assays because of its noticeable sensitivity and specificity. The method is relatively simple assay for evaluating the infection of animals and also is particularly useful test for screening a large number of specimens (21, 22).

High seroprevalence of *Toxoplasma* infection in examined sheep in this research may be attributed to some factors including: humid and temperate climate which providing favorable condition for spororization of Oocytes; the absence of routine treatment against feline toxoplasmosis, considerable cat abundance and exposure to pastures and drinking water contaminated with cats faces.

In conclusion, the results of the present survey indicates a widespread exposure of sheep to *T. gondii* in Golestan Province and there is risk of acquiring infection of human by consumption of raw and undercooked meat of sheep. Furthermore, the probability of economical burdens due to toxoplasmosis in sheep farming industry in this region is high.

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REFERENCES
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