

INFECTION RATE OF TOXOPLASMOSIS IN ANGORA GOATS OF DUHOK PROVINCE-IRAQ

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ABSTRACT

In this study the seroprevalence of active toxoplasmosis represented by *T. gondii* IgM in angora goats was detected in Zakho and Semel districts of Duhok province-Iraq for the first time. *T. gondii* antibodies were detected at the laboratory of college of Veterinary Medicine of Duhok University from April 2009 to May 2010. Ninety two (92) serum samples were collected from clinically healthy adults' angora goats (54 and 38 were obtained from Semel and Zakho, respectively). Indirect Enzyme Linked Immunosorbent Assay was applied and the overall infection rate was %13.04. Results show that the infection rate was different between the two regions with a higher rate recorded in Zakho. Female and older animals were affected with higher infection rates than males and younger animals. It can be concluded that toxoplasmosis is an active infection among angora goats of Duhok province, therefore

for more biosecurity measures and to minimize the zoonotic impact of the disease all animals must be screened periodically.

INTRODUCTION

The Angora goat is a breed of domestic goat that is named after Ankara, Turkey, historically known as Angora. Angora goats produce the lustrous fibre known as mohair (1). It has been reported that rural people greatly depend on goats for the livelihood due to its contribution to food security and creation of assets (2). Goats are considered as an important source for zoonotic diseases including toxoplasmosis which is one of the more common protozoal zoonoses world-wide (3). The causative agent of *Toxoplasma gondii* (*T. gondii*) is a facultatively heteroxenous, polyxenous protozoon exists in three forms: oocysts, tachyzoites, and bradyzoites. Since oocysts are only produced in the definitive host; members of the family Felidae can infect humans and other intermediate hosts through ingestion (3, 4). The two latter stages are present as tissue cysts, or bradyzoites. Ingestion of these cysts in contaminated meat is also a source of infection (5, 6). It has been also reported that the human infection can also occur through ingestion of unpasteurised milk containing tachyzoites (3, 7).

Studies had revealed that the seroprevalence of active toxoplasmosis (IgM) is more than 33 % in sheep and 22 % in goats in Duhok province (8, 9); there were no

provided information concerning the infection rate of the disease among the angora goats in Duhok province. It is also unknown to what extent does the infection rate of the disease within the neighboring countries could have an impact on the distribution of the disease within the area. Therefore, the current study aimed to determine the infection rate of active toxoplasmosis in angora goats in Duhok area.

MATERIALS AND METHODS

Study area and animals

To determine the infection rate of toxoplasmosis in border regions of Duhok province, 92 serum samples were collect from clinically healthy adult angora goats originated from different farms located in Semel (n= 54) and Zakho (n=38) districts of Duhok province at two different groups, age group (≤ 3 years n=60 and >3 years n=32) and sex group (male n=20 and female n=72)

Serological examination

Blood samples were taken from jugular vein into plane tubes. The collected bloods were conveyed to the Veterinary Medicine, University of Duhok–Iraq. The collected blood samples were centrifuged at 5000 round per minute (r.p.m) and the sera were stored at 20 and later assayed for *T. gondii* antibodies (IgM). In this study, indirect

ELISA technique was performed to detect immunoglobulin (IgM) antibody against *T. gondii* using a commercial enzyme-linked immunosorbent assay (ELISA, ID Vet Innovative Diagnostic, France). The results expressed as a percentage (S/P %) of the mean absorbance values of the sample (S) to the mean absorbance value of the positive (P) control sample provided with the diagnostic kit. Depending on the manufacturer's recommendation, Sera with $S/P\% \leq 40\%$, 40% and 50% and $\geq 50\%$ were regarded as negative, suspicious, and positive, respectively.

Statistical analysis

Chi-square test and GraphPad Prism 6 software were used for detection of significant differences among groups. The difference in infection rate among groups was analyzed statistically by Chi-squared independence. P values < 0.05 were considered significant (10).

RESULTS

In total, 12/92 (%13.04) of goats sera reacted positively for *T. gondii* (IgM) antibodies (Figure 1). The detected *T. gondii* antibodies in indirect ELISA test with the % S/P positive were ranging from 57 to 197 in the samples and of those six samples were greater than 150 (Figure 2).

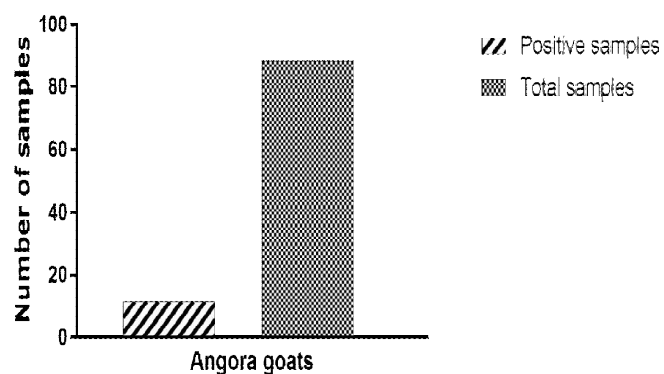


Figure 1: Infection rate of *Toxoplasma gondii* (IgM) antibodies detected by indirect ELISA test in angora goats in Duhok province ,Iraq.

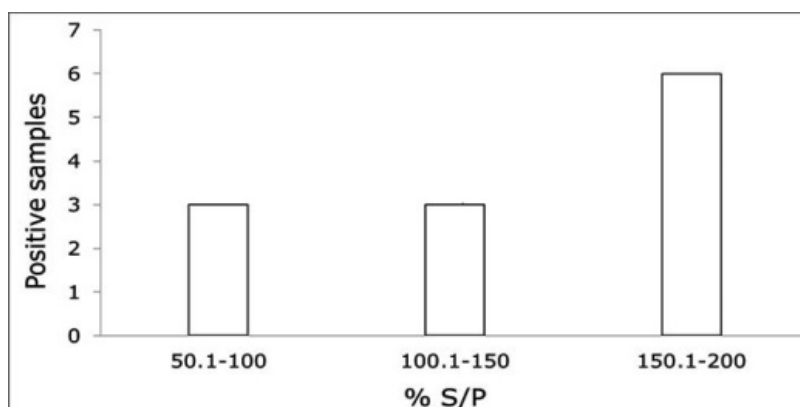


Figure 2: The ratio of S/P (%) of *Toxoplasma gondii* (IgM) antibodies detected by indirect ELISA test in angora goats in Duhok province ,Iraq.

Table 1: Infection rate of *Toxoplasma gondii* (IgM) antibodies detected by iELISA test in angora goats in Zakho and Semel districts-Duhok province /Iraq:

Location	Number of tested samples	positive No.	%
Semel	54	7	12.96%
Zakho	38	5	13.16
Total	92	12	13.04%

The infection rates of *T. gondii* (IgM) antibodies in two different locations in Duhok province were detected; however, no significant differences were reported between the tested groups in this study, the data revealed that the infection rate in Zakho was %13.16 (5/38) which was not significantly greater ($P>0.05$) than that in Semel %12.96 (7/54) (Table 1).

The infection rates of the disease among different age groups were also reported in this study and the highest rates were at age greater than three years %15.6(5/32) compared to that of %11.66 (7/60) at age of ≤ 3 years (Table 2).

Table 2: The infection rates of *Toxoplasma gondii* among age groups of angora goats in Duhok province /Iraq:

Age	Number of tested samples	positive No.	%
>3 years	32	5	15.60%
≤3 years	60	7	11.66%
Total	92	12	13.04%

In addition, the infection rates of the disease among the sex groups were also recorded and the results show that the rate in females 11/72 (15.3%) was not significantly ($P>0.05$) higher than those of male 1/20(5%) animals (Table 3).

Table 3: The infection rates of *Toxoplasma gondii* among sex groups of angora goats in Duhok province /Iraq:

Sex	Number of tested samples	Positive No.	%
Male	20	1	5%
Female	72	11	15.27%
Total	92	12	13.04%

DISCUSSION

Angora goats are regarded as an important economical income with regards to their milk (cheese production), meat and mohair production mainly for the rural people in Eastern (the province of Van) and South-eastern (the province of Siirt) of Turkey (11). In this study, the results showed that 13.04 % of goats' sera reacted positively for *T. gondii* (IgM) antibodies by using indirect ELISA technique since it is considered to be one of the most sensitive immunological techniques (12). Indirect ELISA is a two-step ELISA which involves two binding process of primary antibody and labelled secondary antibody. The primary antibody is incubated with a specific antigen is adhered to the wells of a microtiter plate followed by the incubation with the secondary antibody. The concentration of primary antibody present in the serum directly correlates with the intensity of the colour (13).

The infection rate in this study is lower than that was reported in aborted does 22.64 % in Duhok province previously (8). The difference between the two studies with regards to the infection rate of the disease is probably due to the differences within the grazing patterns where animals were examined in this study were housed compared to those animals were tested by Nawzat and Omer (8) were raised outdoors which could thus have more contact with oocyst shed by cats in the environment. Besides, the area and

the time of year where the samples were collected were different within the two studies; this study was carried during the hot seasons which could have great impact on the survival of the infective stage of the parasite within the environment, while Nawzat and Omer (8) study was carried during winter and spring. It has been reported that the difference in the climate could have significant impact on the variation in the seroprevalence of toxoplasmosis in different areas (14).

Higher infection rates have also been reported in the neighbouring countries. In Turkey, the infection rate of toxoplasmosis in Eastern and South-eastern Anatolia (the provinces of Van and Siirt) in goats was 72.7% (11). In Ankara, the infection rate of Toxoplasmosis in angora goats was 82.53% (15). In Syria, the seroprevalence of *T. gondii* IgG antibodies using Hemagglutination test HAT in ten different provinces in goats were 19.46 % (16). Previous study have shown that the highest seroprevelence rates in Palmyra were 33.3 %, and in Al- Quamishli were 28.3% which are in close contact with Zakho and Semel districts. It has been found that the infection rate of the disease in the marginal areas of Syrian and expands towards the north-east was significantly higher than the centre and the other part of the country. The differences between the rates that were reported within the neighbouring countries and in this study could be due to the variations in the diagnostic techniques were used in these

studies where the indirect ELISA technique was used in this study compared to Hemagglutination test HAT used by Ural et al (15) and Sabin-Feldman Dye Test (SFDT) Protocol used by Roukbi et al (16), or the difference could be due to species of the animals were used, or due to frequency of cats in the animals' farm and the management conditions (2, 17). The higher infection rates in Zakho than that in Semel might be due to the fact that Zakho is closer to Turkish border than Semel. The data presented above suggest that the infection rate of toxoplasmosis is very high in Turkey which could have a direct impact on the infection rate of the disease within the neighbouring countries.

Differences within the antibodies titers between the tested samples were also reported in this study where the ratio of samples antibodies titters to the control positive were ranging from 57 to 197 and of those six samples were greater than 150. It is believed that the variations within the antibodies titers could be due to the variations of the doses and the infective stage of the parasite where the susceptible animals are exposed (5).

The ages of the animals could have a great impact on the infection rates of the disease. In this study the higher rates were among the older animals. It is believed that the older animals expose to the risk factors for a longer period of time than the younger

ones (18). In addition, the older animals have more chance for frequent exposure to the infective stage of the parasite (5, 19).

Evidence demonstrates that the sex of animals has a significant influence on the infection rates of toxoplasmosis in goats. In this study, the results showed that female animals were more infected as compared to males and these findings are in agreement with the findings of Shah et al (20) and Ahmed et al (21). The higher infection rates in female than the male could be due to the small number of male goats were kept for breeding whilst others were culled or sold, or it might be due to the stress of pregnancy, lactation and hormonal difference leading to immune-suppression that may expose the female goats to toxoplasmosis (22)

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معدل الخمج لداء المقوسات في ماعز الانجورا في محافظة دهوك-العراق

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الخلاصة

أجريت الدراسة الحالية في كلية الطب البيطري، جامعة دهوك من شهر نيسان ابريل ٢٠٠٩ ولغاية شهر أيار مايو ٢٠١٠ اذ تم جمع ٩٢ عينة مصل من ماعز الانجورا السليمة سريريا (٥٤ و ٣٨ من كل من سيميل وزاخو ، على التوالي). تم تحديد الانتشار المصلي لداء المقوسات النشط في ماعز الانجورا في مناطق زاخو وسيميل باستخدام تقنية الاليزا (ELISA) بالاعتماد على الكلوبيولين المناعي (IgM). اظهرت نتائج الدراسة الحالية، ان معدل الخمج الكلي للمرض بلغت ١٢ / ٩٢ (١٣.٠٤%)، اذ ازدادت هذا المعدل في منطقة زاخو عند مقارنتها بمنطقة سميل و كذلك لوحضت بمعدلات عالية في الاعمار الكبيرة و في الإناث مقارنة بالاعمار الصغيرة وفي الذكور ,على التوالي. استنتج من هذه الدراسة ان داء المقوسات هو احد الامراض الخمجية التي تصيب ماعز الانجورا في محافظة دهوك لذا و للحفاظ على الامن الحيوى والاقلال من فرص انتقال المرض الى الانسان ننصح بالفحص الدوري للحيوان في المنطقة.

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