

Serological survey on Toxoplasmosis in sheep and goats in Nazareth, Ethiopia

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SUMMARY

Serological survey to detect antibodies to *Toxoplasma gondii* was carried out using the Modified Direct Agglutination Test (MDAT) and ELISA Enzygnost IgG Test on 116 sheep and 58 goats of over 6 months of age in Nazareth area (39.17°N, 8.33°E), Ethiopia. Seroprevalence of 52.6% in sheep and 24% in goats were reported by the MDAT and 56% in sheep and 25.9% in goats by the ELISA Test. Almost perfect agreement (K=0.09) was found between the two serological tests. Using the MDAT as a reference test, the sensitivity and specificity, of the ELISA Test were 98.4% and 90.9% respectively.

KEY WORDS : *Toxoplasma gondii*, ELISA Test, Modified Direct Agglutination Test, Prevalence, Small ruminants, Ethiopia.

RÉSUMÉ

Prévalence sérologique de la Toxoplasmose chez le mouton et la chèvre dans la région de Nazareth, Éthiopie. Par T. NEGASH, G. TILAHUN, S. PATTON, F. PRÉVOT et PH. DORCHIES.

Une enquête sérologique pour la mise en évidence des anticorps spécifiques de *Toxoplasma gondii* a été réalisée sur 116 sérums de moutons et 58 sérums de chèvres de plus de six mois prélevés dans la région de Nazareth (39.17°N, 8.33°E), Éthiopie. Les échantillons ont été examinés en parallèle par un test d'agglutination directe et par ELISA. Les séroprévalences mesurées avec le test d'agglutination ont été respectivement de 52,6 % chez le mouton et de 24 % chez la chèvre. Avec le test ELISA, les valeurs ont été de 56 % chez le mouton et de 25,9 % chez la chèvre. Une concordance parfaite entre les deux tests sérologiques a été constatée (K=0.09). Par rapport au test d'agglutination directe, la sensibilité et la spécificité de l'ELISA ont été respectivement de 98,4 % et de 90,9 %.

MOTS CLÉS : *Toxoplasma gondii*, ELISA, Agglutination directe, Prévalence, Petits ruminants, Éthiopie.

Introduction

Toxoplasma gondii infects a wide range of animals including mammals and birds. The domestic cat and wild felids play a crucial role in the epidemiology of this infection as definitive host through shedding oocysts. Prenatal problems such as abortion and neonatal mortality in sheep and goats are the major clinical manifestations of infection [3]. In most countries, toxoplasmosis comes as the second in prevalence after chlamydial abortion. Prenatal mortality rates (including ovine abortion and neonatal mortality due to *T. gondii*) in affected flocks can be as high as 50% and in non-clinical cases may result in low losses [8]. Therefore, the infection has an economic and clinical significance in many sheep and goat producing countries.

In Africa, there are few reports on toxoplasmosis, prevalence rates ranging from 7% to 63% have been reported [2, 7, 8, 9, 12]. In Ethiopia, seroprevalence rates of 22.9% and 11.9% are reported in sheep and goats respectively [2, 4].

The objectives of this study were to estimate the prevalence rate of *T. gondii* by Agglutination Test and ELISA in small ruminants under periurban management in Rift Valley area, Eastern Ethiopia.

Material and methods

INVESTIGATED AREA

The study was carried out from November 1999 to March 2000 in and around Nazareth, Ethiopia. Nazareth is a town 90 kms South East of Addis Ababa (39.17°N - 8.33°E) with an altitude of 1622 m asl. Situated in the Rift Valley, it receives an annual rainfall of 800 to 900 mm and temperature range from 13.9 to 27.7°C [6].

INVESTIGATED ANIMALS

The study was conducted on 116 sheep and 58 goats. Sheep and goats of less than 6 months of age were not included in the study to avoid measuring antibodies passively transferred in colostrum. Blood samples from sheep were collected through a systematic random sampling procedure [10]. However, the low goat population density in the area enacted the sampling of all available ones. Approximately 5 ml of blood from the jugular vein were aseptically collected and the serum separated and stored at -20°C until used.

The Modified Direct Agglutination Test (Toxo - screen

DA, Dace Behring Marburg GmbH, Germany) and the ELISA (Enzygnost Bio Merieux, SA, Lyon, France) Toxoplasmosis /IgG Enzyme test were conducted according to the manufacturers' recommendations.

STATISTICAL ANALYSIS

Kappa statistic test was used to test the agreement between the two serological tests. It is defined as the excess agreement that expected by chance, divided by the potential excess. Kappa values of greater than 0.81: almost perfect agreement, 0.6 - 0.80: substantial agreement 0.41 - 0.06 moderate agreement, 0.21 - 0.09: fair agreement; 0 - 0.2 slight agreement and 0: poor agreement [10].

Results

Out of 116 ovine serum samples 61(52.6%) and 65(56%) were positive with MDAT and ELISA Test respectively (Table I). There is no statistically significant difference between the results of the two tests as they detected similar proportion of positive serum samples. Test agreement beyond chance between the two tests was $K=0.90$ and indicates almost a perfect agreement. Using the MDAT as a reference test, the sensitivity and specificity of the Enzygnost Test were 98.9% and 90.9%.

Seroprevalence for the 58 goat samples was 24.1% (14/58) by the MDAT and 25.9% (15/58) by the ELISA have been observed (data not shown).

		MDAT		
		Positive	Negative	Total
ELISA	Positive	60	5	65
	Negative	1	50	51
	Total	61	55	116

TABLE I. — Comparison of the MDAT and Enzygnost tests for the detection of anti-*Toxoplasma gondii* IgG antibodies in sheep.

Discussion

The results of this work further confirm the presence of *T. gondii* infection in sheep and goat populations in Ethiopia. The difference in seroprevalence infection in sheep and goats between the present work and the previous reports from Ethiopia may be attributed to difference of serological methods and in localities where samples have been done, because there are numerous eco-climatic areas in this country. *Toxoplasma* seroprevalence is variable, higher prevalence being observed in warm and moist areas than in cold or hot dry areas [2]. Apart from this, variation may also be related to the age of the animals sampled and husbandary practices.

The overall prevalence recorded in sheep in the present work is higher (54.7%) compared to the previous reports from Ethiopia and other African countries. Prevalence rates ranging from 11.5% to 39% have been recorded in various

African countries including Ethiopia [2, 4, 8, 11, 12]. A still wider spectrum of seroconversion rate from 21% of sheep sera in Brazil [5] to 88.7% in Cankiri, Turkey [1] have been recorded.

The overall seroprevalence of 26.7% recorded in goats in the present study is higher than those reported earlier from Ethiopia [2, 4]. In other African countries, infection rates reported are higher : 31,9 % in Tanzania [11] and 63 % in the Sudan [12].

The MDAT and ELISA Tests detected similar proportion of *Toxoplasma* positive serum samples. Therefore, both are reliable for population screening tests. However, both tests have their own advantages and limitations. The need for species specific conjugates, and automatic processor to increase the efficacy and spectrophotometer for quantifying the activity of antibodies by ELISA Test may limit its use. On the other hand, the MDAT is safe and does not require species specific conjugate and can be used on any species. Furthermore, the perfect agreement between the two tests as explained by good k-value, suggests the use of one procedure over the other depending on the choice of the investigator and availability of equipment.

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References

1. — BABUR C., INCI A., KARAER Z. : Detection of *T. gondii* seropositivity in sheep and goats around Cankiri, Turkey using SFT. *Act. Parasito. Turcica*. 1997, **21**, 409-412.
2. — DECONINCK P., PANGUI L.G., AKAKPO J., GARROUSTE A., QUATTARA L. ROGER F., TIBAYRENC R., DORCHIES P. : Prevalence of toxoplasmosis in small ruminants in Tropical Africa. Results of seroepidemiological survey. *Revue Méd. Vet.* 1996, **147**, 377-378.
3. — DUBEY J.P., WELCOME F.L. : *Toxoplasma gondii* induced abortions in sheep. *JAVMA*, 1988, **193**, 698-700.
4. — BEKELE T., KASALI O.B. : Toxoplasmosis in sheep, goats and cattle in Central Ethiopia. *Vet. Res. Commun.* 1989, **13**, 371-375.
5. — MARTINS J.R., HANCOCK R., CORREA B.L., CERESER V.H. : Occurrence of antibodies to *Toxoplasma gondii* in sheep in the district of Livramento, Rio Grande do Sul, Brazil. *Pesq. Agr. Pec. Gauch.* 1998, **4**, 27-29.
6. — National Meteorological Service Agency, Addis Ababa, Ethiopia. 1999
7. — OKOH A.E.J., AGBONLAHOR D.E., MOMOH M. : Toxoplasmosis in Nigeria: A serological survey. *Trop. Anim. Hlth. Prod.* 1981, **13**, 137-143.
8. — RADOSTITS O.M., BLOOD, D.C., GAY C.C. : A textbook of the disease of cattle, sheep, pigs, goats and horses. 8th ed. W.B. Saunders, London. 1994
9. — SINGH B., MOSLLA P.: Seroprevalence and Pathogenesis of *Toxoplasma gondii* in sheep and goats in tropical regions. In: Proceedings of the Second Tanzania Veterinary Association Scientific Conference. *J. Tanz. Vet. Assoc.* 1984, **2**, 210-216.
10. — THRUSFIELD M. : Veterinary Epidemiology, 2nd ed. Blackwell Science Ltd. U.K. 1995.
11. — WILSON M., WARE D.A., JURANEK D.D. Serologic aspects of toxoplasmosis. *JAVMA* 1990, **196**, 277-278.
12. — ZAIN ELDIN E.A., ELKHAWAD S.E., KHEIR H.S.M. : A serologic survey for *Toxoplasma* antibodies in cattle, sheep, goats and camels. (*Camelus dromedarius*) in the Sudan. *Rev. Elev. Med. Pays. Trop.* 1985, **38**, 247-249.