

PREVALENCE OF *Toxoplasma gondii* ANTIBODIES IN CAMELS AND THEIR HERDERS IN THREE ECOLOGICALLY DIFFERENT AREAS IN SUDAN

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ABSTRACT

A total of 153 serum samples from dromedary camels (*Camelus dromedarius*) and 45 serum samples from their drivers and herders from Butana plains, North Kordofan, and South Kordofan were tested for *Toxoplasma gondii* antibodies by the Latex Agglutination Test (LAT). The sero-prevalence rate among camels and camel herders was 22.2% and 53.3%, respectively using LAT. There was a relationship between prevalence rate in camel and their herders in Butana plains ($P < 0.05$) but no significant relationship was found between age in camel herders and sero-reactivity ($P > 0.05$). The study suggests the wide spread of infection of *T. gondii* among camel drivers who consume camelid unboiled milk and raw liver which was important from public health view point.

Key words: Antibodies, latex agglutination test (LAT), one-humped camels, Sudan, *Toxoplasma gondii*

Toxoplasmosis is a wide spread zoonotic parasite infection caused by the coccidian *Toxoplasma gondii*. Man is infected by consuming infected raw or insufficiently cooked meat and meat products of sheep, goats and cattle. It has been isolated from the unboiled milk of infected cows, goats, sheep and pigs. In human, infection with *Toxoplasma gondii* is normally chronic but largely asymptomatic, though it may cause stillbirth, blindness, mental retardation and occasional death of congenitally infected infants (Frenkel, 1989).

The first report of human toxoplasmosis in Sudan was made in Khartoum and reported an overall prevalence of 61% (Carter and Fleck, 1966). Another study made by Abdel-Hameed (1991) involved resident of Giezera province showed prevalence 41.7%.

Camels are little studied especially from the point of view of disease (Gill and Prakash, 1968). Blanc and Bruneau (1950) studied toxoplasmosis in camels and demonstrated the presence of neutralising antibodies in an experimentally infected animal. Abbas *et al* (1987) reported a prevalence rate of 12% in Sudan in camels and Elamin *et al* (1992) reported 67% prevalence of toxoplasma in camels in Butana plains.

Therefore, the aim of this study was to determine the prevalence of toxoplasmosis and the role of infected camels to infect the camel herders.

Materials and Methods

The study areas are the middle (Butana area) and the west (Northern and South Kordofan) of Sudan. A total of 153 serum samples from camels and 45 serum from camel herders were examined for *Toxoplasma gondii* antibodies using Latex Agglutination Test (LAT) (Toxo-Latex® SPINRER EACT, S.A. Ctra. Santa coloma, Spain). The normal level of titre was <4 IU/ml. The sera samples collected from Butana plain, south and north Kordofan were 71, 27, 55, 10, 7 and 28 in camels and camel herders, respectively.

SPSS Package for Windows was used for the analysis as described by Neave (1981) in order to see if there is a significant difference between the observed and expected.

Results

LAT for *Toxoplasma gondii* antibodies revealed 34 (22.2%) and 24 (53.3%) positive cases in camels and camel herders, respectively. Sero-prevalence among camels is given in table 1 and camel herders in table 2. The sero-prevalence of toxoplasma in camels in the three areas was highest in South Kordofan (37.0%) and lowest in North Kordofan (18.2%). No relationship was found between the areas and the sero-reactivity of toxoplasma in camels ($P > 0.05$).

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The sero-prevalence of toxoplasma in camel herders in the same areas was the highest in Butana plains (100%) while it was lowest in North Kordofan (32.2%).

There was an association between the different areas and positive cases in camel herders ($P < 0.05$) but no significant differences were found between age and positive cases ($P > 0.05$). There was a significant link found between the infection in camels and camel herders in Butana plains ($P < 0.05$).

Discussion

The study indicated that the camels in many parts of Sudan had antibodies against *Toxoplasma gondii*.

Camels can acquire the infection through ingestion or inhalation of sporulated oocysts that are shed by cats. The other members of the family Felidae can also spread toxoplasma via their faeces (Jewell *et al*, 1972).

The epidemiology of toxoplasmosis has been studied most widely in western countries, but in sub-Saharan Africa data are limited (Bisson *et al*, 2000).

The first study of toxoplasma in camels in Sudan was done by El Din *et al* (1985) who reported 54% incidence from slaughter-camels. Bornstein (1987) and Abbas *et al* (1987) reported 22.5% prevalence by Sabin-Feldman Test (SFT) and 12% by Indirect Haemagglutination Test (IHAT). Elamin *et al* (1992) found 67% prevalence in Butana plains by Latex Agglutination Test (LAT). In present study, LAT was used in 3 different areas in Sudan found high rate in South Kordofan (37.0%). Although there

was no significant relationship between the area and sero-reactivity of toxoplasma but the different range may be due to the humidity and the rate and duration of the rainfall which extend from March to November. In many tropical countries the prevalence of toxoplasmosis was found to be high in the humid areas than in the dry areas (Tizard *et al*, 1976; Beattie, 1982). Barbier *et al* (1983) reported higher prevalence of antibodies in areas of high rainfall.

The prevalence obtained from this study matched with prevalence reported in camels of different countries, e.g. 11.1% in India by Dye Test (DT) and 10.8% by Indirect Haemagglutination Test (IHAT) (Gill and Praksh, 1968) and in Egypt 27.9% by Michael *et al* (1977) and 17.4% by Hilali *et al* (1998) and in Saudi Arabian camels Hossain *et al* (1987) recorded 0.0% and Hussein *et al* (1988) reported 16.0% by Indirect Haemagglutination Test (IHAT). The rate of infection in camels in United Arab Emirates ranged 30.9-36.4% by Direct Agglutination (DA) and Indirect Haemagglutination test (IHAT) (Afzal and Sakkis, 1994).

Some researchers have pointed *Toxoplasma gondii* as occupational infection. Gupta *et al* (1985) found the higher sero-titres among the laboratory animals handlers and postmortem attendants. Horio *et al* (2001) reported the prevalence among 67 slaughter-house workers and 22 (32.8%) were positive for toxoplasma. Another study reported 52.4% by IHAT and 44.1% by Indirect Fluorescent Test (IFT) among workers of slaughter homes (Ibrahim *et al*, 1997).

The difference in prevalence in Butana plains and South, North Kordofan might be due to the purpose of camels keeping. In Butana plains camel

Table 1. *Toxoplasma gondii* antibodies titre in camels by Latex Agglutination Test

S.No.	Location	Total Samples tested	Antibody titre no. of samples (%)			
			1:4	1:8	1:16	1:32
1.	Butana Plains	71	14 (19.7%)	12 (16.9%)	2 (2.8%)	0 (0%)
2.	South Kordofan	27	10 (37%)	6 (22.2%)	3 (11.1%)	1 (3.7%)
3.	North Kordofan	55	10 (18.2%)	7 (12.7%)	3 (5.5%)	0 (0%)
	Total	153	34 (22.2%)	25	8	

Table 2. Intensity of Reaction Using Latex Agglutination Test (LAT) in the camel herders in the different locations.

Location	Reaction	Titre			Total
	Positive	1/8	1/16	1/32	
Butana Plains	10 (100%)	6 (60%)	4 (40%)	0 (0%)	10
South Kordofan	5 (71.4%)	3 (60%)	2 (40%)	0 (0%)	7
North Kordofan	9 (32.2%)	6 (66.7%)	3 (33.3%)	0 (0%)	28
Total	24 (53.3%)	15 (62.5%)	9 (37.5%)	0 (0%)	45

herders consume unboiled milk and raw liver but camels in Kordofan are used for pack and draft purpose and riding and little milk is consumed.

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