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STUDIES ON *TRYPANOSOMA EVANSI* IN LOCAL ARABIAN CAMELS (*CAMELUS DROMEDARIUS*) IN SAUDI ARABIA: PREVALENCE, HAEMATOLOGICAL MANIFESTATIONS AND EFFECT ON BEHAVIOUR

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INTRODUCTION

Infection of animals with *Trypanosoma evansi* is prevalent in many tropical and subtropical countries. It is regarded as one of the major protozoal diseases affecting camels (Higgins, 1983; Boid et al., 1986). The infection causes tremendous losses in life and diminishes the overall productivity of camels. Few studies have been conducted on *T. evansi* in camels in Saudi Arabia. Diab et al. (1984) was the first to record the parasite in a general survey of blood parasites in slaughtered camels in the Eastern and Southern Regions of Saudi Arabia. Hussein and Hussein (1985) recorded a prevalence rate of 1.78% (5 of 280) with *T. evansi* in camels slaughtered in Riyadh abattoir.

No studies have been conducted so far on *T. evansi* in camel herds living under natural conditions in Saudi Arabia, regarding prevalence, clinical manifestations, some haematological changes and effects of the infestion on camel behaviour. The objectives of the present study were to investigate the above mentioned aims in some camels bred near Jeddah, Western Region of Saudi Arabia.

MATERIAL AND METHODS

This study was conducted during the period from September- December 1989 in the Jeddah area of Saudi Arabia. A herd of locally bred Arabian Camels *Camelus dromedarius* (Sawahli breed) consisting of one dominant male, 50 adult females, 12 subdominant males and 12 young females was studied.

Members of the herds were identified by marks/names to facilitate future studies. The studies on prevalence and intensity of *T. evansi*, clinical manifestation and haematological changes and effect on behaviour were conducted as follows:

a. Prevalence Studies:

10 ml of bloodwere collected by venipuncture from the Jugular vein into vacutainers coated with di-sodium ethylene diamine tetracetate (EDTA) as anti-coagulant. The blood was divided into two parts: one for prevalence and the other for haematological studies. The prevalence was estimated by examination of wet blood and thin blood films stained with Giemsa stain and by inoculation (intraperitoneally) of 0.5ml. of heparinized blood into adult male mice of M.F.I. strains. Wet blood and Giemsa-stained thin films from inoculated mice were examined 12 hours and 7 days after inoculation. The intensity of parasitaemia recorded in blood collected from camels was recorded as low (one parasite per X 600 microscope field) moderate (10 parasites per X 600 microscope field) and heavy (100 parasites per 600 microscope field).

Faecal samples were collected from *Trypanosoma* infected and non-infected camels as to the occurrence of gastrointestinal helminths according to El-Bihari (1985). Camel skin (at the inguinal and perineal regions) were examined for ectoparasites. A group of

camels positive for trypanosomiasis but free of other parasites was investigated for clinical, haematological manifestations and behaviour pattern. Camels infected with other parasites in addition to trypanosomiasis were excluded. Camels free of trypanosomiasis and other parasites were kept as controls.

b. Clinical and haematological manifestations:

Some clincial manifestations in infected camles in relation to the intensity of infection, were recorded. Haematological indices such as total erythrocytes (RBC), leucocytes (WBC) counts, packed cell volume (PCV), mean corpuscular volume (MCV) and haemoglobin concentration (Hb) were studied by standard methods (Davis and Lewis, (1975) in a group of 15 non-infected camels and 15 *Trypanosoma* infected camels.

c. Behaviour studies:

Thirty female camels, 8 years old, living in an unguarded condition were allocated to categories (N=15) infected with *T. evansi* as detected in (a) or uninfected control camels (N = 15). The camels were individually studied for one hour within the active phase period of camels (7 - 11 a.m). The behaviour of each camel was recorded using a coloured video tape camera (Sanyo : Betamovie). Subsequently, the tapes were analysed by using a 7-channel timer in terms of times allocated to 9 broad categories of behaviour (Al-Haxmi and Al-Harthi, 1989), namely: social; non-social; attack; threatening; defensive; displacement; resting; and the feeding behaviour including the number of feeds. The Mann Whitney "U" tests (Seigel, 1956) was employed for statistical analysis of behaviour data collected. The student t-test was used to analyse other parameters.

RESULTS

a. Prevalence and intensity of *T. evansi* in camels:

The trypanosomes recorded in this study were identified as those described by Boid et al. (1986). Based on measurements from 100 trypanosomes the PF (total length including free flagellum) was 47.6 ± 5.0 um, the PA (body length excluding free flagellum) was 30.5 ± 5.4 um, the FF (length of free flagellum) was 17.1 ± 3 um, the BW (maximum body width excluding the undulating membrane) was 2.8 ± 8 um, and the LN (length of the nuclues was 3.4 ± 1.0 um).

The prevalence rate by examination of camel blood stained with Giemsa was 13.3% (10 of 75). However, the prevalence rate increased by incoulation of mice with camel blood to 26.6% (20 of 75). The onset of parasitamia started 12 hours post-inoculation and trypanosoma mostly disappeared from mice blood 20 days post-inculation. The parasitaemia was low in 4 of 10 camels, moderate in 4 of 10 camels and and heavy in 2 of 10 camels.

b. Clinical and haematological manifestations:

The most common clinical manifestations of trypanosomiasis in camels were: emaciation, reduction or almost disappearance of the hump, atrophy of the thigh muscles, corneal opacities, diarrhoea, abortion, oedema of the dependent parts and inability to feed the youngs. These were more evident in camels with heavy parasitaemia which eventually died.

The haematological indices in camels infected with *T. evansi* and in control non-infected camels are shown in **Table, 1.** The infected camels had significantly lower RBC, Hb and PCV values than the non - infected camels. Leucocystosis was higher in infected than in non-infected camels. There was no difference in MCV in infected and non-infected camels.

TABLE (1): Comparison between mean haematological indices of camels infected with Trypanosoma evansi and control non-infected camels.

Haematological index	Infected * camels (Mean±SD) (15)	Non-infected camels (Mean±SD) (15)	Level of• significance
RBC ($X10^{12}$ per 1)	5.6±2	8.8±2	P < 0.01
Hb (g per d L)	6.35±3	10.64±3	P < 0.01
PCV (1 per 1)	.13±0.04	0.20±.05	P < 0.001
Total WBC ($X10^{9}$ per 1)	17.62±5	13.3±2	P < 0.01
MCV (fl)	54.9±2	58.25±1	P > 0.01

• Significance of haematological indices were calculated using student t test .

TABLE (2): Comparison of the behaviour of camels with T.evansi to that of non-infected camels
(Median with range)

TEST GROUP	Time (in seconds) Allocted to:								
	Social behaviour	Non-social behaviour	Attack	Threat	Defense	Displace-ment	Rest	Feeding	No. of feeding
Control	0.0	920.0	0.0	0.0	0.0	0.0	0.0	1518.0	14.0
Camels	0.0-74.0	0.0-3542.0	0.0-4.0	0.0-0.0	0.0-0.0	0.0-194.0	0.0-3600.0	0.0-2748.0	0.0-35.0
Infected	0.0	2550.0**	0.0	0.0	0.0	0.0	0.0	0.0*	0.0*
Camels	0.0-586.0	0.0-3600.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-70.0	0.0-3600.0	0.0-2695.0	0.0-27.0

*Differs from control $P<0.01$ (Mann Whitney 'U' test)
**Differs from control $P<0.001$ (Mann Whitney 'U' test)

c. Behaviour of camels infected with *T. evansi* in comparison to non-infected controls:

There was no significant difference (Mann-Whitney "U" test) between the infected camel behaviour category and the control non-infected camel behaviour category on the allocated time to social behaviour, attack, threat, displacement and resting behaviour **(Table, 2)**. There was however a significant increase in the time allocated to non-social investigation ($Z = 2.66$, $p < 0.001$) in infected than in non-infected camels. there was a significant decrease in the accumulated time to feeding behaviour and the number of feeds in infected than in non - infected camels ($Z = 0.871$, and $Z = 0.703$, both $p < 0.01$).

DISCUSSION

The present study demonstrates that *T. evansi* infection rate is relatively high in Arabian camels living under natural conditions in the Western Region of Saudi Arabia. The use of more advanced concentration technique (Kelly and Schillinger, 1983; Zwegarth et al, 1986) may reveal a higher prevalence rate. Wilson et al. (1983) classified the disease risk of trypanosomiasis in camels in Kenya to 5 types according to mortality, the presence or absence of emaciation and anaemia, the presence or absence of circulatory trypanosomes and antibody production. Herds suffering from high mortality rate, anaemia and emaciation denote severe diseases with potential harmful economic loss. On the other hand the presence of herds without anaemia, emaciation or humoral trypanosome antibodies indicate trypanosomiasis with minimal economic loss. Such studies are likely needed in herds of camels in Saudi Arabia.

The haematological investigation carried out in this study indicate the presence of anaemia as one of the major features of this disease. It has been recorded as a main pathological feature of trypanosomiasis in camels. (Higgins, 1983; Boid et al., 1986).

The clinical features recorded in some infected camels in the present study coincide with those related to the chronic form of the disease as described by Singh et al. (1980), and Boid et al. (1986). Various trypanosomicides (Samorin and Suramin) are currently used as therapeutic and prophylactic measures against *T. evansi* in camels in Saudi Arabia. (Ghandour, personal communication). Research is recommended to assess the efficacy of such compounds as well as other new compounds, against the local strains in Saudi Arabian camels.

The effect of *T. evansi* infection on the behaviour of camels in the present study denotes a change of the normal social behaviour and feeding habits. The results conform with results by other workers (Singh et al., 1980; Khanna et al., 1987). This change in behaviour of infected camels will induce a viscious circle aggravating the course of infection and manifestations of trypanosomiasis. It is hoped that this base-line study could stimulate further studies on trypanosomiasis in camels in Saudi Arabia.

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SUMMARY

Natural infection with *T. evansi* was studied in a herd of 75 Arabian camels *(Camelus dromedarius)* in the Western Region of Saudi Arabia. The prevalence rate was 13.3% as revealed by thin blood smear examination and 26.6% as shown by animal inoculation. The infection was characterized by marked anaemia. Clinical manifestations indicative of chronic infection were observed in some of the infected camels e.g. emaciation, marked reduction of size of the hump, atrophy of the thigh muscles, corneal opacities, diarrhoea, abortion, and/or inability to feed the youngs. Infected camels showed some changes in behaviour such as non-social behaviour and loss of appetite.

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