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OCCURRENCE AND TRANSMISSION OF CAMEL TRYPANOSOMIASIS IN NORTHERN KENYA

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ABSTRACT

Camel trypanosomiasis was confirmed in selected northern Kenya herds using the enzyme linked immunosorbent assay (ELISA), Mouse Inoculation (MI) and Blood Smear (BS) techniques. The ELISA results indicated current or past trypanosome prevalence rates of 72-95%. MI and BS techniques revealed current infection rates upto 19.2 and 11.5%, respectively.

Trypanosome infection rates were significantly elevated during the wet season based on the MI diagnostic technique. The mean infection rates were 13.7 ± 5 and 4.55 ± 2.2 for the wet and dry season, respectively. There were no seasonal differences in infection rates in camels based on the ELISA technique. Active transmission of camel traypanosomiasis was ascertained by regular monitoring of 10 sentinel camels. Three of these sentinel camels became infected 8-9 months after introduction, which in the absence of *Glossina* spp., supported the concept of mechanical transmission. The trypanosome species involved was confirmed to be *Trypanosoma evansi* Steele from a preliminary survey.

Key words: Camel, *Glossina* spp., mechanical transmission, *Trypanosoma evansi*

Trypanosomiasis is considered as one of the most important blood protozoan disease which has an impact upon the economic and agricultural development of tropical Africa (Jordan, 1986; Mawuena, 1988). Mohammed (1984) reported 30% morbidity and 100% mortality in Somalia camels as a result of *T. evansi* infection and Luckins (1988) reported *T. evansi* to be a constraint to camel production in Asia.

In northern Kenya, trypanosome stocks affecting camels were reported to be of the '*evansi*' type by Gibson (1981). Olaho *et al* (1987) found that trypanosomiasis was responsible for an abortion rate of 62.5% and a mortality rate of 76.5% in camel herds in the Galana ranch region of coastal Kenya. Losses in Kenyan camel herds in terms of abortions, emaciation and death due to trypanosomiasis were also documented by Gitatha (1980); Rutagwenda (1982, 1985) and Wilson *et al* (1983).

The distribution of camel trypanosomiasis in northern Kenya is unusual because the distribution for most part lies outside the distribution of *Glossina* spp. This combined with the fact that *T. evansi* does not develop in *Glossina* spp., suggests that mechanical transmission of camel trypanosomiasis is taking place in the region. Clarification of questions relating to camel trypanosomiasis in northern Kenya that need further investigations include vector identification, epidemiology, diagnosis and disease control. Incriminated but unconfirmed mechanical vectors of camel trypanosomiasis in the region include tabanids, biting muscids other than *Glossina*, hippoboscids and soft ticks. In this study, disease transmission by flies other than *Glossina* spp. in northern Kenya is confirmed.

Materials and Methods

Camel sera was separated from jugular blood samples taken from individual camels representing several herds within the study area in northern Kenya at sites e.g. Olturot, Mount Kulal, Wamba, Ngurunit, Lai-Samis, Korr, Kargi and Ula-Ula and Log-Logo. The ELISA technique was employed to determine previous or current trypanosomiasis and to screen camel herds and subsequently identify suitable herds for further epidemiological studies of trypanosomiasis in the area. Camel IgG (CIgG) and Rabbit anti camel IgG (RACIgG) were prepared after the method of

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Nakane and Kawaoi (1974) as modified by Olaho *et al* (1984). The RACIgG-Peroxidase (RACIgG-PO) conjugate was prepared using Horse raddish Peroxidase (Sigma type VI) and rabbit-anti-camel IgG as described by Olaho *et al* (1984). Soluble trypanosome antigen was prepared from a KETRI stabilate or *T. evansi* (KETRI 12429) as described by Luckins (1977).

Thick and thin blood smears were prepared from samples of camel blood. Thin smears were fixed in absolute methanol for 30 seconds. Both smears were stained with Giemsa and examined under the X40 objective for trypanosomes and positive cases recorded for each herd bled.

Mouse inoculation was done by injecting 0.5 ml of anticoagulated blood of each sample intraperitoneally into two mice, which were thereafter examined for trypanosome infection. Mice tail were snipped with a fine pair of scissors and drops of blood obtained was used to prepare thin and thick blood smears as already described above. Mice were examined in this way daily for 60 days.

Five trypanosome-free camels aged four years confirmed in screening by ELISA, MI and BS techniques were selected as sentinels and subsequently introduced into a stationary camel herd at Olturot study site. Another set of five sentinels were introduced into a local herd at Kargi study site. All ten sentinels were checked for trypanosomiasis monthly using ELISA, MI and BS techniques.

Results

Trypanosome infections in camels

According to ELISA results (Table 1), all the camel herds samples had individual animals with elevated trypanosomal antibody levels to *T. evansi* KETRI 12429 antigen. Incidences of infections in camels ranged from 72-95%, with a mean infection rate of 87.1%.

According to the MI technique not all individual camel samples were infected. Infection rates ranged from 2% (Wamba, Ngurunit and Korr study sites) to 19.2% (Ngurunit study site) as shown on Table 1. Trypanosome infection rates based on the MI technique, in camels at all sites were elevated during the wet months (season) as opposed to the dry months. Mean trypanosome infection rates were 13.78 ± 5% and 4.5 ± 2.2% for wet and dry months, respectively based on the MI technique.

Blood smear results (Table 1) detected trypanosomiasis in camels at all other sites except Korr, Log-log and Lai-Samis. Infection rates when detected, ranged from 1.7% (Olturot site) to 11.5% (Ngurunit site). Mean trypanosome infection rates

Table 1. Trypanosome infection rates in camel herds at selected sites in northern Kenya.

Site	Diagnostic		Method	
	No. Bled	ELISA	Mouse inculation	Blood smears
Olturot-1	60	86.6	6.7	1.7
Olturot-2	101	84.1	6.9	2.0
Olturot-3	60	85.0	18.3*	8.3*
Olturot-4	95	85.0	8.4	2.1
Olturot-5	120	86.7	8.3	3.3
Olturot-6	60	95.0	14.2**	6.6**
Mt. Kulal	100	91.5	11.0*	3.0
Wamba	100	93.0	16.7*	3.9*
Ngurunit-1	50	92.3	2.0	2.0
Ngurunit-2	60	90.0	2.0	1.0
Ngurunit-3	52	94.0	19.2**	11.5**
Ngurunit-4	50	92.5	2.0	2.0
Ngurunit-5	60	95.0	15.7*	6.7*
Lai-Samis	50	78.0	4.0	0.0
Korr-1	100	76.0	2.0	0.0
Korr-2	50	80.0	4.0	0.0
Ula-Ula	50	76.0	12.0	6.0
Log-Logo	50	72.0	10.0	0.0
Mean		87.1%	11.3%	3.9%
S.D.		7.26	4.97	3.0
S.E.		1.6	1.09	0.6
Var.		49.4	24.7	7.4
C.V.		8.3%	41%	78%
Wet Season = 13.78 ± 5%			5.6 ± 3%	
Dry Season = 4.5 ± 2.2%			1.9 ± 0.6%	

* = month of May

** = month of November

were 5.6 ± 3% and 1.9 ± 0.6% for the wet and dry months, respectively based on the BS technique, a further indication of elevated trypanosome infection incidence during the wet season.

Trypanosome infection of sentinel camels

The infection status of the 10 sentinel camels are shown in Fig 1. At Olturot site, one of the five sentinels (camel no. 93) was positive based on ELISA, MI and BS technique, after a duration of 8 months. Infection was first detected in the month of November which was immediately after the short rains. The other four sentinels (nos. 67, 63, 98 and 58) were not positive on subsequent checks nine months later. At Kargi study site, 2 camels were positive for trypanosomiasis after a duration of 8 to 9 months. Infection in one of these camels (no. 45) was detected by both the ELISA and MI technique 8 months after introduction and by all three methods a month thereafter. Infection in the second camel (no.7) was detected by the ELISA, MI and BS techniques 9 months after introduction.

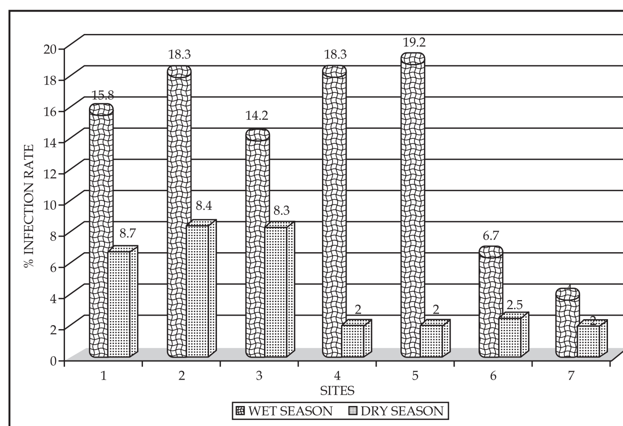

Fig 1. Camel trypanosome infection rates during wet and dry seasons at selected sites in northern Kenya based on MI technique.

Discussion

Commonly used diagnostic techniques for animal trypanosomiasis include centrifugation, mouse inoculation, DNA probes, wet films, blood smears and immunological assays.

Kelly and Schillinger (1983) reported on the usefulness of the Micro haematocrit centrifuge technique (MHCT) in diagnosis of *T. evansi* in camels. Rutagwenda (1982) diagnosed upto 10% camel trypanosomiasis using the MHCT but this is not practical for field screening in remote sites.

Mouse inoculation has been used with much success to diagnose *T. evansi* infection in camels by workers such as Pegram and Scott (1971); Killick-Kendrick (1963); Robson and Rickman (1973); Geigy *et al* (1975). The reliability of mouse inoculation technique has further been documented by many workers among them Wilson *et al* (1983); Baker (1974); Killick-Kendrik (1963); and Pegram and Scott (1971). Furthermore Paris *et al* (1985) showed that mouse inoculation was more sensitive for detection of *T. brucei* than centrifugation and blood smears. Mouse inoculation was adopted in this study to detect sub patent trypanosome infections in camels that could not be detected in the wet films or blood smears. Almost similar to the findings of this study, are results reported by Godfrey and Killick-Kendrick (1963), who detected upto 27.6% trypanosome infection rate in 145 camels in Nigeria. The MI technique was found important in this study not for its reliability, but in identifying individual animals that needed immediate treatment for the benefit of the pastoralists whose camel herds were being used for the study.

There had been difficulties of identifying trypanosomes in mixed infections, hence species-specific DNA probes were developed (Basagoudanavar *et al*, 1998; Kihurani *et al*, 1989; Kukla *et al*, 1987 and Qu *et al*, 1999).

Immunodiagnostic techniques based on detection of specific antibodies (Luckins *et al*, 1979) or specific antigens (Nantulya, 1989) have been found reliable in detecting *T. evansi* in camels in Sudan and Mali, respectively. For this particular study however, the antigen detection ELISA was found potentially suitable. The positive ELISA results were based on presence of antibodies alone, and therefore indicative of current or past infection but not necessarily the active infections detected by MI and BS technique. Although ELISA did not differentiate active from past trypanosome infections, it was useful for large screening of sera samples and thus indicative of previous trypanosome challenge in the camel herds studied. The usefulness of ELISA for large scale screening of animals has been supported by Wilson (1969);

Askar and Ochilo (1972); Luckins (1977); Nantulya *et al* (1989) and Rebeski *et al* (2000). ELISA is simple and observable colour change in positive cases is an added advantage. Furthermore, results thus obtained were useful in identifying herds for further epidemiological studies. For purposes of disease control, it is apparent that the best period to undertake any such measures would be during the wet season. An attempt to relate the incidence of camel trypanosomiasis with biting flies in this study revealed that disease incidence was higher during the wet months (May to November), when biting flies were observed to be abundant. Conclusive data on the incriminated fly vectors is not herein given but absence of *Glossina* spp. during the study period suggests mechanical transmission of camel trypanosomiasis in northern Kenya.

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CORRIGENDUM

A reference published in manuscript entitled, "Detection of apoptosis in the lymphoid organs of the dromedary camel" in page no. 166 of December, 2002 issue of JCPR bears a wrong name of Journal. The correct reference is:

"Zeidan and Pabst R (2002). Lymphocyte proliferation in lymphoid organs of the dromedary camel using the monoclonal antibody MIB-5 against the proliferation associated nuclear apitoKi-67. Anatomia Histologia Embyrologia, in press."

Camel Publishing House apologises the error.