*J. Protozool. Res. 11, 19-25 (2001)*


# Surra in Camel Calves in Laikipia District of Kenya

*Z. K. Njiru[1], I. M. Ole-Mapeny[1], J. 0. Ouma[1], J. M. Ndung'u[1] and W. M. Olaho-Mukani[2]*

*1. Kenya Trypanosomiasis Research Institute (KETRI). P. 0. Box 362, Kikuya, Kenya.*

*2. Livestock Health Research Institute (LIRI). P. 0 Box 96, Tororo, Uganda*

## ABSTRACT

Camel trypanosomosis (Surra) is one of the most important diseases affecting camel calves. It presents itself as an acute form and is usually fatal if treatment is not carried out. A study was initiated at Mogwooni ranch in Laikipia district of Kenya to survey the prevalence of trypanosomosis in camel calves of mixed breeds, and to evaluate the microhaematocrit centrifugation technique (MHCT), monoclonal antibody based card latex agglutination test (Suratex®), wet smear and mouse inoculation (MI) in the diagnosis of the disease in camels. The tests were assessed for a period of 16 months. The mean *Trypanosoma evansi* prevalence ranged from 4.5% as determined by the wet smear, 11.1% by MHCT, 14.6% by MI, to 28.3% by Suratex®. Young calf death rate due to trypanosomosis was 12.3% while overall mortality rate was 15.0%. The cost of veterinary care (anti-helminthics, acaricides and trypanocides) was on average US$ 4.6 per calf per year. It is thus recommended that diagnosis accompanied by proper treatment be carried out routinely for the survival of camel calves in trypanosomosis endemic areas.

**Key Words**: Camels, *Trypanosoma evansi*, Trypanosomosis and camel calves

## INTRODUC TION

Camels have been a neglected domestic species in the promotion of livestock health and production. Only recently have they become the subject of intense and systematic interest in connection with increasing productivity of the arid and semi-arid lands (ASALs).

Kenya has a camel population estimated at 1 million (KETRI 1998) of which 99% are reared in trypanosomosis endemic areas. 60% of Kenya's land mass lies in the ASAL, where the camel

has proved to be the most suitable livestock species. For pastoralists who live on these lands, the camel plays a major economic role in subsistence, particularly in the provision of milk, and forms the corner-stone of the social organisation of the pastoral society (Baumann and Zessin 1992). Information on camel calf diseases in Kenya is sparse. Data on the prevalence of trypanosomosis, which is a major killer disease in calves, is particularly lacking. Olaho-Mukani et al. (1987) noted that trypanosomosis causes anaemia, mortality and impaired growth in camel calves. Moreover, recent studies in Kenya have shown that camel trypanosomosis is endemic in Laikipia district and is by far the most important disease affecting the camel (Njiru et al 1998). The disease is caused by *Trypanosoma evansi* and runs an acute or a chronic course (Wilson 1970).

In Kenya, more emphasis is being placed on the improvement of the camel calf because it forms the future of camel stock. Thus more and systematic studies need to be carried out on this age group in camel herds. The primary objective of the present study therefore, was to investigate the prevalence of trypanosomosis in camel calves (suckling and immature) under an extensive ranch management system and further validate the available diagnostic tests for camel trypanosomosis.

## MATERIALS AND METHODS

### Study area

The study was conducted at Mogwooni Ranch, in Laikipia district of Kenya which is one of the 24 ASAL districts in Kenya. It lies between longitude $36^0$ 4' West and $37^0$ 27' East and between latitude $0^0$ 17' South and $0^0$ 45' North. During the study period the annual rainfall ranged from 600 to 900mm. The vegetation is predominantly Savannah with scattered acacia and shrubs. Large numbers of biting flies (*Stomoxys spp*) inhabit the dry riverbeds, especially during the wet season (Njiru et al 1998).

### Herd structure

Data on 84 calves was collected monthly for l6 months from July 1997 to October 1998. All animals were kept under an extensive ranch management system and grazed as a

single herd. Two age groups were recognised in the herd, namely: suckling (≦18 months) and immature (>18 months, ≦36 months). The camel calves consisted of Pakistan, Somali and Turkana breeds and their crosses. Introduction of Pakistan breeds in Kenya was an effort to improve camel husbandry especially in terms of milk production (Simpkin et al 1997).

**Parasitological examinations and packed cell volume (PCV)**

Trypanosome infections were detected using the Suratex® (Nantulya 1994), microhaematocrit centrifugation technique (MHCT), mouse inoculation (MI) and wet blood smear method while PCV was determined following the method of Schalm et al.
(1975). All assays were done monthly.

**Indicators of mortality**

Two basic mortality rates were calculated for the time covering the study period. These included:

Crude death rate (CDR) (%) = (Number of deaths / year x 100) / Average herd size.
Young Stock death rate (YSDR) (%)= (Number of deaths of animals ≦3 year / year x 100) / Number of live births

**Costs of drug**

Data on the type, amount and cost of drugs administered to each camel calf was recorded. From this, the cost of drugs used during the study period was calculated.

**Data analysis**

Analysis of variance (ANOVA) was used to analyse the PCV of infected and non-infected calves in the different age groups. A value of $P \leqq 0.05$ was considered significant. Agreement between different assays was measured by kappa test.

## RESULTS

### Herd investigation

Table 1 shows the percentage infection rates in each age group. During the study period, most infections were recorded in immature calves (13.3%) than in the suckling calves (7.3%). Pakistan breed had the highest number of infected calves 51 (34.4%), while Pakistan-Somali crossbred were 41 (27.8%), Somali breed 33 (22.2%), Turkana breed 11 (7.8%) and Somali-Turkana crossbred 11 (7.8%).

Table 1. Percentage of infections detected in each age group of camels using the MHCT method

| Group | Total No. | Infected | % |
|---|---|---|---|
| Suckling | 480 | 35 | 7.3 |
| Immature | 844 | 112 | 13.3 |

### Haematology and Serology

Table 2 shows the analysis of variance for PCV between infected and non-infected calves in different age groups. Significant differences were observed between the suckling and immature groups of animals.

Table 2. Analysis of variance of PCV between infected and non-infected camel calves in the different age groups

| Group | | n | mean ±SEM | P |
|---|---|---|---|---|
| Suckling | Infected | 35 | 22.4 ± 0.58 | 0.001 |
| | Non-infected | 445 | 24.9 ± 0.18 | |
| Immature | Infected | 112 | 23.7 ± 0.19 | 0.001 |
| | Non-infected | 732 | 27.5 ± 0.11 | |

### Diagnosis

The most sensitive method of detecting trypanosome infection was Suratex® (Table 3). However, it failed to detect 13 cases that were, MHCT positive, with large numbers of trypanosomes (+6) in the blood. Suratex® detected 137 (91.1%) of MHCT positive samples and 175 (90.7%) of MI positive samples. All infecting trypanosomes were identified as *Trypanosoma evansi*. Some calves that were positive with *T. evansi* were reported to lick soil. The test of agreement between Suratex® and MHCT, Suratex® and MI, and Suratex® and WS were 0.8, 0.5 and 0.1 respectively. The highest sensitivity (93.19%) and specificity (80.03%) were recorded between MHCT and Suratex®.

Table 3. Prevalence of Trypanosomosis in camels at Mogwooni Ranch (July 1997 – October 1998)

| **Detection method** | **No. of tests** | ***T. evansi*** |
|---|---|---|
| Wet blood smear | 1324 | 60 (4.5%) |
| MHCT | 1324 | 147 (11.1%) |
| MI | 1324 | 193 (14.6%) |
| Suratex® | 1324 | 372 (28.1%) |

**Deaths due to trypanosomosis**

Most deaths were recorded during the wet season. CDR and YSDR were 10 (11.9%) and 5 (10.6%) during the wet season (Mar-Jun and Nov-Dec), and 3 (3.5%) and 1 (2.1%) during the dry season (Jam-Feb and Jut-Oat) respectively. Other causes of deaths were diarrhoea and accidents.

**Cost of treatment**

Trypanocides were the most used drugs followed by acaricides, while the use of antibiotics and anti-helminthics was low. The total cost of trypanocides, acaricides, anti-helminthics, and antibiotics were US$ 200, 102, 87 and 21, respectively. The average cost of trypanocides per camel calf per year for the Pakistan, Pakistan-Somali, Somali, Turkana, and Somali-Turkana breeds were US$ 4.5, 2.5, 1.5, 1.5, and 0.5, respectively.

## DISCUSSION

Trypanosomosis is endemic in most camel herds in Kenya. The results of the present study show that the disease was endemic in this herd as evidenced by the serological and parasitological results. Correct diagnosis of the disease is essential for appropriate treatment to be made. This effort however, is hindered by the lack of a sensitive and specific diagnostic kit. Suratex®, a test that detects circulating trypanosome antigens was the most sensitive in detecting infections, although it failed to detect some parasitilogically positive cases. This may occur during the early stages of the disease before sufficient trypanosomes have been destroyed by the host immune response to release measurable quantities of antigen in peripheral circulation (Nantulya and Lindqvist 1989). In some instances some positive camel calves were reported to lick soil. This behaviour was not recorded in other calves. We do not have an explanation for this

but it may indicate depletion of some minerals and/or depraved appetite (pica), which might be trypanosomosis related.

Infections and mortality due to trypanosomosis were high during the wet season, possibly due to accompanying increase in fly numbers. The only trypanosome species recorded was *T. evansi*. The absence of other trypanosome species could be due to lack of the tsetse fly vectors in the study area. Immature camels had a higher disease incidence, suggesting a higher exposure to the biting flies and/or higher susceptibility to trypanosomosis. The lower disease incidence observed in suckling camels may be attributed to less exposure to biting flies (suckling are left in boma during grazing time) and protection by maternal antibodies during suckling. The devastating effects of the disease were evident in the anaemic state of the immature camels. This may result in a slow growth rate, a longer duration to maturity, and even death.

Introduction of the Pakistan breed in Kenya was an effort to improve camel husbandry especially in terms of milk production. It has however been shown from previous studies that these breeds are more susceptible to trypanosomosis than the local ones (Njiru et al. 1998). This is further supported by the amount of trypanocides used on them when compared to other breeds. The Pakistan camel is therefore being crossbred with local breeds in order to overcome its high susceptibility to infection. The resulting crossbred calves were less susceptible to trypanosomosis than pure Pakistan ones. However, longitudinal studies are necessary in order to monitor their reproductive and productive performance in trypanosomosis endemic areas.

From the foregoing it is evident that trypanosomosis is a major constraint to camel husbandry. Constant surveillance followed by instant and proper treatment could however, contain the situation. We would therefore, recommend strategic control of trypanosomosis in calves by avoiding areas in which vectors are in large numbers, use of more than one diagnostic kit and application of pour-ons rather than blanket treatment with trypanocides. This would improve the camel calf, hence assurance of the camel stock.

**ACKNOWLEDGEMENTS**

The authors would like to thank the staff of Biochemistry and Immunology divisions at KETRI for their participation in this study, Dr. Chris Field for allowing us to monitor his

camels and Dr. V. Nantulya for donating Suratex®. This work received financial assistance from the Kenya Government and FARM-Africa, and is published with kind permission of the Director, XETRI.

**REFERENCES**

Baumann, M. P. O. & Zessin, K. H. 1992. Productivity and health of camels (*Camelus dromedarius*) in Somali: Associations with Trypanosomiasis and Brucellosis. *Trop. Anim. Hlth. Prod. 24*:145-156.

Kenya Trypanosomiasis Research Institute (KTRI). 1998. Strategic plan of 1990-2000. p 7. Revised Edition, Visions design, Nairobi.

Nantulya, V. M. 1994. Suratex®: A simple latex agglutination antigen test for diagnosis of *Trypanosoma evansi* (Surra). *Trop. Med Parasitol. 45*:9-12

Nantulya, V. M. & Lindqvist, K. J. Q. 1989. Antigen detection enzyme immunoassays for the diagnosis of *Trypanosoma vivax*, *T. congolense* and *T. brucei* infections. *Trop. Med. Parasitol. 40*:267-272

Njiru, Z. K., Ouma, J. O., Ndung'u, I. M & Simpkin, P. S. 1998. Packed cell volume (PCV) in diagnosis of Surra in the field pp 23. *In*: The proceedings of 7th KETRI Internal Annual Scientific Review. Outreach and communication press, KETRI, Kenya.

Olaho-Mukani, W. M., Mutugi, M. W., Kuto, B., Alushula, H., Kagwima & Njogu, A. R. 1987. The role of trypanosomiasis as a constraint to camel production in Kenya pp135-141. *In*: The proceedings of the 8th Annual Medical Scientific Conference, Nairobi Kenya.

Schalm, O. W., Jain N. C & Caroll, E. J. 1975. Veterinary haematology, 3rd Edition., Lea and Febinger, Philadelphia.

Simpkin, S. P., Rowlison, P, Tullu, D & Lesorogol, P. 1997. A comparison of two traditional camel calf management systems in Kenya and their implications for milk production. *J. Camel. Pract. Res. 2*:229-234.

Wilson, R. T. 1970. The camel. Longman, London and New York.