RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES
ISSN 2221-1896
www.roavs.com

First field investigation report on the prevalence of trypanosomosis in camels in northern Tanzania

E. S. Swai, W. Moshy, E. Mbise, J. Kaaya and S. Bwanga

Veterinary Investigation Centre, PO Box 1068, Arusha, Tanzania

Abstract

Parasitological evaluation of equine trypanosomosis in 193 camels (49 male and 144 female) from 8 geographical localities of northern, Tanzania were carried out during the period of June-August 2010. The evaluation was carried out using Giemsa stained microscopy examination of blood smear. The overall detected prevalence of camel trypanosomosis was 8.2% with highest prevalence in Kilindi district (100%) and with most of the positive slides showing 2+ and 3+. A higher infection was found in brought-in as compared to homebred camels (18.1% *vs.* 0.9%; P<0.05). When body score condition was considered, infection rate was 100, 6.8 and 3.5% in camels recorded to have poor, fair and good body score, respectively. It was concluded that camel trypanosomosis is prevalent in camel herds and administrative localities, source, and body condition score were identified as important risk factors for the distribution of camel trypanosomosis in the area under study. To our knowledge, this is the first report for the detection of trypanosome pathogen in camels in Tanzania.

Key words: Camels, prevalence, risk factors, Tanzania, trypanosomes

Introduction

Tsetse-transmitted animal and human trypanosomosis is considered to be one of the major constraints to improved livestock and agricultural production in sub-Saharan Africa (SSA) (Kristjanson et al., 1999). It is currently estimated that about 66 million people and 48 million cattle are at risk of contracting African trypanosomosis from the 23 species and 33 subspecies of tsetse flies infesting 10 million km^2 of Africa stretching across 40 countries (WHO, 1998; Kristjanson et al., 1999). Tsetse transmitted African trypanosomosis is responsible for 55,000 human and 3 million livestock deaths annually (Mulumba, 2003; Abenga et al., 2002).

In Tanzania, it is estimated that 11 million head of cattle, 7 million small ruminants, nearly 4 million people and 2 million wildlife animal species are at the risk of contracting trypanosomosis at any one time (MoAC, 1998), though these figures many vary over years. Consistently about 13,127,000 ha of agriculturally suitable land for livestock and wildlife grazing is tsetse infested (MoAC, 1998). The most important tsetse-borne diseases in Tanzania include bovine and human trypanosomosis caused by the four major species of salvarian trypanosomes namely, *T. congolense*, *T. vivax* and *T. brucei brucei* and *T. brucei rhodesiense*. One of the major factors influencing the transmission of animal and human trypanosomosis is the vector-tsetse fly distributions (Ford and Katondo, 1977). The main field vectors for transmission of trypanosomosis includes the seven species of Glossina, namely *G. morsitans*, *G. pallidipes*, *G. longipennis*, *G. brevipalpis*, *G. austeni*, *G. swynertonni* and *G. fuscipes* (Ford and Katondo, 1977).

While animal trypanosomosis mainly in cattle and small ruminants is well documented in Tanzania, on the contrary, information on camel trypanososmosis is not known and not available (Nonga and Kambarage, 2009). Camel trypanosomosis, also known as surra, is caused by *Trypanosoma evansi*. The disease is the most important single cause of economic losses in camel rearing areas, causing morbidity of up to 30.0% and mortality of around 3.0% (Njiru et al., 2001).

The present study was planned to investigate the prevalence of *T. evansi* infection in camels and to assess the relationship between trypanosomes prevalence and some risk factors responsible for maintenance and transmitting the disease in the northern geographical localities of Tanzania.

Materials and Methods

This cross-sectional study was conducted in randomly selected camels belonging to eight districts of the Tanga, Kilimanjaro, Arusha and Manyara regions, north Tanzania. The eight districts which covers an area

of 51,974 km^2, lies between Latitude 2^o 11' and 6^o 14' South of Equator, and Longitude 35^o 11' and 38^o 26' East of Greenwich. The climate is sub-humid with temperatures ranging from 14^{o}C to 23^{o}C on high elevation areas and 30^{o}C to 37^{o}C along north coastal Indian Ocean shore. The study areas experiences two main seasons, the dry season, from May to October and the wet season, from November to April with rainfall ranging from 635 mm to 3,050 mm, with low rainfall in the low laying areas and high rainfall on high altitude and plateau areas. The amount and duration of rainfall varies from year to year and from season to season.

The study subjects were all ages, sexes, indigenous breeds of camel, (one hump camel) reared under extensive husbandry which allows free grazing, usually mixed with livestock from other villages. The list of all camel owners in each district was obtained from District Livestock Office and further validated from the data we obtained from Heifer Project International country office, the main supplier of the camels in Tanzania. Data were collected using semi-structured questionnaire and information asked included herd size, source of animals classified as homebred or brought–in, sex, age retrieved from owner herd record. Body condition of camels was assessed visually and rated as poor, fair and good. Field survey was conducted during the period of June to August 2010.

Sampled camels were restrained in a kraal or boma using sisal ropes and nose rings. Thin blood was drawn from ear vein using a sharp hypodermic needle. A drop of blood was taken near one end of the clean glass slide and another slide used to prepare the blood smear**.** The dried blood smears were fixed in methyl alcohol (absolute) for 5 min and allowed to dry. The dry smears were placed in a glass staining jar containing working 10% Giemsa stain for 20 min. Subsequently the smears were taken out and washed with phosphate buffer solution (PBS) to remove excess stain. The slides were allowed to dry in air and then examined by microscope under oil immersion with a 100x objectives lens (Murray et al., 1979) for the detection of trypanosomes in the blood. Ten fields in each smear were examined in order to establish whether the smear was positive or negative. Quantification of the number of parasites (parasitemia level) was done by physical counting of the parasites (Murray et al., 1982). Species identification was confirmed by morphological examination of trypanosomes on Giemsa stained thin blood smear as described by (Murray et al., 1977).

Statistical analysis

Data collected from each study animal and laboratory analyses were coded into appropriate variables and entered in Epi-info (version 6.04d, CDC, Atlanta, USA). Biostatistical analysis was performed using Epi-info (version 6.04, CDC, Atlanta, USA). The point prevalence was calculated for all data as the number of infected individuals divided by the number of individuals sampled x 100. Categorical data were analyzed by using Chi-square (χ^2) test of independence. In all the analyses, a value of $p < 0.05$ was considered significant.

Results and Discussion

Over all, fourteen herds from 8 geographical localities of northern Tanzania were visited, owner or any other household member interviewed and 193 (49 male and 144 female) animals examined/sampled during the period of June-August 2010 (a 100% response rate). The interviewed households had about 338 camel with an average (mean ± SD) herd size of 24.1± 21.9, (range, 3-72).

The overall prevalence of trypanosomosis in camels was recorded as 8.3%. Affected camels showed increased body temperature, emaciation, dullness, impaired appetite and laboured breathing. The prevalence rates ranged from 0 % (Same, Mwanga, Monduli, Arumeru, Simanjiro) to100% (Kilindi) (Table 1), and in camels in Kilindi had the highest prevalence rate (100%), which is significantly different from that of the other administrative localities. These results are parallel with the investigations made by Tekle and Abebe (2001) and Pathak et al., (1993), who reported 10.9% and 7.5 % prevalence of *T. evansi* in camels, respectively. This overall rate of prevalence was slightly lower than that reported for camels in arid to semi arid regions of west and north Africa (Delafosse and Doutoum, 2004). But this prevalence rate is higher than that reported in Somalia and West Africa (Dirie et al., 1989; Baumann and Zessin, 1992; Dia et al., 1997; Joshua et al., 2008). One possible explanation for the lower prevalence rate detected in this study could be or related to distribution, challenge and density of parasite vector – the tsetse flies as well as vector control management practices (Ford and Katondo, 1977). A more plausible explanation for the differences in prevalence rate could be the different sensitivity of different test methods, because different microscopic methods could result in small difference in positive rates in the survey of camel infection with *T. evansi*. For example, Delafosse and Doutoum, (2004) compared the effectiveness of different methods including Buffy coat technique (BCT), haematocrit centrifugation technique (HCT) and card agglutination test (CAT) for detecting trypanosomes and the results showed that the positive rate obtained using CAT and HCT were higher than that obtained using BCT method (Ngaira et al., 2002). Microscopic examination of blood smears was used in the present study because of its simplicity and easy handling, even in a developing country, in addition to lacks of the equipments needed

for Enzyme-linked immunosorbent assay (ELISA) and Polymerase chain reaction (PCR) in its rural districts. Magona et al., (2003) reported 78% sensitivity and 27% specificity when compared to gold standard tests, i.e. ELISA and PCR.

Table 1: Administrative localities and sex-wise prevalence of trypanosomes in camels

District	Male	Positive (%)	Females	Positive (%)	Overall (%)
Same	3	0(0)	9	0(0)	0(0)
Mwanga	2	0(0)	6	0(0)	0(0)
Hai	4	0(0)	16	1(6.3)	1(5)
Meru	7	0(0)	13	0(0)	0(0)
Monduli	7	0(0)	0	0(0)	0(0)
Longido	17	0(0)	67	0(0)	0(0)
Simanjiro	7	0(0)	20	0(0)	0(0)
Kilindi	2	2(100)	13	13(100)	15(100)
Total	49	2(4.08)	144	14(9.7)	16(8.3)

No significant sex related differences (P>0.05) in prevalence were observed in camels. Other studies in Asia have also reported sex related differences in prevalence in camels (Shah et al., 2004) where females (15.68%) were observed to be more susceptible to disease than their male (11.76%) counterparts.

Infection rate according to body condition score was recorded and the results highlighted highest prevalence in animals rated to be at poor to fair compared to good body score counter part animals, respectively (Table 2). Higher infection recorded in poor to fair scored animals might be due to lowered body resistance due to nutritional stress or other concurrent infections and therefore rendering them more susceptible to *T. evansi* infection.

Prevalence varied with the mode of acquisition of the animals (Table 3). Brought-in animals were significantly more likely to be positive for *T. evansi* than were homebred animals. This finding may suggest that, most farmer dispose off their camel stock because of various reasons, which include diseases.

Age-wise analysis revealed that there was no significant difference in prevalence between age groups. However, the present finding is in agreement with reports of few workers (Pathak and Khanna, 1995) who reported that all camels were equally susceptible to trypanosome infection regardless of breed and age.

Table 2: Body condition score-wise prevalence of trypanosomes in camel

Score	Number sampled	Total number positive for trypanosomes	Prevalence (%)
Poor	6	6	100
Fair	102	7	6.8
Good	85	3	3.5

Table 3: Animal source-wise prevalence of trypanosomes in camel

Score	Number sampled	Total number positive for trypanosomes	Prevalence (%)
Brought-in	83	15	18.1
Home bred	110	1	0.9

In conclusion, results of the present investigation indicated for the first time that camel trypanosomosis is prevalent in northern Tanzania. Therefore enhanced integrated vector and parasite strategies and measure should be carried out to prevent and control *T. evansi* infection. In agreement with established evidences, this study also indicated administrative localities, source, and body condition score as important risk factors for the distribution of camel trypanosomosis in the area. Therefore further studies should be conducted to substantiate the above findings so that the actual prevalence of the disease and species involved is determined and a feasible method of prevention of infection with trypanosome parasites implemented.

Acknowledgements

We thank MoLD&F for funding this work. The excellent cooperation of camel owners and extension field staff is highly acknowledged. We thank the Director, Veterinary Service for permission to publish the paper.

References

Abenga, J. N., Ewenzor, F.N.C., Lawani, F.A.G., Ezebuiro, C., Sule, J. and David, K.M. 2002**.** Prevalence of trypanosomiasis in trade cattle at slaughter in Kaduna State, Nigeria. *The Journal of Parasitology*, 23: 107-110.

Baumann, M. P. and Zessin, K.H. 1992**.** Productivity and health of camels (Camelus dromedarius) in Somalia: associations with Trypanosomosis and brucellosis. *Tropical Animal Health and Production,* 24(3):145-156

Delafosse, A. and Doutoum, A.A. 2004. Prevalence of Trypanosoma evansi infection and associated risk factors in camels in eastern Chad. *Veterinary Parasitology,* 119(2-3):155-164.

Dia, M.L., Diop, C., Aminetou, M., Jacquiet, P. and Thiam, A. 1997**.** Some factors affecting the prevalence of Trypanosoma evansi in camels in Mauritania. *Veterinary Parasitology,* 72(2):111-20.

Dirie, M.F., Wallbanks, K.R. and Aden, A.A. Bornstein, S. and Ibrahim, M.D. 1989. Camel Trypanosomiasis and its vectors in Somalia. *Veterinary Parasitology,* 32(4):285-91.

Ford, J. and Katondo, K.M. 1977**.** Maps of tsetse fly (Glossina) distribution in Africa 1973, according to sub-generic groups on scale of 1:5,000,000. *Bulletin of Animal Health and Production in Africa,* 15: 188-194.

Joshua, K., Turaki, A.U., Egwu, G. O., Mani, A.U., Saidu, M.K., Abdullahi, J.G. and Hussaini, H.A. 2008**.** Haemoparasites of camels (Camelus dromedarius) in Maiduguri, Nigeria. *Animal Research International,* 5: 2

Kristjanson, P.M., Swallow, B.M., Rowlands, G.J., Kruska, R.L. and Leeuw, P.N. 1999**.** Measuring the costs of African animal trypanosomosis: the potential benefits of control and returns to research. *Agricultural systems,* 59: 79-98.

Magona, J. W., Mayende, J. S., Olaho-Mukani, W., Coleman, P.G., Jonsson, N. N., Welburn, S.C. and Eisler, M.C. 2003. A comparative study on the clinical, parasitological and molecular diagnosis of bovine trypanosomosis in Uganda**.** *Onderstepoort Journal of Veterinary Research,* 70(3): 213-218.

Ministry of Agriculture and Cooperatives (MoAC)., 1998**.** 13th Coordination meeting on Framing in Tsetse Control Areas of East Africa, Kampala, Uganda, 7-8 May 1998. Prepared by Tsetse and Trypanosomiasis Control Section, Dar-es-Salaam

Mulumba, K. 2003**.** Socio economic and agricultural factors in the research and control of trypanosomiasis. PAAT technical and scientific series 4. FAO/ WHO/ IAEA/ OAU.

Murray, M. D., Murray, P.K. and McIntyre, W. I.M. 1977. An improved technique for the diagnosis pf African trypanosomes. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 71: 325-326.

Murray, M. D., Clifford, J. and McIntyre, W. I. M. 1979. Diagnosis of African Trypanosomiasis in bovine. Trans. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 73: 120-121.

Murray, M., Morrison, W.I. and Whitelaw, D.D. 1982**.** Host susceptibility to African trypanosomiasis: trypanotolerance. *Advances in Parasitology,* 21: 1-68

Ngaira, J. M., Bett, B. and Karanja, S.M. 2002. Animal-level risk factors for Trypanosoma evansi infection in camels in eastern and central parts of Kenya. *Onderstepoort Journal of Veterinary Research,* 69(4): 263-271.

Nonga, H. E. and Kambarage, D.M. 2009**.** Prevalence of bovine trypanososmis in Morogoro, Tanzania. *Pakistan Journal of Nutrition,* 8(3): 208-213.

Njiru, Z.K., Ole-Mepeny, I.M., Ouma, J.O., Ndungu, J.M. and Olaho-Mukani, W. 2001**.** Prevalence of trypanosomiasis in camel calves: a pilot study in Laikipia District of Kenya. *Revue d'elevage et de médecine vétérinaire des pays tropicaux*, 34: 183-186.

Pathak, K.M., Arora, J.K. and Kapoor, M. 1993**.** Camel trypanosomosis in Rajasthan, India. *Veterinary Parasitology,* 49(2-4):319-23.

Pathak, K.M.L. and Khanna, N.D. 1995. Trypanosomiasis in camel(*Camelus dromedarius*) with particular reference to Indian sub-continent: a review. *International Journal of Animal Science,* 10: 157-162.

Shah, S. R., Phulan, M.S., Memon, M.A., Rind, R. and Bhatti, W.M. 2004. Trypanosomes infection in camels. *Pakistan Veterinary Journal,* 24(4): 2009-210

Tekle, T. and Abebe, 2001. Trypanosomiasis and helminthoses: major health problems of camels(*Camelus dromedarius*) in the Southern rangelands of Borena, *Ethiopia. Journal of Camel Practice Research*, 8(1): 180-181

WHO 1998. Control and surveillance of African trypanosomiasis. A report of WHO expert committee. WHO technical report series no. 881 WHO Geneva.