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Seasonal prevalence of bovine trypanosomosis in Abu Hugar District, Central Sudan

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Summary

During a period of one year, trypanosomosis surveys were conducted in a tsetse-free area of Sennar state, central Sudan. In the study area randomly selected cattle were sampled and their blood was investigated using parasitological diagnostic methods. At the same time the population of biting flies was sampled and identified. The monthly average prevalence of bovine trypanosome infection in the study area was rcorded. Trypanosome infections in the study area were found to be mainly due to *Trypanosoma vivax.* These infections significantly reduced the average packed cell volume of the affected animals. The monthly prevalence of infection was coincided with the density of biting flies, such as *Tabanus* and *Stomoxys* spp. This may indicate the important role of mechanical transmission in the epidemiology of bovine trypanosomosis in the area.

Introduction

Animal trypanosomosis is of tremendous importance to the Sudan. It does not only affect the distribution of cattle, but also the distribution and even the habits of the principal tribes (Lewis, 1949). In Bahar El Gazal and Equatoria states, the disease is so severe that cattle are not kept in tsetse-fly areas. However, it is in the central region outside the tsetse fly belt, animal trypanosomosis chiefly flourishes, usually in the cattle of the nomadic tribes of central Sudan (The *Baggara* in Kordofan and Darfur states, *Kenana, Rufaa, Seliem* of the Blue and White Nile States). These nomads trek their animals from the tsetse-free open grass plains into the fly-infested savanna wood-land for dry season grazing where their cattle become infected with trypanosomes (Lewis, 1953).

Animal trypanosomosis; *T. vivax, T. congolense* and *T. brucei,* are transmitted mechanically by blood sucking and biting flies (Desquesnes and Dia, 2003, 2004; Mihok *et al.,* 1995). This occurs during the rainy season when cattle usually return for the wet season grazing in central Sudan
(Abdalla and Elmalik, 2003; Abdalla *et al.,* 2005). The disease occurs through the agency of biting flies of the families Tabanidae, Muscidae and
Hippoboscidae (Abdalla and Elmalik, 2003; Abdalla *et al.*, 2005). This survey was conducted to determine the prevalence of trypanosome infections in cattle in the area of Abu Hugar, central Sudan and to identify the seasonal changes in the prevalence rate of the disease.

Materials and Methods

Study area: The investigation was conducted for one year from May, 1999 to April, 2000 at an area about 15 Km south of Singa Town, the capital of Sennar State, central Sudan. The area is famous for its indigenous *Kenana* breed of dairy cattle and the *Watish* breed of sheep. The annual rainfall was about 300 mm. The ambient temperature ranges from as low as 15°C in January (winter) to above 40 °C in the hot dry season (summer). The relative humidity ranges between 25% (dry) to 85% in wet seasons. Chemotherapy is the only trypanosomosis control method used in the study area. Veterinary supervision is inadequate, which may lead to the inappropriate use of drugs or use of drugs of substandard quality. Natural vegetation is affected by cultivation during the rains and irrigated plots along the bank of Blue Nile. The main trees are of *Acacia* spp. and *Balanites* spp. Grass is plenty during the rains, but it becomes drier and scarce in dry season. For these reason nomadic herds of cattle, sheep and goats are trekked south-wards as far as the river *Khor Yabus* where they contact tsetse and become infected with trypanosomes (Mohamed-Ahmed, 1989).

Sampling method: The parasitological diagnostic tests used were those described by Paris *et al.* (1982). Between May 1999 and April 2000, a total of 500 head of cattle were sampled. Blood was collected from an ear vein into heparinized microhaematocrit centrifuge capillary tubes and onto glass slides in order to make thick and thin blood smears. The capillary tubes were sealed with "Cristaseal" (Hawksley, UK) and centrifuged immediately in a microhaematocrit centrifuge for 5 min at 9000 rpm. After centrifugation, the packed cell volume (PCV) was determined. Animals with a PCV $\leq$ 24% were considered to be anaemic. The buffy coat and the uppermost layer of red blood cells in each specimen were extracted, placed onto a microscope slide and examined under a phase contrast microscope with a X40 objective lens for the presence of motile trypanosomes. The thick and thin blood smears were stained with Giemsa and examined under a light microscope using a x 100 oil immersion objective lens.

Entomological survey: The population of biting flies was monitored using unbaited canopy traps (Challier *et al.*, 1977). Three traps were deployed in representative habitats in the study sites for 4 days each month. Records were kept of the fly species and number of each species captured in each trap during each month. The monthly mean of apparent abundance (AA) of biting flies in the study sites was calculated as the mean number of biting flies captured per trap per month.

Statistical analyses: The prevalence rate of infection, monthly mean and standard deviation of trap catches of biting flies and PCV were recorded. For monthly proportions student t-test for trap catches against months was carried. The relationship between the prevalence rate of trypanosome infection and the AA of biting flies was determined to show correlation. Before analysis the data of biting flies pooled and transformed into Log_{10} (n+1) also percentage of prevalence rate of infection.

Results

A total of 22 animals were found to be infected with trypanosomes. The average parasitological prevalence was 4.4%. The infected animals were found harbouring *Trypanosoma vivax*. (Table 1). The average PCV of the animals infected with trypanosomes was 22.1 ± 3.4% in the study area. It was significantly lower (P = 0.001) than the average PCV of the animals that were parasitologically negative (29.1 ± 2.2 %). Throughout the entomological surveillance period, no tsetse flies were captured in the area. *Tabanus* (*T. taeniola, T. agrestis and T. sufis*), *Hippobosca* spp., *Stomoxys calcitrans* were biting flies captured in the area. The AA of biting flies showed a clear seasonal trend with high AA peak in September and October, respectively (Table 1). The monthly AA of biting flies correlated significantly (P= 0.03) with the prevalence of trypanosome infections in the preceding months of high peak (October and November).

Discussion

The results of this study further confirm that trypanosomosis still constitutes an important disease of cattle in the central Sudan. Taking into account the low sensitivity of the parasitological diagnostic methods and the uncontrolled use of trypanocidal drugs, the real prevalence of infection is probably substantially higher. (Abdalla *et al.*, 2005).

The prevalence of trypanosome infections increased substantially during the rainy season (June to October) and remained high during the early dry season (November). Outbreaks of acute *T. vivax* in Sudan cattle
have been associated with increased rainfall (Elkarib, 1961; Abdalla and ElMalik, 2003; Abdalla *et al.*, 2005; Boeder *et al.*, 1984; D'Amico, *et al.*, 1996) The correlation between the prevalence of trypanosome infections and the AA of biting flies also suggests a close link between trypanosomosis challenge and the number of biting flies (Rahman, 2005). The trypanosome infections in the study area was due to *T. vivax*. This high proportion of *T. vivax* infections is in accordance with the observations made in other tsetse-free areas of Sudan demonstrated a high level of interaction between cattle and biting flies during the rainy season. (Abdalla and Elmalik, 2003; Abdalla *et al.*, 2005; Rahman, 2005). However, the role of mechanical transmission of *T. vivax* in such areas cannot be underestimated. Similar conclusions were drawn by Kidanemariam *et al.* (2002) who conducted surveys along the edge of the tsetse-belt in southern Ethiopia. Although it has been shown that *T. congolense* and *T. brucei* can be transmitted mechanically, the transmission rate is usually low (Mihok *et al.*, 1995). The presence of trypanosome infections resulted in a significant decline in PCV and body condition score. Other factors such as malnutrition or other diseases may also affect the PCV and body condition. However, it is unlikely that the impact of those additional factors differs greatly between the parasitologically positive and negative animals.

From the present study it can thus be concluded that trypanosomosis is an important disease and still constitutes a potential threat to the health and productivity

of cattle in the economically important central Sudan. The relative epidemiological importance of the various species of biting flies may need further studies.

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Table 1. Mean and standard deviation of pooled biting flies and prevalence rate of trypanosomosis

Month	Pooled Tabanidae		Pooled Muscidae		Trypanosomosis rate	
	Mean±SD	Log_{10} (n+1)	Mean±SD	Log_{10} (n+1)	Prevalence Rate %	Log_{10} (n+1)
May	9.5±1.12	1.02	34.75±1.43	1.55	0.2	0.08
June	12.75±0.82	1.14	61.75±1.09	1.79	0.2	0.08
July	30.25±1.21	1.47	132.5±1.8	2.13	0.4	0.15
August	35.38±1.43	1.561.69	181.5±2.29	2.26	0.2	0.08
September	48.25±1.38	1.69	231.25±1.79	2.36	0.2	0.86
October	47.5±1.12	1.68	143.5±1.12	2.16	1.2	0.7
November	12±1.24	1.11	114.75±1.48	2.06	0.8	0.15
December	4.25±0.91	0.72	34.5±1.8	1.55	0.4	0.08
January	5.13±0.97	0.79	29.5±1.6	1.48	0.2	0.08
February	3.63±1.44	0.67	9±1.41	1	0.2	0.08
March	4±1.16	0.69	13.5±1.48	1.16	0.2	0.8
April	2.63±1	0.56	13.75±1.47	1.17	0.2	0.08