

The prevalence of trypanosomosis in small ruminants and pigs in a sleeping sickness endemic area of Buikwe County, Mukono district, Uganda

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Key words

Sheep - Goat - Pig - Trypanosomosis - *Trypanosoma brucei* - *Trypanosoma congolense* - *Trypanosoma vivax* - *Trypanosoma brucei rhodesiense* - Endemics - Parasitemia - Uganda.

Summary

A survey of trypanosomosis in goats, sheep and pigs was carried out in Buikwe County, Mukono District of South Eastern Uganda between April and August 1994. Infection rates of 8.8 % in 204 goats, 26.7 % in 60 sheep and 32.4 % in 68 pigs of all ages and both sexes were recorded. *Trypanosoma brucei* parasites were found in goats and pigs, *T. congolense* in sheep and pigs and *T. vivax* in goats and sheep. Infection rates were similar in both sexes of animal species and it was observed that *T. vivax* caused high levels of parasitaemia while *T. brucei* infections were associated with very low levels of parasitaemia. *Trypanosoma brucei* infections accounted for 66.7 % and 30 % of all infections in goats and pigs, respectively. It is postulated that some of these *T. brucei* parasites could be *T. b. rhodesiense*, the causing agent of sleeping sickness in this area.

■ INTRODUCTION

Most studies on the prevalence of trypanosomosis in sleeping sickness foci have been carried out in cattle with less emphasis placed on small ruminants and pigs. Sheep and goats have often been used in studies on experimental trypanosomosis as models for the disease in cattle because they are considered as convenient hosts rather than possibly important hosts of the parasite (1). However, recent epidemiological studies from Ethiopia (2), Tanzania (7) and Zaire (3) have reported high infection rates in sheep and goats. In sleeping sickness foci, it is becoming increasingly recognised that small ruminants and pigs are capable of acting as reservoir hosts of infections which can later be passed onto other animals and humans (2). The significance of this possibility is emphasized by the fact that small ruminants and pigs are not normally involved in trypanosomosis control programmes, which are largely reserved for cattle. Buikwe County, in Mukono district of Uganda, lies on the northern shores of Lake Victoria, an area known to be endemic for sleeping sickness. There is no previous report of trypanosomosis in small ruminants and pigs in this area. This study therefore aims at providing information on the prevalence of trypanosomosis in these animals in a tsetse-challenged area.

■ MATERIALS AND METHODS

Study area

The survey was carried out over a period of six months (April-September 1994) in Buikwe County. This area is near Jinja and

Iganga, South East Busoga, the sites of recent human trypanosomosis epidemics (1980 and 1989). Mabira forest covers a large portion of this area.

Animals

A total of 332 animals comprising 204 goats, 60 sheep and 68 pigs were sampled over a period of six months. Animals of all ages and sexes were involved in the survey. Goats in this area are kept peridomestically by either tethering or free grazing. Sheep, on the other hand, tend to go along with cattle, and pigs are usually tethered near the homestead.

Sample collection and examination

Blood samples (5 ml) were obtained from the jugular vein into tubes containing ethylene diamine tetra acetic acid (EDTA) as an anticoagulant for estimation of packed cell volume and parasitaemia by the buffy coat/darkground method (6, 11). Thick smears were made on the spot by a puncture of the ear vein and thin smears were made in the laboratory for identification of trypanosome species. Packed red cell volume and estimation of parasitaemia were performed within six hours of sample collection. Examination of stained smears was carried out within one week.

■ RESULTS

Infection rates

It was observed that 56 (16.8 %) out of 332 animals sampled were positive for one or more trypanosome species.

In goats, 18 (8.8 %) were positive. Two thirds (12) of these infections were due to *Trypanosoma brucei*, 4 to *T. vivax* and 2 to

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mixed *T. brucei* and *T. vivax*. No *T. congolense* parasites were detected in goats.

In sheep, 16 (26.7 %) were positive for one or more trypanosome species; A quarter (4) of the infections were due to *T. vivax*, half (8) to *T. congolense* and 4 to mixed *T. congolense* and *T. vivax*. No *T. brucei* parasites were found in sheep.

In pigs, 22 (32.4 %) were positive for trypanosomes. Ten of them were due to *T. congolense*, 6 to *T. brucei* alone and 4 to mixed *T. brucei* and *T. congolense* infections. Trypanosomes found in two pigs could not be categorised into a species type.

T. brucei accounted for 37.5 %, *T. congolense* for 40.6 % and *T. vivax* for 21.9 % of all identified trypanosomes.

Management and sex influences

It was observed that goats which were tethered had lower infection rates than animals let free to graze on the fringes of the forest. The sex of the animal did not influence infection rates.

Parasitaemia patterns

By the buffy coat/darkground method, it was observed that *T. vivax* induced highest intensity of parasitaemia in sheep and goats. In more than 50 % of *T. vivax* infections, parasitaemia was greater than 4+ (i.e. 4-10 trypanosomes per field).

T. congolense infections had low parasitaemia in sheep and goats but was high in pigs. More than 50 % of *T. congolense* infected pigs had parasitaemia scores of 3+ (i.e. 1-3 trypanosomes per field of observation).

T. brucei infections had very low parasitaemia intensities in goats and pigs and no *T. brucei* parasites were detected in sheep. All infections had parasitaemia scores of 1-2+ (i.e. 1-10 trypanosomes in the whole slide).

Clinical picture and packed red cell volume (PCV)

All animals sampled were apparently healthy. However, the PCV values of all trypanosome infected animals were lower than those of non-infected animals, irrespective of the infecting trypanosome species. Packed red cell values in infected animals ranged from 20-24 % while uninfected animals had PCV values ranging from 29-40 %, not considering small breed variations in PCV values. Unfortunately, the positive animals have not been monitored beyond the study period.

■ DISCUSSION

The present survey revealed that infection rates in small ruminants and pigs are high in Buikwe County in Mukono district. It was observed that 16.8 % of the animals sampled were positive for trypanosome parasites and that *T. brucei* accounted for 14 out of 18 infections in goats and 10 out of 22 infections in pigs. On the other hand, *T. congolense* was responsible for 50 % of trypanosome infections in sheep and 14 out of 22 infections in pigs while *T. vivax* was detected in 6 out of 18 positive goats and 6 out of 16 positive sheep. Overall, 8.8 % of the goats, 26.7 % of the sheep and 32.4 % of the pigs were positive for parasites. These infection rates are higher than those recorded by Okuna and Mayende (9) in the neighbouring district of Iganga, the scene of the previous sleeping sickness epidemic of 1989. They reported infection rates of 1 % in goats and 6 % in sheep. There are no other comparable studies reported from Uganda. However,

Mwambu *et al.* (7) in a survey in Kigoma region of Tanzania reported 4.1 % infection rates in sheep and 3.4 % in goats. Their observations agree with those of Robson and Ashkar (12) on trypanosomosis studies in sheep and goats in the Lambwe Valley of Kenya.

The high infection rates found in this study suggest that the disease is more important in sheep and goats than was previously believed. Twelve of the 18 positive goats had *T. brucei*, 4 had *T. vivax* and 2 had mixed *T. brucei* and *T. vivax* parasites. No *T. congolense* parasites were detected in goats. At the same time, *T. brucei* infections (single and mixed) accounted for 42.9 % of all positive cases. These observations contradict those of Mwambu *et al.* (7) who found that more than half of the trypanosomes in goats belonged to the *T. congolense* group, 35.7 % to that of *T. vivax* and 12.3 % to that of *T. brucei*.

Trypanosoma brucei parasites show very low parasitaemia and unless more sensitive methods are used, e.g. concentration techniques, many of them may be missed. Management of goats appeared to influence their infection rates in that tethered animals had lower rates than animals let free to graze. This may be associated with the fact that tsetse are attracted by moving objects and grazing animals get deeper in the forest hence increasing their chances of being bitten by tsetse.

In pigs, 10 of the 20 positive cases had *T. brucei* parasites and the rest of them *T. congolense*. No *T. vivax* was detected in pigs. These observations agree with those of Makumyaviri *et al.* (5) who recorded *T. congolense* infection rates of 76.2 % and *T. brucei* rates of 16.0 % in pigs in a sleeping sickness area of Bas Zaire. No studies on the prevalence of trypanosomosis in pigs have been carried out in Uganda, apart from that of Okuna *et al.* (10). The present study has shown that trypanosomosis is prevalent in pigs on tsetse-infested northern shores of Lake Victoria. In this area where *Glossina fuscipes fuscipes* has been shown to be peridomestic (8), pigs, like small ruminants, are kept in close contact with people.

Infection rates in pigs recorded in this study are higher than those reported by Okuna *et al.* (9). In the area under investigation here, pigs are kept by households where there is no cattle. In the absence of cattle, for which it has been suggested that they were the main source of blood meal for tsetse in the area (4), tsetse would feed on pigs as alternative sources of blood meal, thus explaining the high infection rates.

No isolates of *T. brucei* infections were subjected to the blood incubation infectivity test (BIIT) to determine their ability to infect humans. However, in Kiguru and Bugweri counties of the Iganga district, not far from Buikwe County, Okuna and Mayende (10) sampled from cattle *T. brucei* which, via BIIT, was proved to be *T. b. rhodesiense*. Similarly, Mwambu *et al.* (7) observed that 16.7 % of *T. brucei* isolates obtained in the Kigoma region of Tanzania gave reactions indicative of *T. b. rhodesiense*. It is therefore likely that some of the *T. brucei* infections found in goats and pigs are *T. b. rhodesiense*, the cause of sleeping sickness in the area. What has clearly emerged, however, is that goats, sheep and pigs are infected with trypanosomes and they can act as reservoirs of these trypanosomes which could later be passed onto other susceptible animals and possibly humans. Goats, sheep and pigs are never treated either chemotherapeutically or chemoprophylactically against trypanosomosis as they are normally presumed to be free of the disease. The fact that they are able to harbour the parasites for a long time and yet maintain fairly good body condition makes these animals suitable reservoirs of infection. Further investigations are necessary to clarify the role of these animals in the transmission dynamics of human sleeping sickness in the area.

■ CONCLUSION

The survey has revealed that trypanosome infection rates in goats, sheep and pigs are high in a sleeping sickness endemic area of Mukono district, South-East Uganda. All three trypanosome species namely, *T. brucei*, *T. congolense* and *T. vivax*, were found in animals and *T. vivax* infections were associated with high intensity parasitaemia while *T. brucei* caused very low levels of parasitaemia. Animals of both sexes were equally infected with trypanosomes. It is possible that some of the *T. brucei* parasites identified are *T. b. rhodesiense*, the cause of human sleeping sickness in the area.

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Résumé

Katunguka-Rwakishaya E. Prévalence de la trypanosomose chez les petits ruminants et le porc dans une zone endémique de la maladie du sommeil dans le comté de Buikwe, district de Mukono, Ouganda

Une enquête sur la trypanosomose chez les chèvres, les moutons et les porcs a été réalisée dans le comté de Buikwe, district de Mukono en Ouganda du Sud-Est d'avril à août 1994. Des taux d'infection de 8,8 p. 100 chez 204 chèvres, 26,7 p. 100 chez 60 moutons, et 32,4 p. 100 chez 68 porcs de tous âges et des deux sexes ont été enregistrés. *Trypanosoma brucei* a été détecté chez les chèvres et les porcs, *T. congolense* chez les moutons et les porcs, et *T. vivax* chez les chèvres et les moutons. Les taux d'infection étaient semblables pour les deux sexes des espèces animales. Il a été observé que *T. vivax* causait de hauts niveaux de parasitémie, tandis que les infections à *T. brucei* étaient associées à de très bas niveaux de parasitémie. Les infections dues à *T. brucei* étaient à l'origine de 66,7 p. 100 de toutes les infections chez les chèvres et 30 p. 100 chez les porcs. Il est émis l'hypothèse que certains de ces *T. brucei* pourraient être *T. b. rhodesiense*, l'agent responsable de la maladie du sommeil dans cette région.

Mots-clés : Ovin - Caprin - Porcin - Trypanosomose - *Trypanosoma brucei* - *Trypanosoma congolense* - *Trypanosoma vivax* - *Trypanosoma brucei rhodesiense* - Endémie - Parasitémie - Ouganda.

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Resumen

Katunguka-Rwakishaya E. Prevalencia de la tripanosomosis en pequeños rumiantes y cerdos en una zona endémica de la Enfermedad del Sueño en el condado de Buikwe, distrito Mukono, Uganda

Entre abril y agosto 1994, se llevó a cabo una encuesta sobre la tripanosomosis en cabras, ovejas y cerdos en el condado de Buikwe, distrito Mukono del sud este de Uganda. Se registraron tasas de infección de 8,8 p. 100 en 204 cabras, 26,7 p. 100 en 60 ovejas y 32,4 p. 100 en 68 cerdos de todas las edades y ambos sexos. *Trypanosoma brucei* se encontró en cabras y cerdos, *T. congolense* en ovejas y cerdos y *T. vivax* en ovejas y cabras. Las tasas de infección fueron similares para ambos sexos. Se observó que *T. vivax* provocó niveles elevados de parasitemia, mientras que *T. brucei* se asoció con niveles muy bajos de parasitemia. Las infecciones por *T. brucei* representaron 66,7 p. 100 y 30 p. 100 de todas las infecciones en cabras y cerdos respectivamente. Se postula que algunos de estos *T. brucei* podrían ser *T. b. rhodesiense*, agente causal de la Enfermedad del Sueño en esta área.

Palabras clave : Ovino - Caprino - Cerdo - tripanosomosis - *Trypanosoma brucei* - *Trypanosoma congolense* - *Trypanosoma vivax* - *Trypanosoma brucei rhodesiense* - Endemia - Parasitemia - Uganda.