African Journal of Biotechnology Vol. 7 (13), pp. 2295-2298, 4 July, 2008
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB08.059
ISSN 1684–5315 © 2008 Academic Journals

Full Length Research Paper

Comparative haematological changes in experimentally infected Savannah brown goats with *Trypanosoma brucei* and *Trypanosoma vivax*

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Accepted 1 May, 2008

A comparative study of haematological changes in Savannah brown goats experimentally infected with *Trypanosoma brucei* and *Trypanosoma vivax* was carried out using thirty (30) goats aged between 20 and 48 months and average weight of 13.00 kg. The parameters determined before and after infection included parasitemia, rectal temperature, weight, PCV, and total plasma protein. The mean weight, rectal temperature, parasitemia, packed cell volume, total plasma protein of *T. brucei* infected goats were 11.88 kg, 39.18°C, 2.40, 22.1% and 11.88 g/dl, respectively, while *T. vivax* infected goats were 12.34 kg, 39.18°C, 2.20, 23.2% and 12.34 g/dl, respectively. The values of the same parameters in the control were 14.89 kg, 38.70°C, 25.8% and 7.06 g/dl, respectively. The parasites significantly (P < 0.05) affected the haematological parameters of the animals. *T. brucei* infection in the goats was more severe than the *T. vivax* infection.

Key word: *Trypanosoma brucei*, *T. vivax*, haematology.

INTRODUCTION

Trypanosoma is known to render approximately a quarter of African arable land mass unsuitable for profitable livestock farming (Molyneux, 1997). It causes the death of well over 3 million cattle annually with an estimated lost potential of $6-12 billion US dollars (Mortelmans, 1986; ILRAD, 1994).

Sheep and goats constitute about one third of the total population of the world's ruminants (Devendre and Mcleray, 1983). Griffin (1978) reported that sheep and goat give quicker returns and lower per head value than cattle. Ruminants provide ready source of meat and protein for human consumption. However, disease such as animal trypanosomiasis possess a great risk to their production. The economic impact of the disease on these animals has been shown to be substantial (Luckins, 1992). Kalu et al. (1991) reported that *Trypanosoma vivax* and *T. congolense* were the most prevalent species encountered in sheep and goats in Gboko local Government area of Benue State. This is because their grazing requirement compels these animals to traverse different vegetation zones, especially during the dry season to the southern areas of Nigeria many of which are tsetse-infested. Infection of these animals causes symptoms manifested by intermittent fever, anemia, and pyrexia lymphatic enlargement with hepatomegaly (Dam et al., 1996). The severity of the infection is influenced by a number of factors; virulence of the different species of trypanosomes, age, nutritional status, and the breed are important (Murray et al., 1982; Awobode, 2006).

This study was carried out to compare the severity of *T. brucei* and *T. vivax* on some hematological values in savannah brown goats experimentally infected.

MATERIALS AND METHODS

Experimental animals

Thirty (30) Savannah brown goats (15 males and 15 females), aged between 20 and 48 months and weighing between 10.00 and 16.00 kg were obtained from Markafi and Maigana markets (areas free from tsetse flies) in Kaduna State. All the animals were dewormed upon arrival and maintained in a fly proof isolation unit during the period of experi-ment. They were allowed to acclimatize for four weeks and fed legume hay supplemented with maize offal and molasses, water and commercial mineral salts were provided *ad*

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Table 1. Heamatological values of the infected goats within a period of 4 weeks.

Parameter	Control	*T. brucei* infection	*T. vivax* infection
Weight (kg)	14.04±0.16[a]	11.88±1.42[b]	12.34±1.17[c]
Rectal temp. (°C)	38.70±0.05[a]	39.18±0.27[b]	39.18±0.29[b]
Parasitemia	-	2.40±1.51[a]	2.20±3.04[a]
Packed cell volume (%)	26.40±0.80[a]	22.10±3.30[b]	23.22±5.37[c]
Total plasma protein (g/dl)	7.16±0.15[a]	5.98±1.19[b]	6.34±0.74[c]

Means in the same row with different superscripts are significantly different (P < 0.05).

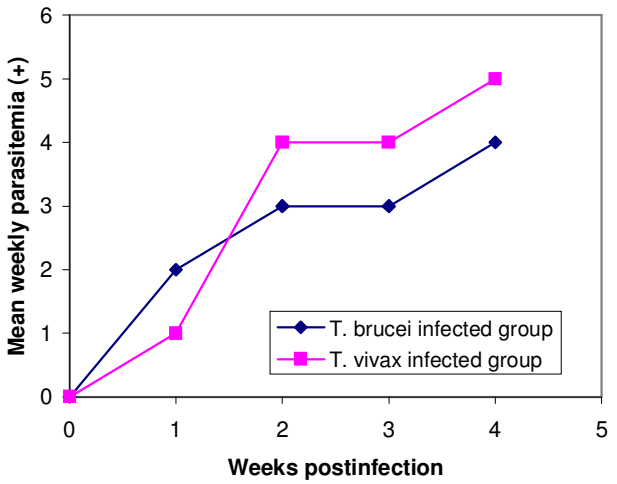

Figure 1. Mean parasitemia of infected goats within 4 weeks.

libitum. During this period, the blood of the animals was examined weekly for haemoparasites. Furthermore, the animals were treated with Oxy-tetracycline LA (Tridox®, Farvet) 1 ml/kg body weight for bacterial infection. Berenil (Eagle Chemical Company Ltd, Ikeja, Nigeria) was administered at 3.5 mg/kg body weight for haemoparasites and sprayed Asuntol for ectoparasite. They were also prophylactically treated with Amprolium against coccidiosis.

Parasites

T. brucei strain was obtained from an infected dog kept in the small animal clinic of the Veterinary teaching Hospital, Ahmadu Bello University Zaria and inoculated into a donor goat, while *T. vivax* was obtained from the Nigerian Institute of Trypanosomiasis and Onchocerciasis Research (NITOR) Kaduna.

Infection of the animals

Blood was collected from a goat heavily infected with *T. brucei* and immediately diluted with sterile buffered phosphate saline (pH 7.2). Ten healthy goats were injected with 2 ml of 1 x 10^6 *T. brucei* through the jugular vein (Group A consisting of ten goats). Group B also (consisting of ten goats) were similarly inoculated with 2 ml of 1 x 10^6 *T. vivax*. Group C consisting of ten goats were the control.

Parameters monitored

Weight, rectal temperature, parasitemia packed cell volume, white blood cell and total plasma protein were monitored on a weekly basis for 9 weeks. Rectal temperature was taken once daily at 7 am, by inserting a clinical thermometer into the rectum of the goats for 3 min. A weighing scale was used for weekly weighing of the goats. Blood samples were obtained weekly by jugular vein puncture into tubes containing ethylene diaminetetraacetic acid (EDTA) as anticoagulant. Packed cell volume (PCV) was measured using the standard microhematocrit method according to Schalm et al. (1975). Parasitemia was counted using the semi- quantitative scoring method. Total protein was read from a Goldberg refractometer (Coles, 1986). White blood cell count was estimated by method of Schalm et al. (1975).

Statistical analysis

The data collected in the study were subjected to statistical analysis using the t – test with P < 0.05 considered significant.

RESULTS AND DISCUSSION

The heamatological values of the infected animals are shown (Table 1). The parasites were detected by wet smear, the pre-patent period for *T. brucei* infected goat had a mean of 4.6 days, while the *T. vivax*-infected goats had a mean of 5.3 days. The *T. vivax*-infected goats had more rapid population of parasites compared to the *T. brucei*-infected goats within two weeks post infection (Figure 1). The initial signs of parasitemia were intermittent pyrexia, lethargy, isolation, reduced feed intake, rapid weight loss, and rough hair coat later followed by anorexia and recumbency. *T. vivax*-infected goats were significantly parasitemic compared to the *T. brucei*-infected goats. As the parasites were detected in the blood there was a steady rise in rectal temperature in the first week post infection (Figure 2), thereafter it became intermittent in weeks 2 and 3 before a steady rise (week 3 to 4), peaking (39.5°C), and before the death of the animals in the *T. brucei* and *T. vivax*-infected goats. The control had fluctuation in rectal temperature but was not above 39°C. There was a steady decrease in the weight of the animals infected with *T. brucei* and *T. vivax*. However, the decrease in weight of goats infected with *T. brucei* was more significant than the *T. vivax*-infected goats in the second and third week post infection (Figure 3). Packed cell volume of the two groups of goats infected with the parasites steadily decline and reached significant levels in the fourth week post infection (Figure 4) corresponding with significant population of parasites.

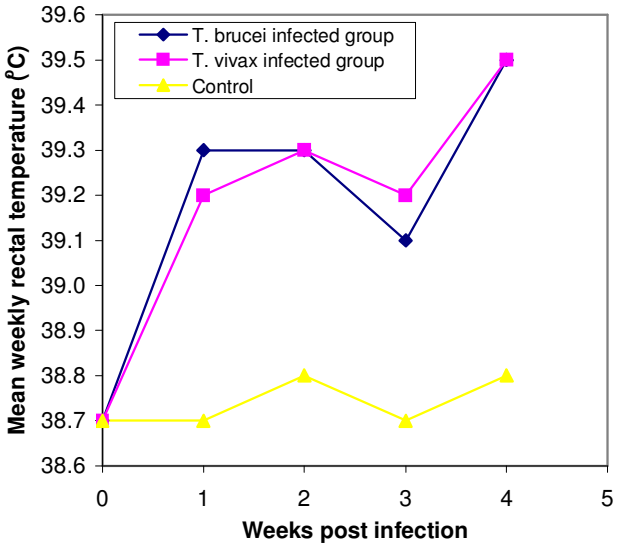

Figure 2. Mean rectal temperature of infected goats within 4 weeks.

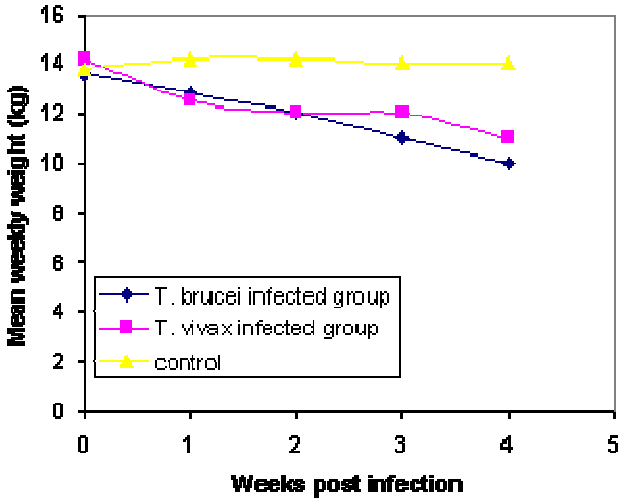

Figure 3. Mean weight of infected goats within 4 weeks.

sites. With a steady rise in population of parasites in both *T. brucei* and *T. vivax*-infected goats, there was a corresponding steady decline in the total plasma protein from the second to the fourth week post infection (Figure 5). The decline in the total plasma protein in the *T. brucei*-infected goats is more significant when compared to the *T. vivax*-infected goats.

All the goats challenged with *T. brucei* and *T. vivax* developed parasitemia; the *T. brucei* and *T. vivax*-infected goats had a pre-patent period of 4.6 and 5.3 days, respectively. The results revealed that, increase in population of the parasites corresponded with rise in rectal temperature, rapid weight loss, packed cell volume decline and decrease total plasma protein, in all the infected

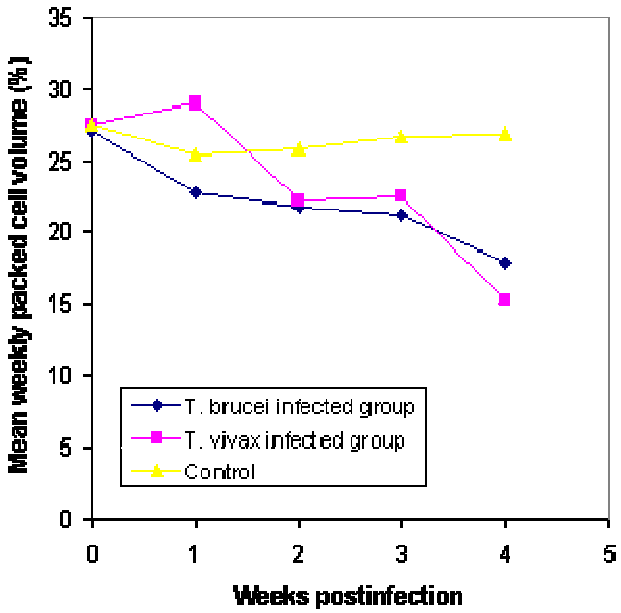

Figure 4. Mean packed cell volume of infected goats within 4 weeks

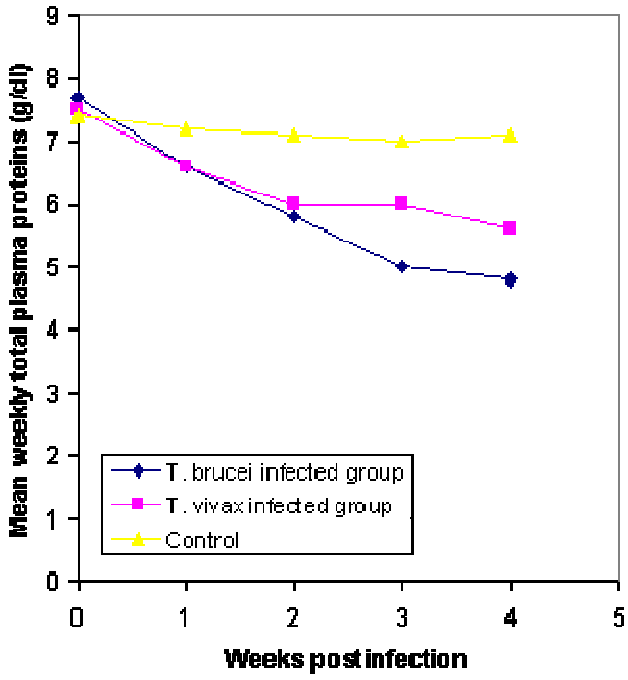

Figure 5. Mean total plasma protein of infected goats within 4 weeks.

goats. *T. brucei*-infected goats were significantly more affected than the *T. vivax*-infected goats. The result agrees with a similar work in which a significant fall in packed cell volume of goats infected with *T. vivax* was reported (Anosa and Isoun, 1977; Masake, 1980; Murray

and Dexter, 1988; Sekoni et al., 1990; Akinwale et al., 1999). Biochemical changes have been observed to be associated with trypanosome infection in animals and several factors have been found to influence the nature and severity of these changes (Anosa, 1988). The results obtained revealed decrease in total plasma protein in all the infected animals, which is similar to results obtained by (Sekoni, 1990) who reported decrease in total plasma proteins in bulls experimentally infected with *T. vivax.* However, Taiwo et al. (2003) reported significant elevated levels of total plasma protein in sheep experimentally infected with *T. brucei*. Pathological and biochemical changes are associated with trypanosome infection. The onset of anemia and the extent to which the packed cell volume fall correlate closely with the appearance, height and duration of parasitemia (Luckins and Gray, 1978). It appears that *T. brucei* was more pathogenic than *T. vivax*, because *T. brucei*-infected goats had higher rectal temperature, lower weight, lower packed cell volume, lower total plasma protein and higher population of parasites compared to the *T. vivax* infected goats.

Conclusion

This study has revealed that savannah brown goats experimentally infected with *T. brucei* and *T. vivax* developed acute form of trypanosomiasis which is associated with high rectal temperature, decrease weight, anemia, and hypoproteinemia. The severity of the disease was more in *T. brucei* infected goats.

ACKNOWLEDGEMENTS

We wish to thank sincerely Prof. Mamman M., Director of Division of Agricultural Colleges, Ahmadu Bello University, Zaria and the technical staff of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria for support and technical assistance.

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