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Sokoto Journal of Veterinary Sciences
ISSN 1595-093X

J.S. Neils *et al.* /*Sokoto Journal of Veterinary Sciences* (2008). **7**(1): 50-52.

Effect of *Trypanosoma congolense* infection on serum cobalt level in Yankassa sheep

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Abstract

Eighteen (18) Yankassa sheep divided into three groups (A, B and C) of 6 animals each. Groups A and B animals were infected with 2ml x105 *Trypanosoma congolense*; group A was treated with Berenil® (Hoechst AG, Frankfurt, Germany) at first peak of parasitaemia, while group B animals were left untreated. Blood samples were taken once a week before infection and thereafter twice a week but for parasitaemic determination, it was done daily from the tip of the ears. In all groups, Cobalt (Co) was determined by the use of Atomic Absorption Spectrometer (UNICAM SOLAAR 32). The mean concentrations of Co fluctuated in the course of the experiment with slight decrease in the infected groups, but there was no significant difference (P>0.6553) with those of the control. This indicates that trypanosomosis in Yankassa sheep due to *T. congolense* has no effect on serum cobalt.

Key words: Trypanosomosis, *T. congolense*, Yankassa Sheep, Cobalt, Serum

Introduction

Trypanosomosis remains a matter of concern in the tropics and of recent other parts of the world. Efforts towards the knowledge of its pathogenesis as well as management and eradication have been on for decades (Okochi *et al.*, 2003).

Trypanosome-infected animals suffer all forms of distress until treated. Most distresses suffered have been blamed on the parasites alone, but there may be other underlying factors.

Microminerals perform vital functions in the body of an animal which include: (i) activation of tissue enzymes (ii) co-factors to metabolic reactions, (iii) carriers of protein (iv) metalloenzymes (vi) protection against diseases etc (Georgievskii *et al.*, 1982; Martin *et al.*, 1994; Eloise *et al.*, 2003; Haenlein, 2004). The inadequacy of some of these microminerals may mar some vital functions of the tissues or organs leading to much distress (Awolaja *et al.*, 1997).

Cobalt was first shown to be of value to ruminants in 1935 (Anon1, 2006). The only known animal requirement of cobalt is as a constituent of vitamin B12 which has 4% Co in its chemical structure (Anon, 2006). Microorganisms in the rumen are able to synthesize enough Vitamin B12 needs of the ruminants if the diet is adequate in Co. Normally; Co is not stored in the body in sufficient quantities. The small amount that is stored in muscles, liver and kidney does not easily pass back into the rumen or intestinal tract where it can be used for the synthesis of Vitamin B12 (Underwood, 1977; Anon, 2006). The deficiency of cobalt does not usually immediately affect the production of Vitamin B12 in sheep but it is only when long standing (Underwood, 1977).

The response of Cobalt in the serum of Yankassa sheep before and after infection with *T. congolense* was evaluated.

Materials and Methods

Experimental Animals

Eighteen (18) Yankassa sheep were purchased from a tsetse free area of Nigeria and divided into three groups; A, B and C of six animals each.

Groups A and B sheep were each infected with 2ml of blood (from donor animal) containing 105 parasites (*T. congolense*, Karu strain) via jugular veni-puncture while group C animals served as uninfected control. The infected animals in group A were treated on the day of first peak of parasitaemia with Berenil® (Hoechst AG, Frankfurt, Germany) at a dose rate of 3.5mg/kg body weight intramuscular while group B animals were left untreated.

Sample Collection

Blood

Blood samples (6mls) per animal were taken from all groups once a week pre-infection and twice a week post-infection when parasitaemia was patent. Thereafter, after first peak of parasitaemia, samples were taken once a week. Auricular venipuncture was used for the daily monitoring of parasitaemia.

Serum

The 6 mls of blood sample collected from each animal in all groups were transferred into clean dry test tubes and allowed to stand at room temperature sufficient enough for serum separation, and later centrifuged at 2000gm for 15 minutes. The resultant sera were then harvested into clean serum vials and stored at -20^{o}C until analyzed.

Analysis of Samples

The stored sera were used for the determination of concentrations of Cobalt using the Atomic Absorption Spectrometry (UNICAM SOLAAR 32) technique.

Statistical Analysis

SAS V8.1 statistical package (2004) was used.

Results

A decrease in the mean cobalt concentration occurred in group A sheep to 0.60ppm and 0.59ppm by weeks 2 and 5 post-infection, respectively. There was no significant difference (P>0.05) between the pre and post-infection mean values in this group.

The mean cobalt concentration in sheep from group B also decreased slightly to 0.59ppm by week 4 post-infection and continued to fluctuate at different weeks and by week 8 it was 0.83ppm when the experiment was terminated. The difference in the mean associated with this group of sheep was statistically not different (P>0.05) from the values in the control sheep (Fig 1). The uninfected group, relatively, there was no change in mean concentration. However, there was a significant difference (P<0.0075) between the mean cobalt concentrations in the infected and the uninfected control groups but no significant differences (P>0.9795) that occurred between groups A and B post treatment.

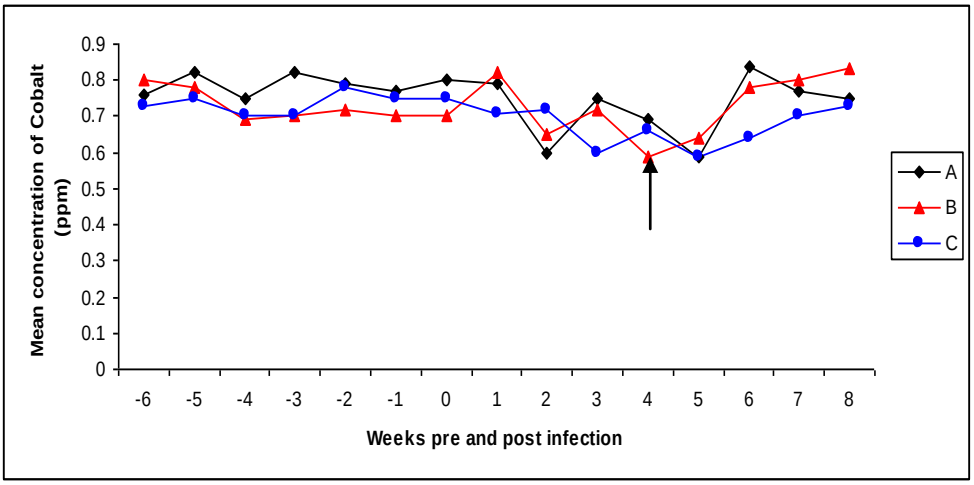

Figure 1

Mean serum concentration of Cobalt in Yankassa sheep infected with *T. congolense*.

Key: A = Infected and treated group;

B = Infected and untreated group;

C = Uninfected group

↑ = Point of treatment

Discussion

In this investigation, Cobalt did not produce significant depletion even in the course of parasitaemia; this may not be unrelated to the basic function of the element which principally is found in the rumen. The Co stored in muscles, kidney and liver is unavailable to the rumen microflora for utilization (Underwood, 1977) but can be released into the blood stream during the course of infection (stress) and this might have compensated for the loss of cobalt in circulation thereby resulting in insignificant difference ($P>0.9795$) between the infected and infected untreated groups (Berger, 1996).

Because of the high concentration of Co maintained during the trypanosome infection of sheep, in this study it may seem that trypanosomosis has little or no effect on the serum concentration of cobalt.

It may also seem that the body has to maintain fairly regular level of Co concentration in the plasma, in that lowering of the concentration may make the animal easily succumb to trypanosome as well as other infections faster (Berger, 1996).

Conclusion

Although the principal area of activity of Cobalt is in the rumen, but its stores are muscles, kidney and the liver; it seems trypanosomes infection does not deplete the concentration of cobalt in the serum of Yankassa sheep and therefore may not be a micromineral that farmers should worry about in endemic areas of trypanosomosis. However, animals should be provided feed that contain enough cobalt for improvement of body resistance to other diseases.

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