

## **Serum total proteins, albumin and albumin globulin ratio in Yankasa sheep experimentally infected with *Trypanosoma congolense* and immunomodulated with levamisole**

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### **ABSTRACT**

Serum total protein, albumin and albumin globulin ratio were determined in Yankasa sheep experimentally infected with *Trypanosoma congolense* and immunomodulated with levamisole. The packed cell volume decreased significantly ( $P < 0.05$ ) between the infected groups with and without immunomodulation with levamisole when compared to the controls. Serum total protein and albumin decreased significantly ( $P < 0.05$ ) in the infected groups with and without immunomodulation when compared to the controls. The differences between the infected groups with and without immunomodulation was not significant ( $P > 0.05$ ). Albumin globulin ratio decreased significantly ( $P < 0.05$ ) in the infected group with and without immunomodulation when compared to the controls but the difference was not significant ( $P > 0.05$ ) between the infected groups with and without immunomodulation. Generally, levamisole administration did not alter the course of the infection in Yankasa sheep when compared to the infected group without immunomodulation. The experimental period lasted six weeks.

**Key words:** serum proteins; Yankasa sheep; immunomodulation; *Trypanosoma congolense*

### **INTRODUCTION**

Animal trypanosomiasis and tsetse flies are widely distributed in Nigeria from latitude 4°N to 13°N, an area covering all the five agro-ecological zones of the country. It is known that pathophysiological alterations occurs in the cellular and plasma components of blood during infection (Makinde *et al.*, 1991). Haematological and serum biochemical aberrations are characteristics of trypanosome infections, the severity of which are often determined by the strain of the infecting trypanosome and the host (Anosa, 1988 a,b). Serum protein changes have been reported in West African dwarf sheep experimentally infected with *T. brucei* (Ogunsanmi *et al.*, 1994), in *T. congolense* infected Scottish Blackface sheep (Katunguka-Rwakishaya *et al.*, 1995) and *T. congolense* infected Zambian goats (Witola and Lovelace, 1997). Immunosuppression is a frequent accompaniment of African trypanosome infections (Taylor, 1998). There is a dearth of information on serum protein changes in *T. congolense* infected sheep immunomodulated with levamisole, an anthelmintic and a non specific immunopotentiator.

### **MATERIALS AND METHODS**

#### **Experimental animals**

Seventeen Yankasa sheep of mixed sexes and aged between nine months to one year were used for the study. The sheep were acclimatized for three weeks in a fly proof pen. During this period they were screened against any infections. The sheep were treated with Ivermectin (Kepromec®, Holland) and administered with Oxytetracycline Long Acting (TetroxyLA®, Bimeda, Holland). They were fed grass hay,

groundnut hay and wheat bran. Feed and water were provided *ad libitum*. During acclimatization, blood samples were collected to obtain baseline values.

### Parasite

*Trypanosoma congolense* (NITR/Zonkwa) isolated from a pure natural infection of cattle herd in Zonkwa, Kaduna State and obtained from the National Institute for Trypanosomiasis Research (NITOR) was used for the study. The parasites were cryopreserved in liquid nitrogen from where they were subpassaged into donor albino rats before use.

### Experimental Design

The sheep were divided into three groups based on their mean packed cell volumes (PCV). Group 1 consists of five animals (uninfected control group). Group 2 and 3 consisted of six sheep each. All sheep in group 2 and 3 were each infected with about  $2 \times 10^6$  trypanosomes via jugular venepuncture using a 5ml syringe and 22G needle with blood from a previously infected donor sheep. Group 3 sheep were each administered Levamisole at 2.5 mg/kg subcutaneously every week throughout the experimental period.

### Sample Collection and Analyses

Blood (2ml) was collected daily for PCV into Ethylene Diamene Tetracetic Acid (EDTA) tubes via jugular venepuncture using a 5ml syringe and a 22G needle. 3 ml of blood was collected into sterile labeled tubes for separation of serum. Serum total protein was determined by the Biuret method and serum albumin the Bromocresol Green method (Reinhold, 1953). Globulin content was calculated from the difference between serum total proteins and albumin content. Data were analysed by analysis of variance (ANOVA).

## RESULTS AND DISCUSSION

The packed cell volume (PCV) in the infected Yankasa sheep decreased sharply from the pre-infection in value of  $30.2 \pm 3.4\%$  in the infected group and  $30.0 \pm 2.2\%$  in the infected immunomodulated group to  $23.3 \pm 2.1\%$  and  $23.0 \pm 3.4\%$  ten days post-infection respectively. The decrease in the PCV values in infected groups is in agreement with previous works (Saror, 1979; Adah *et al.*, 1993). The PCV values also dropped in the Levamisole administered group in almost the same sequence with the infected group (Fig. 1).

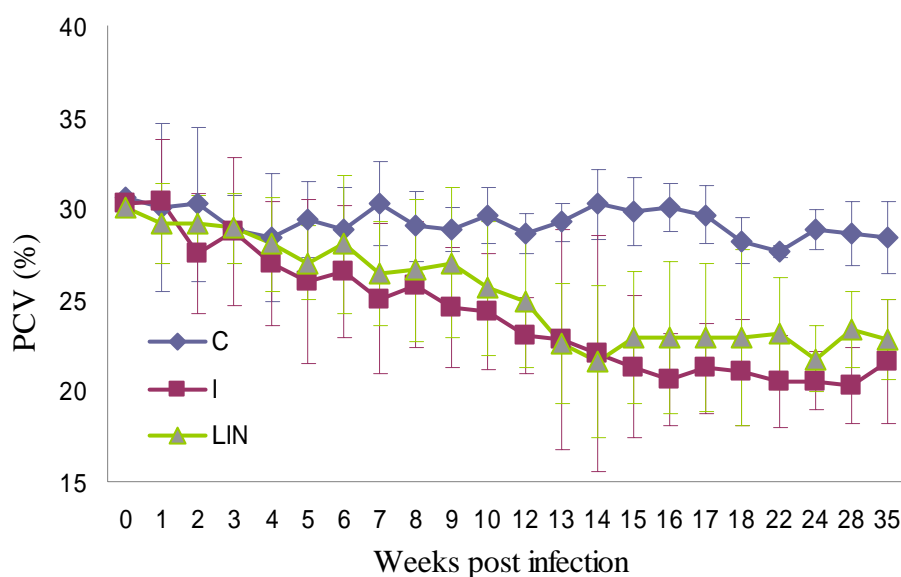


Figure 1: Packed cell volume (%) of *T. congolense* infected (I), *T. congolense* infected and immunomodulated with levamisole (LIN), and uninfected control sheep (C).

Change of serum protein ratio in *Trypanosoma congolense* infected sheep

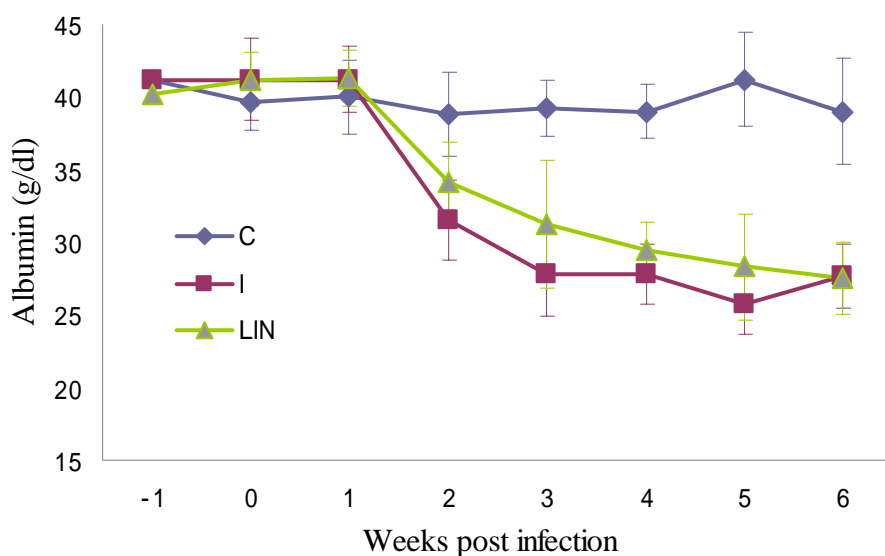


Figure 2: Mean weekly serum albumin concentrations (g/dl) in *T. congolense* infected (I), *T. congolense* infected and immunomodulated with levamisole (LIN), and uninfected control sheep (C).

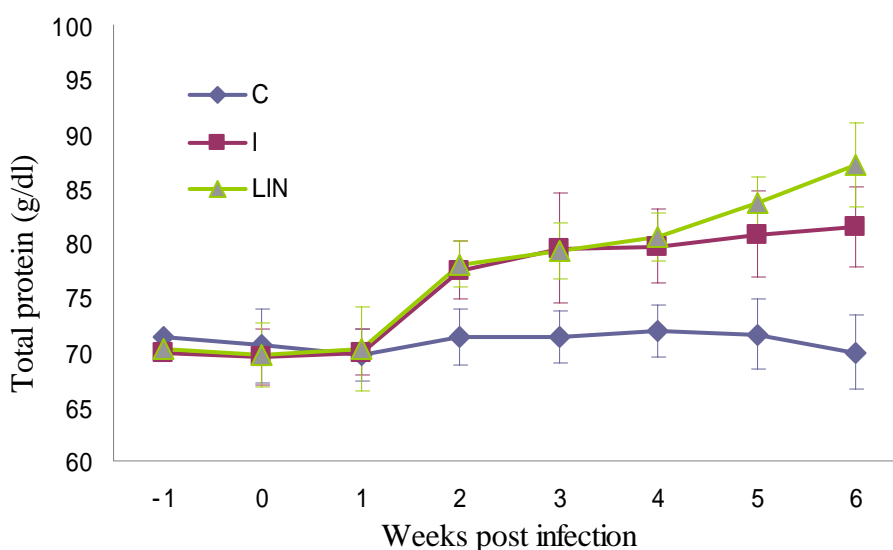


Figure 3: Mean ( $\pm$  S.D) Weekly serum total protein concentration (g/dl) in *T. congolense* infected (I), *T. congolense* infected and immunomodulated with levamisole (LIN), and uninfected control sheep (C).

The serum total proteins changes in the infected sheep were as shown on Fig. 3. The pre-infection serum protein concentration was  $70.0 \pm 2.6$  g/dl and  $70.2 \pm 2.9$  g/dl in the infected group and the infected immunomodulated group respectively. The values increased to  $81.5 \pm 2.7$  g/dl and  $87.2 \pm 2.0$  g/dl ( $P < 0.05$ ) in the infected group and the infected immunomodulated group respectively. Serum total proteins are reported to increase in trypanosome infected animals (Akinbamijo *et al*, 1992; Witola and Lovelace, 1997). The increase in serum total protein could be attributed to gammaglobulinemia which is a predominant feature of trypanosomiasis, primarily due to increases in IgM levels (Anosa and Isoun, 1976; Ogwu *et al.*, 1986). In

contrast, a decrease in serum total protein concentration was reported in *T. congolense* infected sheep (Katunguka-Rwakishaya *et al.*, 1995).

Serum albumin concentration (Fig. 2) decreased significantly ( $P < 0.05$ ) from pre-infection values of  $41.2 \pm 2.86$  g/dl and  $40.2 \pm 1.9$  g/dl in the infected group and infected immunomodulated group respectively to  $27.6 \pm 5.1$  g/dl and  $27.5 \pm 1.8$  g/dl in the infected group and infected immunomodulated group respectively. Decreases in serum albumin is in agreement with the observations in *T. congolense* infected sheep (Katunguka-Rwakishaya *et al.*, 1993), and *T. vivax* infected goats (van Dam *et al.*, 1998). However, Witola and Lovelace (1997) reported that there was no significant variation in mean albumin values of *T. congolense* infected goats. The decrease in serum total protein could be attributed to a decrease in serum albumin probably from decreased hepatic biosynthesis.

The albumin globulin ratio shown on Fig. 4 decreased significantly ( $P < 0.05$ ) from a pre-infection value of 1.43 and 1.34 in the infected group and the infected immunomodulated group respectively to 0.49 and 0.46 in the infected group and the infected immunomodulated group six weeks post-infection respectively.

The significant drop in albumin globulin ratio could be due to a significant decrease in albumin concentration in the infected animals and an increase in globulin concentration in the infected animals. This agrees with the observations of Ogunsanmi *et al.* (1994) and van Dam *et al.* (1998).

The net effect of the administration of Levamisole to *T. congolense* infected sheep did not alter significantly the PCV, serum total proteins, serum albumin and albumin globulin ratio as observed in our study. The effect of immunopotentiators depends on factors such as host immune state, severity of infection, dose and timing of drug administration (Abath *et al.*, 1988).

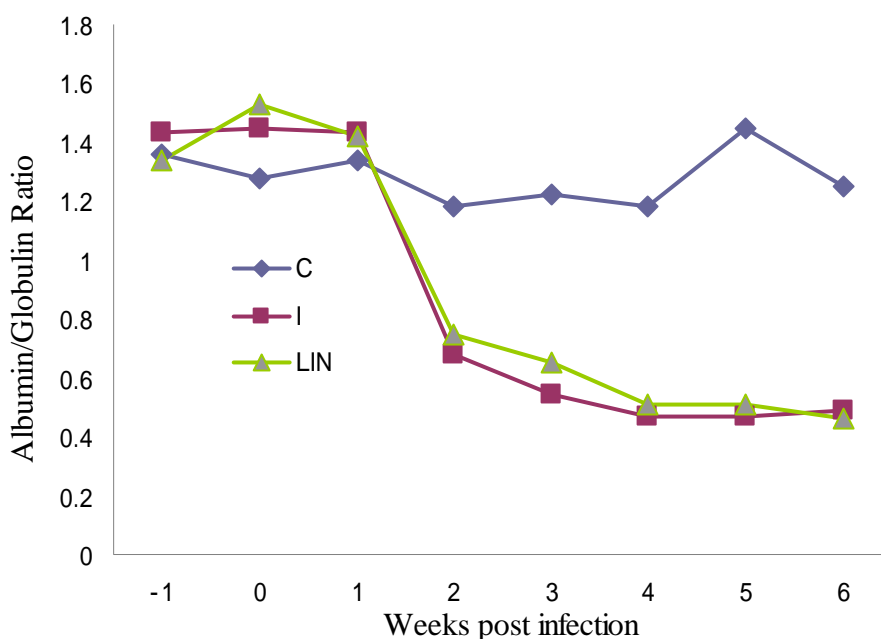


Figure 4: Albumin globulin ratio in *T. congolense* sheep, *T. congolense* infected and immunomodulated with Levamisole (LIN), and uninfected control sheep (C).

#### ACKNOWLEDGEMENT

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