

SHORT COMMUNICATION
**THE EFFECT OF TRYPANOSOMOSIS ON PLASMA PROTEIN LEVELS IN
INDIGENOUS CATTLE**

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ABSTRACT

A field survey involving 180 adult white Fulani cattle was carried out in the Guinea Savannah and Derived Savannah vegetational zones of South Western Nigeria to determine the effect of natural trypanosomal infection on plasma protein levels. Enzyme-linked immunosorbent assay (ELISA) and blood parasitological examinations were used as diagnostic indices.

The results showed a prevalence of 36.7% mixed infection in the animals sampled. It was also observed that the albumin level was lowered, globulin level increased and the total protein level was slightly on the increase.

Trypanosomal infection in this study therefore affects the concentrations of total and differential plasma protein levels in indigenous cattle.

Keywords: Trypanosomosis, plasma protein, cattle

INTRODUCTION

Trypanosomosis, a haemoprotozoan disease caused by *Trypanosoma* species and transmitted by *Glossina* (tsetsefly) vector is known to affect man and animal (Losos and Ikede, 1970; Ukoli, 1990). The disease is the most important constraint to cattle production in the humid and sub-humid Africa (Jawara, 1990) hence the importance of its early diagnosis and treatment. Early diagnostic techniques that have been used include the blood parasitological examination method (Ukoli 1990) and the more sensitive serological techniques such as the enzyme linked

immunosorbent assay (ELISA) (Nantulya, 1989).

In addition to these methods, changes in the level of plasma proteins have also been employed for the early diagnosis of Trypanosomosis (Coles, 1967). In this regards, changes in the albumin and globulin concentrations have been used as an index of the presence or absence of trypanosomal infection. The level of these plasma protein is known to be dependent on and can be influenced by the state of health, plane of nutrition, hormonal imbalance as well as the water balance amongst other factors (Schalm *et al.*, 1975). Cole (1967) asserted that certain alterations in the total concentrations or in a variation in the components comprising the total protein may be of significance in terms of the diagnosis and prognosis of the infection.

The objective of this study was to determine the effect of Trypanosomosis on total and differential plasma protein levels and thus explore these changes as a diagnostic tool.

MATERIALS AND METHODS

Animals

180 adult white Fulani cattle were used for this study. These animals were screened randomly from eight herds selected from the Guinea Savannah and the Derived Savannah vegetational zones of South Western Nigeria. The study was carried out between June 1992 and March 1994. The animals were reared under nomadic Fulani management and were under constant exposure to tsetse flies.

TABLE 1: PREVALENCE OF TRYPANOSOMAL INFECTION IN GUINEA SAVANNAH AND DERIVED SAVANNAH VEGETATIONAL ZONES

Vegetational Zone	Herd No	Herd Size	Number (%) +VE	Number (%) -VE
Guinea Savannah (G.S)	I	28	12(42.9%)	16(57.1%)
	II	35	15(42.9%)	20(57.1%)
	III	27	4(14.8%)	23(85.2%)
	IV	25	5(20%)	20(80%)
Derived Savannah (D.S)	V	17	4(23.5%)	13(76.5%)
	VI	21	12(57.1%)	9(42.9%)
	VII	19	9(47.4%)	10(52.6%)
	VIII	8	5(62.5%)	3(37.5%)

Experimental Procedure

Blood samples (5ml) were collected by jugular venipuncture using herparinised vacutainer tubes. The samples were kept on ice using field flasks and were thereafter examined for the presence or absence of trypanosomes approximately three hours after collection. The buffy coat also examined for the presence of trypanosomes. Wet smears of the samples were made and slides which were positive for trypanosomes were stained with Giemsa. Identification of Trypanosome species was based on the speed and type of movement as well as the morphology of the stained organism (Coles, 1967). Antigen-ELISA technique was used in conjunction with the examination of the buffy coat to determine the presence, absence and or level of infection. All samples which were positive for trypanosomes using both the blood parasitological examination and the ELISA technique as well as those which were negative were analysed to determine the total and differential plasma protein concentration. The total plasma protein (g/dl) was estimated by the Biuret method (Wintrobe, 1974) while plasma albumin was determined using the Sigma Diagnostic Albumin kit. The plasma protein values obtained (total, albumin and globulin) in the presence of trypanosomes are presented as arithmetic means. The

mean values of the positive samples were compared using the student t-test. Probability values of 0.05 or less were considered significant.

RESULTS

Parasitological examination as well as ELISA analysis of the blood samples indicated the presence of a mixed trypanosomal infection comprising of *Trypanosoma brucei*, *T. vivax* and *T. congolense* in herds screened in the two vegetational zones (Table 1).

From the results obtained using the two diagnostic indices, namely: the mean total and differential plasma protein concentrations were obtained in both vegetational zones. This is presented in Table 2.

DISCUSSION

The results of this study shows that Trypanosomosis is prevalent in the Guinea Savannah as well as the Derived Savannah vegetational zones of South Western Nigeria. This study also reveals that definite changes in the level of concentration of the plasma protein also takes place. For instance the normal levels of total protein, albumin, and globulin are 7.0 - 8.5; 3.0 - 3.8 and 3.6 - 4.4 respectively, however it can be inferred from this study that in most herds' the mean value of albumin fell below this range

TABLE 2: PLASMA PROTEIN CONCENTRATION IN (G/DL) CATTLE SCREENED FROM THE GUINEA AND DERIVED SAVANNAH VEGETATIONAL ZONES.

Vegetational Zone	Herd	Herd Size	Albumin		Total Protein		Globulin	
			+V	-VE	+VE	-VE	+VE	-VE
Guinea Savannah (G.S)	I	28	2.36	2.65	7.81	6.75	5.46	3.91
	II	35	2.45	3.15	7.49	6.78	5.05	3.54
	III	27	2.49	2.40	6.93	8.49	4.44	6.04
	IV	25	5.32	5.13	8.87	7.79	3.55	2.66
Derived Savannah (D.S)	V	17	1.74	2.95	8.15	7.41	6.41	4.46
	VI	21	2.99	3.85	7.15	7.00	4.18	3.15
	VII	19	4.17	4.67	6.89	6.85	2.72	2.18
	VIII	8	4.36	4.33	6.77	6.77	3.04	2.44

while most herds in this study had higher globulin level compared with the normal. For total protein, the variation is slight.

The picture of total protein as regards this study shows that there is a slight increase, though this was not statistically significant. The work of Tabel *et al.*, (1980) showed that decreased total serum protein levels occurred in cattle during the first five weeks of *T. congolense* infection after which there was gradual increase to low normal values. Anosa and Isoun (1976) found an initial increase in the levels of total protein in sheep and goats following infection with *T. Vivax* with a drop later to levels which still remained higher than control levels. Arowolo (1992) observed a reduction in total serum protein and attributed this to haemodilution and an increased metabolism associated with fever produced at the acute phase of the disease.

The result of this study with respect to serum albumin indicates that the level of albumin in samples that were positive was lowered when compared with the samples negative for trypanosomal infection. Using the student t-test statistics ($P < 0.05$), there was a significant difference. This observation is similar to the report of Tabel *et al.* (1980) who stated that there was a significant drop in serum albumin levels after 15 days post-infection period in cattle

infected with *T. vivax* and *T. congolense*. Tabel (1978) was of the opinion that although plasma dilution might account for changes in the level of serum albumin, an increased rate of catabolism or a decreased rate of synthesis could be regarded as a potential cause of hypoalbuminaemia. Jennings *et al.*, (1974) postulated that there is increased protein catabolism in trypanosomosis, therefore low albumin concentration may be expected. Anosa (1988) also observed that the most consistent change in serum protein levels found in Trypanosomosis is depressed albumin level

With respect to globulin, this study has shown that the mean values for the samples which are positive for trypanosomal infection are higher than the negative samples. This is also supported by Rees and Clarkson (1967) who observed that increased serum globulin levels is a feature of trypanosomal infection. Aiyedun (1975) observed an increase in the level of immunoglobulin M (IgM) in human trypanosomosis.

Anosa (1988) also observed that one of the most consistent changes in serum protein levels found in Trypanosomosis was elevated globulin primarily due to hypergammaglobulinaemia.

The mean plasma protein and differentials

in the 2 vegetational zones were also compared and it was observed that the values for total proteins and globulins were higher in the Guinea Savannah. Reverse is the case for albumin in the 2 vegetational zones.

Finally, one must however stress that part of the survey was carried out during the dry season when the pasture is difficult to come by and also very poor in nutritional value. The stress of poor nutrition could therefore contribute to the picture stated above.

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