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Performance of West African Dwarf (WAD) goats infected with the Sokoto (Northern Nigeria) strain of *Trypanosoma evansi*

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Performance, live weight, Trypanosome, Infection.

1 SUMMARY

Nutrition plays an important role in modulating the severity of trypanosomosis. Sixteen West African Dwarf (WAD) goats were experimentally infected (i v) with $2.0x10^6$ (approximately 2 million Sokoto isolate of *Trypanosoma evansi).* They were fed groundnut hay, maize offal, and Digiteria hay at libitum .Total plasma protein and live weight gain of the goats in response to the experimental infection were determined for 6 weeks post-infection. Majority of the goats (75%) recorded increase in total plasma protein whereas 60% of the goats recorded an increase in live weight from the first week to the end of the experiment with 40% having their own increase at the last 2 weeks of the observation period. The study shows that WAD goats infected with this isolate of Trypanosoma evansi gained weight, since appetite was not affected. Feed supplementation is recommended for livestock kept in trypanosome endemic areas especially during period of food scarcity for increase productivity of the animals.

2 INTRODUCTION

Trypanosomosis is the major factor limiting livestock productivity in large areas of humid and sub-humid Africa (Mihret and Mano, 2007). Direct losses as a result of trypanosomosis in terms of meat and milk, traction power and programmes to control the disease have been put at US$ 500 million annually while the indirect losses on crop agriculture and human welfare arising from farmers inability to keep livestock in areas with great trypanosomosis risk have been estimated at US$ 5 billion per annum (ILRI, 1997).

Trypanosoma evansi is responsible for a disease know as "surra", and is the most widespread pathogenic trypanosome globally (Luckins, 1988; Cadioli et al., 2006). It has a wide range of hosts and is pathogenic to many species of domestic and wild animals (Franke et al, 1994a; Herrera et al., 2002). It is primarily transmitted mechanically by biting flies from the species like Tabanus, Stomoxys, Haematopota, lyperosia, and Chrysops spp (Fraser, 1909 Luckins, 1999a; Nieschulz, 1926; 1927a, Nieschulz, 1927b; Luckins, 1999a). Subclinical infections have been reported in sheep and goats from Sudan and cattle from Brazil (Luckins, 1999a).

In Africa, Camels are the most important host (Dia *et al.,* 1997), but cattle have also been reported as the next most highly

susceptible animals (Mahmoud and Gray, 1980). In Nigeria, experimental studies have shown that donkeys, cattle, sheep, and goats are susceptible to *Trypanosoma evansi* but undergo a protracted course of the disease (Ilemobade, 1971; Audu *et al.,* 1999; Shehu *et al.,* 2006). There are considerable differences in the severity of syndromes caused by *Trypanosoma evansi* infection in different geographical areas of its occurrence, depending on the virulence of the strain and the susceptibility of the host (Herrera *et al.,* 2004). The pre-patent period of the disease varies according to the animal species affected and the immune status of such infected animals (Ilemobade, 1971). Although *T.evansi* is primarily a parasite of camels, there is a likelihood that animals herded together with camels especially small ruminants may become infected with *T. evansi* (Ngeranwa *et al.,* 1993). There is paucity of information on the disease pattern in different livestock species in Africa.

In sub-Saharan Africa, especially in Nigeria, small ruminants form an important part of livestock industry and because of the search for source of animal proteins for the rapidly growing human population in developing countries; attention has been shifted to goat rearing as an additional source of milk and meat (Yanan *et al*., 2007). In Nigeria, extensive work has been done on animal trypanosomosis (Anosa, 1977; Saror, 1975; Sackey, 1998; Shehu *et al*., 2006), but little has been done on infection due to *T. evansi* especially in West African Dwarf goats. Since there is considerable difference in the severity of syndromes caused by *T.evansi* infection in different geographical areas of its occurrence, it is desirable to evaluate the performance of West African Dwarf goats infected with this strain of *T. evansi.* The present experimental study was designed to estimate the performance of West African Dwarf goats infected with this isolate of *T.evansi* on the bases of total plasma protein and live body weight gain.

3 MATERIALS AND METHODS

3.1 Source of *Trypanosoma evansi*. The parasite was isolated from naturally infected camels at slaughter in Sokoto township abattoir. Two rats were used to preserve the parasite and then the rats were transported by road from Sokoto Township to Department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria.

3.2 Experimental animals and management: Twenty two (22) West African Dwarf (WAD) goats of both sexes and aged between 2-4 years were purchased from Kafanchan market in the Southern part of Kaduna state and transported by road to Zaria.

On arrival, they were ear-tagged and physically examined for Ectoparasites. They were screened for endo-and- haemoparasites using routine laboratory tests viz: Thin, thick blood stained smears, haematocrit centrifuge, flotation and sedimentation methods Those infected with strongyles were treated with albendazole orally at therapeutic dose rate of 7.5mg/ kg body weight and against coccidiosis using amprolium at therapeutic dose rate of 1.5g/10kg body weight in drinking water for 5 days. All the animals were free of ectoparasites, and those with evidence of *Anaplasma ovis* through thin blood stained smears were treated with long acting oxytetracycline (Tridox L.A, Farvet Bladel Holland) at a dose rate of 20mg/kg body weight. The goats were then kept in an arthropod-proof pen and fed with ground nut hay, maize offal (Dusa) and *Digiteria* hay. Water and salt licks were given *ad libitum*.

The animals were examined for haemoparasites and intestinal helminthes once weekly for the 5-week period of conditioning. They were re-screened for parasitic infections a day prior to experimental infection and were found negative. Base-line parameters (total plasma protein and live body weight) were taken during the conditioning period. After the conditioning period, the sixteen surviving goats were randomly divided into four groups (A-D) of four goats each. The groups were treated as follows;

Group A consisted of four infected goats out of which two were treated with Diminazene acturate (with the possibility of treating *Trypanosoma evansi* may be dwelling in the tissues/organs)at the dose rate of 3.5mg/kg body weight on day 21 post-infection (chronic phase, with possibility of the

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parasites being in tissues/organs). The treatment meant for day 7 (acute phase) was not given because the animals were aparasitaemic. Two of the goats in group B were similarly treated with Isometamedium Chloride (with the possibility of treating *Trypanosoma evansi* which may be dwelling in the tissues/organs and also to test the efficacy of the two drugs) at the dose rate of 0.5mg/kg body weight. Group C and D goats served as positive (infected untreated) and negative (uninfected untreated) controls respectively.

3.3 Experimental Infection: Eight (8) adult albino rats were used as donors. The rats were sourced from the Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria. They were screened and certified negative for haemoparasites using routine laboratory test. Using thin, thick blood stained smears and haematocrit centrifuge techaque The rats were then inoculated intraperitoneally with *T. evansi* parasitaemic blood to multiply the parasites. At 4 days post-inoculation, patent parasitaemia was established and became massive by haematocrit centrifuge technique and at more than 20 trypanosomes per microscopic field. The rats were bled via the ocular vein into a flat-bottom flask containing EDTA as anticoagulant dispensed at 1mg/kg and was later diluted with phosphate buffered saline glucose. Each of the goats in groups A-C was infected through the intravenous inoculation of 2ml of blood containing $2.0x10^6$ *Trypanosoma evansi* as quantified using the improved Naubauer haemocytometer (Petana, 1963) with grams of iodine as diluent.

3.4 Post-infection monitoring: The blood was collected through venipucture of the jugular vein using 21 gauge needle and syringe total serum protein concentration of all the experimental goats was determined twice weekly using Goldberg Refractometer according to Schalm *et al.* (1995) and their live body weight also determined once a week with the aid of portable foot weighing balance throughout the 6 weeks of the observations.

3.5 Statistical analysis: All data obtained were subjected to analysis of variance and when significant difference was observed, treatments were separated using Duncan multiple Range Test. Values of $P<0.05$ were considered significant.

4 RESULTS

Total plasma protein: The value of total plasma protein recorded pre-infection varied from 6.00 ± 0.08gm/dl in group D to 6.95 ± 0.21 gm/dl in group B, and the value was not significantly ($P> 0.05$) different. The highest value of total protein was obtained in group B in the 4th week (Fig.1).

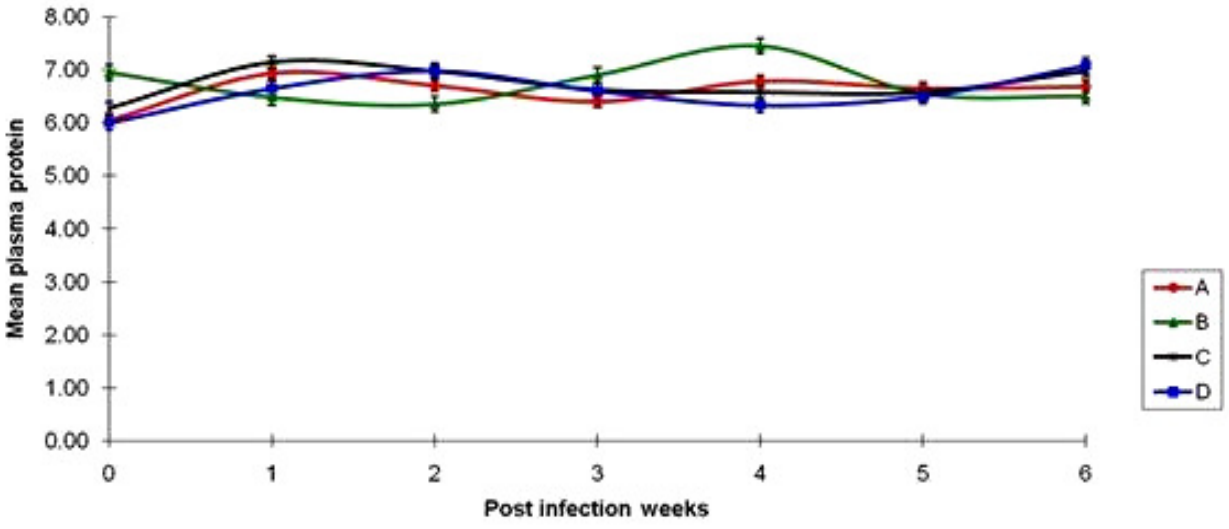

Figure 1: Weekly mean of total plasma protein of WAD goats experimentally infected with Sokoto isolate of *T.evansi.* **Note:** Live weight of WAD goats infected with 2.0 x 10^6 *T. evansi* (Sokoto isolate). Two of the infected goats in groups A (♦) and B (▲) were treated at day 21; while groups C (x) and D (■) animals served as positive and negative controls respectively.

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The mean weekly live weight of the animals varied from 8.50 ± 0.65kg to 11.75 ± 0.85kg pre-infection and this value was not significantly (P>0.05) different between the groups. However the animals in group D had their weight fluctuated between 10.50 ± 1.85 in week 1 to 11.75± 1.93kgin week 7 (Fig.2).

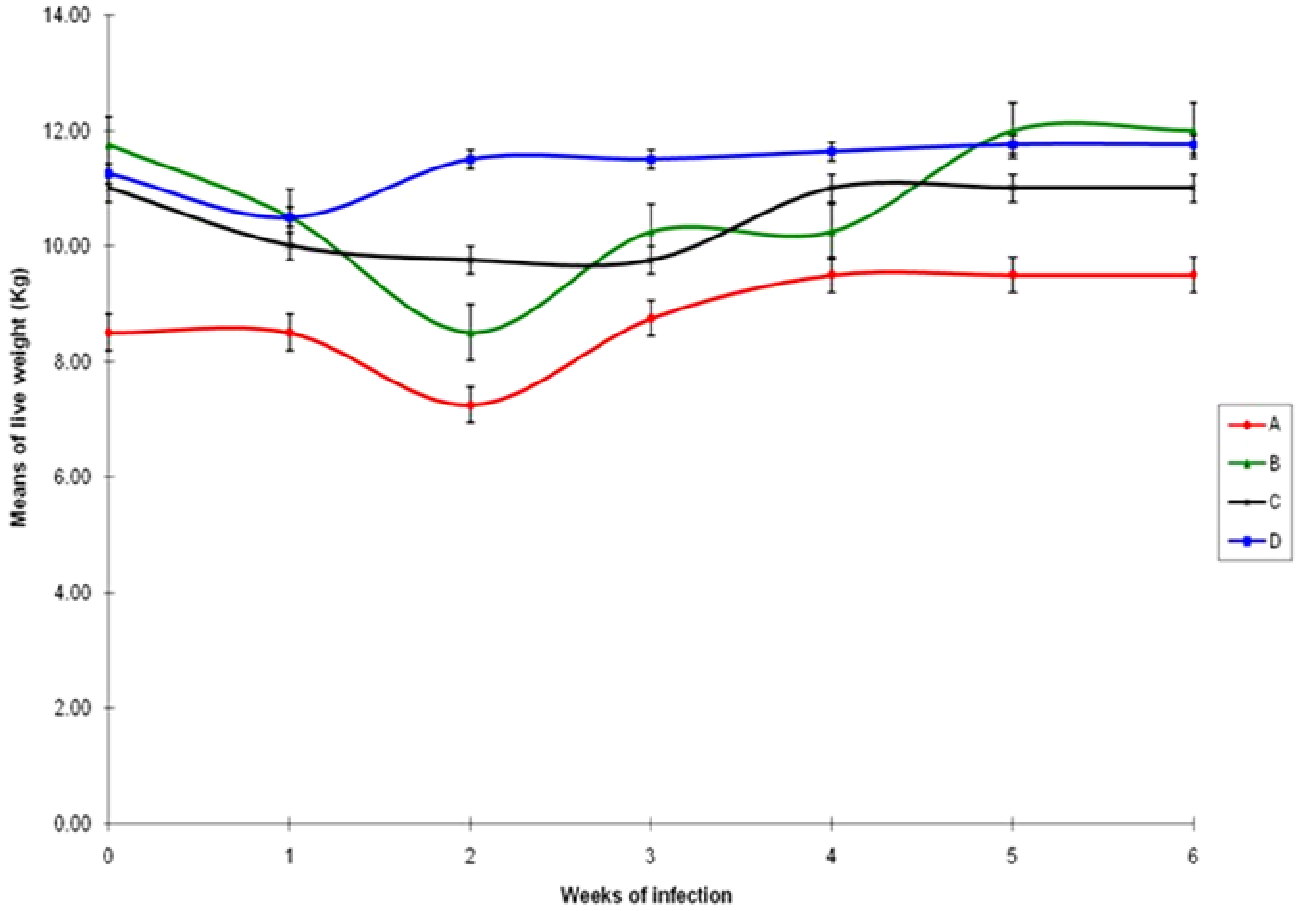

Figure 2: Weekly means of live weight of WAD goats experimentally infected with T.evansi (Sokoto isolate)
Note: Live weight of WAD goats infected with 2.0 x 10^6 *T. evansi* (Sokoto isolate). Two of the infected goats in groups A (♦) and B (▲) were treated at day 21; while groups C (x) and D (■) animals served as positive and negative controls respectively.

5 DISCUSSION

The value of total plasma protein recorded in all the treated groups were within the normal value recorded for goats (Adenkola and Durotoye, 2004). It also agreed with previous reports by Boid *et al.*, (1980); Marques *et al.*, (2000); Cadioli *et al.*, (2006), that animals infected with *Trypanosoma evansi* show an increase in total plasma protein concentration. This study has also confirmed that good nutrition help in modulating/reducing the pathogenic effect of trypanosomosis in animals as earlier reported by other researchers (Payne *et al.,* 1991; Holmes *et al.*, 2000).It has been reported that weight loss is a feature of trypanosomosis and it is caused by decline in dry matter intake and catabolisation of body reserves to meet the increased requirements for maintenance (Verstegen et al.,1999).Therefore adequate nutrition will prevent alternative utilization of fat for the energy requirement by the infected animal. The study shows that WAD goats infected with this isolate of *Trypanosoma evansi*

gained weight, since appetite was not affected. In most of the trypanosusceptible goats, appetite is not affected ,but the goats loss weight and have low plasma protein value. This shows some level of tolerance by this breed of goats, since previous reports (Dargartes *et al* ., 2005; Shehu *et al*., 2006), recorded emaciation and weight loss in goats infected with *Trypanosoma evansi* as part of main clinical signs. The slight decreased in weight recorded at the early weeks of infection in some of the goats may be as a result of individual variation in susceptibility of the goats to the parasite as earlier mentioned, that severity and susceptibility depend on the animal species and immune status of the animals infected (Ilemobade, 1971; Herrera *et al*.,2004).

In Northern Nigeria, where the incidence of *Trypanosoma evansi* is seen to be higher than the Southern part(any refs), it is suggested that adequate feed supplementation be made available to the animals especially during the long months of dry season (5 months) when there is high food scarcity to reduce the pathogenic effect of trypanosome in the animals. This system of management will increase productivity of the livestock and income of the farmers Production is luxury (i.e. excess nutrient in the system than body physiological requirement), this will result in increase calving rate, short calving intervals and weigh gain by the livestock.

In conclusion, the findings from this study revealed that infection of WAD goats with *Trypanosoma evansi* (Sokoto isolate) had no effect on the protein level of the infected goats.

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