

The Interaction of *Trypanosoma congolense* and *Haemonchus contortus* Infections in Yankassa Sheep

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Abstract: An experimental study on dual infections with *Trypanosoma congolense* (Tc) and *Haemonchus contortus* (Hc) was conducted in 30 female Yankassa sheep aged between 12 and 25 months. Parasitological observations like prepatent period, faecal egg count, worm burden were made on animals infected with *H. contortus* alone and *T. congolense* also alone. Then one group was infected with *T. congolense* and one week after *H. contortus* infection and another group vice versa. It was observed that in Tc+Hc group, *T. congolense* infection lowered the normal resistance to *H. contortus*. The prepatent period was reduced to 17 days as compared to 21 days in single *H. contortus* and in *H. contortus* preceding *T. congolense*, respectively. Anemia, diarrhea and rough hair coat were the major presenting clinical signs. L_3 establishment was significantly enhanced in Tc+Hc infected group, higher worm burden was also observed in the same Tc+Hc infected group. The result clearly indicated the immunosuppressive effects of Trypanosomiasis on the animal's inability to resist helminthic infection.

Key words: *Trypanosoma congolense*, *Haemonchus contortus*, interaction, sheep

INTRODUCTION

Trypanosomiasis and gastrointestinal parasitism continue to be the major constraints to livestock production in sub-Saharan Africa (Gossen *et al.*, 1997). The additional problems of immunosuppression in trypanosomiasis (Holmes *et al.*, 1994; Scott *et al.*, 1997), renders the animals more susceptible to secondary infection (Nantulya *et al.*, 1982). Though single parasitic infections in a host are not uncommon in nature, mixed infections with various species or with several different types of parasites is the rule (Sharma *et al.*, 2000). In mixed infections the presence of a pathogen may enhance the effect of the other in the host. This is more likely to occur when the first infection has an immunosuppressive effect on the host thus making the latter more vulnerable to other parasites to which it was otherwise resistant. The interaction between two or more parasites is an inevitable situation which may lead to significant physiological and biochemical changes in the body tissue and fluids which could not be attributed to either of these parasites individually (Sharma *et al.*, 2000). This study was carried out to determine the possible effects of concurrent infections with *T. congolense* and *H. contortus* in experimental infected Yankassa sheep.

MATERIALS AND METHODS

Animals: Thirty females Yankassa sheep aged between 12-25 months having approximately the same body weight and health status were used for the study. The sheep were housed in fly and tick-proof pens in the department of Veterinary Parasitology and Entomology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria. All selected sheep were screened for haemoparasites along with other internal and external parasitic infections.

Irrespective of infection or otherwise, all the animals were prophylactically treated with 2.5% suspension of Albendazole (SAM Pharm. Nigeria Limited), at the dose rate of 7.5 mg kg⁻¹ body weight given per Os. Also, the animals were treated with Diaminazine Aceturate at 3.5 mg kg⁻¹, (Hoechst, Germany) against trypanosomiasis and long acting oxytetracycline (Pfizer products Ltd, Ikeja, Nigeria), at 20 mg kg⁻¹ body weight intramuscularly against *Anaplasma ovis*. They were also vaccinated against *Pestes de Petit Ruminatum* (PPR) using Tissue Culture Rinderpest Vaccine (TCRV). Ectoparasite control was carried out by spraying the sheep with solution of Asuntol at a concentration of ml L⁻¹ of water (Bayer AG, Germany). All the animals were ear tagged,

Table 1: Experimental protocol for single and mixed infection of *T. congolense* and *H. contortus*

Group	No. of animals infected	Infection regimen	
		Day 0	Day 7
A	6	1500L ₃ <i>H. contortus</i> /animal orally	
B	6	10 ⁶ <i>T. congolense</i> /animal IV	
C _a	6	10 ⁶ <i>T. congolense</i>	1500L ₃ <i>H. contortus</i> /animal orally
C _b	6	1500L ₃ <i>H. contortus</i> /animal orally	10 ⁶ <i>T. congolense</i> IV
Control	6	Control	Control

Key: L₃ = Infected Larvae, IV = Intravenous Injection

kept in different groups including control and maintained in complete hygienic conditions, provided with groundnut and beans crop residues. Cotton seed cake, wheat bran, slat-lick and water were provided *ad libitum*.

Experimental design: The 30 experimental animals were divided into four groups A, B, C and D. Group A and B consisted of 6 animals each, while Group C had 12 animals and Group D (control) had 6 animals (Table 1). Animals in Group A and B were singly infected with *Haemonchus contortus* and *Trypanosoma congolense*, respectively. Animals in Group C were further divided into 2 groups C_a and C_b. Six animals in Group C_a had doubled infection with *T. congolense* preceding *H. contortus* while the remaining 6 in Group C_b had double infection but in reverse order. Group D animals served as control

Laboratory strain of *T. congolense* was obtained from National Institute of Trypanosomiasis Research (NITR) Vom, Plateau State and maintained in laboratory animals (mice) for 5 days, at peak of parasitaemia, the trypanosome parasites were harvested and inoculated into a donor sheep, at high level of parasitaemia 1×10⁶ trypanosomes were inoculated into each of the experimental sheep intravenously.

For *H. contortus*, hundreds of adults female *H. contortus* were recovered from ovine abomasum purchased from the abattoir. The tissues were crushed gently in a mortar, mixed with sterile bovine faeces and then incubated for 7 days at 23-27°C. The third stage larvae (L₃) were recovered on Day 7 and the concentration per 100 µL determined. Each of the experimental animals was given 1500 L₃ per Os.

RESULTS

All the sheep in group A infected with *H. contortus* (Hc) alone developed patent infection. Initially, 80% of the sheep started passing out eggs in their faeces by Day 25 however by Day 27 pi, the infection was patent in all the sheep in the group. The Egg Per Gram of faeces (EPG) rate picked up slowly from 476±11.3 on Day 25, to

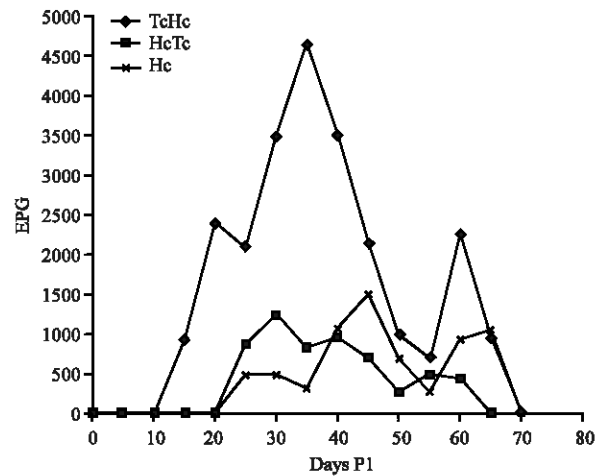


Fig. 1: Mean EPG of single and mixed infection of *T. congolense* and *H. contortus* in yankassa sheep

attend a peak of 1488±2.1 on Day 45 pi and then dropped to 1035±1.6 on Day 65 pi. By Day 70 pi no eggs were found in the faeces. In Group C_a (Tc+Hc), having dual infections, the infected animals developed patent infection rapidly as revealed by the results of faecal examination. Typical eggs of worms were first noticed on Day 15 pi, when 25% of the sheep were found to be discharging *H. contortus* eggs in their faeces. By Day 18, all the sheep in the group were found to be positive for *H. contortus* eggs in their faeces. The mean egg count was 913±1.5 on Day 15 pi. However, this reached a peak of 4635±3.5 on Day 35 pi declined to 960±1.5 on Day 65 and zero by Day 70 pi. A higher weekly mean egg of 4635±1.5 was observed in sheep infected with Tc+Hc on Day 28 pi and was statistically significant (p<0.05) when compared with the values of egg in group C_b (Hc+Tc) on the same day.

In animals of group C_b (Hc+Tc), where L₃ of *H. contortus* preceded by the *T. congolense* infection after 1 week's interval, 30% of the animals started discharging eggs on Day 25 pi. By Day 30 pi all the sheep were positive for *H. contortus* eggs. The mean of 862±1.2 on Day 25 pi rose gradually to reach a peak of 1240±1.6 on Day 30 pi, there after, the egg declined to 431±0.9 on Day 60 pi and was nil by Day 65 pi (Fig. 1).

The mean abomasal worm load encountered in euthanized and post mortem cases in group C_a (Tc+Hc), having double infection in which *T. congolense* preceded *H. contortus* infection was significantly more (p<0.05) than the worm population in other 2 groups A (Hc) and C_b (Hc+Tc).

All the trypanosome-infected groups (B, C_a and C_b) showed different prepatent periods. The parasitaemia in

the Tc+Hc was patent on Day 5 pi while in the Hc+Tc group it was patent on Day 7 pi. The Tc infected group had a prepatent period of 10 Days.

Mean parasitaemia remained high during the initial phase of the infection and declined during the later phase (Day 12-45 pi), giving mean parasitaemic score of 3.2 ± 0.1 and 0.3 ± 0.1 , respectively for the two periods. All the trypanosomes infected groups (Hc+Tc and Tc) remained parasitaemic up to Day 45pi, while in the Tc+Hc group, there was parasitaemia up to Day 50 pi.

DISCUSSION

This study revealed that the mixed infection of *T. congolense* in Yankassa sheep apparently lowers the body resistance to *H. contortus* infection, making the animal more susceptible to the helminth infection. Higher rate of L_3 establishment was observed in this study, this is in consonance with the findings of Sharma *et al.* (2000) who observed an enhanced L_3 establishment in co-infection of *T. evansi* and *H. contortus* in goats. The mean prepatent period observed in this study in sheep infected with *H. contortus* alone was 21 days, whereas, in sheep with co-infection (Tc+Hc) it was reduced to 17 Days. These findings agree with the results of Griffin *et al.* (1981), Kaufman *et al.* (1992) and Goossens *et al.* (1997), who reported reduction in prepatent period of *H. contortus* in goats, cattle and sheep, respectively that had prior trypanosomal infection. In this study, the Yankassa sheep infected with *H. contortus* which was followed by *T. congolense* after one week had prepatent period of 21 days which is known to be normal. The reduction in prepatent period observed in this study, could suggest the fact that *T. congolense* infection facilitate the development of *H. contortus* larvae leading to their early maturation. It is also possible that the immunosuppressive effect of *T. congolense* infection on IgE production (Griffin *et al.*, 1981) might have contributed to the early establishment of the *H. contortus* infection. IgE is normally responsible for protecting the host against parasite in the gut (Oglive and Parrot, 1974).

Higher mean abomasal worm population was observed in animals with dual-infection in group C_a (Tc+Hc). These findings were in similar with the report of Griffin *et al.* (1981), they observed higher abomasal worm population in goats having dual infection (Tc+Hc). The high worm population could be attributed to the immunosuppressive effects of *T. congolense* infection which lowered the host resistance against *H. contortus*.

All the trypanosome-infected groups (B , C_a and C_b) showed parasitaemia at different periods. The infections were patent on Day 5, 7 and 10 pi for the Tc+Hc, Hc+Tc and Tc groups, respectively. Present observations differed from Sharma *et al.* (2000) who recorded parasitaemia within 7 days of infection in all the trypanosome-infected groups.

CONCLUSION

The present study demonstrates the importance of the co-infection in sheep, especially in areas that is endemic for trypanosomosis, where strategic measures might be required for the control of Helminthosis

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