THE EFFECTS OF *Trypanosoma congolense* INFECTION ON PARASITAEMIC LEVELS, WEIGHT CHANGES, FOOD AND WATER CONSUMPTION IN EXPERIMENTAL RATS

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ABSTRACT

Albino rats (Wister strain) were infected with a *Trypanosome congolense* as a model to study the effect of trypanosomiasis on parasitaemic levels, weight changes, food and water intake. Rat infection revealed development of parasitaemia within 7 days of intraperitonial inoculation and irregular fluctuations of parasitaemic levels with maximum parasitaemia attained on day 16 post infection. There was also growth retardation in infected rats associated with decreased food and water consumption when compared with uninfected rats ($P<0.05$). The degree of growth retardation experienced by trypanosome infected animals is influence by energy intake. These findings provide strong evidence that infection with *Trypanosoma congolense* is associated with lack of appetite and muscular degeneration.

Keywords: ***Trypanosoma congolense*, weight changes, food intake, rats.**

INTRODUCTION

Trypanosomiasis is a parasitic disease that affects domestic and wild animals including humans, and is usually fatal if the host is not treated. It is caused by flagellated protozoan parasites of the genus *Trypanosoma,* and is transmitted mainly by different species of tsetse fly of the genus *Glossina.* The disease is endemic to 36 countries of sub-Saharan Africa where the tsetse vectors are found (Chadenga, 1994; WHO, 1998). The disease shows a host of adverse clinical manifestations in both livestock and human, producing symptoms such as intermittent fever, headache, anaemia, enlargement of superficial lymph nodes, abortion, infertility, loss of nervous coordination following infection of central nervous system (by *T. brucei)* and a high mortality if left untreated (Jones *et al,* 1996; Akinwale *et al,* 1999). Studies using animal species especially rodents have been very helpful to these effects. Researches on the effects of the disease have been documented (Adejinmi and Akinboade, 1999; Ajuwape and Antia, 1999; Holmes *et al,* 2000).

Sub-Sahara Africa is faced with food shortages to sustain the constantly growing population coupled with environmental degradation that make these countries poor. Tsetse fly transmitted trypanosomiasis is a major factor in this regard. To overcome these problems researches should be geared towards increased livestock production and hence rural development. In order to catalyse real livestock production growth and improvement in the standard of living, there is need to address the fundamental issue of food sufficiency by improving the health need of human and his animals. This study helps to investigate the direct impact of trypanosomiasis on weight gain, food and water intake as a measure of productive impact in livestock.

MATERIALS AND METHODS

Source of Laboratory Rats and Experimental *Trypanosoma congolense*

White male albino rats (Wister strain) weighing between 120-150g used in this study were purchased from the animal house of the National Institute for Trypanosomiasis Research (NITR), Vom. *Trypanosoma congolense* (Lafia strain) was obtained from National Institute for Trypanosomiasis Research (NITR), Vom. This was passaged two times in albino rats before use as donors.

Experimental Infection of Laboratory Rats

Male Albino rats (Wister strain) were infected with *T. congolense*. The rats were divided into two groups of 5 rats per cage and kept at room temperatures fluctuating from 28-35^{0}C. (Group 1: infected and Group 2: not infected). The two groups of rats were housed in separate plastic cages equipped with ^{1}/4-inch wire mesh lids and fed growers' mash (Top Feeds Nig. Ltd) and drinking water *ad-libitum* throughout the 28 days of study.

To initiate infections in experimental rats (Group 1), the donor was killed by anaesthetizing with ether and blood was collected by cardiac puncture and the number of parasites assessed by the haemocytometer technique as described by Sannusi, (1977). Dilution of the parasites was made in phosphate glucose buffered physiological saline solution. Experimental rats were given 5 x 10^3 trypanosomes in 0.5 ml volume administered via intraperitonial (i.p.) route. All the animals used in this study had no prior trypanosome infection as evidenced in negative blood test. The experiment was terminated on post infection day 28.

Collection of Blood Samples from Experimental Rats

Blood smears from tail vein for determining parasitaemia were made daily for the first 1 week and at 4 days intervals, beginning 1 week post infection and continuing till end of study period. Quantification of parasitaemia was assessed by haemocytometer technique (Sannusi, 1977) and the number of trypanosomes determined at designated times was expressed as mean number of trypanosomes per ml of blood.

Determination of Weight Changes, Food and Water Consumption

The initial and final weight of experimental rats, their daily food and water consumption were taken using weighing balance (Triple balance) and measuring cylinder as required. Food and water consumption were determined by deducting the amount of food or water left from the amount provided daily. Thereafter the mean of the amount consumed was determined. The student's *t*- test was used to analysis the data and a P-value of <0.05 or less was considered significant.

RESULTS

Parasitaemia was first detected on day 7 post-infection with mean parasitaemia of 135 ± 0.2 x 10^6/ml of blood, this level of parasitaemia was persistent and reached a maximum mean of 337 ± 1.2 x 10^6/ml of blood on day 16 post-infection and this was significantly higher ($P<0.01$) than the parasitaemia levels obtained in other days of the experimental period (Fig. 1). Thereafter, parasitaemia dropped and rose to another peak (265 ± 2.8 x 10^6/ml of blood) on day 20 post-infection. This peak was then followed by irregular

fluctuations in the number of detectable parasites in decreasing order for the remaining period of the experimental period.

The live body weight changes of trypanosome infected rats and normal rats were determined at day 0 and 28 days post infection and mean body weight of each group of rats was calculated. The results obtained are presented in Table 1. The baseline body weight was not different among the groups. However, the weight loss was observed in trypanosome-infected rats as against weight gain in normal rats.

Daily food and water consumption per rat group were measured in trypanosome infected and normal rats (Table 2). Infected rats had their food and water intake reduced during the period of the study as compare to normal rats.

DISCUSSION

In the recent past, research on livestock has increased tremendously and effort is directed towards establishing normal and abnormal changes of diseases such as trypanosomiasis that could help in its epidemiological monitoring. Laboratory experiment in rat or mouse model has made great impact in these areas of research.

The findings in parasitaemia showed that the pre-patent period for experimental infection of rats with *T. congolense* is about 7 days employing intraperitonial route of inoculation and it is able to attain about 3-fold rise of the first detectable level of parasitaemia in 7 days. The decreasing number in the detectable parasites thereafter may imply that self-cure could be probable.

Weight loss was first observed in infected rats on day 8 after *T. congolense* inoculation, whereas uninfected rats kept on gaining weight. Better growth rate observed in uninfected rats could be attributed to increased food and water consumption and weight loss in infected rats could be attributable to parasite-induced lack of appetite and muscular degeneration. Itard, (1990) stated that the apparent weight loss was due to increase in parasitaemia. Changes in weight might possibly reflect the severity of the disease progress and also serve as a diagnostic aid. It is also a fact that nutritional status of the host influences the pathogenesis of the infection (Agyemang *et al*, 1990; Little *et al*, 1990) by promoting body weight gains; therefore animals should constantly be well nourished so as to withstand parasitaemia.

CONCLUSION

Trypanosomiasis is a huge constraint to livestock production and as such an economic set back. The development of basic and applied research to control these neglected diseases will promote positive impact on food sufficiency and quality of life.

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REFERENCES

Adejinmi, J. O. and Akinboada, O. A. 1999. Changes in Body Weight, Temperature and Haematological parameters in WAD Goats with Experimental Mixed *Trypanosoma brucei* and *Cowdria ruminantum* Infection. *Tropical Veterinarian*. 17: 211-217.

Agyemang, K., Dwinger, R. H., Touray, B. N., Jeannin, P., Fofana, D. and Grieve, A. S. 1990. Effects of nutrition on degree of anaemia and weight changes in N'Dama cattle infected with trypanosomes. *Livestock Production Sciences*. 26: 39-51.

Ajuwape, A. T. P. and Antia, R. E. 1999. Haematological changes in Nigerian Zebu cattle with Aparasitaemic but antigenaemic trypanosomosis. *Tropical Veterinarian*. 17:37-42.

Akinwale, O. P., Nock, I. H., Esievo, K. A. N. and Edeghere, H. U. F. 1999. The effect of Experimental *Trypanosoma vivax* infection and treatment on the packed cell volume of three breeds of Nigerian goats. *The Nigerian Journal of Parasitology*. 20: 27-32.

Chadenga, V. 1994. Epidemiology and control of trypanosomiasis. *Onderstepoort Journal of Veterinary Research*. 61(4): 385-390

Holmes, P. H., Katunguka-Rwakishaya, E., Bennison, J. J., Wassink, G. J and Parkins, J. J. 2000. Impact of nutrition on the pathophysiology of bovine trypanosomiasis. *Parasitology*. 120: S72-S85.

Itard, J. 1989. African Animal Trypanosomiasis. Manual of Tropical Veterinary Parasitology, English edition. CAB International, Wallingford, Oxon, UK. Pp179-290.

Jones, T. C. Hunt, D. and King, N. W. 1996. Diseases due to protozoa-Trypanosomiasis. In: Veterinary Pathology 6th ed. Pp583-589. William and Wilkins, Baltimore.

Little, D. A., Dwinger,R. H., Cliford, D. J., Grieve, A. S., Kora, S. And Bojang, M. 1990. Effect of nutritional level a nd body condition on susceptibility of N'Dama cattle to *Trypanosoma congolense* infection in the Gambia. Proceedings of the Nutrition Society 49:209A.

Sannusi, A. 1977. Enumeration of trypanosomes in the haemocytometer, problem and prospects. 1st Annual Conference of the Nigerian Society of Parasitology, Ibadan, Nigeria. August 30, 4.

WHO. 1998. Contrl and surveillance of African trypanosomiasis. Report of a WHO Expert Committee, WHO Technical Report Series No. 881. Geneva.

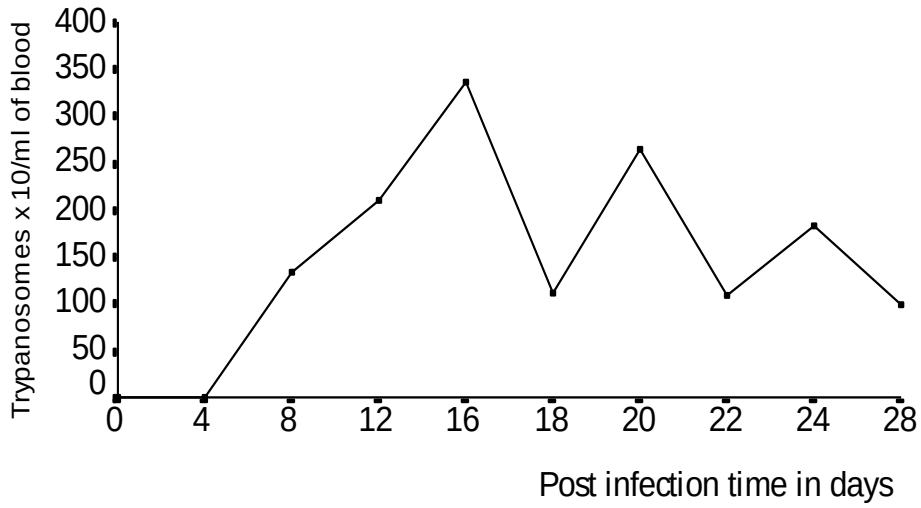

Fig. 4.4: Mean parasitaemia of 5 rats infected with Trypanosoma congolense at 8 weeks of age

Table 1: Effects of experimental *Trypanosoma congolense* infection of rats on live body weight changes

Groups	Weight (g)		
	Initial	Final	Change
Infected rats	135.0 ± 2.8	128.8 ± 0.6	6.2 ± 0.5[a]
Uninfected rats	136.0 ± 9.8	144.6 ± 6.5	8.6 ± 0.6

Values are mean ± SEM (n=5)
As compared to uninfected rats [a]P<0.05

Table 2: Effects of experimental *Trypanosoma congolense* infection of rats on daily food and water consumption

Groups	Food (g)			Water (ml)		
	Initial	Final	Change	Initial	Final	Change
Infected rats	47.7±1.9	9.6±0.0	38.1±1.9[a]	210.9±0.2	86.6 ±0.2	124.3±0.2[b]
Uninfected rats	46.1±1.8	92.3±0.6	46.2±2.6	201.6±0.1	251.1±0.2	49.5±0.4

Values are mean ± SEM (n=5)
As compared to uninfected rats [a]P<0.05, [b]P<0.001,