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SHORT COMMUNICATION

EFFECT OF VITAMIN C ON THE PACKED CELL VOLUME OF TRYPANOSOME INFECTED RATS

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Abstract

This research was interested in using nutrient in the amelioration of trypanosomiasis which is one of the most endemic diseases of livestock. The study was carried out to evaluate the effect of Vitamin C on the Packed Cell Volume (PCV) of *Trypanosoma brucei* infected rats. Twenty albino rats (*Rattus novegicus)* were used. They were divided into four groups. Cages A and B contained non infected rats while Cages C and D contained infected rats. Treatment one contained only chick mash while treatment two contained 1kg of chick mash and 1g of vitamin C thoroughly mixed together. Rats in Cages A and C were fed Treatment 1, while rats in Cages B and D were fed Treatment 2. Rats in Cages A and B served as control groups. Blood samples of the rats were taken weekly for determination of Packed Cell volume using haematocrit centrifuge method. The experiment lasted for five weeks. At the end of the experiment, it was observed that rats fed with Vitamin C had higher average PCV than the rats fed only chick mash. The rats in Cage B had approximately 48% PCV while that of Cage A had approximately 46% PCV. Also in the infected group, those in Cage D had approximately 40% PCV while those in Cage C had approximately 30% PCV. It was also observed that rats fed with vitamin C lived longer than the rats fed only chick mash in the case of rats infected with *T. brucei*.

Keywords: Packed cell volume, *Trypanosoma brucei*, *Rattus novegicus.*

Introduction

Trypanosomiasis is one of the most important livestock diseases in sub-Saharan Africa (Morrison *et al.,* 1981). The protozoan parasite that causes it is *Trypanosoma* species and is transmitted by tse tse flies (*Glossina* species) (Vaclav, 1980). Trypanosomiasis retards livestock production (Stephen, 1986). The disease is known as nagana in livestock. It is caused by *Trypanosoma brucei*, *Trypanosoma congolense* or *Trypanosoma rhodesiense*.

The parasite causes tissue damage by utilization of metabolites, excretion of toxic substances, mechanical damage to the host's tissue and immune mediated injuries. The first wave of parasitemia is accompanied by depressed packed cell volume (PCV), neutropenia and thrombocytopenia (Krampitz, 1970). Trypanosome infection is associated with anaemia, pyrexia (hyperthermia), coachexia, loss of appetite, reproductive disorders including abortions in pregnant animals and eventually death (Shaw and Dusanic, 1973; Ogwu and Nuru, 1981; Ogwu *et al.,* 1980). Improvement on host's nutrition is important in moderating the severity of pathophysiological effect of trypanosomiasis and also influences the rate of recovery (Katungka-Rwakishaya, 1996). It was also

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discovered that supplementary feeding significantly reduces the severity of trypanosomiasis (Agyemang *et al.,* 1990; Little *et al.,* 1990).

Trypanosome is known to attack red blood cells and vascular endothelium. It concentrates more in the peripheral circulation (Jackson, 1979). The number of parasites in the blood is more in the tip of an infected rat's tail than other places. Relatively high virulence has been observed in highly susceptible strains of mice infected with trypanosome. This leads to death between days 10 and 20 (Jackson, 1979).

It has been reported that Vitamin C operates at the cellular level in that it reaches every cell of the body. The concentration of vitamin C in both blood serum and tissue is high (Eberhard *et al*., 1989). Vitamin C plays important role in the manufacture and defense of connective tissues and elaborate matrix that holds the body. It also serves as primary ingredient for collagen. Vitamin C is required for growth and repair of tissues in all parts of the body. It helps the immune system to fight against foreign invaders (Eberhard *et al*., 1989). Vitamin C helps in control of blood pressure and protects the tissues and blood from free radical damage.

In line with the background that vitamin C has protective measures in the tissues and cells and that trypanosomiasis depressed PCV, this study was conducted to determine the effect of vitamin C on the PCV of trypanosome infected rats.

Materials and methods

Twenty 90-days old female albino rats (*Rattus norvegicus*) were used for this experiment. The rats were marked for identification and held in stainless wire-rats-cages in clean experimental animal house. The cages were labeled A to D corresponding to four groups and each group had five rats. Diet 1 was given to rats in Cages A and C while Diet 2 was given to rats in Cages B and D. Diet 1 contained only chick mash while Diet 2 contained 1kg of chick mash mixed with 1g of vitamin C. Rats in Cages A and B were not infected while rats in Cages C and D were infected with *T. brucei*. One rat was first inoculated with trypanosome of NITR type from Veterinary Medicine Faculty, University of Nigeria, Nsukka. It was isolated from other animals and after 14 days of inoculation, the blood of the rat was used to inoculate others. Each experimental rat that was inoculated was given 0.1ml of infected blood in normal saline, which contained about eight thousand trypanosomes, using a matching chart (Herbert and Lumbsden, 1976) to determine the level of parasitemia. Rats in Cages A and B served as control groups. Each experimental set up was replicated three times. The rats had unrestricted supply of clean drinking water.

The blood of the rats were taken weekly for determination of PCV. The rats tails were giving sharp cut through which blood is drained into haematocrit capillary tubes and centrifuged at 10,000 r.p.m. for 5 minutes using haematocrit centrifuge, after which the centrifuge reader was used to obtain the PCV.

Statistical analysis

The data were analyzed for significant differences by analysis of variance (ANOVA) using SPSS version 11.0 ® for windows. Specific differences in treatment means were determined using Least Significant Difference (LSD) and the Duncan's New Multiple Range Test (DNMRT) (Steel and Torrie, 1990).

Results

Figure 1 shows the average PCV of rats with the different treatment. Rats fed with Diet 2 (Cages B and D) had the highest PCV compared with ones fed with Diet 1 (Cages A and C). Rats in Cages A and B served as control and rats in Cage B (fed with diet 2) had higher PCV than rats in Cage A (fed with diet 1). Also in the infected groups, rats in Cage D (fed with diet 2) had higher PCV than rats in Cage C (fed with diet 1). Rats in cage D had PCV above 30% while those in cage C had PCV below 30%. There is a significant difference ($p<0.05$) between rats in Cage B and those in Cages C and D. There is also significant difference ($p<0.05$) between rats in Cage C (infected rats fed with diet 1) and those in Cage D (infected rats fed with diet 2).

Discussion

Rats fed with Diet 2 (rats in Cages B and D) had the highest Packed Cell Volume (PCV). In the control group (Cages A and B), though the rats were not infected the ones in Cage B had the highest PCV and also the infected rats in Cage D had higher PCV than those in Cage C, indicating that Vitamin C had good impact on the cells as stated by Eberhard *et al*. (1989). In the case of infected rats, those in Cage D had trypanotolerance than those in Cage C, and this is in agreement with the suggestion that the degree of trypanotolerance is greatly affected by nutritional status of host animals (Murray, 1988; Agymang *et al*., 1990) and that supplementary diet enhances trypanotolerance in rats (Mgbenka and Ufele, 2004). It is therefore inferred that vitamin C enhances trypanotolerance in rats.

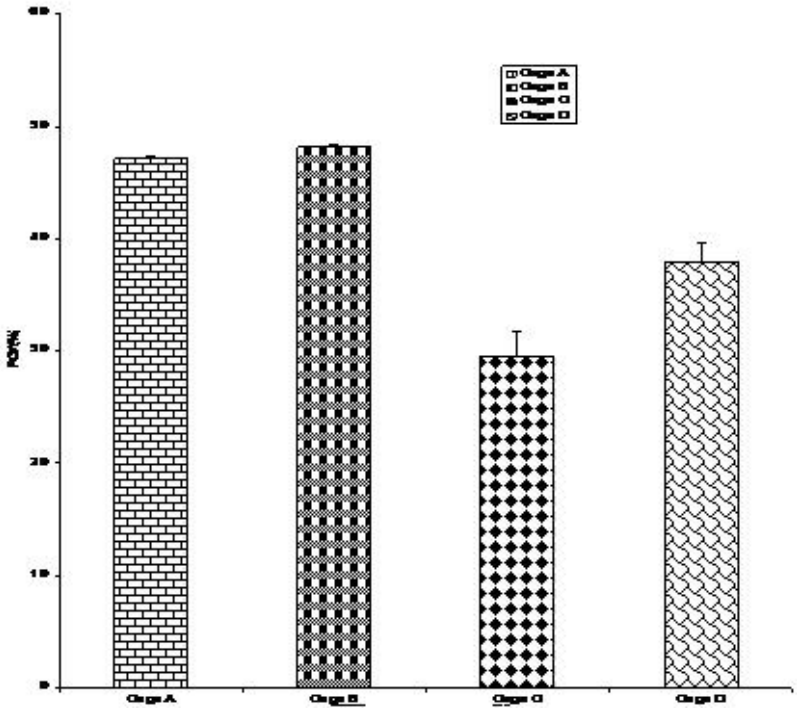

Fig.1. Mean of packed cell volume (PCV) of rats fed with different treatments to check the effect of vitamin C on trypanosomiasis

Conclusion

From the results obtained in this study, depression of PCV in infected rats is reduced using vitamin C as food supplement. As this findings proved positive in administration of vitamin C to ameliorate PCV depression by trypanosomiasis in rats (*R. norvegicus)*, thereby enhancing trypanotolerance, it opens up interests in further research in adapting the findings to higher animals.

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