Volume 3 No.5, May 2013 ISSN 2224-3577

International Journal of Science and Technology

http://www.ejournalofsciences.org

The Roles of Dietary Vitamins A and D Supplements in Treatment of Hypoproteinamia Induced by Trypanosoma Brucei – Infected Rats

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ABSTRACT

The roles of dietary vitamins A and D supplements in the treatment of hypoproteinamia induced by Trypanosoma brucei – infected rats were studied. The rats were inoculated with trypanosomes intraperitoneally and samples were collected on fourth, eight, twelfth and sixteenth days of post infection. The experiment was carried out at the Department of Biochemistry, Nnamdi Azikiwe University Awka. Seventy five parasite free-albino rats were used, which were divided into five groups. Group A (control) was left uninfected with trypanosomes, group B and C were infected vitamins A and D per kg of feed respectively, group D was infected with trypanosomes and treated with 30mls of vitamin A plus 30mls of vitamin D and group E was infected and left untreated. Analyses of sera using Bradford method and cellulose acetate electrophoresis showed that vitamins A and D influenced the state of hypoproteinamia in the trypanosome - infected rats. This was manifested by a positive increase in the level of total serum protein concentration, albumin and beta-globulin concentration. The vitamins also delayed the proliferation of the parasites associated with trypanosomiasis.

Keywords: *Vitamin A, Vitamin D, Trypanosoma brucei, and Rattus norvegicus.*

I. INTRODUCTION

Trypanosomiasis is associated with a decreased serum protein as infection progressed. Nutrition is important in moderating the severity of pathophysiological effect of trypanosomiasis and also influences the rate of recovery[1]. It was also discovered that supplementary feeding significantly reduces the severity of trypanosomiasis[2;3]. Vitamin A is essential for the development of bursa of fabricius, thymus and immunity in chickens[4]. Vitamin A supplements strongly increase serum protein and glucoprotein synthesis which maintain synthesis of surface coating mucopolysaccharides.

Over the years, vitamin A has been used to tackle all kinds of infections and it is very popular both among the low, middle and higher socio-economic class[5;6]. Vitamin D was discovered a long time ago as an essential nutrient for calcium and phosphate homeostasis, and thus is essential for bone health [7].

Over the last decade, a plethora of literature confirmed the existence of the vitamin D receptor (VDR) on multiple tissues, and therefore it is accepted now that vitamin D functions extend above and beyond bone homeostasis. It has been demonstrated that among the desirable and protective functions of vitamin D, it has anti-inflammatory and anti-atherogenesis effects[8;9;10;11;12] and decreased rennin activity and biosynthesis[13;14] . Vitamin D also induces cell differentiation[15].

In this study, we shall focus our research on defining serum levels of vitamins A and D that exert beneficial effects particularly on the available exogenous compound approved for human use and vitamins A and D impacts on serum levels in animals infected with *Trypanosoma brucei*.

II. MATERIALS AND METHODS

Three months old male albino rats (Rattus norvegicus) weighing
approximately 145g, 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 E corresponding to five groups and each group had five rats.

Diet 1 was given to rats in cage A which contained 1kg of chick mash without vitamins. Diet 2 was given to rats in cage B which contained 1kg of chick mash mixed with 60mls of vitamin A. Diet 3 was used to feed rats in cage C which contained 1kg of chick mash mixed with 60mls of vitamin D. Diet 4 was used to feed rats in cage D which contained 1kg of chick mash mixed with 30mls of vitamin A plus 30mls of vitamin D and Diet 5 was used to feed rats in cage E which contained 1kg of chick mash without vitamins. Rats in cage A were not infected while rats in cages B, C, D and E were infected with Trypanosoma 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 that

rat was used to inoculate others. Each experimental rat that was intraperitoneally infected with about 10^6 T. brucei in 0.5ml of cold saline diluted tail blood from a donor rat, using a matching chart16 to determine the level of parasitaemia. Rats in cages A and E served as control groups. Each experimental set up was replicated three times. The rats had unlimited supply of clean water.

5ml of the blood of the rats were collected in each experimental day which was four days intervals for sixteen days of the experimental period to determine the total serum protein, albumin and beta- globulin concentration. The collected blood was allowed to clot for about 30minutes at room temperature. Then each sample was centrifuged at 3, 000 rpm for 15 minutes and then serum was removed. The sera were used for total serum protein and serum fractions determination using Bradford method and cellulose acetate electrophoresis respectively. The absorbance of the solutions was read at 520 nm-wavelengths using spectrophotometer.

Statistical Analyses

The data were presented as means of ± SEM of three replicates values. The data were determined using 2-way ANOVA and data obtained were reported as mean concentration.

III. RESULTS

The result obtained indicated that administration of vitamins A and D improved the serum protein of trypanosome infected rats. This was shown in tables 1, 2, and 3. Table 1 shows the level of total serum protein concentration of the experimental rats. The lowest level of total serum concentration of 49.12 g/l, 17.76g/l albumin, and 3.46g/l beta-globulin was observed in infected untreated rats, which was cage E. Followed by 51.04g/l total serum protein concentration, 20.76g/l albumin concentration and 5.87g/l beta-globulin concentration was observed in infected rats treated with 60mls of vitamin A per kg of chick mash, which was cage C. Followed by 52.71g/l total serum protein concentration, 23.32g/l albumin concentration and 5.99g/l beta-globulin concentration was observed in infected rats treated with 60mls of vitamin D per kg of chick mash, which was cage B. Then infected rats which were treated with 30mls of vitamin A plus 30mls of vitamin D per kg of chick mash, had 60.70g/l of total serum concentration, 30.18g/l albumin concentration and 7.68g/l beta-globulin concentration, which was Cage D. The highest level was seen in rats in cage A which had 61.37g/l of total serum concentration, 32.53g/l albumin concentration and 8.26g/l beta-globulin concentration, which was cage A.

IV. DISCUSSION

The observed effect of vitamins A and D supplements from this study on the serum protein of trypanosome- infected rats when compared with the infected untreated rats showed that both vitamins had positive influence on the defense capacity of infected treated animals.

In the present investigation, both vitamins A and D presumably kept the free radical load in infected rats low as well as preventing the disease associated depletion in systemic tissues and organs. This would provide greater protection for cell membrane components as well as other susceptible cellular components, hence significantly retarding tissues and organs damage. Therefore, this study has provided evidence that vitamins A and D has a potential for influencing the state of hypoproteinamia in the trypanosome - infected rats.

V. CONCLUSION

We thus conclude that consumption of vitamins A and D by T. brucei infected rats prevented fall in systemic antioxidants reserve and alleviated disease- induced damage.

Table 1: **Total serum protein (g/l) of rats with the length of Post-infection (Pi).**

Length of Pi	Rats in Cage A	Rats in Cage B	Rats in Cage C	Rats in Cage	Rats in Cage E
4	60.80	59.84	58.60	60.69	58.80
8	60.92	56.24	55.86	59.81	54.20
12	61.86	53.46	51.88	61.74	48.82
16	61.90	41.31	36.80	60.54	34.64
Total	**245.48**	**210.85**	**204.14**	**242.81**	**196.46**
Mean	**61.37**	**52.71**	**51.04**	**60.70**	**41.12**

Table 2: Albumin conc. (g/l) of the experimental rats with the length of Post-infection (Pi).

Length of Pi	Rats in Cage A	Rats in Cage B	Rats in Cage C	Rats in Cage	Rats in Cage E
4	32.70	30.22	30.02	31.64	27.84
8	31.84	23.90	20.40	30.58	15.62
12	32.84	22.06	19.74	29.92	15.74
16	32.72	17.08	12.88	28.56	11.84
Total	**130.10**	**93.26**	**83.04**	**120.70**	**71.04**
Mean	**32.53**	**23.32**	**20.76**	**30.18**	**17.76**

Table 3: Beta-globulin conc. (g/l) of experimental rats with the length of Post-infection (Pi)

Length of Pi	Rats in Cage A	Rats in Cage B	Rats in Cage C	Rats in Cage	Rats in Cage E
4	7.86	6.44	6.43	7.84	5.84
8	8.68	6.02	5.98	8.02	3.21
12	8.18	5.86	5.48	7.84	2.68
16	8.33	5.62	5.60	7.03	2.10
Total	**33.05**	**23.94**	**23.49**	**30.73**	**13.83**
Mean	**8.26**	**5.99**	**5.87**	**7.68**	**3.46**

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