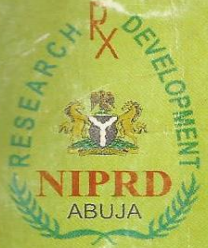


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**Effect of Garlic on Total Free Fatty Acid Levels of Rats Experimentally  
Infected with *Trypanosoma brucei brucei***

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**Abstract**

The effect of garlic on white albino rats experimentally infected with *Trypanosoma brucei-brucei* (Federe/CT/28/NITR) was investigated. Groups of rats were treated orally at 24 hours post infection for 7 days with 50, 100, 150 and 200 mg garlic per kilogramme body weight. Free fatty acid (FFA), serum albumin and packed cell volume (PCV) were determined on day 7. The result showed a significant decrease in FFA levels and increase in serum albumin levels of garlic treated rats when compared to infected and untreated rats ( $P < 0.05$ ). There was also a significant improvement in PCV values of garlic treated rats when compared to uninfected and untreated ones ( $P < 0.05$ ). This implies that oral treatment of trypanosome infected animals with garlic can effectively prevent the rise in FFA levels.

Key words: *Trypanosoma brucei brucei*, garlic, free fatty acid.

**Introduction**

Landsteiner and Raubitschek (1) found that degenerating trypanosomes, probably *T. brucei* generated a lipid soluble factor and possibly a fatty acid that could lyse red cells. It was also shown by other workers that massive trypanosome destruction occurs regularly as a result of host immune response (2). Apart from the free fatty acid (FFA) derived from autolysing trypanosomes, phospholipase A, which is capable of catalysing the hydrolysis of fatty acid ester linkage in endogenous phosphatidylcholine or phosphatidyl ethanolamine to liberate FFA and lysophospholipid is also produced (3). FFA is generated into the blood via various ways during the course of trypanosome infection (2, 3).

Garlic (*Allium sativum* Linn.) is a common foodstuff to which has been ascribed many medicinal effects. The hypocholesterolemic effect of garlic was first reported by Tempel (5), followed by the reported hypolipidemic effect (6, 7).

This work aims at determining the effect of whole garlic treatment on total serum FFA levels in rats infected with *T. b. brucei*. Such study will afford a better management of red cell lyses that result into anaemia during trypanosomiasis.

**Materials and Methods**

Male adult white albino rats weighing between 150 - 200 g and *Trypanosoma brucei brucei* (Federe/CT/28/NITR) maintained by serial passage in rat were used. They were

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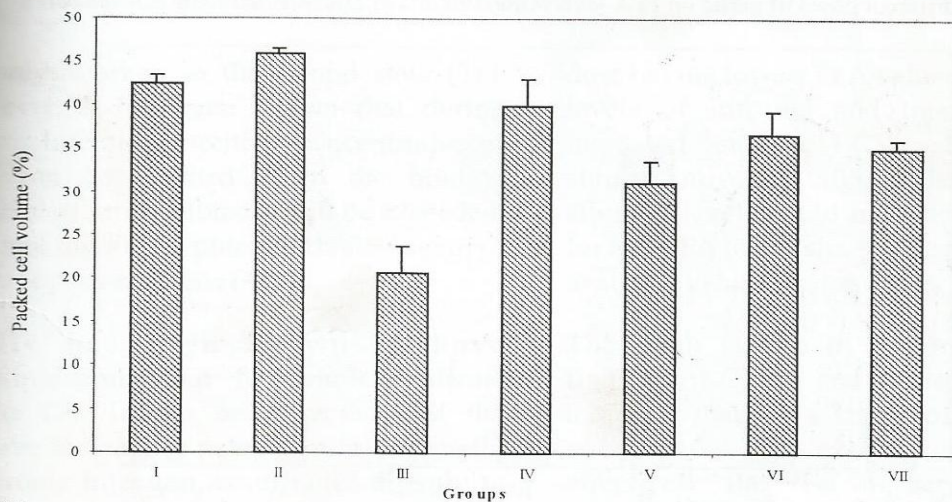
obtained from Parasitology Section of the Nigerian Institute for Trypanosomiasis Research (NITR) Vom.

**Preparation of garlic:** The dry cloves of garlic were removed leaving the succulent fresh bulb which were oven dried at 440°C for 18 hours. The dried garlic was then ground into fine powder before use.

**Experimental design:** The rats were divided into 7 groups of 4 rats each and allowed two weeks for acclimatization. Group I consisted of uninfected and untreated rats while group II were uninfected but treated orally with garlic at 50 mg per kilogramme body weight daily for 7 days. Group III was infected and untreated whereas each rat in groups IV - VII was given 0.1 ml containing  $1 \times 10^5$

trypanosomes and treated orally with whole garlic at 50, 100, 150 and 200 mg per kilogramme body weight respectively, 24h post infection (PI). Subsequently the treatment continued daily for 7 days. The rats were sacrificed on day 8 PI and blood samples collected by cardiac puncture. Forty microliters of whole blood was used for FFA determination as described by Itaya (8); Packed Cell Volume (PCV) was determined by microhaematocrit method using heparinised capillary tubes. The remaining whole blood was left to clot in a clean centrifuge tube at room temperature for 1 h. The clear serum separated at 2000 g for 10 min by centrifugation was used for albumin estimation using bromocresol green method (9).

Fig 1: Effect of different doses of garlic on PCV (%) of rats infected with *T. b. brucei*



- Key:
- I Uninfected and untreated
  - II Uninfected and treated with 50 mg/kg body weight
  - III Infected and untreated
  - IV Infected and treated with 50 mg/kg body weight
  - V Infected and treated with 100 mg/kg body weight
  - VI Infected and treated with 150 mg/kg body weight
  - VII Infected and treated with 200 mg/kg body weight



### Results

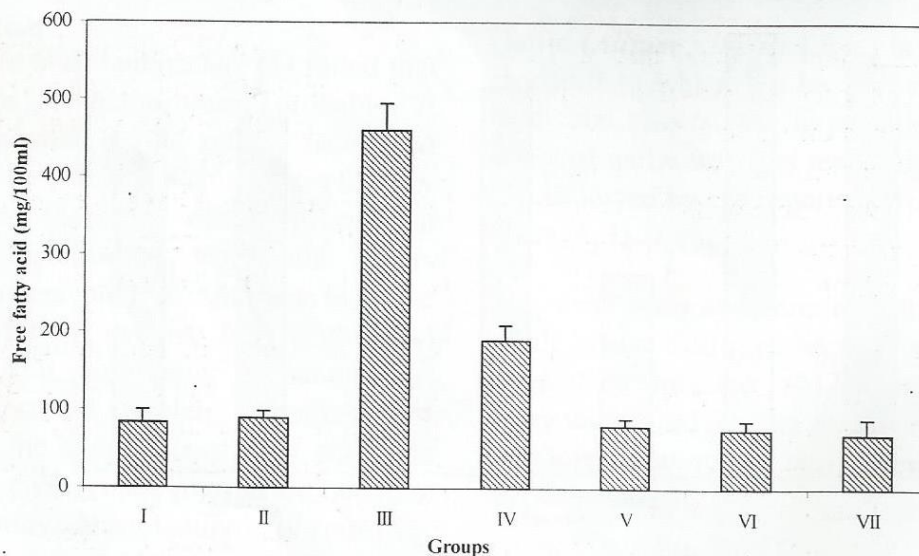
The infected rats developed parasitaemia 2 days PI and one rat in group III died of acute infection at day 7 PI. There was low parasitaemia in infected and treated groups. The PCV values of rats in group III dropped significantly when compared with those of group I ( $P < 0.05$ ). There was also an improvement in PCV of rats in groups IV-VII treated with various concentration of garlic (Fig. 1). Garlic treatment of infected rats prevented effectively the rise in FFA levels ( $P < 0.05$ ) and reduced it to even below the normal levels (group 1) when compared to infected and untreated rats (Fig. 2). The total serum albumin concentration of rats in group III dropped significantly ( $P < 0.05$ ) while those in groups IV - VII compares favourably with those of control groups I and II (Fig. 3). The data were summarized as mean  $\pm$

standard deviation (SD) and significant difference was assessed after a paired Student's *t* test (10).

### Discussion

FFA does not normally exist in free state in the blood but complexed to serum albumin (11). It is thus unlikely to reach haemolytic levels until there is massive trypanosome destruction and when the binding capacity of serum albumin is exceeded (12). It has earlier been shown that in trypanosomiasis, there may be severe haemolytic crisis which is caused by surface active agents which are cytolytic and FFA has been grouped among such agents especially linoleic (2). It is generally felt, however, that the haemolytic properties of FFAs are not significant *in vivo* because of the fact that they are rapidly bound to serum albumin and are not

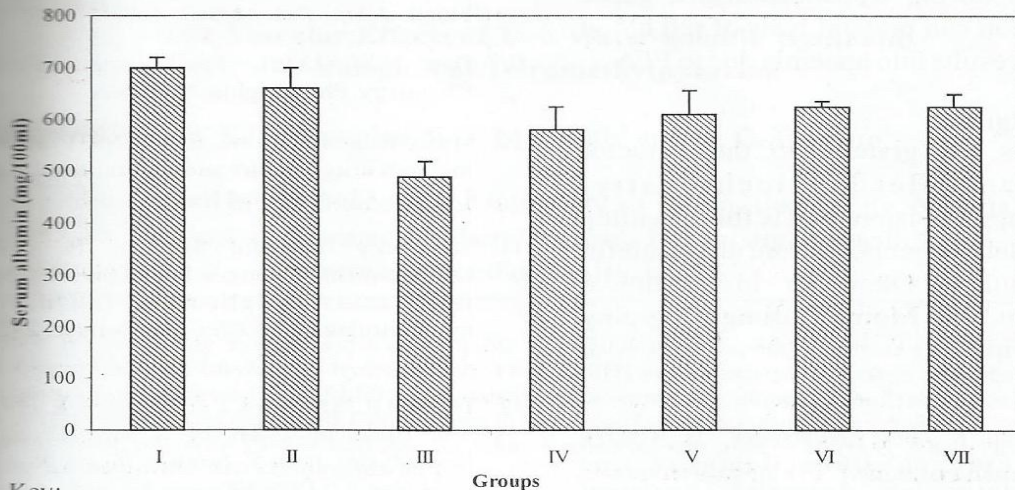
Fig. 2: Effect of different doses of garlic on FFA levels (mg/100 ml) of rats infected with *T. b. brucei*



Key:

- I Uninfected and untreated
- II Uninfected and treated with 50 mg/kg body weight
- III Infected and untreated
- IV Infected and treated with 50 mg/kg body weight
- V Infected and treated with 100 mg/kg body weight
- VI Infected and treated with 150 mg/kg body weight
- VII Infected and treated with 200 mg/kg body weight

Fig. 3: Effect of different doses of garlic on albumin levels (mg/100 ml) of rats infected with *T. b. brucei*



Key:

- I Uninfected and untreated
- II Uninfected and treated with 50 mg/kg body weight
- III Infected and untreated
- IV Infected and treated with 50 mg/kg body weight
- V Infected and treated with 100 mg/kg body weight
- VI Infected and treated with 150 mg/kg body weight
- VII Infected and treated with 200 mg/kg body weight

haemolytic when in the bound state (11). However, it has been shown that during chronic infection, a critical concentration of FFA can be reached when the binding capacity of serum albumin will be exceeded, thus making FFA a potential lysing agent of erythrocyte membrane (4).

Garlic has been shown to have hypolipidaemic and hypocholesterolemic effects (7). It can be expected that the massive increase in parasitaemia, especially in chronic infection, contributes directly to the increase in serum FFA concentration since a large number of parasites will be autolysing (4). In this study the administration of whole garlic to infected rats prevented the FFA raising effect which was dose dependant manner with highest garlic

dose having lowest FFA values. The albumin levels of infected and treated rats were increased and the PCV values improved significantly ( $P < 0.05$ ). The increase in albumin levels could have been responsible for low FFA levels since more albumin will be available to bind excess FFAs.

The result is also in conformity with the findings of Chang and Johnson (13), which indicated that, the addition of garlic oil to a sucrose+cholesterol diet prevented effectively the rise in serum and liver cholesterol, triglycerides and FFA.

#### Conclusion

Whole garlic when administered orally to *T. b. brucei* infected rats prevented effectively the rise in FFA levels, increased serum albumin



and improved the PCV values. The study implies that during trypanosomiasis, garlic administration can prevent lysis of red blood cells which results into anaemia due to FFA.

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