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ANTI-HISTAMINERGIC ACTIVITY OF AFRICAN BREAD FRUIT SEED DIET ON GASTRIC ACID SECRETION IN RATS

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ABSTRACT

Effect of consumption of breadfruit (*Treculia Africana*) seed diet on gastric acid secretion in rats was studied Fifteen adult Wistar rats were randomly assigned into three groups of five rats each The feeding regimens lasted for a period of 4 weeks Gastric acid secretion was then collected from each rat after a 12-18 hr fast under urethane anaesthesia by continuous perfusion The mean basal gastric acid output in control group was 7 02 ± 0 08umol/l/10min and the groups that received, 10% and 100% bread fruit diets were 5 98 ± 0 07 and 7 07±0 30 umol/L/10min respectively When histamine (100mg/kg body weight) was administered, the increase in GAO was least in 100% breadfruit (1 59%), while the greatest increase (83 0%) was produced by rats fed on 10% breadfruit diet On the other hand, 100% breadfruit fed rats produced the greatest reduction (31 62%) in GAO following cimetidine administration (11.40mg/kg; P<0 05) While rats fed on 10% breadfruit diet produced the least reduction, 13 39% (7 32 ± 0 29umol/10min , basal to 5 82 ± 0 20umol/10min , P<0 05) in GAO upon administration of cimetidine It is therefore concluded that, breadfruit strongly inhibits histamine induced stimulation of gastric acid secretion Breadfruit may therefore be beneficial to peptic ulcer patients or peptic ulcer prone individuals

KEYWORDS: Breadfruit; Gastric acid output, anti-histaminergic.

RUNNING TITLE: Consumption of African Breadfruit

INTRODUCTION

African Breadfruit tree (*Treculia Africana*) is native to many parts of West Tropical Africa. It extends to Angola, Mozambique, Sudan and Sao Tome Island (Hutchinson and Dalziel, 1954). In Nigeria different tribes have their local names, the Efiks and Ibibio call if 'Ediang', the Yorubas 'Afon' the Benins 'Ize' and the Hausas 'Barafuta' (Keay and Standfield, 1960) Bread fruit is reach in proteins (Edet *et al.*, 1982; Edet, 1984b) It has most of the essential amino acids (Okafor and Okolo, 1974). The African bread fruit seed has been estimated to contain various concentrations of fiber, fat and moisture (Edet, 1974) It is eaten either cooked or boiled (Umoh, 1998) It has been reported that the fruit contains vitamins especially, vitamin C, fats carbohydrates and minerals (Umoh, 1998) Breadfruit is nutritious and useful both medicinally and health wise (Okafor and Okolo, 1974; Runsewe-Abiodun, 2001).

In the face of paucity in scientific reports on the effects of breadfruit on gastric acid secretion, it is therefore the main objective of this study to investigate the effect of chronic consumption of breadfruit diet on gastric acid secretion and to elucidate its probable mechanism of actions using selected pharmacological agents.

MATERIALS AND METHODS

Experimental animals

The experimental animal of choice for this study was the albino Wistar rats. They were obtained from the animal house of the Department of Physiology, University of Calabar, Nigeria. Their weight was between 140 and 200g

Collection and treatment of samples

African breadfruit

Ripen fruits of African Breadfruit tree were collected between July and August in the thick forest of Aba, Abia State of Nigeria The fruits were then allowed to ferment and the fermented mass macerated and washed with tap water until the slimy jelly like substances covering the seed were sun-dried for 10 minutes and then oven-dried in an Amstels Hearson oven for 24 hours at 60^{0}C The dried testae (seed coats) were removed and the endosperm ground to powder in an electric grinder (National brand, M/No MK308, Japan) The powder was stored in an air tight container at room temperature

Corn starch

Corn starch (ogi), *Zea mays* linn, is a starch produced from wet milled fermented corn The corn was bought from a local market in Calabar, soaked for two days, ground, washed and sifted with a locally made sieve The wet product was dried for three days and finally ground to powder with an electric blender The powder was then sifted with a 30 mesh sieve and used for the preparation of the altered diets The composition of corn starch diet was prepared following International council of Nutrition Standard.

Composition of the altered diets.

The three different diets used in this study were prepared as stated by International council of Nutrition Standard Mineral and vitamin compositions of the diet are also as stated by International council of Nutrition Standard (ICN, 1979/80)

In the composition of the diets, after all other nutrients were added and properly mixed, Corn starch was then added last. This composition was based on the fact that most people consume bread fruit alone, while some people supplement it with other meals

Experimental design

Fifteen Wistar rats (140g to 200g) were randomly assigned to three groups of five rats each They were then placed on the following diets, group one rats received normal rat chow (control), the second group took 10% breadfruit diet (diet 1), and the third group was placed on 100% breadfruit diet (diet 2) they were all allowed free access to drinking water

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which was replaced every morning The feeding regimens lasted for a period of 4 weeks

Preparation of animals for collection of gastric acid

Prior to the collection of gastric acid, animals were fasted for 12 to 18 hours to get rid of any faecal matter in the stomach. This was followed by intraperitoneal injection of 25% urethane at a dose of 6ml per Kg body weight of the animal The animals were then laid on the dissecting board, an incision was made on the neck to expose the tracheal for tracheal cannulation, and this was to allow for clear airways. Another incision was made on the abdomen about an inch along the linea alba. The stomach was exposed and the thread passed at the pyloric end under the pyloric sphincters In this case, the small intestine and part of the liver were exposed. A transaction of the duodenum was made near the pyloric sphincter and another cannulation place and firmly held with a thread, care was taken not to rupture blood vessels of the duodenum, and after this the stomach and other exposed structures were put back and covered with normal saline swab An orogastric infusion tube was carefully passed from the mouth through the oesophagus to the stomach and ligated just behind the tracheal cannula to prevent reflux; care was taken not to damage the vagus nerve. The exposed end of the orogastric tube was passed through a water bath to maintain the perfusate at a physiological temperature (37°C) and to pre-warm the experimental solution. The other end of the orogastric tube was attached to a 50ml syringe mounted on a perfusor pump. The animal was warmed with a table lamp to maintain the body temperature at 37°C by the help of a thermometer

Measurement of gastric acid output

The continuous perfusion method by Gosh and Schild (1958), modified by Amure (1967) was used. The rats were first perfused with 0.9% normal saline at the rate of 1.0ml/min the aliquots were collected after 10minutes of infusion and was titrated with 0.01 N NaOH using phenolphthalein as an indicator. A pink colour discharge indicated the end point of the titration and the volume of the base used was read off and recorded. The first 10-20 minutes effluent collected was discarded to avoid erroneous acid secretion induced by trauma. When a stable acid secretion was obtained, cimetidine or histamine was administered and acid output determined every 10minutes using the method described above

Drug Treatment

Drugs used in this study were cimetidine (Sigma, UK), 11.4mg/Kg body weight and histamine (Sigma, UK), 100mg/Kg body weight

Statistical analysis

The results were all expressed as mean ± SEM The results were compared with the one way analysis of variance, followed by a Post-hoc test (LSD-test) P value less than 0.05 was judged significant.

RESULTS

Table 1: Effect of Breadfruit, Cimetidine and Histamine induced gastric acid output in rats.

Diet	Mean acid output (umol/L/ 10min)	Gastric output (umol/L/min)					
		Cimetidine			Histamine		
		Mean basal output	Peak acid output	% decrease in acid output	Mean basal output	Peak acid output	% decrease in acid output
Control	7.20 ± 0.08	7.04 ± 0.13	4.90 ± 0.50**	29.91	7.20 ± 0.08	12.16 ± 1.26**	69.17
Breadfruit 10%	5.98 ± 0.07^{NS}	7.32 ± 0.29	5.82 ± 0.20*	13.39	5.98 ± 0.07	10.92 ± 0.96**	83.00
100%	7.07 ± 0.30^{NS}	7.02 ± 0.30	4.78 ± 0.34*	29.91	7.56 ± 0.34	7.68 ± 0.20^{NS}	1.59

Effect of bread fruit diet on gastric acid secretion

The mean basal gastric acid output in the control rats was observed to be 7.20 ± 0.08, it was slightly and insignificantly lower in 10% (5.98 ± 0.07umol/L/10min) and in the 100% breadfruit fed rats (7.07 ± 0.30umol/L/10min.). Table 1

As shown in Table 1, the control rats produced 29.91% (P<0.01) reduction in gastric acid output following administration of cimetidine producing. While in the rats fed on 10% breadfruit diet the reduction following administration of cimetidine was 13.39% (P<0.05); and in the rats fed on 100% administered of cimetidine produced 29.91% (P<0.05) reduction in GAO. Table 1, fig. 1

Upon histamine administration, the control group produced 69.17% increase in mean acid output (P<0.01). While in the rats fed on 10% breadfruit diet the increase was 83.00% (P<0.01) but in rats fed 100% breadfruit diet it was only 1.59%. Table 1, fig. 2

DISCUSSION

The effect of chronic consumption of breadfruit diet on gastric acid secretion was studied in Wistar rats. The results obtained showed that chronic consumption of breadfruit has no effect on the gastric acid output in rats. However, it was found that breadfruit inhibited the effect of histamine-induced gastric acid secretion in rats. Histamine induced gastric acid output was blocked by administration of cimetidine. This is in consonance with previous report by Boucher, (1977) and Ganong, (1997). It has been suggested that subcutaneous histamine stimulates copious secretion of acid in rat's stomach through the H_2 receptor, (Garrison, 1992).

When histamine was administered to the rats fed with the breadfruit diet, the increase in acid secretion was significantly lower than that obtained when histamine was administered to the control rats. This shows that breadfruit has undetermined pharmacological agent that inhibits histamine stimulated acid secretion in the stomach, this, probably by inhibiting the gastric mast cells activity (Nosal *et al*, 1991). The inhibition of histamine induced acid secretion by the breadfruit diet suggests that it might block the H_2 receptors. This is supported by the fact that the reduction in gastric acid output following cimetidine administration was greatest in the rat fed on 100% bread fruit. Cimetidine is a pharmacological agent that blocks the action of histamine on the H_2 receptors (Boucher, 1977; Garrison, 1992). It is however possible that other pathway may be involved which were not investigated in this study.

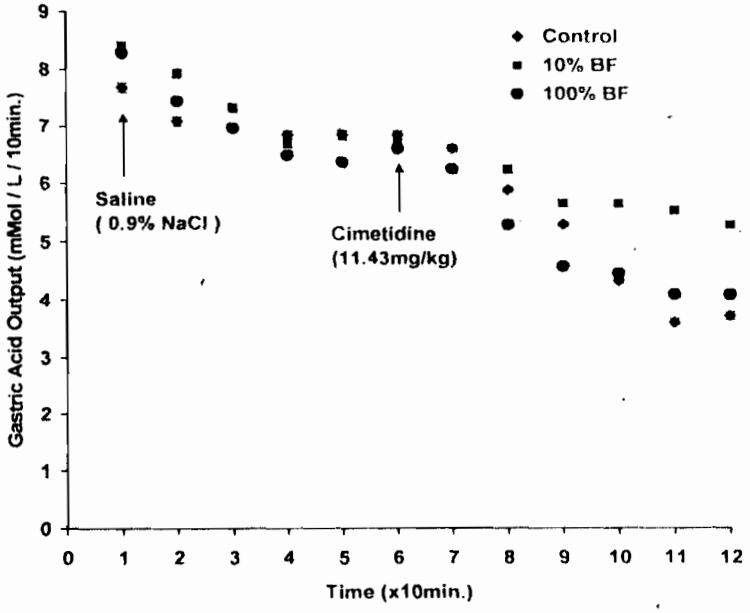

Fig. 1 : Comparison of the effect of cimetidine(11.43mg/kg) on the gastric acid output of rats fed normal chow,10%, and 100% bread fruit diets, values are mean ± SEM, n = 5.

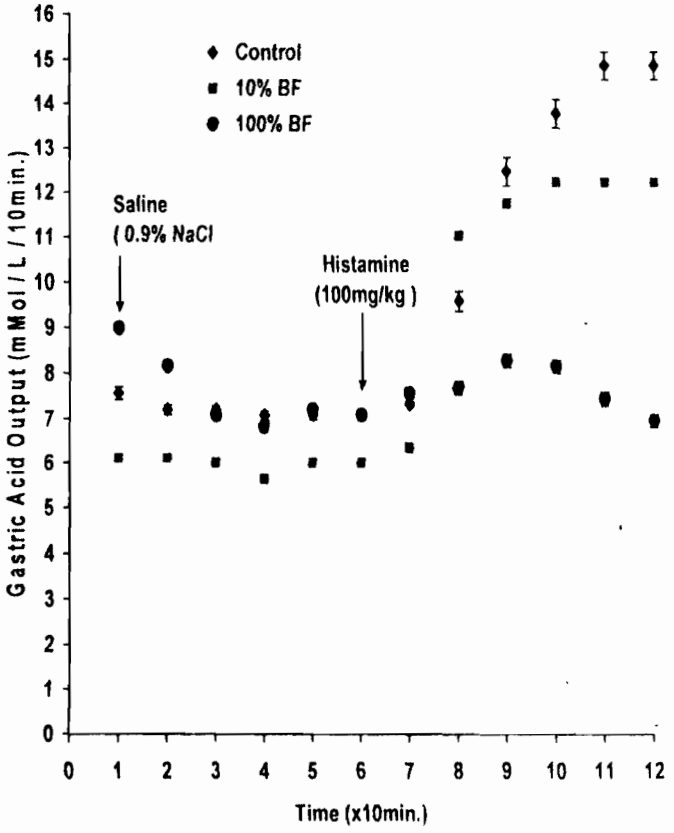

Fig. 2: Comparison of the effect of histamine(100mg/kg) on the gastric acid output in rats fed normal chow,10% and 100% bread fruit diets, values are mean ± SEM, n = 5.

CONCLUSION

In conclusion, breadfruit is a weak inhibitor of gastric acid secretion under normal physiologic conditions, but it strongly inhibits histamine induced stimulation of gastric acid secretion. Cimetidine inhibits histamine stimulation of gastric acid secretion; therefore breadfruit may act by blocking histaminergic H_2 receptor mechanism to inhibit gastric acid induced secretion. However, breadfruit may act through other pathways which are not investigated in this study. Breadfruit may therefore be beneficial to peptic ulcer patients or peptic ulcer prone individuals.

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