



Histological Changes In The Pancreas of Wistar Rats Fed With Diets Containing *Yaji* (Local meat Sauce)

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ABSTRACT

The meat delicacy called 'Suya' is native to the northern region of Nigeria but widely consumed across the country. It is served with its sauce called *Yaji*. His sauce is prepared by the physical mixture of spices that include clove, ginger, black pepper, and red pepper, as well as salt, magi cubes and groundnut powder. Records have shown that the individual active ingredients of substances have side effects when consumed in excess. This study seeks to determine the effect of *Yaji* (Suya sauce) on the histology of the pancreas in 20 rats. They were divided into 4 groups. Group D served as control while C, B and A received 10%, 20% and 30% of *Yaji* per kilogram of feed respectively at 71.3g of the feed per day for a period of 3 weeks. Comparison of the treated pancreas with those of the control animals indicated a pronounced histological alterations in the 30% and 20% treated animals. Necrosis of acinar cells occurred in group A with decrease in the number of beta cells. Enlarged acini was observed in B with distinct signs of capillary degeneration. In both A and B, the epithelial lining of the acini were discontinuous. C showed no distinct alteration except the stained colloids suggesting increase in secretion. C also showed distended duct. These histological alterations in A and B has shown that excessive consumption of *Yaji* can induce pancreatitis and diabetes mellitus.

Keywords: Spices, Suya, *Yaji*, Diabetes Mellitus.

Adequate nutrition is a basic human need and a prerequisite for health, which implies that proper nutrition provide adequate food and supplement to convey the required nutrients for optimal health (Enwonwu, 1980). To this effect, international bodies like the World Health Organization (WHO) and UNICEF, supports that every public policy decisions on nutrition in health and other sectors require knowledge of the extent to which people consume sufficient food of adequate quality (Mason et al, 1984).

Today, much have been written about malnutrition which, and in most cases is as a result of faulty nutrition, poor diet or excessive consumption of particular foods (Bender 1975). This recalls the words of paracesius (1493-1541) who said that "all things have poisonous qualities, it is only the dose that makes a thing, a poison".

(Witschi, 1980) stated that even oxygen that is essential to life is toxic if concentration is raised five fold while Christie and Christie (1977) reminds everyone that food nourishes us and poison destroys us. Yet, food poisoning is not exotic but a hazard of everyday life. Defining food poison, Atman (1982) stated that it is a clinical syndrome arising from the ingestion of food that is contaminated or itself toxic. For this reason, Twoney and Taylor (1978) suggested education of

all sections of the public with regards to diet and nutrition; thereby encouraging WHO, FAO AND UNICEF's principles of surveillance on nutrition in order to ensure that proper decisions are made to improve nutrition in populations.

In addition, diseases and illments like atherosclerotic vascular diseases, hypertension, obesity, tooth decay, osteoporosis, diabetes and cancer have been implicated in association with faulty nutrition (el lozy et al, 1980), most of which are blamed on the ignorance exhibited by their victims (Christie and Christie 1977). Yes, most people take in food items indiscriminately. One of such, are those ingredients that give pungency to food as well as flavor. These include spices, seasonings, herbs and extract derived from them. A list of spices include pepper, cinnamon, cloves, cardamom, ginger, turmeric, nutmeg, mace and vanilla.

Suya is antive to the northern region of Nigeria. The people prepare it and sell it boneless lean meat of mutton, beef or Goat meat staked on sticks and coated with its sauce (*yaji*). It is then oiled and roasted around a burning fire. The roasting last for about 20 30 minutes and it is done by arranging the sticks round the fire. He added that *yaji* is a complex mixture of groundnut powder, spices and salt.

This study specifically seeks to determine the effect of '*Yaji*' whose combined active ingredients

include eugenol, gingerol, glutamate, sodium chloride, capsaicin and piperine on the histology of the pancreas.

MATERIALS AND METHODS

20 rats of wister strains *rattus norvegicus* maintained in an experimental animal house. 10 male and 10 female rats were involved. They were fed with growers mash until they attained the weight of 160–200gm. The cages used were metal cages and were of good ventilation. These cages have a built in hopper for food and an inverted water bottle which has a stainless tube for the water outlet. On daily bases, these cages were cleaned to prevent infection. The animals were divided into four (4) groups of five (5) each as follows:

Group A: Animals in this group, received 30% of Yaji per kilogram of feed for 3 weeks at approximately 71.3g of the feed per day.

Group B: Animals in this group, received 20% of Yaji per kilogram of feed for 3 weeks at approximately 71.3g of the feed per day.

Group C: Animals in this group, received 10% of Yaji per kilogram of feed for 3 weeks at approximately 71.3g of the feed per day.

Group D: Animals in this group (control), received 0% of Yaji per kilogram of feed for 3 weeks at approximately 71.3g of the feed per day.

All the animals were subjected to the same environmental condition throughout the period of the study.

The ingredients of Yaji used for this study were bought based on equivalent amounts and not on weight as no standard weight per ingredient exist. The amounts of these ingredients include Groundnut powder, N60, Red pepper N40, Ginger N40, Black pepper N10, Clove N10, Maggi cubes N10, and salt N5. Most of these ingredients bought were in powdered form except Clove and Black pepper. A hand grinding machine was used to grind this two ingredients. All the ingredients now in powdered form, were weighed using a triple balance and the weight of each constituent substance is given in table (1) below.

After weighing these substances, they were then mixed together by physical means. 300gm, 200gm, and 100gm of the Yaji prepared were then administered to the rats as 30%, 20% and 10% per kilogram of feed respectively. Therefore on daily bases, the feed given to the rats would contain a daily amount of the constituent substances in the order given in table (2) below.

At the end of 3 weeks, the rats were sacrificed and the pancreas removed immediately for tissue processing. Stains used were Haematoxylin and Eosin. Haematoxylin and Eosin.

RESULTS

At the end of three (3) weeks, there were no significant changes in the weight of the animals. However, increased demand for water with increased urine output was observed in A and B especially in A.

On Plate 1 (30% w/w of Yaji) x 200, group A showed that the acini has discontinuous epithelial cell lining with relatively small acini as well as distinct pyknotic nuclei.

On Plate 2 (20% w/w of Yaji) x 200, B showed that the epithelial cells lining the acinic are discontinuous in some areas. Here, these are less colloids and hence stain pale as well as Islet cells. The acini and Islet cell mass are large.

On Plate 3 (10% w/w of Yaji) x 200, group C acini showed epithelial lining cells with indistinct cell nuclei. The acini intensely stained eosinophilic colloids and the islet cells stain deeply. The Islet cell mass appear large. Distended duct appeared in C.

On Plate 4 (0% w/w of Yaji Control) x 200, group D, showed distinct epithelia cell outline lining the acini. The cells stain intensely basophilic with distinct nuclei. Within the acini is in closed eosinophilic colloids.

Table 1: Weight of each of constituents in the prepared Yaji (Suya sauce)

Ingredients	Weight (gm)	Percentage(%)
1. Groundnut powder	1131.3	72.62
2. Red pepper	131.8	8.44
3. Salt	108	6.91
4. Ginger	143	6.91
5. Maggi cubes	26.4	1.69
6. Clove	8.5	0.54
7. Black pepper	8.0	0.51
Total	1557.8	100

Table 2: Qualities of the constituent substances in the daily amount of Yaji administered to the rats in groups A, B and

INGREDIENTS	Daily amount in Yaji		
	300gm	200gm	100gm
1. Groundnut powder	15.56	19.37	5.19
2. Red pepper	1.81	1.21	0.06
3. Salt	1.41	0.99	0.50
4. Ginger	1.98	1.32	0.66
5. Maggi cubes	0.36	0.24	0.12
6. Clove	0.12	0.08	0.04
7. Black pepper	0.11	0.07	0.04



Fig. 1: (A) 30% Yaji



Fig. 2: (B) 20% Yaji



Fig. 3: (C) 10% Yaji

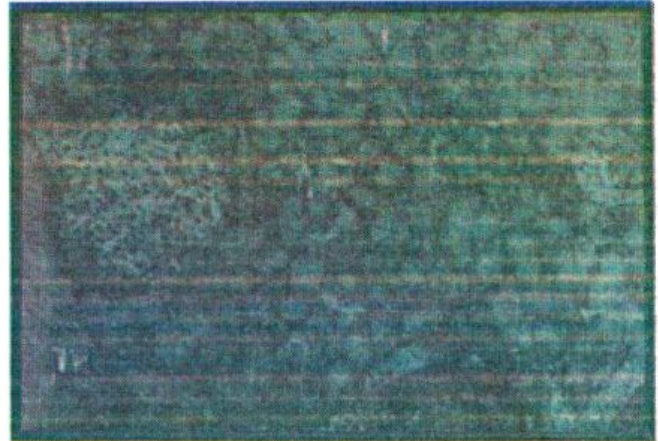


Fig. 4: (D) 0% Control

DISCUSSION

Experimental evidence show that red pepper and black increase gastric secretion (Wade, 1977), which may be responsible for the gastric mucosal damage, observed by Myers et al (1987) when taken in excess. This is also associated with the fact that HCL present in gastric secretion causes greatest release of secretion from the small intestine and that secretin promotes rapid secretion of pancreatic juice rich in bicarbonate ion. If this continues for a while, the cells may respond by increasing in size due to the secretory pressure mounted by the active ingredients in Yaji. This was evident in B.

Moreso, based on the Histological changes observed, it is possible that an increased pancreatic activity might have occurred and that the conspicuous degenerating capillaries seen in B may have been due to the fact that the quantity of Yaji administered in this group as compared to that of A may have been able to affect the pancreas more gradually than that of A.

Secondly, the amount in A may have tremendously increased the secretion of pancreatic juice rich in bicarbonate ion as well as water, in order

to buffer the effect of HCL secreted from the stomach. It can also be remembered that the secretion of pancreatic juice rich in bicarbonate ion and water mainly involves the acinar duct cells and the secretory pressure mounted by this demands may have caused the necrosis of the acini as shown by the pyknotic nuclei, decreased cell size and discontinuous epithelial lining prominent in A. Again, since increase water secretion is involved, it may account for the increased demand for water increase in urine output observed in A and B but especially in A.

Furthermore, with the observations made, the pancreas might have suffered pancreatic damage especially in A. Evidences show that when the pancreas is severely damaged or when the duct is blocked, large quantities of pancreatic secretion become pooled in the damaged areas of the pancreas (Guyton, 1991). Under this condition, the effect of trypsin inhibitor is overwhelmed in which case the pancreatic secretion rapidly becomes activated and literally digests the entire pancreas; this is a feature of acute pancreatitis. The condition is often lethal; it leads to a lifetime pancreatic insufficiency.

Evidence from animal studies suggests that the primary lesion in pancreatitis is necrosis of the parenchyma. This necrosis, involves cells of the duct, acini and to a lesser extent the Islets. Features such as hemorrhage, inflammatory cell infiltration, abscess formation and fat necrosis are secondary (Beck, 1971; Sarner and Cotton, 1984).

Pancreatic necroses also give rise to pseudocytes, which can erode major blood vessels leading to life threatening hemorrhage. It can severely impair gastric emptying and so can reduce gastric motility. Signs of capillary degeneration were observed in groups A and B and so may support the existence of pancreatic necrosis.

Biochemical investigation shows that in acute pancreatitis, there is rise in serum amylase activity, which is evident in hyperglyceridaemia, and hyperamylasaemia that is frequent in diabetic ketoacidosis (Knight et al, 1973). Elevation of pancreatic damage, pseudocytes or abscess formation may also occur in impaired renal failure (Janowitz and Dreiling, 1959).

Diabetes mellitus is known to arise in the first day or two after development of pancreatitis, although it is transient. Transient diabetes mellitus is caused by injury to beta cells and insulin resistance of which can be related to the observed differences between the beta and alpha cells of group A. With relative increase in alpha cells, it means that there is an increase in the amount of circulating glucagons, which have been described, experimentally by Paloyan et al (1966) and this may contribute to hyperglycaemia with depletion of glycogen in the liver and muscle cells.

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