

## **DISINTEGRATION OF THE ISLET CELLS (OF LANGERHANS) FOLLOWING THE ADMINISTRATION OF ETHANOLIC EXTRACTS OF GINGER IN ADULT WISTAR RATS**

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**ABSTRACT:** *This study elucidates the effect of ethanolic extract of ginger on the histology of the pancreas. Forty adult wistar rats weighing 190-200g were divided into five groups designated A, B, C, D, and E; each group containing eight experimental animals. The animals in groups A and B served as the control receiving distilled water and olive oil respectively. The animals in group C, D, and E received 100mg/kg, 250mg/kg and 500mg/kg body weight of ethanolic extract of ginger respectively for fourteen days. Twenty four hours after the last administration, the animals were sacrificed; the pancreas was removed and processed in routine histological technique. Under the light microscope, the result showed normal exocrine part and disintegration of the islet cells (of Langerhans) with pyknotic nuclei. This study showed that the effect on the islet of Langerhans increases as the consumption increases.*

**KEYWORDS:** ginger, pancreas, wistar rats

**Abbreviation:** HDL= high density lipoprotein, SGPT= serum glutamic pyruvic transaminase

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## **INTRODUCTION**

For years, humans have been dwelling on plants for medicinal purpose and for prevention of different ailments in their environments. Herbal medicines are part of plants such as solvent, essential oils, gums, resin exudates and other product of plants that are used therapeutically to provide support of different functional systems and also used for the treatment or prevention of disease in humans (Weiss et al 1993). About 70-80% of human beings in the world depend solely on the medicinal herb for their primary health care reported by World Health Organization (WHO) (Akerele 1993). According to Rashekharam in 2002 reported that 3000 plants are recognised officially in India for their medicinal values and 6000 plants are used in traditional, folk and herbal medicine. Ramakrishnappa in 2003 confirmed that over 7800 medicinal manufacturing companies consume about 2000 tons of herbs yearly in India. Payne and co-workers in 1991 estimated that a small percentage of plant species are investigated phytochemically out of 250000-500000; within this smaller percentage are studied properly in terms of pharmacological properties and ginger is one of such plants.

Ginger is one of the spices used in the world. It is known to emanate from China and spread to India (Blunden et al 2008). Ginger has long been used for the treatment of different ailments such as inflammatory disease and also has various pharmacological activities such as antiemetic, antiulcer, anti-inflammatory, antioxidant, and anti-platelet, glucose and lipid

lowering, cardiovascular and anti cancer activities (Nicoll et al 2009). ginger contains up to 3% of essential oil components that causes the fragrance of the spice (Malo et al 2009).sensory perception of ginger is from volatile oils made of sesquiterpene hydrocarbons such as zingiberene, curcumene and fernesene; non volatile pungent compounds contain gingerol, paradol and shogol that have many properties and zingerone that produce a hot sensation in the mouth (Ali et al 2009). Some studies suggested that ginger can reduce body weight without altering pancreatic lipase level or the bilirubin concentration and also that it has positive effect on increasing peroxisomal catalase and HDL-cholesterol (Mahmoud et al 2013). Ranjit and co-workers in 2013 suggested that ginger administration to diabetic guinea pig restores glucose level, SGPT, SOGT, urea and uric acid. In 2014, Udo-Affah et al suggested that ethanolic extract of ginger showed moderate to reactive lymphoid hyperplasia in the splenic cells and this effect occur as the dose increases. In 2013 and 2014 Eru and co-workers studied the effect of aqueous ginger alone and ginger combined with honey using adult male wistar rats and concluded that it has no noticeable effect on the histology of the stomach. Ede et al 2014 also suggested that ethanolic extract of ginger causes great effect on the kidney mostly the uriniferous tubules.

The pancreas is an elongated accessory digestive gland lying retroperitoneally and transversely across the posterior abdominal wall posterior to the stomach between the duodenum and the spleen. It has an exocrine and endocrine part. The exocrine part secretes pancreatic juice whereas the endocrine part secretes glucagon, insulin, somatostatin and pancreatic polypeptide (Keith & Dalley 1999). The pancreas develops from ventral and dorsal pancreatic buds. The ventral pancreatic bud forms the uncinat process.

However, this study aimed at elucidating the possible effect of ethanolic extract of ginger on the histology of the pancreas of adult wistar rats.

## **MATERIALS AND METHOD**

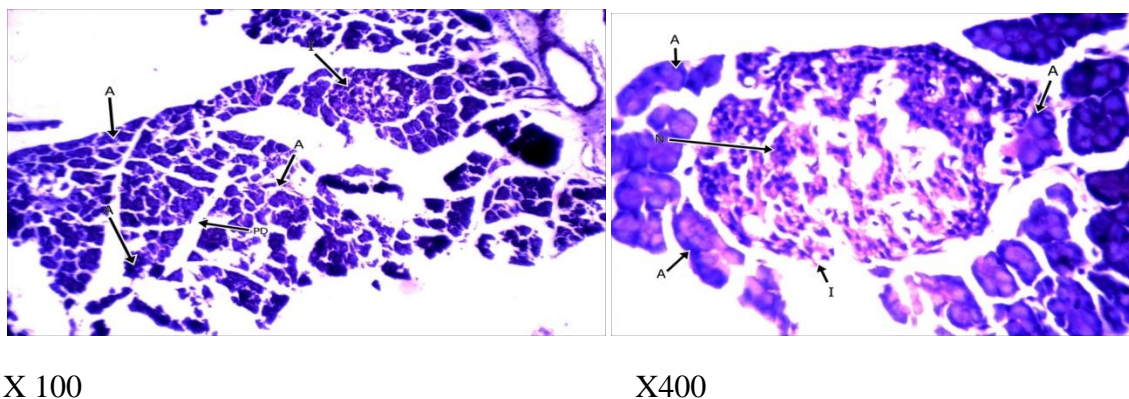
Forty adult wistar rats weighing 190-200g were randomly separated into five groups designated A, B, C, D and E; each containing eight rats. The control groups A and B received distilled water and olive oil respectively. Group C received 100mg/kg, group D received 250mg/kg and group E received 500mg/kg of ethanolic extract of ginger for fourteen days. Twenty four hours after the last administration, the experimental animals were sacrificed and the pancreas removed and fixed in 10% formal saline. Following complete fixation of the pancreas, routine histological technique was carried out. Sections of the pancreas were stained with haematoxylin and eosin stains and viewed under light microscope.

## **RESULTS**

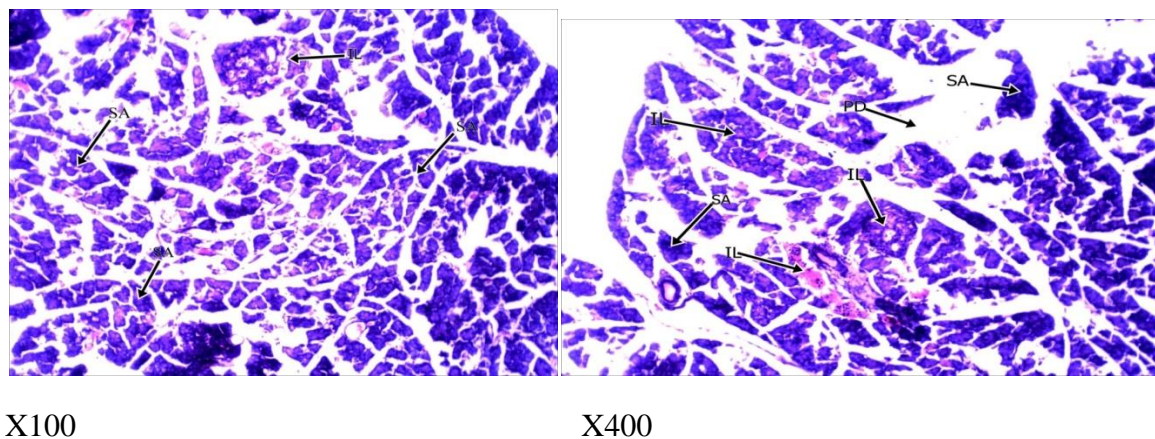
After tissue processing, the tissues were observed under light microscope and the Section of the pancreas showed normal histological features, prominent serous acini which are highly basophilic (blueish staining) with cuboidal epithelium and the lumen are seldom seen in group A, group B. Group C showed lost nuclei material and disintegration of the islet cell (IL). It

shows numerous serous acini with normal histological features, and blood capillaries. The cell also has basophilic nuclei with eosinophilic cytoplasm, group D showed disintegration of the islet cells of Langerhan's in the endocrine part of the pancreas. Both the exocrine parts showed normal histological features with prominent serous acini (SA) lined by cuboidal epithelium, the cells have deeply basophilic nuclei with eosinophilic cytoplasm and group E showed numerous serous acini (SA) lined by cuboidal epithelium in the exocrine part. It showed disintegration of the islet cell of Langerhans (IL) with pyknotic nuclei, no visible change in the serous acini (SA).

**figure i:** group A (normal control) photomicrographs showing normal histology of the pancreas

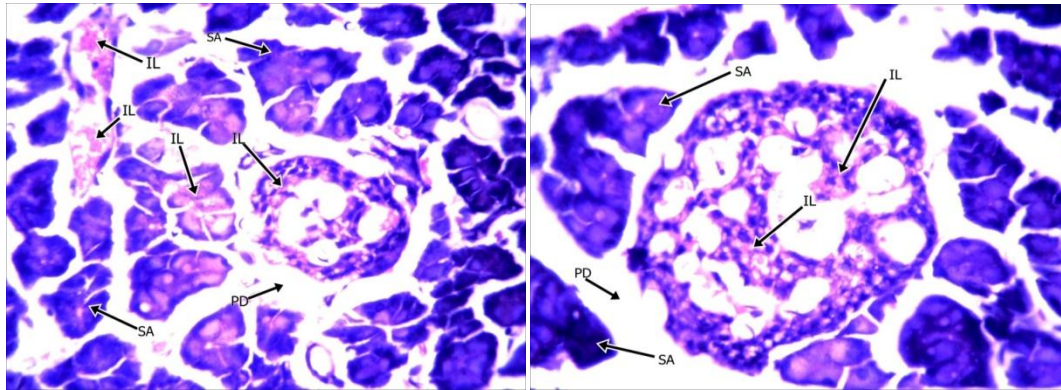


**figure ii:** group B (olive oil control) photomicrographs showing the effect of olive oil on the histology of the pancreas





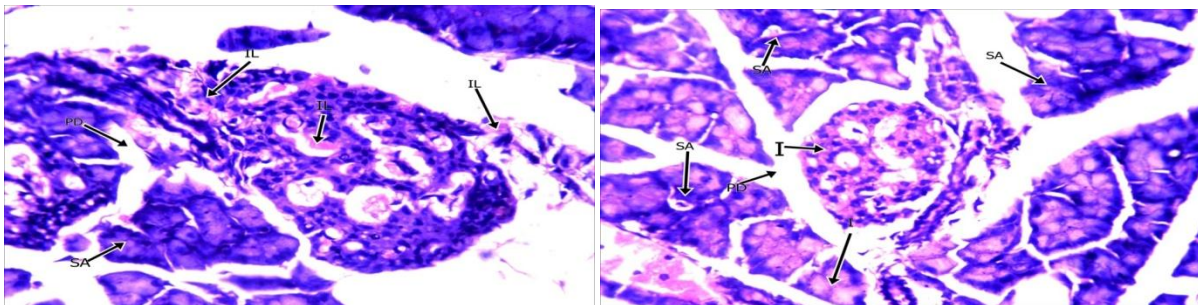
**figure iii:** group C (low dose) photomicrographs showing the effect of the ethanolic extract of ginger on the histology of the pancreas



X 100

X 400

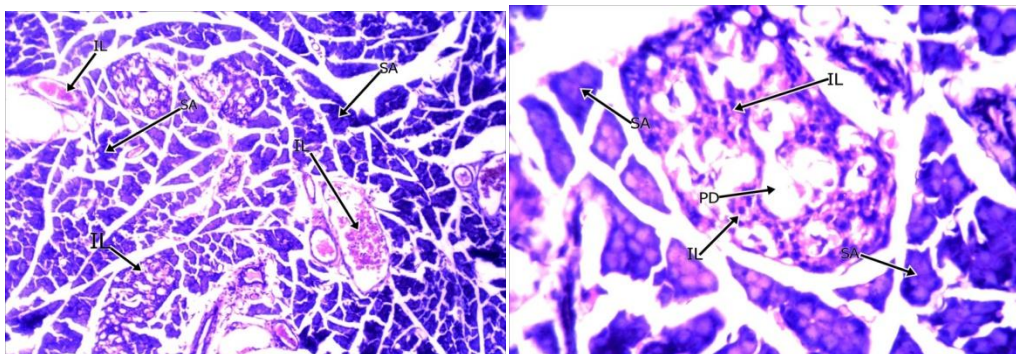
**figure iv:** group D (medium dose) photomicrographs showing the effect of the ethanolic extract of ginger on the histology of the pancreas



X 100

X 400

**figure v:** group E (high dose) photomicrographs showing the effect of the ethanolic extract of ginger on the histology of the pancreas



X 100

X 400

## DISCUSSION

After routine histological technique, the results showed normal histological features in group A and B. Group C, D and E showed normal histological features in the endocrine part of the pancreas, loss of nuclei and disintegration of islet cells (of Langerhans). The islet cells in group E showed pyknotic nuclei. The islet cells are alpha, beta, gamma and PP cells. These cells are known to secrete glucagon, insulin, somatostatin and pancreatic polypeptide respectively. The glucagon secreted by the alpha cells aid in conversion of glycogen stored in the body to glucose when there is less glucose level in the body. Insulin on the other hand converts excess glucose to glycogen to be stored in the body. The somatostatin inhibits the actions of both glucagon and insulin in the body. Disintegration of the islet cells may lead to several illnesses such as hyperglycemia (where there is excess glucose in the blood stream due to the malfunctioning of the insulin secreting cells to perform its task), hypoglycaemia (where glucagon is not secreted to convert stored glycogen to glucose), or brain damage. According to Sally et al in 2007 who studied aqueous ginger and garlic on the isolated perfused pancreas of streptozotocin induced diabetic rats and suggested that ginger may have antidiabetic effect that could be mediated via pancreatic mechanism. In 2013 Nusaibah et al suggested that ethanolic extract of ginger causes hyperplasia of red and white pulp of the spleen, and aggregation of mononuclear cells in liver parenchyma in mice. Ede et al 2014 also found out that ethanolic extract of ginger caused great effect on the kidney mostly the uriniferous tubules. In 2014, Udo-Affah et al found out that ethanolic extract of ginger showed moderate to reactive lymphoid hyperplasia in the splenic cells and this effect occur as the dose increases. In 2013 and 2014 Eru and coworkers studied the effect of aqueous ginger alone and ginger combined with honey using adult male wistar rats and concluded that it has no noticeable effect on the histology of the stomach. Loss of nuclei and disintegration of the islet cells may hinder the function of the endocrine part of the pancreas. Ding and coworkers who reviewed the effectiveness and safety of ginger for pregnancy-induced nausea and vomiting in 2013 found out that ginger is more effective in preventing nausea and vomiting in pregnant women. Due to this destruction of the alpha, beta, gamma and pp cells, the body will not be able to covert both exogenous and endogenous glucose to glycogen, vice versa and inhibiting the actions of alpha and beta cells which may cause other illnesses such as hyperglycemia, hypoglycaemia or brain damage. In conclusion, this study indicates that ethanolic extract of ginger caused disintegration of the islet cells (of Langerhans) of the endocrine part of the pancreas and the exocrine part of the pancreas was unaffected.

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