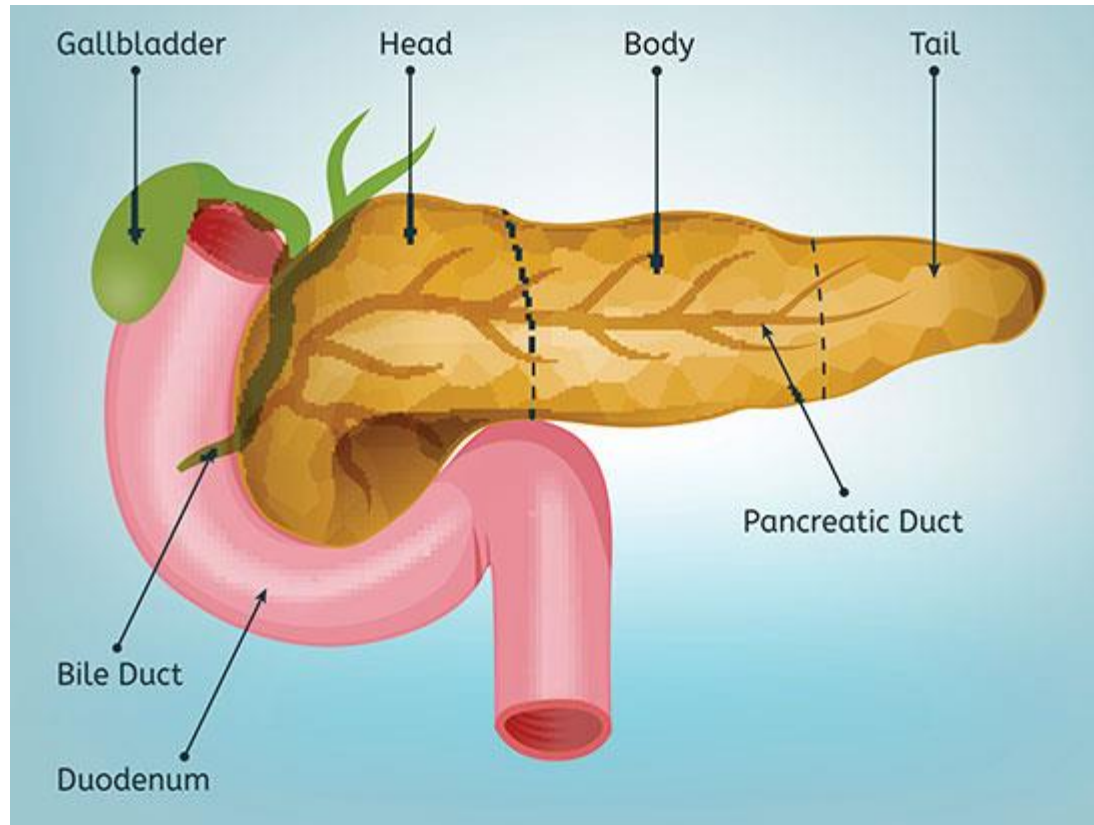


Pancreas



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Introduction

❖ Pancreas is a dual organ having two functions

Endocrine - production of hormones

Exocrine - secretion of digestive juice

Exocrine functions

Functions of Pancreatic Juice -Digestive function

- in Proteins
- Mild action on carbohydrates
- ‘Neutralizing Action’

Proteins - carried out by proteolytic enzymes trypsin and chymotrypsin

Trypsin helps in digestion of milk and in blood clotting

Carbohydrates - Pancreatic amylase converts starch into dextrin and maltose

Lipids

- Pancreatic lipase is a powerful Lipolytic enzyme
- Its activity is accelerated in the presence of bile
- About 80 % of fat is digested by pancreatic lipase
- Digestion of fat by Pancreatic Lipase requires 2 main factors :
 1. Bile salts which are responsible for emulsification of fats prior to their digestion
 2. Colipase which is a coenzyme necessary to hydrolyse dietary lipids
- The deficiency or absence of Pancreatic Lipase leads to excretion of undigested fat into feces

Neutralizing Action:

- Acid chyme enters intestine
- pancreatic juice releases bicarbonate
- Presence of bicarbonate ions makes the pancreatic juice alkaline and thus neutralizes acidity of chyme
- The neutralizing action is an important function of pancreatic juice to protect the intestine from destructive action of acidic chyme

Secretion of pancreatic juice

Secretion of Enzymes: Pancreatic enzymes are derived from amino acids and synthesized in ribosomes

attached to Endoplasmic reticulum of acinar cells in Pancreas

After synthesis, enzymes are packed by Golgi apparatus and stored in cytoplasm

On stimulation, they are released from the acinar cells into Pancreatic duct

Cephalic phase - Secretion of Pancreatic Juice by stimuli arising from the head region is called as the cephalic phase

- phase is under nervous control

Gastric phase - Secretion of pancreatic juice when food enters the stomach is known as the gastric phase

- phase is under hormonal control

Intestinal phase - Secretion of Pancreatic juice when chyme enters the intestine is called as the Intestinal Phase

- Phase is also under hormonal control

Endocrine functions

- ❖ Islets of Langerhans

- ❖ Actions of insulin

- ❖ Glucagon

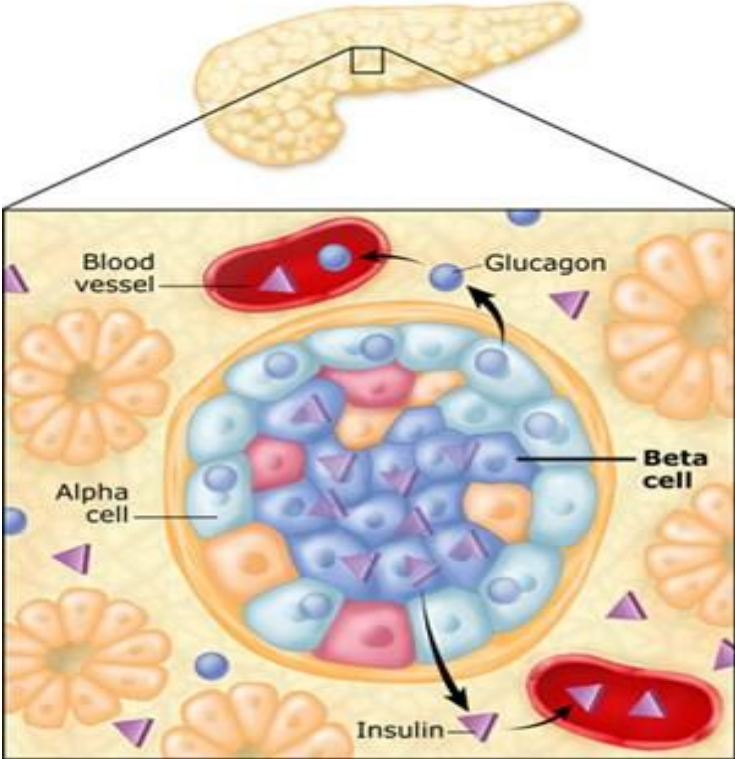
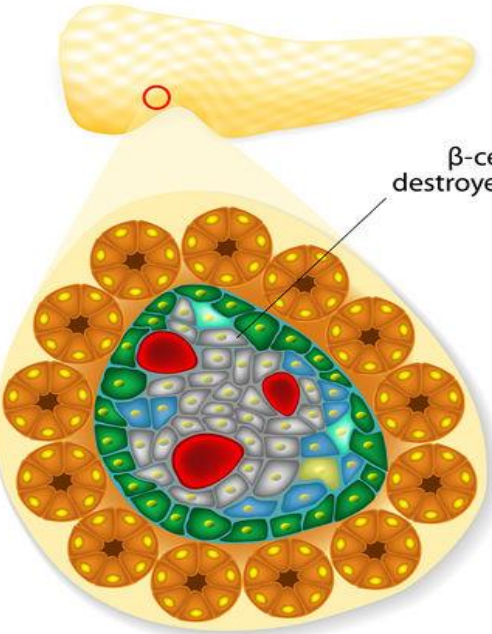
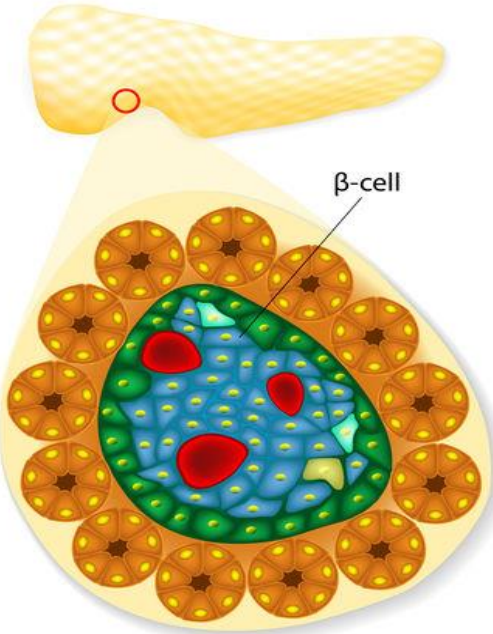
- ❖ Somatostatin

ISLETS OF LANGERHANS

Insulin is Made in the Pancreas

Healthy pancreas

Diabetes mellitus type 1

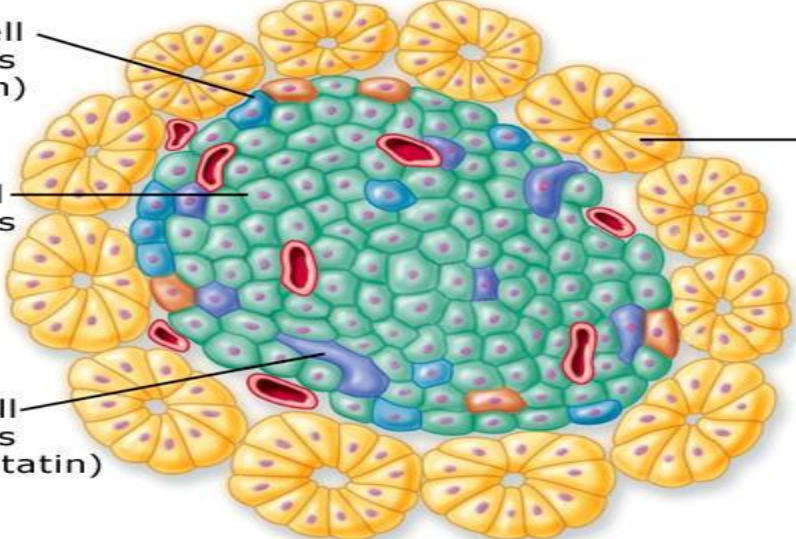


Alpha cell (secretes glucagon)

Beta cell (secretes insulin)

Delta cell (secretes somatostatin)

Exocrine pancreas (acinar cells and duct cells)



Islets of Langerhans

Endocrine function is performed by Islets of Langerhans

It consist of four types of cells :

1. α cells – which secrete glucagon
2. β cells – which secrete insulin
3. δ cells – which secrete somatostatin
4. F or PP cells- which secrete Pancreatic Polypeptide

Insulin

Carbohydrate metabolism – Insulin, anti-diabetic hormone reduces blood sugar level

- Increasing transport and uptake of glucose by the cells
- Promoting peripheral utilization of glucose
- Promoting storage of glucose – glycogenesis
- Inhibiting glycogenolysis
- Inhibiting gluconeogenesis

Protein metabolism - Insulin facilitates the synthesis and storage of Proteins and inhibits cellular utilization of proteins

Fat metabolism - Insulin stimulates the synthesis of fats and store in adipose tissue

Growth - Along with GH, promotes body anabolic action on proteins

Glucagon

- **Antagonist** to insulin
- increases blood sugar level
- increases peripheral utilization of lipids
- facilitates conversion of proteins into glucose
- inhibits secretion of gastric juice
- increases secretion of bile from liver

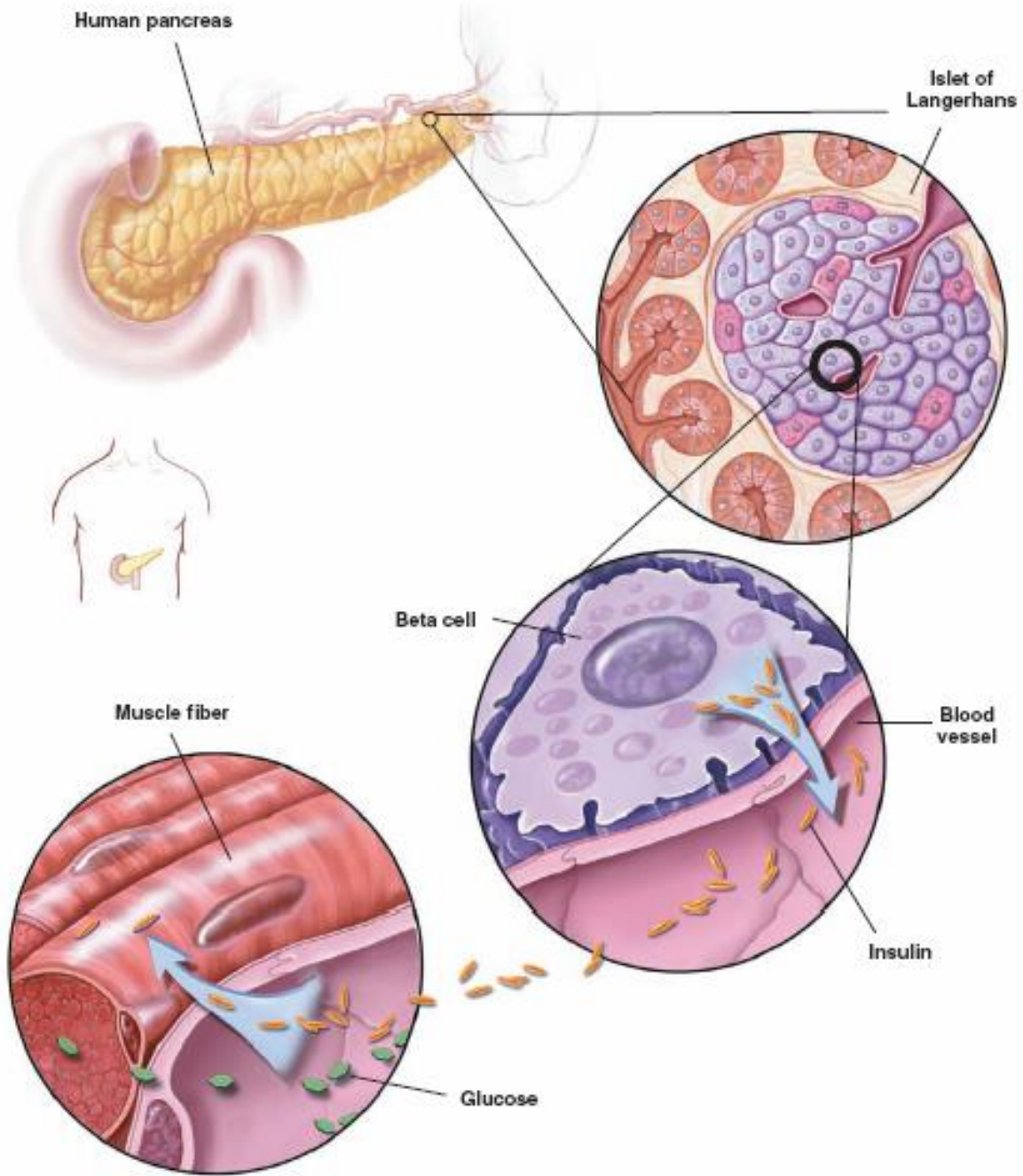
□ **Carbohydrate metabolism** –

- increases glycogenolysis

- increases gluconeogenesis

□ **Protein metabolism** – increases transport of amino acids to liver essential for gluconeogenesis

□ **Fat metabolism** – Lipolytic and ketogenic action



Somatostatin

- acts within islets of Langerhans
- inhibits α & β cells
- decreases the motility of stomach, duodenum and gall bladder
- reduces secretion of GI hormones, Gastrin
- Hypothalamic somatostatin inhibits secretion of GH & TSH
- also known as GHIH