Pancreatic secretions

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Objectives

1. Describe the mechanism of pancreatic secretions from the acinar cells
2. Indicate the composition and role of pancreatic juice in food digestion
3. Describe the activation of the pancreatic enzymes in the lumen of the small intestine
4. Illustrate the regulation of pancreatic secretion (hormonal and neural)

Pancreas

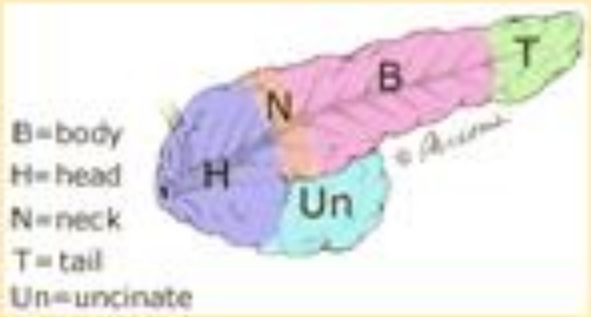
- Gland with both exocrine and endocrine functions
- Location: retro-peritoneum, 2nd lumbar vertebral level
- 15-25 cm long
- 60-100 g
- Extends in an oblique, transverse position
- Parts of pancreas: head, neck, body and tail

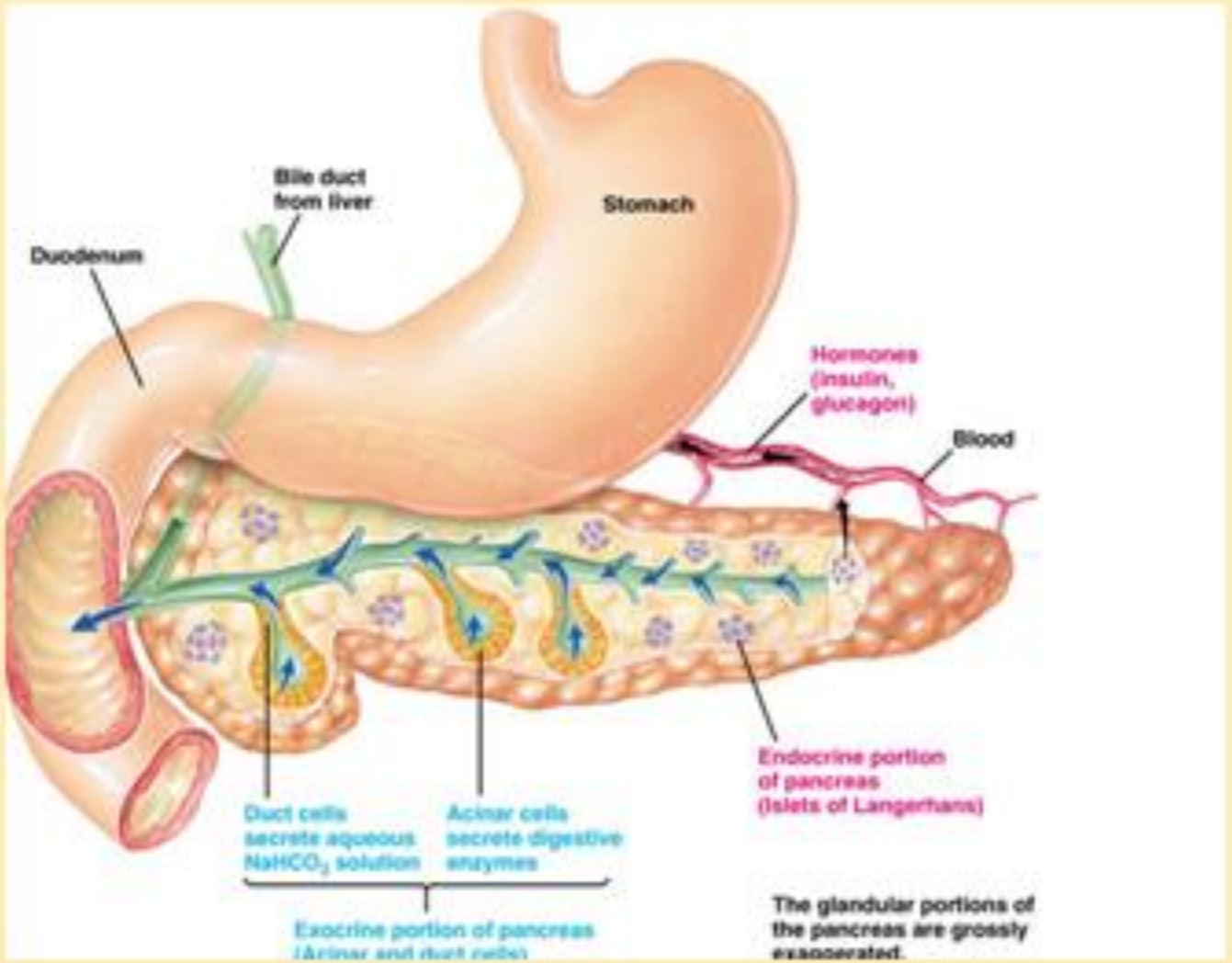
Basic functions of pancreatic secretions

It plays an important role:

- in digestion of lipids proteins and carbohydrates,
- in metabolism since it produces insulin and other hormones.
- in neutralizing the pH to become suitable for the action of the pancreatic digestive enzymes.

Physiological anatomy of Pancreas





Exocrine pancreatic secretions

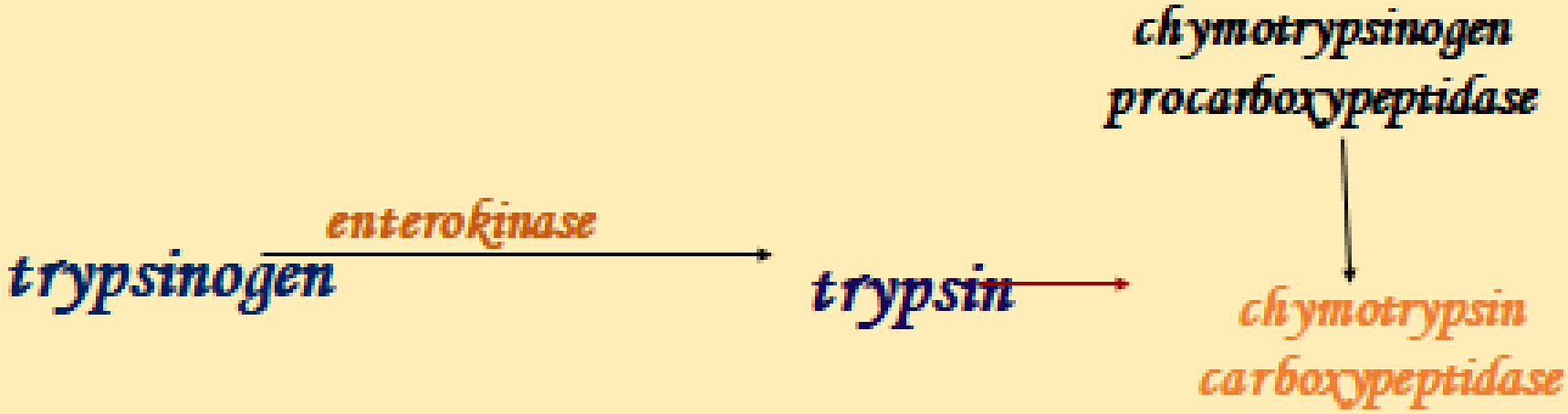
- The pancreas acts as an exocrine gland by producing *pancreatic juice* which empties into the small intestine at hepato pancreatic ampulla
- The pancreas also acts as an endocrine gland to produce insulin.

Wirsung or pancreatic duct

- Drain into duodenum together
- Number of people bile duct drain separately
- 30% of people have accessory duct (duct of Santorini) less like to get gall stone pancreatitis

Mechanism of enzymes activation

Proteolytic enzymes – secreted as inactive precursors



Lipase and amylases in active form
Protease inactive form
Amylase maltose in intestine

Pancreatitis

- Enzyme starts to breakdown cells inside the pancreas
- 65% alcohol abuse
- 20% gall stones
- 15% toxins and drug viral infection or trauma

Microlithiasis

Viscosity

Prevent Pancreatic secretion

Alcohol abuse

Slow down pancreatic peristalsis

Activate trypsinogen

cholecystokinin

- I Cells Upper small intestine
- pancreozymin
- Pancreas Acinar cells
- Enzyme from pancreas trypsinogen
- Decrease gastric motility and secretion and emptying giving the time for duodenum
- Presence of fat and peptides
- Contraction of bile

secretin

- S cells USI
- Affect ducts of pancreases and bile system
- Increase H_2O and HCO_3 duodenum neutralize the acidity higher PH
- Decrees GIT motility and secretions

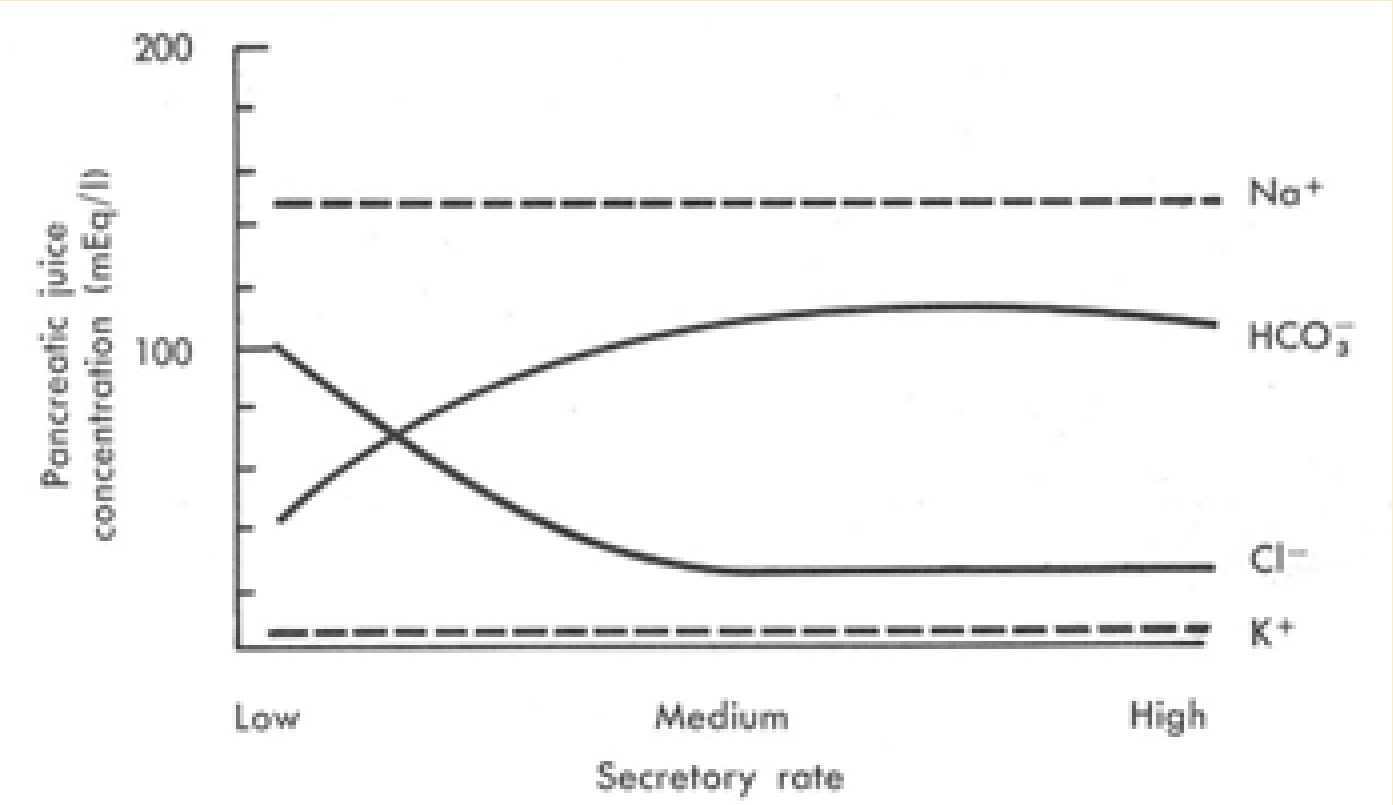
Factors

PH decrease < 4.5

Composition of normal human pancreatic juice

- Cations: Na^+ , K^+ , Ca^{2+} , Mg^{2+}
- (pH approximately 8.0)
- Anions: HCO_3^- , Cl^- , SO_4^{2-} , HPO_4^{2-}
- Digestive enzymes (95% of protein in juice)
- Exocrine cells –produce 1200 to 1500 ml pancreatic juice /day

Secretion of water and electrolytes



- Na, K – the same as in plasma
- Bicarbonate concentration – up to 5 times higher than in plasma

Vasoactive intestinal peptide

- Upper small intestine
- Smooth muscle in blood vessels and gut wall
- Relaxation and decrease motility of gastric and secretion
- Increase intestinal secretion and electrolytes
- Presence of food in duodenum

Glucose dependent insulinotropic peptide

- K cells
- Upper small intestine SI
- Insulin secretin

Gastric inhibitory peptide

Factors

Fat and peptide

Decrease PH

Very very little of insulin stimulated from gastrin

Clinical tie

- Biliary colic

Cholecystitis

CCK

VIPOma

water Diarrhea

Hypokalemia

Achlorhydria decrease HCL

Stomach

- Ghrelin hormone from stomach fasting
- Leptin very thin makes you thin