

Pancreatic secretions

Dr. Arwa Rawashdeh

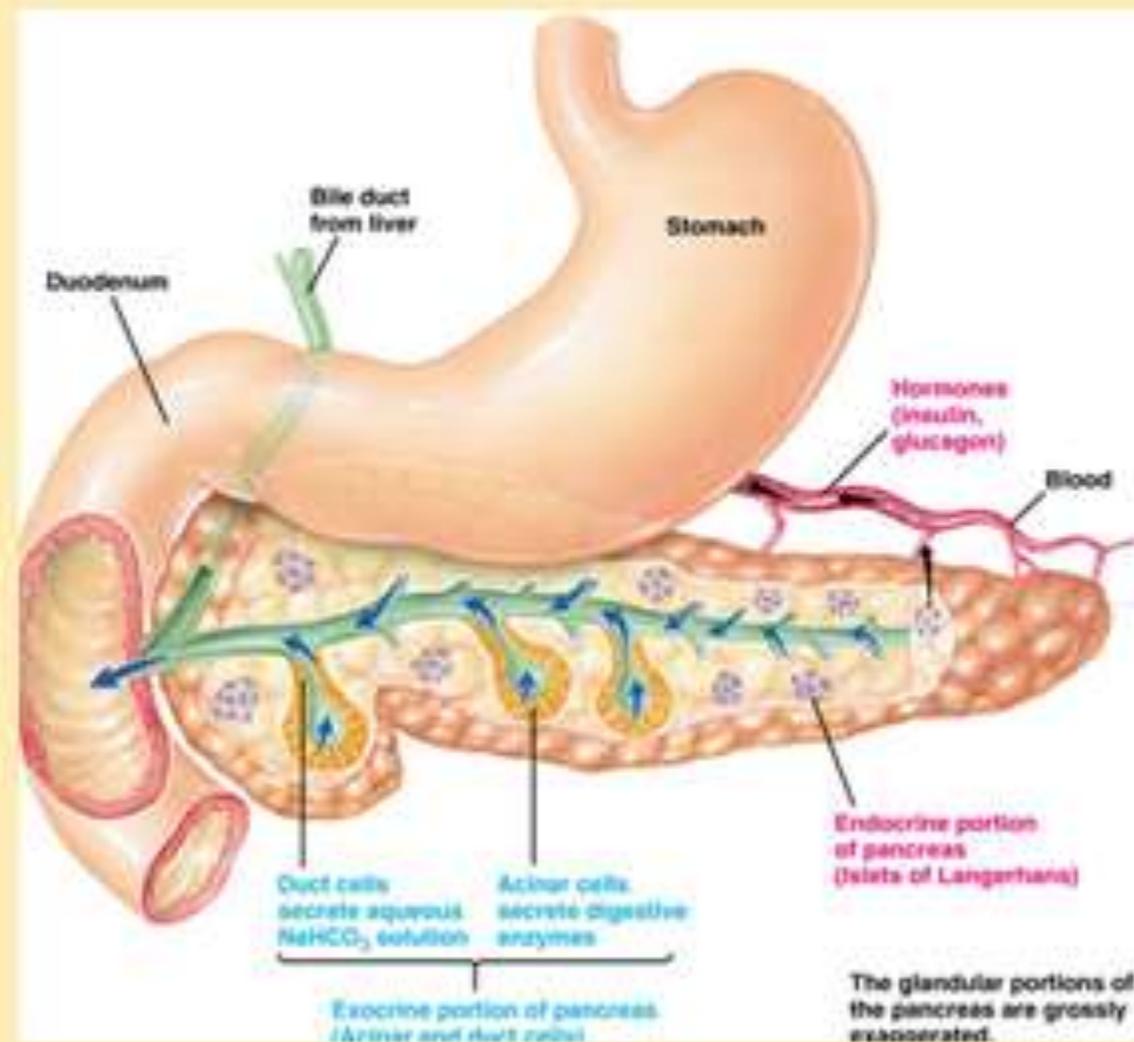
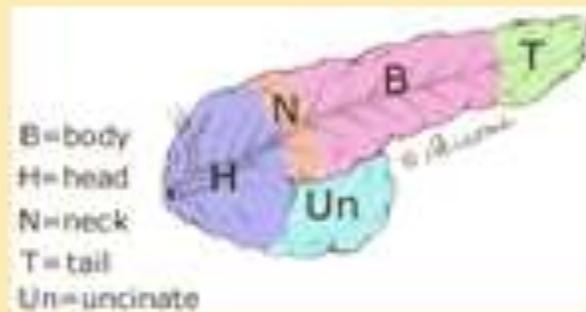
Objectives

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

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.

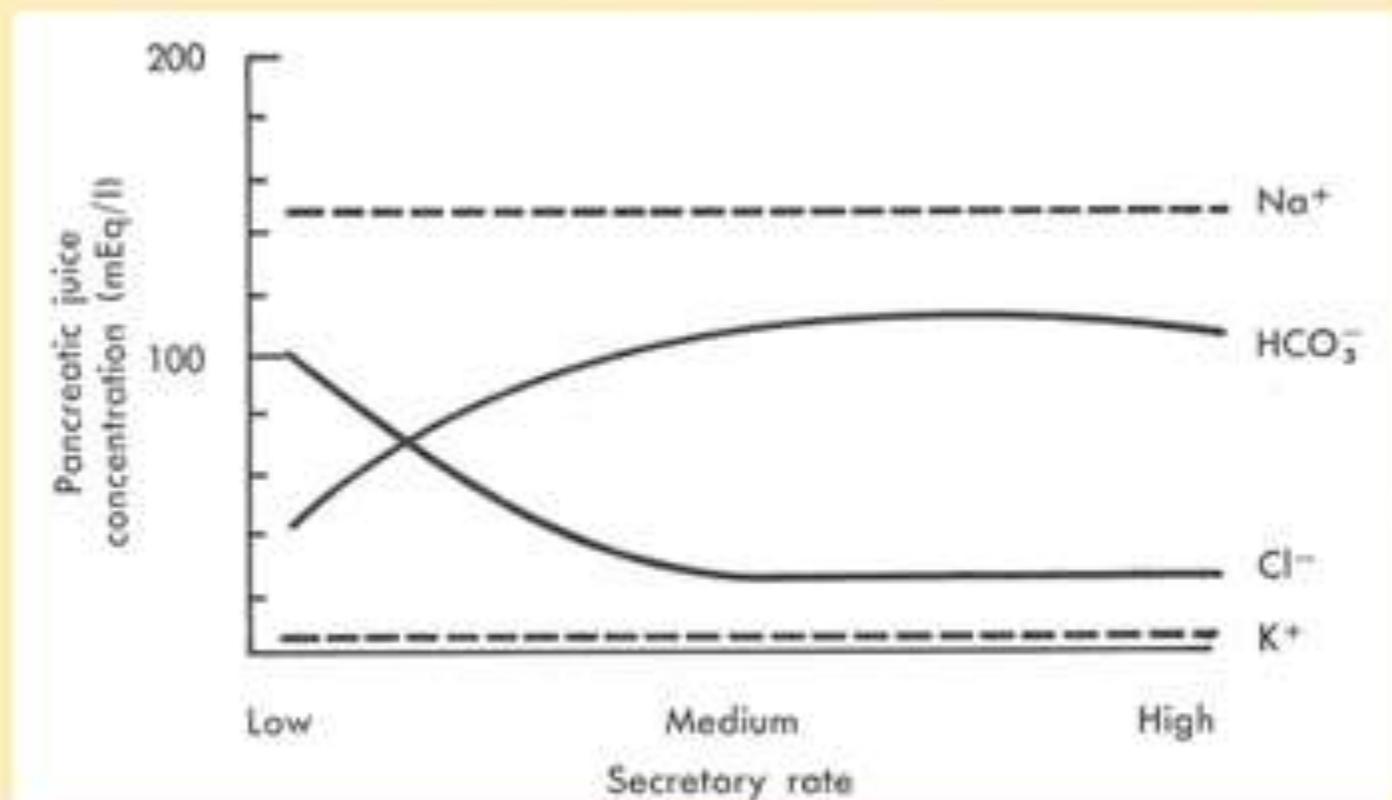
Wirsung or pancreatic duct

- 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

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

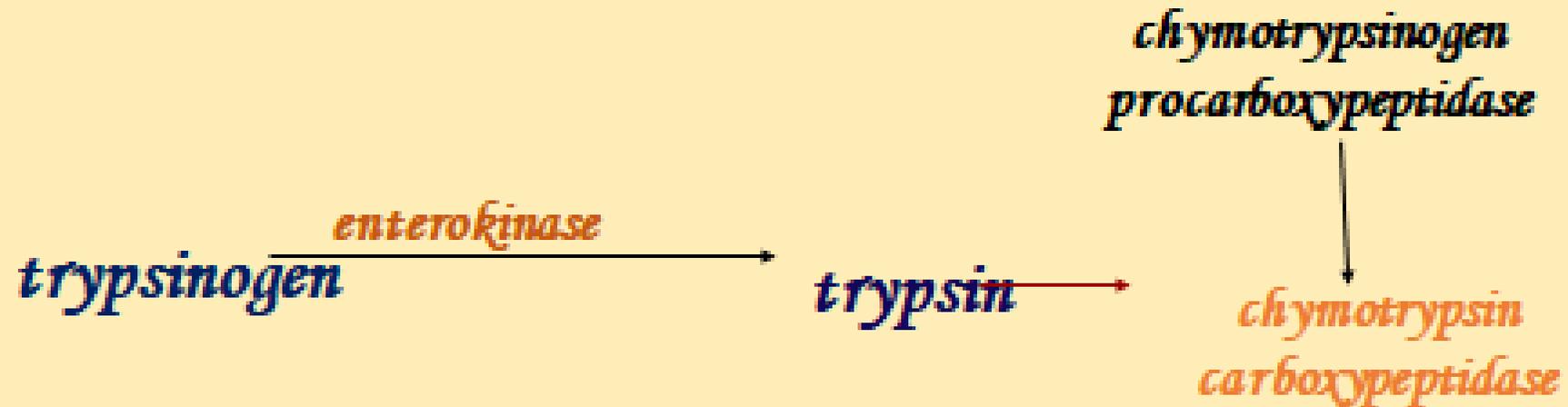
Basic functions of pancreatic secretions

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.**

Mechanism of enzymes activation

Proteolytic enzymes – secreted as inactive precursors



Lipase and amylases in active form

Protease inactive form

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

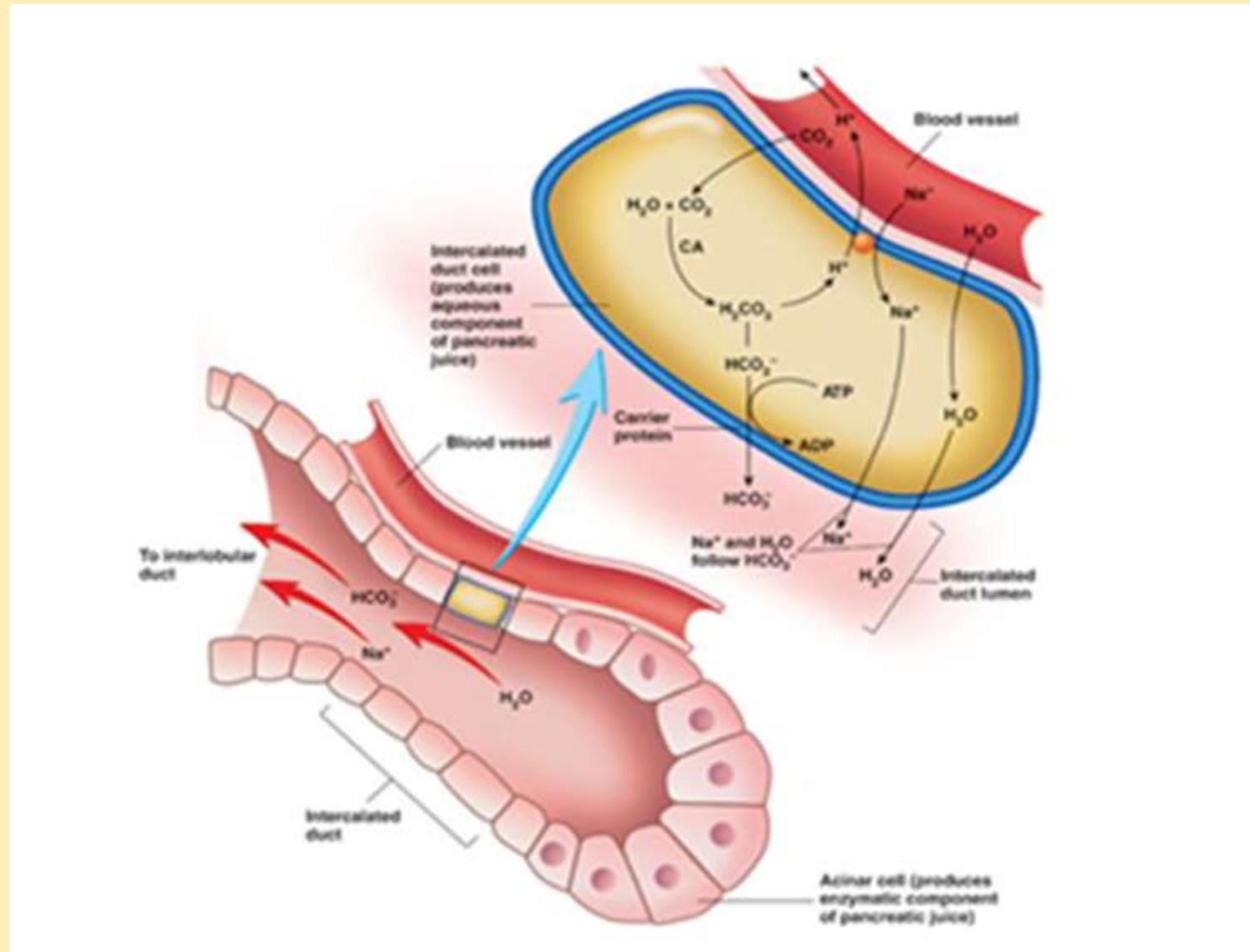
Prevent Pancreatic secretion

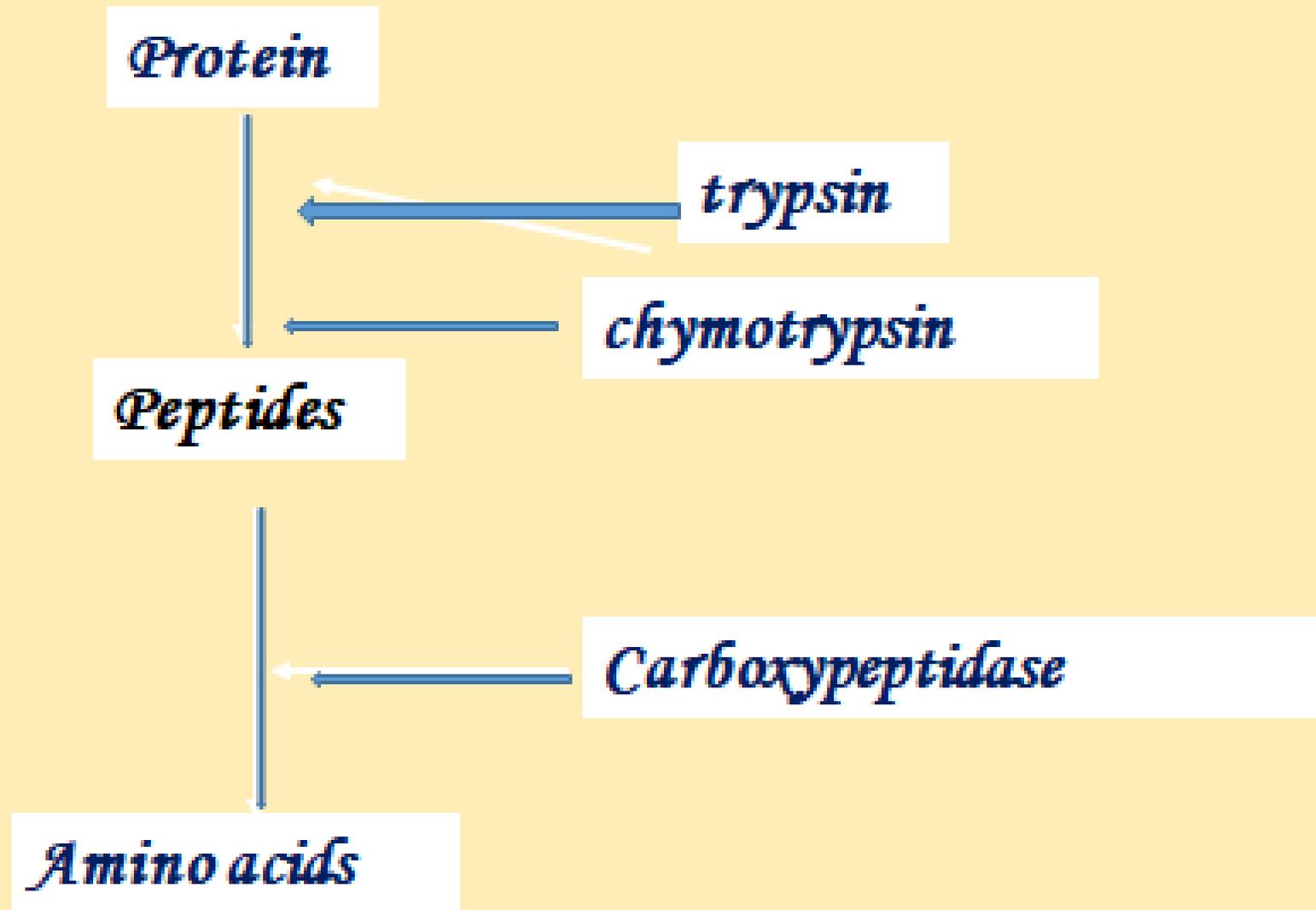
Alcohol abuse

Slow down pancreatic peristalsis

Activate trypsinogen

Bicarbonate ion production in pancreases



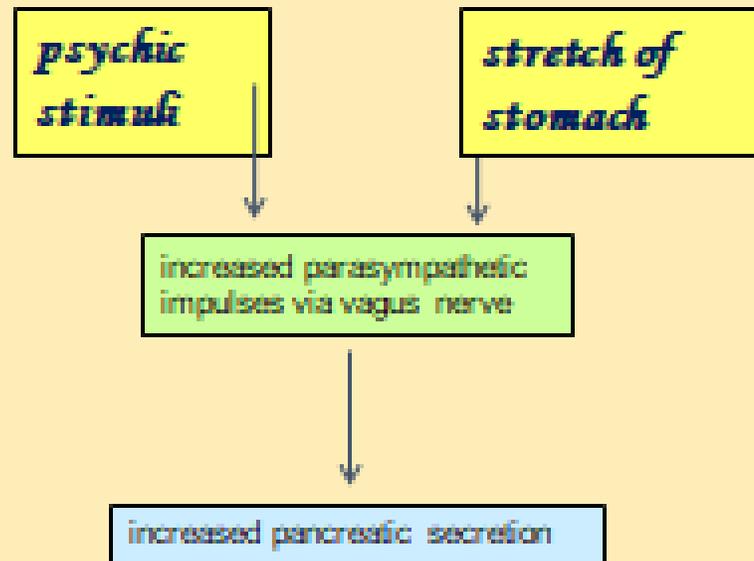


The Three Phases of Pancreatic Secretion

Phase	Stimulant	Regulatory Pathway	Percentage of Maximum Enzyme Secretion
Cephalic	Sight Smell Taste Mastication	Vagal pathways	25%
Gastric	Distention Gastrin?	Vagal-cholinergic	10%-20%
Intestinal	Amino acids Fatty acids H ⁺	Cholecystokinin Secretin Enteropancreatic reflexes	50%-80%

Summary of the pancreatic regulation

NEURAL CONTROL



ENDOCRINE CONTROL

