

Pancreatic secretions

Dr. Arwa Rawashdeh

* In GIT = 2 Functions $\begin{cases} \text{Mechanical} \\ \text{Chemical} \end{cases} \rightarrow \text{For Secretions + Hormones}$

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)

* Most of digestion occur in Small Intestine.

* " " Absorption " " " " " In Duodenum.

Pancreas ⇒ Has a big role in digestion + Absorption of Nutrients.

→ Secretion of enzyme for digestion ((In head + Neck))

→ Secretion of hormones ((Insulin + glucagon + Secretion direct to bloodstream → Supply distal organs. ((Through body + tail))

→ From Islet of Langerhans.

▶ Gland with both exocrine and endocrine functions

→ Covered From front + Sides.

▶ Location: retro-peritoneum, 2nd lumbar vertebral level

→ cuz if occur Any problem in pancreas doesn't cause damage to other vital organs.

▶ 15-25 cm long

▶ 60-100 g

→ small length + weight.

▶ Extends in an oblique, transverse position

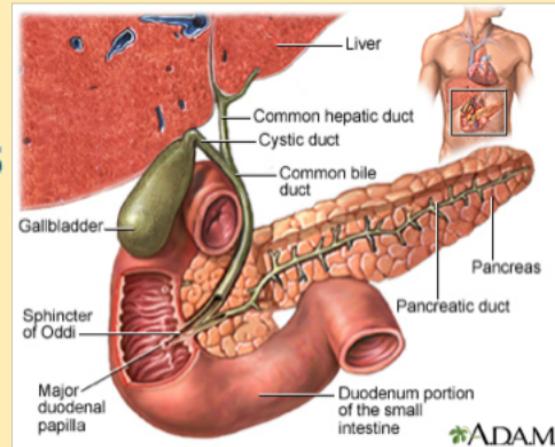
▶ Parts of pancreas: head, neck, body and tail

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.

→ Through Secretion of Bicarbonate HCO_3^- .



* Right + left hepatic duct join to form common hepatic duct.

covered Retroperitoneum

Common bile duct Attach to

pancreatic duct which

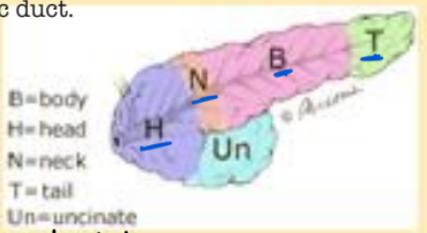
Physiological anatomy of Pancreas

is found on whole length of pancreas and drain to

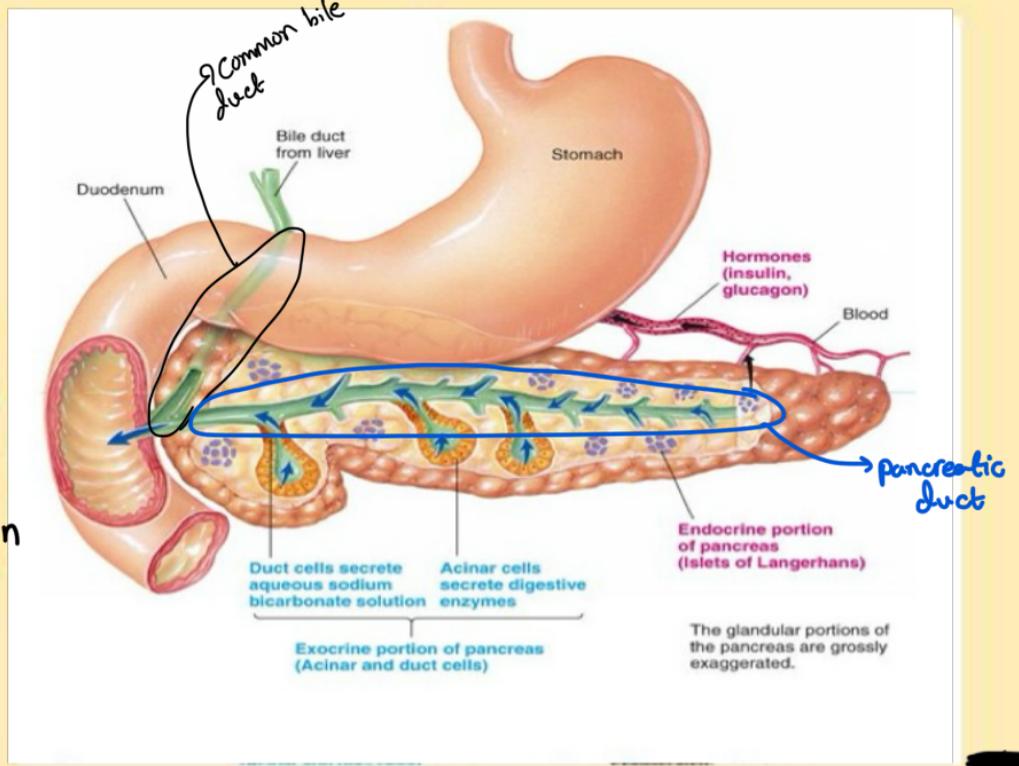
Inside Lumen of duodenum through

Ambulla Vater.

It's an area where your common bile duct meets your pancreatic duct.



* Any problem in biliary system can cause problems in secretions of enzyme + inflammation
* gall bladder Attach to bile duct.



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 In Lumen of Small Intestine

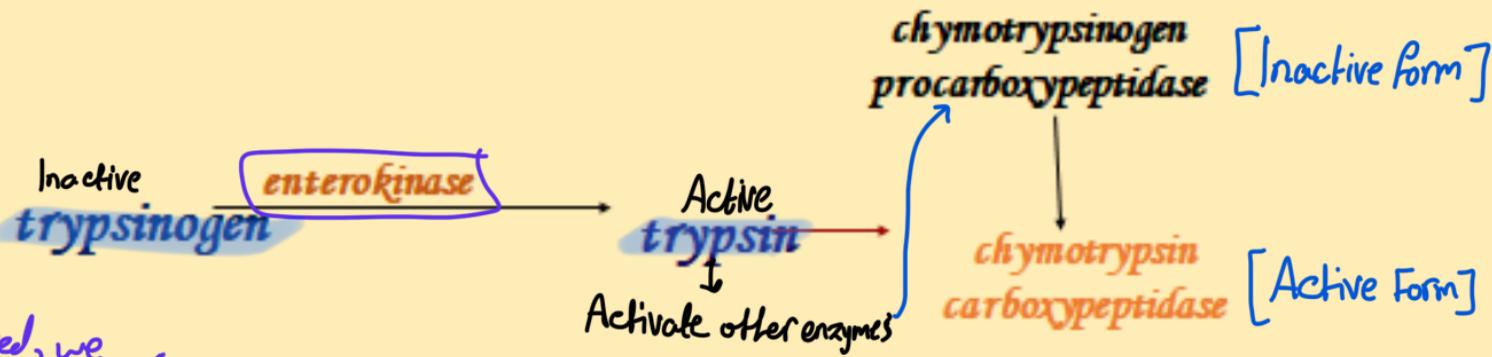
- Drain into duodenum together
- Number of people bile duct drain separately
- 30% of people have accessory duct (duct of Santorini) less like to get gall stone pancreatitis

* If gall stones block pancreatic duct, It will prevent secretions of enzymes.

highlight meals use

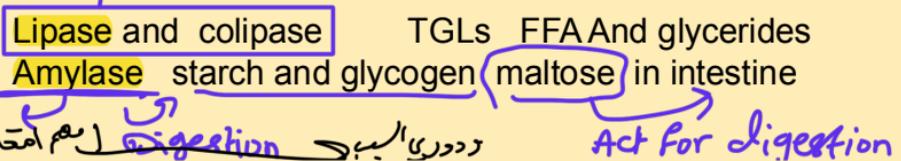
Mechanism of enzymes activation

Proteolytic enzymes – secreted as inactive precursors enterokinase.
 → then convert to Active form when Trypsinogen convert to it's Active form through enterokinase.



Lipase = IF Increased, we know through it that there is a problem in pancreas

Amylase = IF Increased we can't know IF there a problem in pancreas



Pancreatitis

- Enzyme starts to breakdown cells inside the pancreas

- 65% alcohol abuse ^{↖ Lipid soluble} ((Main Cause of problems in Liver + pancreas)) → الكحولية سببت التهابا في الكبد و البنكرياس

- 20% gall stones → May Cause ^{dangerous} Injury in duct + Acinar cells ⇒ In Active enzyme Converted to Active one Causing Inflammation + pain + In Left side of body Same to heart Attack.
- 15% toxins and drug viral infection or trauma

Microlithiasis → Collection of gall stones in pancreatic duct.

Viscosity ↑

Prevent Pancreatic secretion

Alcohol abuse

Slow down pancreatic peristalsis

Activate trypsinogen - elastases systemic inflammatory syndrome → cause VD when secreted = ↑ Area of secretion = go to Circulation

respiratory distress syndrome- DIC ← causing

Lung Most Affected cuz it's good vasculature causing problem in breathing

hates the stomach
cholecystokinin = protein
↳ From SI.
↳ Its secretion facilitate movement of cholecyst

• I Cells Upper small intestine then go to pancreas

• pancreozymin \Rightarrow Same as cholecystokinin.

Affect \rightarrow Pancreas Acinar cells not duct

• Enzyme from pancreas trypsinogen

• Decrease gastric motility and secretion and emptying giving the time for duodenum *Except Gastrin hormone*

• Presence of fat and peptides

• Contraction of bile duct.

secretin

- S cells USI of duodenum
- Affect ducts of pancreases and bile system Not Acinar cells
- Increase H₂O and HCO₃ duodenum neutralize the acidity higher PH
- Decreases GIT motility and secretions

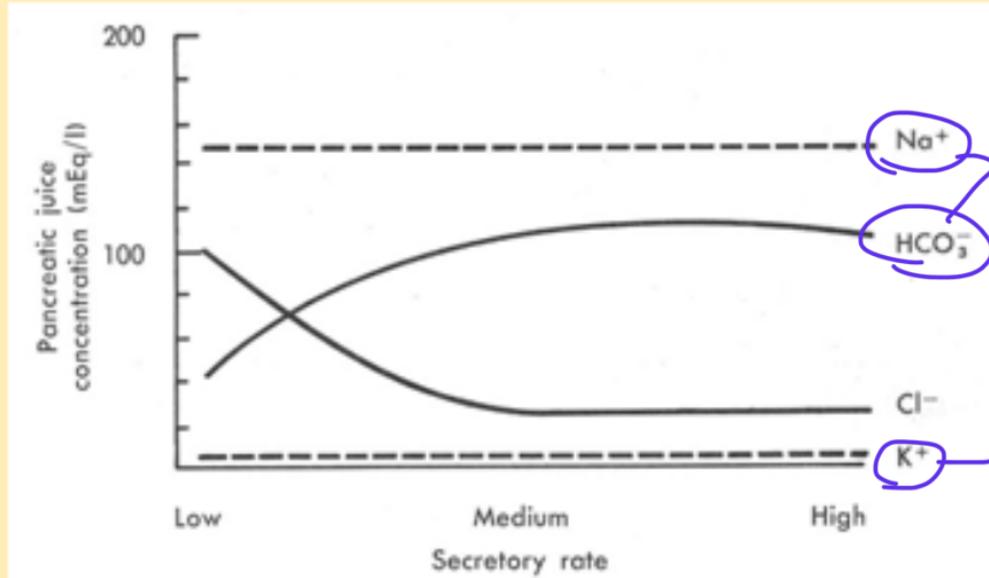
Factors

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-} (hormones)
- Digestive enzymes (95% of protein in juice)
- Exocrine cells –produce 1200 to 1500 ml pancreatic juice
/day

Secretion of water and electrolytes



pancreas في 5 to 6 اضعاف من الموجد في plasma

[] Same to [] of pancreatic secretions

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

Vasoactive intestinal peptide (VIP)

- Upper small intestine → ↑ diameter of BVs.
- Smooth muscle in blood vessels and gut wall
- Relaxation and decrease motility of gastric and secretion
- Increase intestinal secretion and electrolytes
↳ Not gastric cuz it opposite to each other.
- Presence of food in duodenum

pancreatic Acute Injury ⇒ Activation in VIP ⇒ Another enzyme cause

Cancer of pancreas (Exocrine Function Affected NOT Endocrine)

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

Injury in pancreas cause :-

- Biliary colic

Cholecystitis

CCK

VIPOma

water Diarrhea Affect Lossing of electrolytes causing

Hypokalemia Mal Affect heart causing Arrhythmia.

Achlorhydria decrease HCL



From parietal cells + Intrinsic factor = Imp to Absorp B12
causing hemolytic Anemia

* If amylase level increased ,why we can't know if there is a significant problem in pancreas?

The reason elevated amylase levels don't always indicate a significant pancreatic problem is because:

1. Amylase is not pancreas-specific

Amylase is produced by:

The pancreas (mainly the P-type)

The salivary glands (mainly the S-type)

Also found in small amounts in the lungs, fallopian tubes, and intestines.

So an elevated serum amylase can be due to non-pancreatic causes, like:

Salivary gland inflammation (e.g., mumps)

Macroamylasemia

Renal failure (because amylase is cleared by the kidneys)

GI conditions (e.g., perforated ulcer, intestinal obstruction)

2. Amylase can rise in mild or non-specific conditions

Even small, non-serious issues (like vomiting or alcohol use) can cause a slight bump in amylase, which doesn't necessarily mean severe pancreatic damage.

3. Short half-life

Amylase peaks early (usually within 12-30 hours of an acute pancreatic event) and returns to normal in 2-4 days.

So if you test late, it might already be normal even if there was a problem earlier — or elevated due to something else entirely.

Which enzyme is significant for pancreatic injury

? lipase

Because it only produced by pancreas