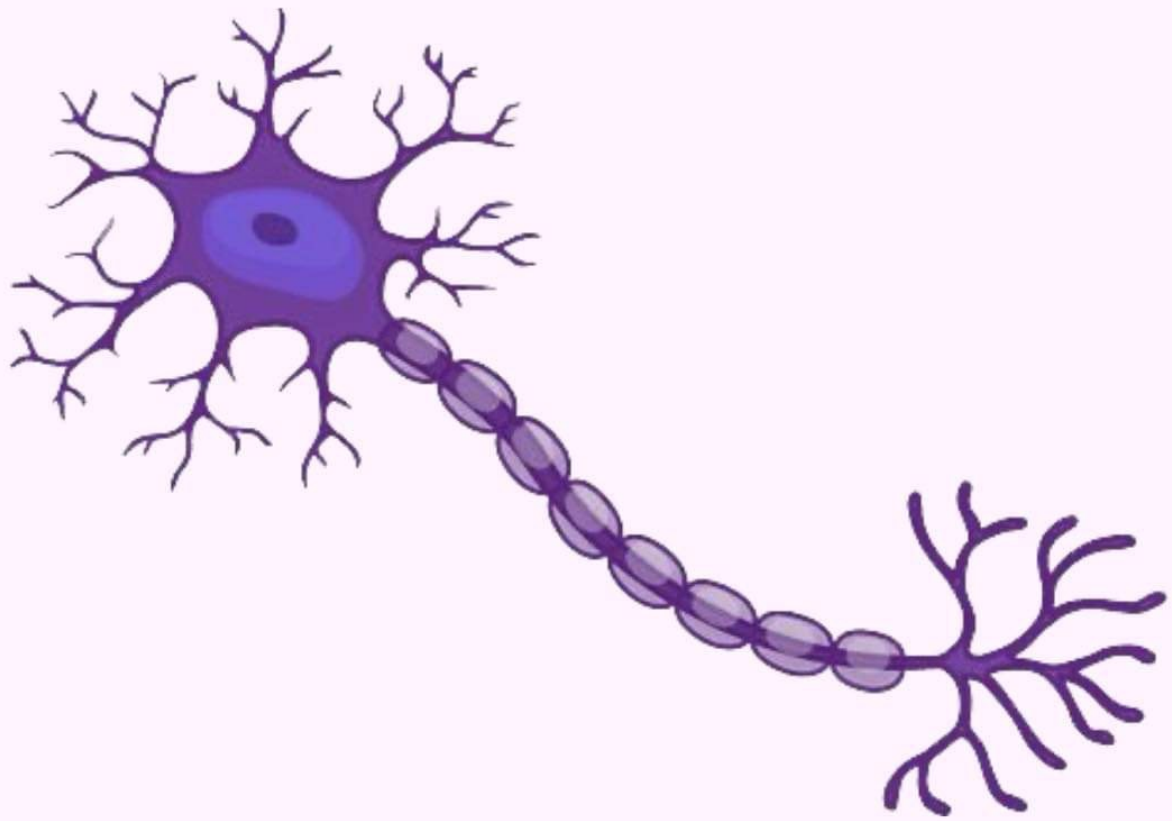




PHYSIOLOGY



LEC NO. : 21

DONE BY : Rana Altarawneh

وَقُلْ رَبِّ زِدْنِي عِلْمًا

تكملة

Digestive System P2

By d Gehan el wakeel

Stomach

Anatomy

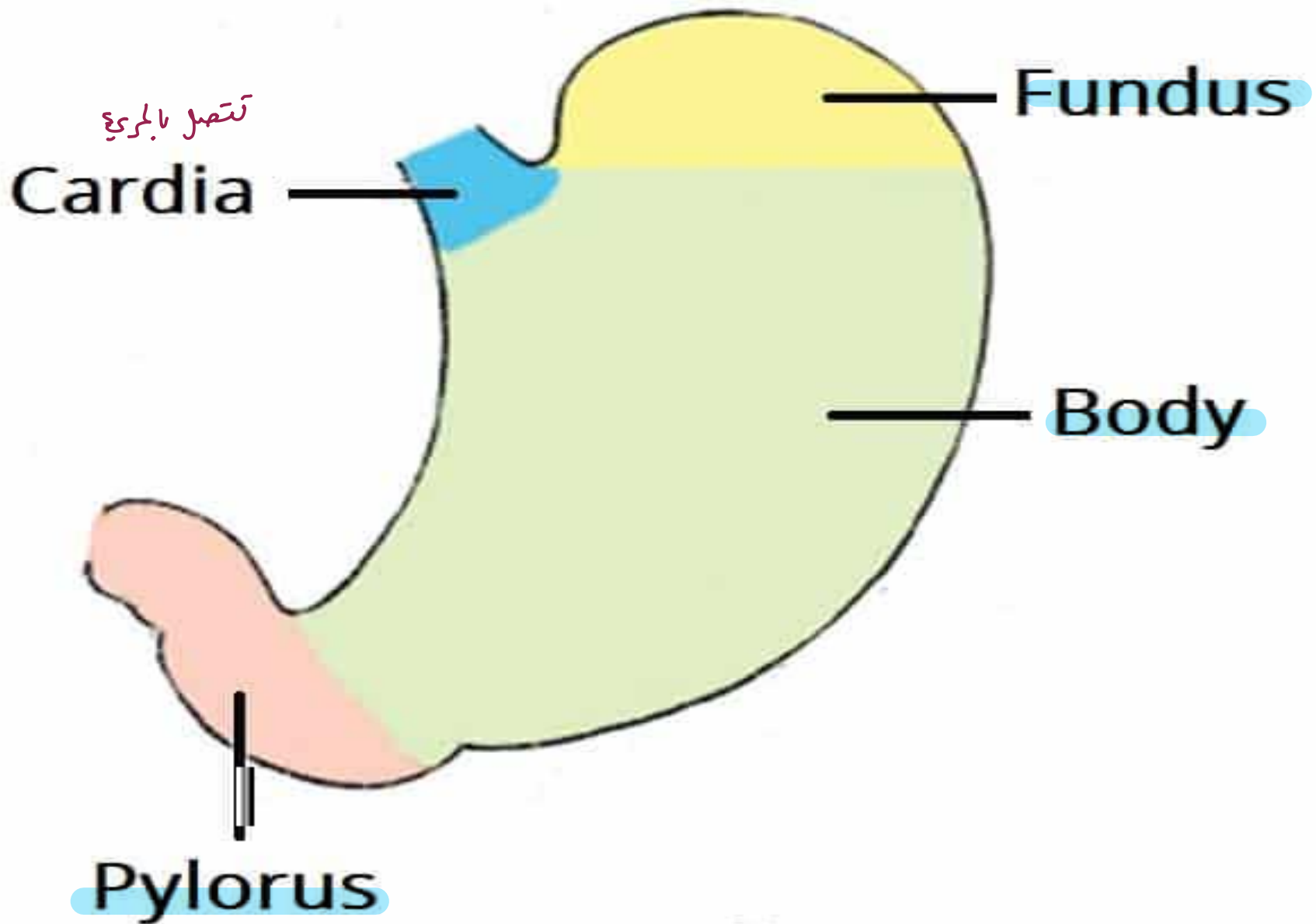
- The stomach is formed of 3 parts: **fundus, body and antrum or pylorus.** ^{أكبر جزء أعلى المعدة} _{يقدم مع ١٢}

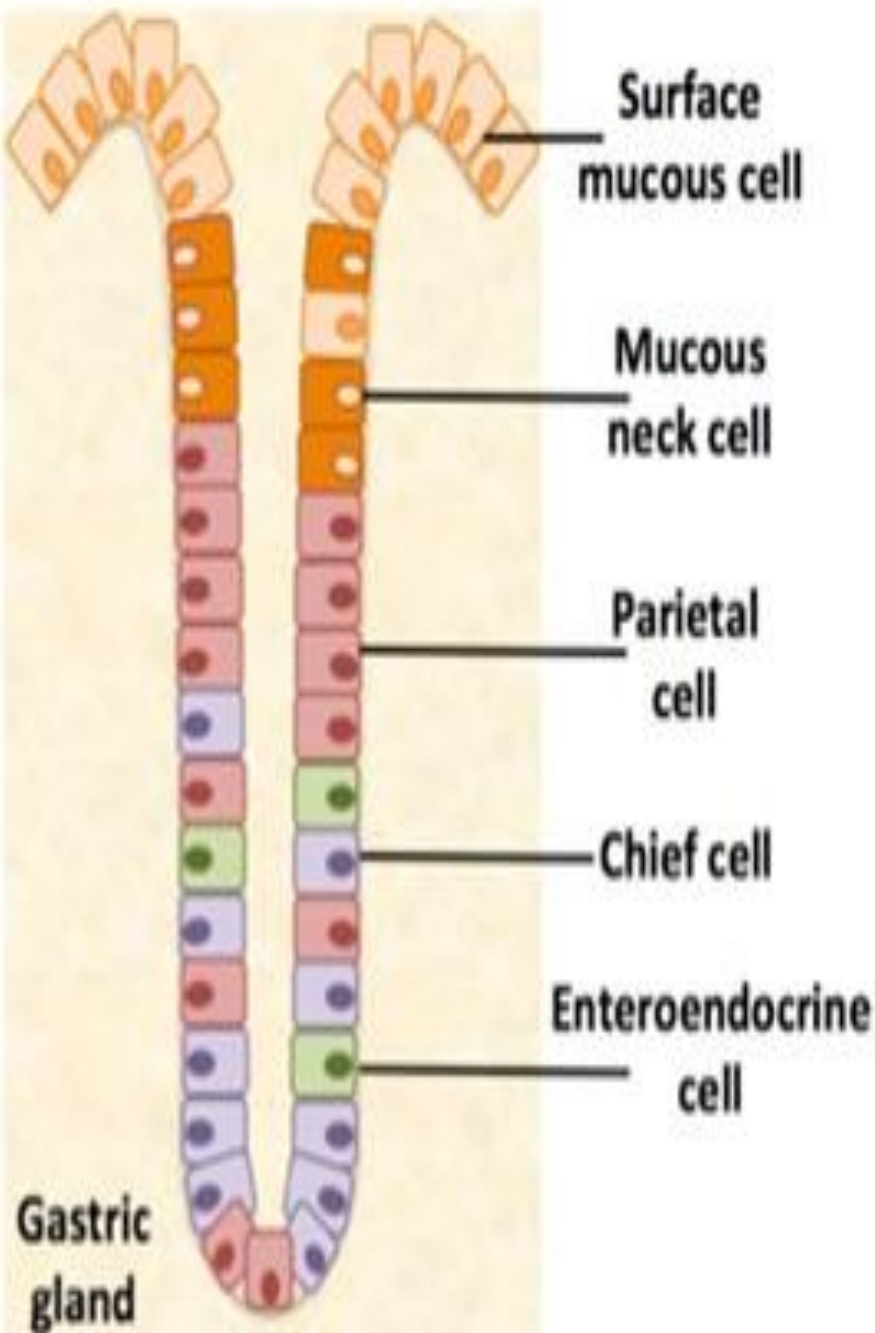
Gastric Glands:

- The gastric mucosa ^{جدار المعدة من الداخل} contain three types of cells ^{يأخذ في صفة Vit-B12}
 - Parietal (oxyntic) cells** → **secrete HCl and intrinsic factor.**
 - Peptic (chief) cells** → secrete proteolytic enzymes
 - Mucous cells** → **secrete mucous.** ^{مخاط}

(pepsin) pepsinogens.
لحم الصخرة الغير نشطة لانزيم الببسين

* مهم :
mucosa → جدار معدة
mucous → مخاط





Cells of the gastric glands	Secretory products
Surface mucous cells	Mucin in an alkaline fluid
Mucous neck cells	Mucin in an acidic fluid
Parietal cells	HCl & intrinsic factor
Chief cells	Pepsinogen & lipase
G cells/enteroendocrine cells	Gastrin

بتخلق HCl

Nerve supply:

يُسيطر عمل الأعصاب على نقل الدم إلى رايحها

محز الأضواء اربا تشتغل

A) Sympathetic supply

B) Parasympathetic supply

1- causes **relaxation of the wall of the stomach and contraction of pyloric sphincter** → delayed emptying
عشان الأكل ما يصر لدا انشامسر

2- Stimulate mucous secretion.

3- **V.C. of gastric blood vessels.**

1- Causes contraction of the wall of the stomach and **relaxation of pyloric sphincter** → rapid emptying.
يعرف المعدة وتروح لدا انشامسر.

2- stimulate secretion of HCL and pepsin

3- **V.D. of gastric blood vessels.** هضم البروتين ↓

عصارة معدية

Gastric Juice

- PH is ^{(1-2) pH} 1 → the most acidic fluid in the body.
- The volume is 3 L/day.

Composition: a. Water 99%. b. HCl 0.5%

- Inorganic constituents** → 0.1%. e.g. Na, K, Ca, Mg.
- Organic constituents** → 0.4%. e.g. complex as ions
 - Enzymes: **pepsinogens, gastric lipase, gelatinase and gastric amylase.**
 - انزيمز هافعة
 - اعزازاوي لل pepsin
 - هضم lipid
 - تفتيت gelatin
 - هضم carbohydrate
 - خامسة starch
 - Mucous.
 - **Intrinsic factor.**

Functions of HCL

1. It **activates pepsinogens into pepsin** and provides the acidic medium needed for their actions. نشيط
غير نشيط
2. **It kills many ingested bacteria.**
3. It helps **Ca and iron absorption.**
4. **Together with pepsin, it helps milk clotting.** تخثر الحليب

* Summary - Func of HCl:-

① تنشيط انزيم pepsin

② قتل bacteria

③ امتصاص Ca + iron

④ milk clotting

Pepsin functions (عضم البروتين)

- The active pepsin **is a proteolytic enzyme which acts on polypeptides to form peptides and peptones.** طريقة امتصاص البروتين
- **It needs a highly acidic medium.**

Intrinsic Factor

- It is secreted by the oxyntic cells. or parietal cell
- It is essential for absorption of vitamin B12.
- Vitamin B12 is essential for maturation of RBCs, so lack of intrinsic factor causes pernicious anaemia



Mucous Secretion

أهمية

a) Is important for lubrication & mixing chime

بجعل غلاف يحوط جدار المعدة

b) Form a gel coat that protect the gastric mucosa from HCl

تخذه

& mechanical erosion by food

I- HCl (hydrochloric acid)

Source :

The parietal (oxyntic) cells , which is characterized by :

- Presence of large number of mitochondria → تعطي طاقة لتصنيع HCl
- Presence of system of canaliculi → مكان تصنيع HCl

Their surface contain 5 types of receptors

5 مستقبلات

	Acts by 2 nd messenger	Stimulated by 1 st messenger	Inhibited by	Effect
1- Muscarinic R.	↑ intracellular Ca ⁺⁺	Acetyl choline	Atropine دواء لعلاج القرحة	inc ↑ HCl
2- Gastric R	↑ intracellular Ca ⁺⁺	Gastrin	Somatostatin	inc ↑ HCl
3- Histamine R	↑ ing C-AMP	Histamine	Somatostatin	inc ↑ HCl
4- Prostaglandins تقلل HCl + تكوين مخاط	↓ ing C-AMP	PGS	Anti-inflammatory drugs يمكن سحب قرحة اذا أخذنا على معدة ما صغى مثل: اسبرين.	del ↓ HCl
5- Somatostatin	↓ ing C-AMP	Somatostatin		del ↓ HCl

N.B

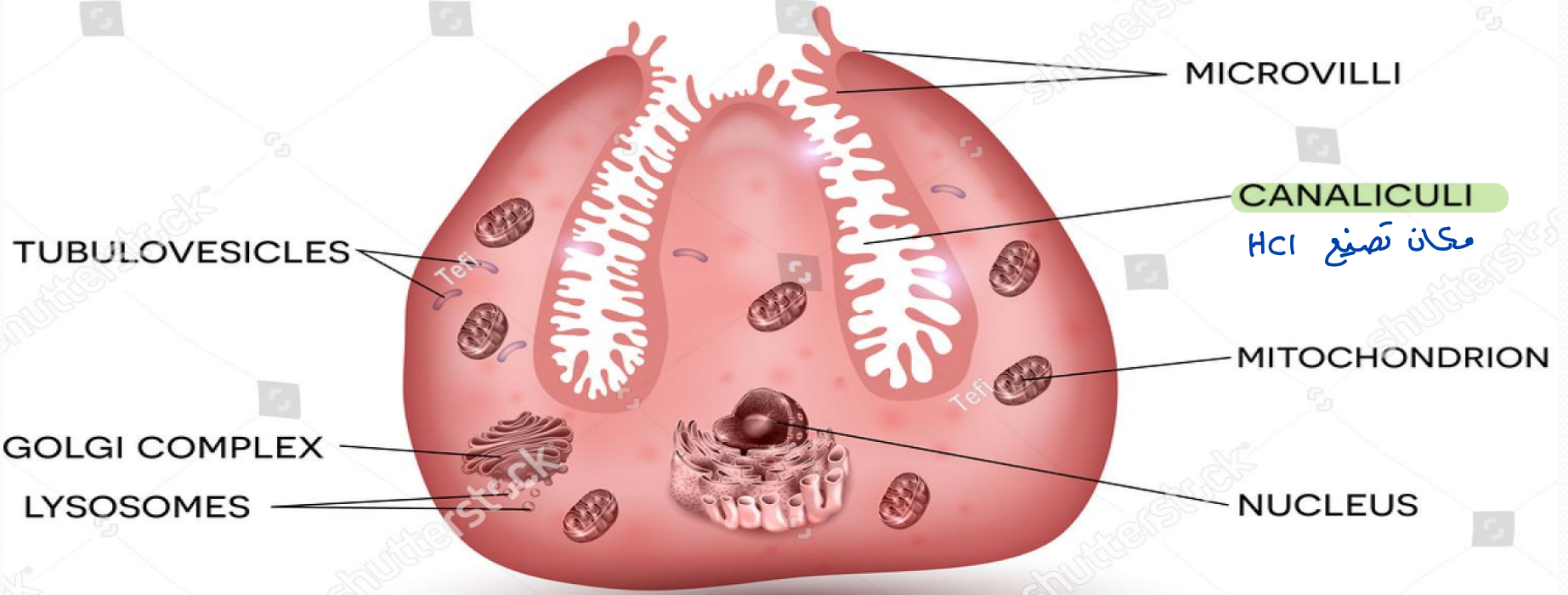
- Patients taking anti-inflammatory drugs complain of hyperacidity and peptic ulcer because these drugs \downarrow PGS \rightarrow \uparrow HCl.

Cellular mechanism for HCl secretion

1. **Cl⁻ is actively secreted into the lumen, this creates -ve potential**
*شحنة (-) تحتاج طاقة
K⁺ دخل لـ lumen وا يجذب لـ Cl⁻*
 2. **K⁺ then diffuses to the lumen attracted by the -ve potential**
 3. **H⁺ is pumped into the lumen in exchange with K⁺ through the **H⁺-K⁺ pump (proton pump)**.**
H⁺
 4. **HCO₃⁻ then diffuses to the extracellular fluid causing **temporal alkalosis (alkaline tide)****
قلوي (قاعدي) من
 5. **Water then diffuses to the lumen by osmosis**
- How HCl produce:**
+ الخلية فيها mitochondria مصنوعة طاقة
انتاج O₂ واخراج CO₂ - راح يتحد مع H₂O ينتج H₂CO₃
راح يتحلل ويعمل HCO₃⁻ و H⁺
HCO₃⁻ - بروح للدم ويدخل بـ Cl⁻ لان بدنا H⁺
بدنا أيون شحنة + ليحدث تبادل مع H⁺، كيف؟؟ عن طريق H-Katpase يتخدم طاقة ناتجة من تكسير atp
بدل H و يخرج Ka بوتاسيوم

PARIETAL CELL

CELL TYPE OF THE STOMACH WALL

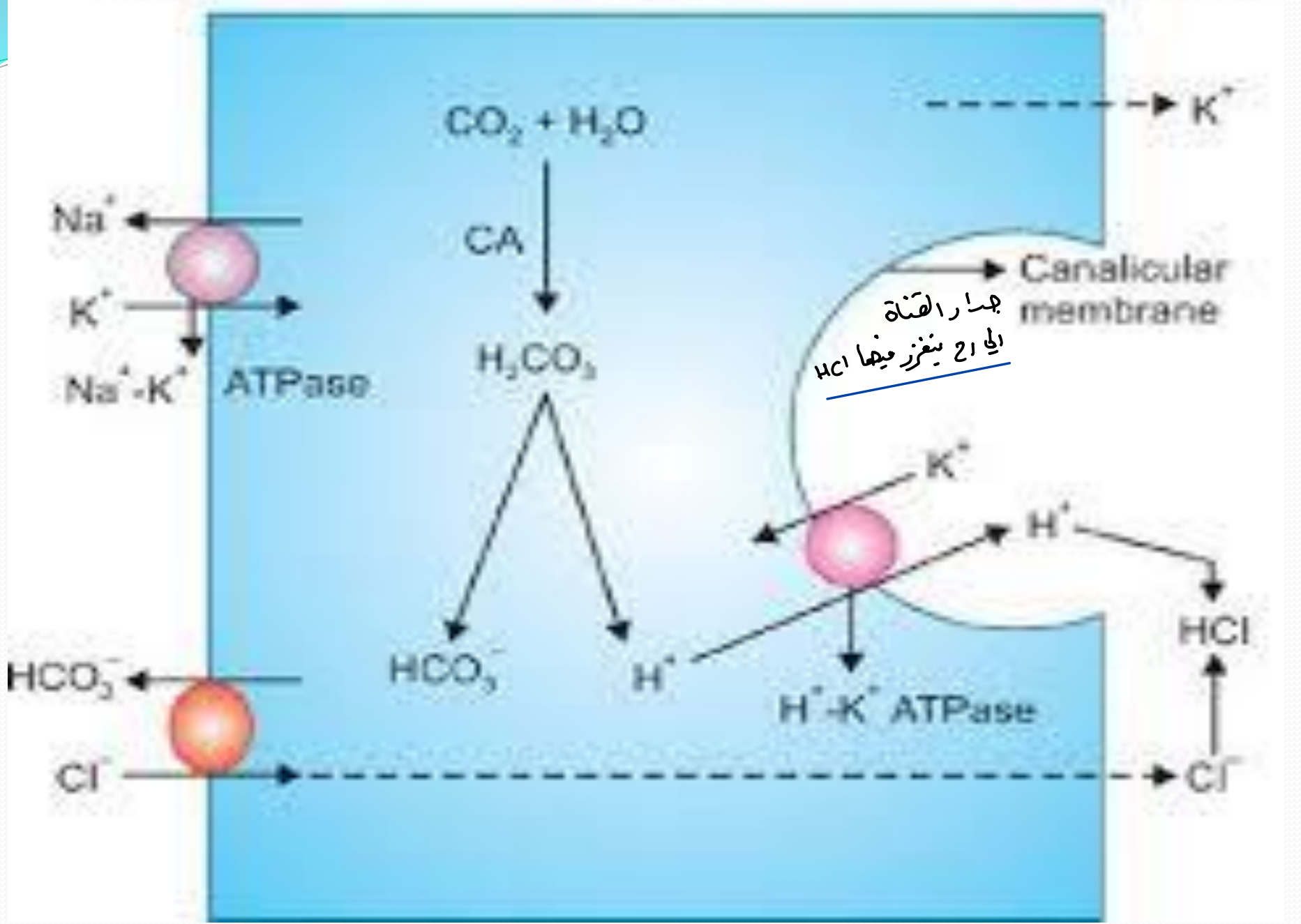


CANALICULI
مكان تصنيع HCl

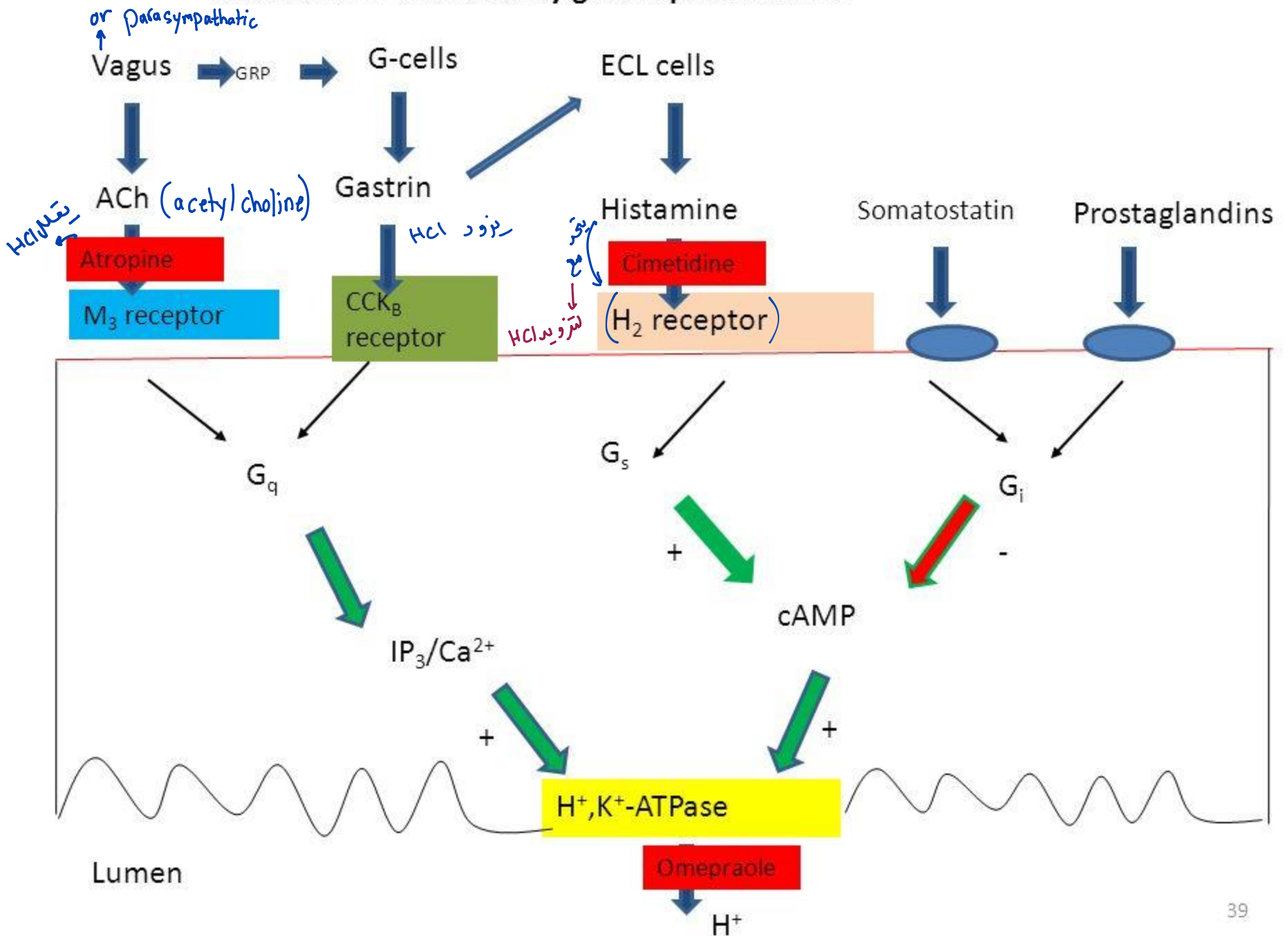
ISF

Parietal cell

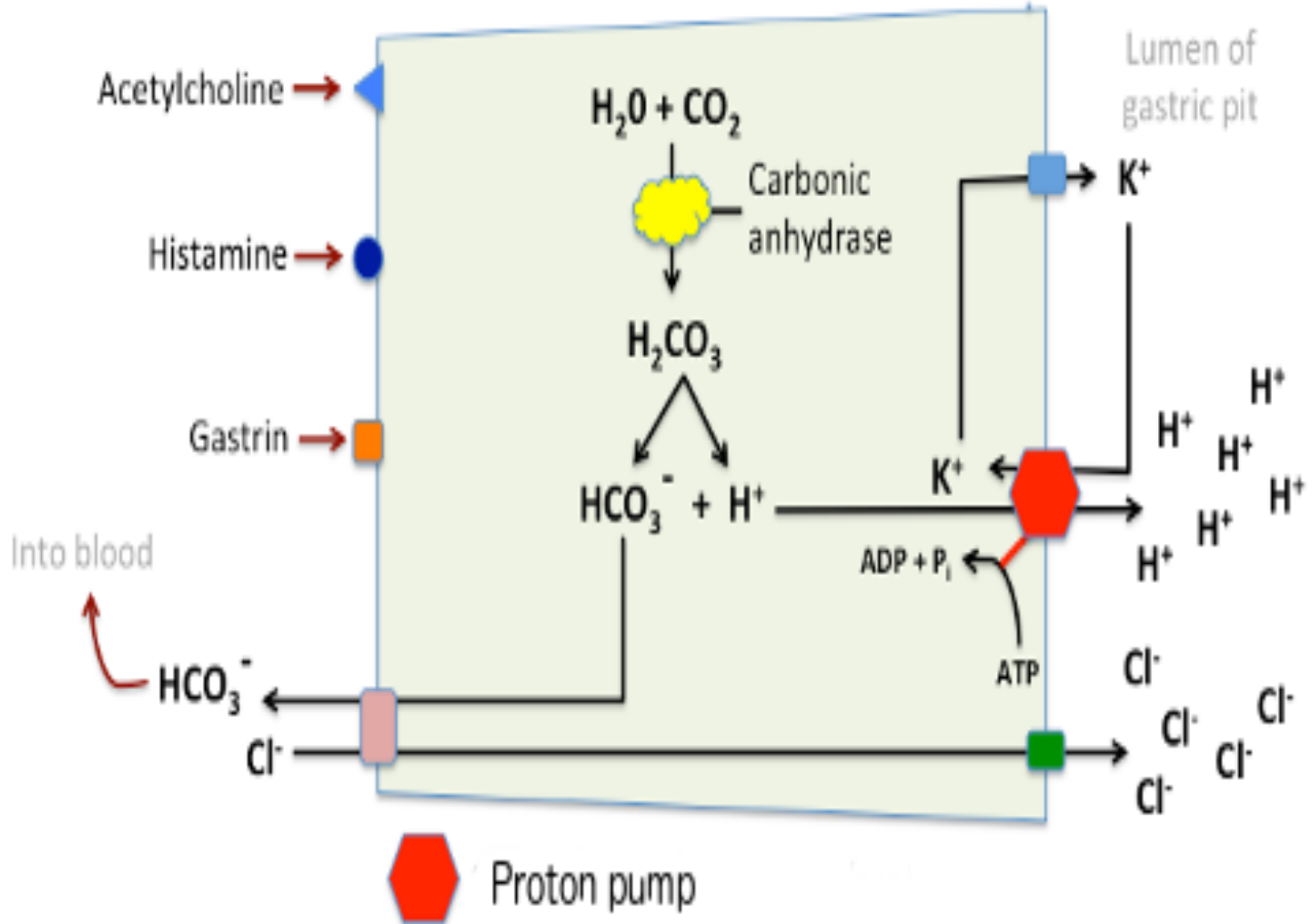
Gastric lumen



Control of H⁺ secretion by gastric parietal cells



Parietal Cell



Control of HCl secretion

إنتاج HCl

a) Stimulators

1. Acetylcholine
2. **Histamine**
3. Gastrin
4. Anger & hostility

↓
الغضب يسبب فرحة المعدة

تقلل HCl

b) Inhibitors

1. **PGS**
2. ↑ acidity in the stomach
3. **Somatostatin, GIP, VIP**
4. Fear & depression

الحزن والاكتئاب يقلل HCl

Functions of HCl

1. **Activate pepsinogens into pepsins.**
2. **Provide the acidic medium needed for the activity of pepsins.**
3. Kills the ingested bacteria
4. **Help iron & Ca^{++} absorption**
5. Help milk clotting.
6. **Controls** the rate of gastric **emptying** so that \uparrow duodenal acidity $\rightarrow \downarrow$

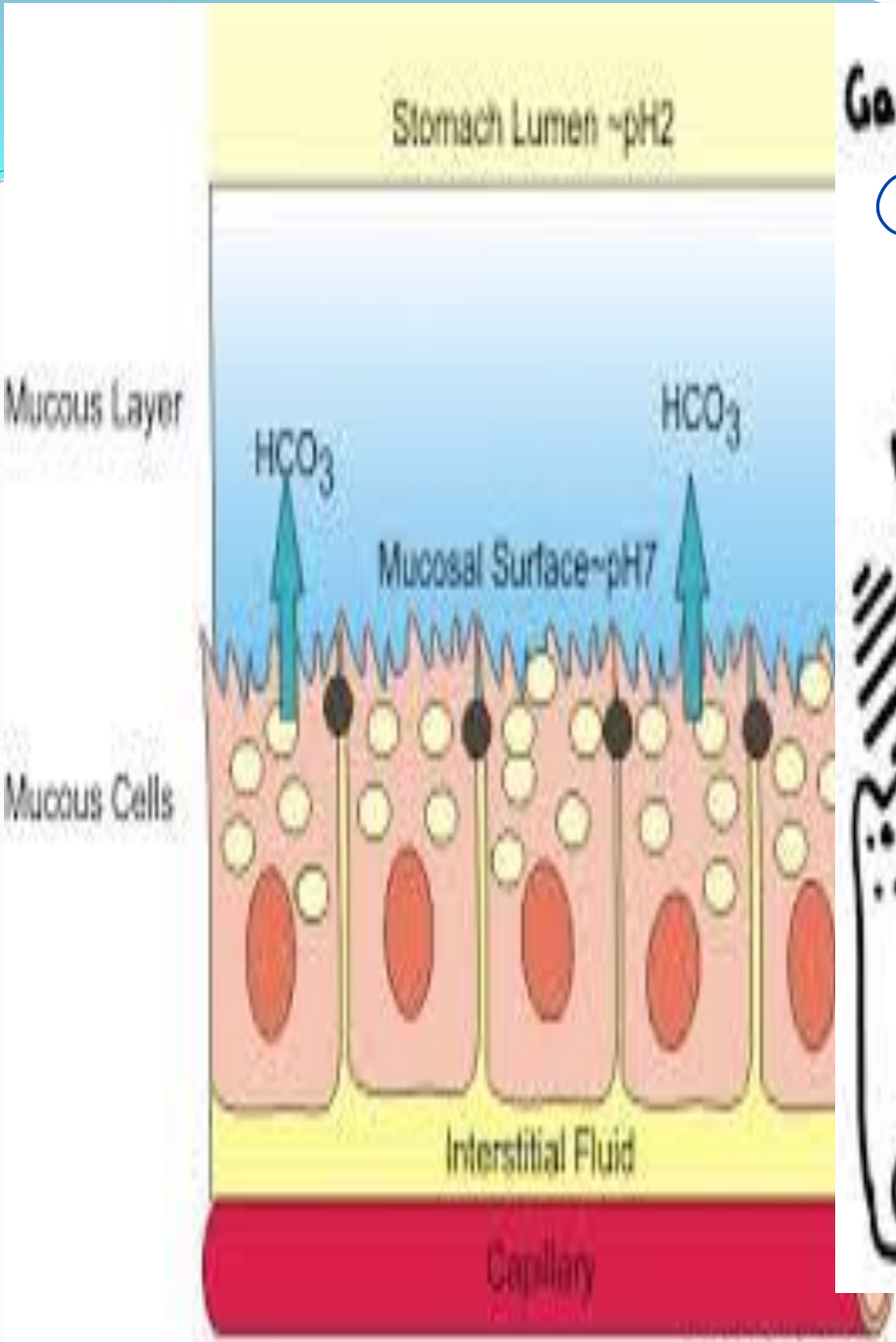
emptying.

مصاراة صفراوية تنفوز من الكب و تمتزج بالحرارة
(HCO_3^-)

7. **Stimulates bile flow & pancreatic juice by increasing CCK &**

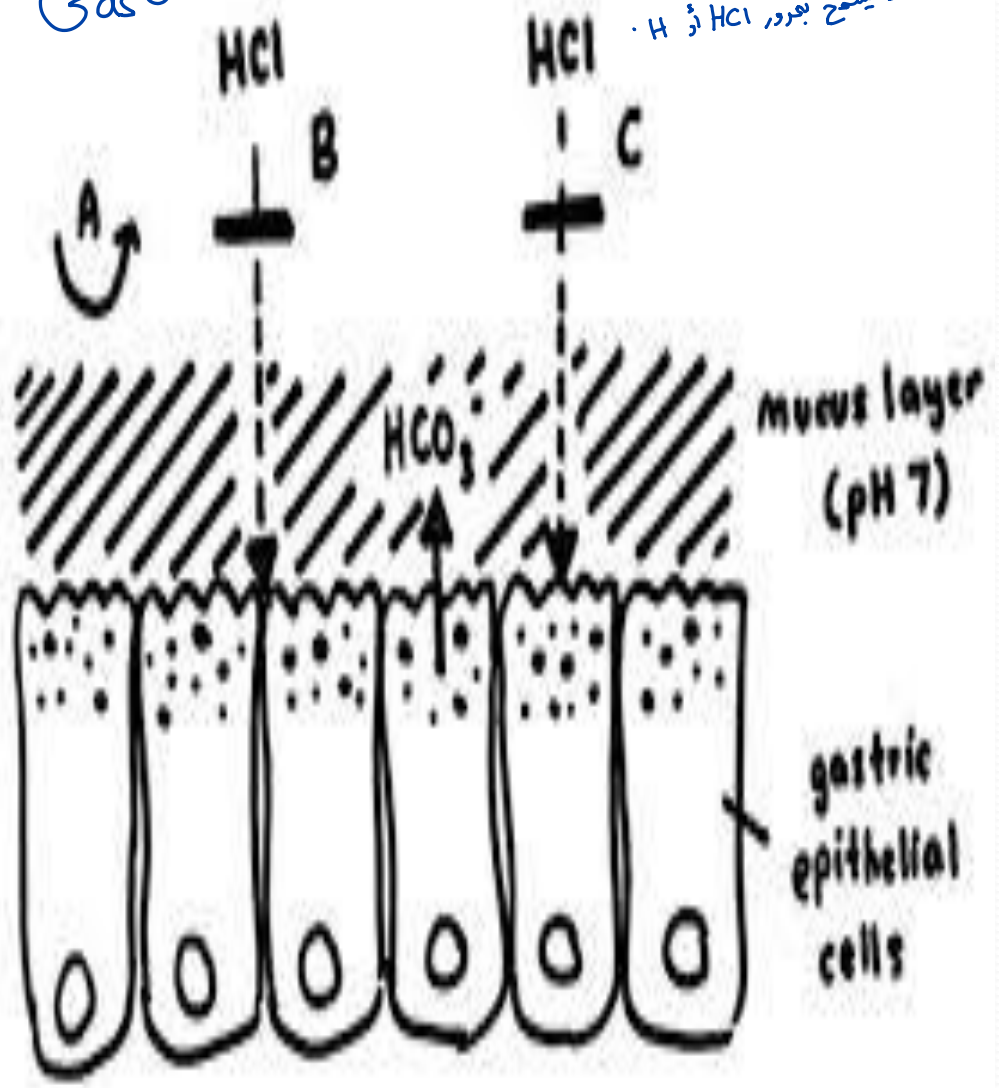
secretin.

هرمونات يتم إفرازها من duodenum بسبب زيادة HCl، والحمضية.



Gastric Mucosal Barrier

Gastric Mucosal Barrier → مخاط معزول عن surface
 • معادلة HCO_3^-
 • فلان لا يسمح بعبور HCl و H^+



عناصر

COMPONENTS OF GASTRIC MUCOSAL BARRIER

- A Compact epithelial cell lining → لا يمر من خلاله
- A special mucous covering مخاط يغلف جدار المعدة
- impermeability of luminal membrane of the جدار المعدة من برا
- gastric mucosal cells to hydrogen ions.
- Rapid replacment of entire stomach lining

Digestive Systems

- Functions of digestive system:
 - Accessory organs

- **Pancreas**

- Exocrine gland between stomach and small intestine
- Produces several digestive enzymes:

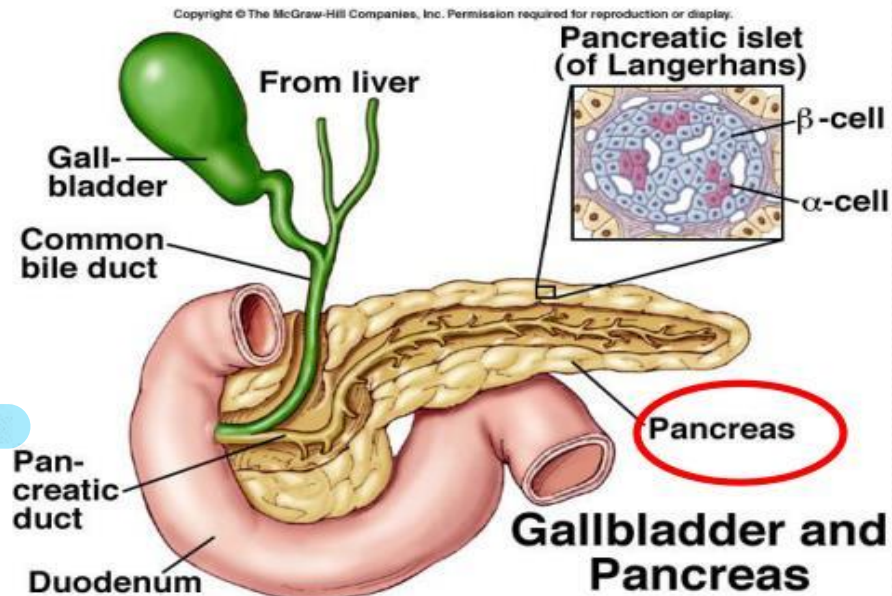
- » **trypsin**: digests proteins

- » **pancreatic amylase**: digests starches

- » **lipase**: digests fats

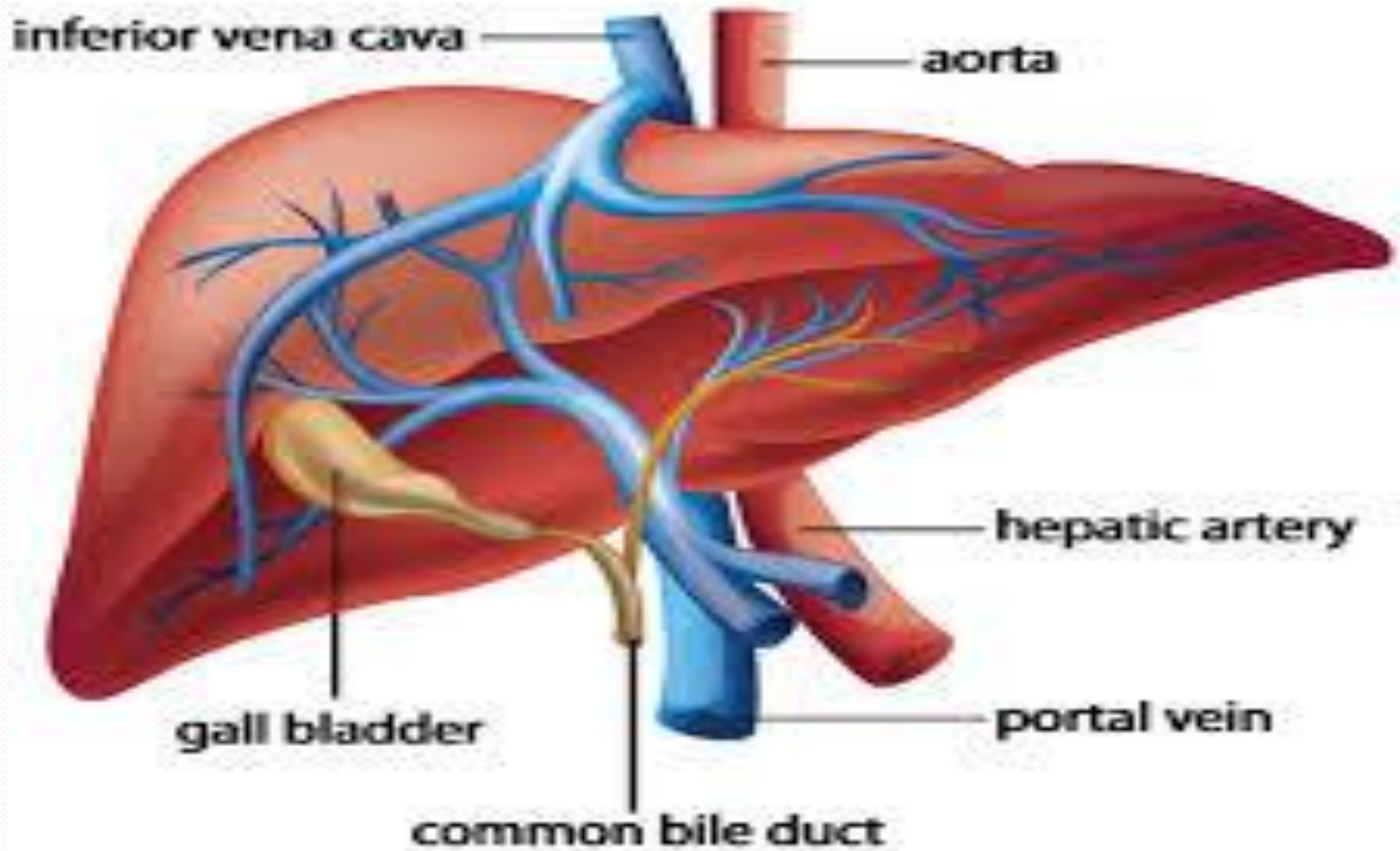
- Also acts as endocrine gland

- » produces hormones to regulate glucose levels in blood (insulin and glucagon)



عضله پرده بین ودهون و نشا ←

Human Liver Anatomy



Functions of the Liver

- Metabolic
- Storage - Glycogen, vitamins (all Fat soluble and few water soluble), iron
- Excretory/Secretory – bile excretion
- Protective (eg. kuffer cells)
- Coagulation – production of clotting factors
- Detoxification of drugs via cytochromes.

عصارة صفراوية يتم تصنيعها
بالكبد وتخزينها بالعذارة ويتم امتدادها
إثناء العضم.

له معالان تجلط (في الكبد)

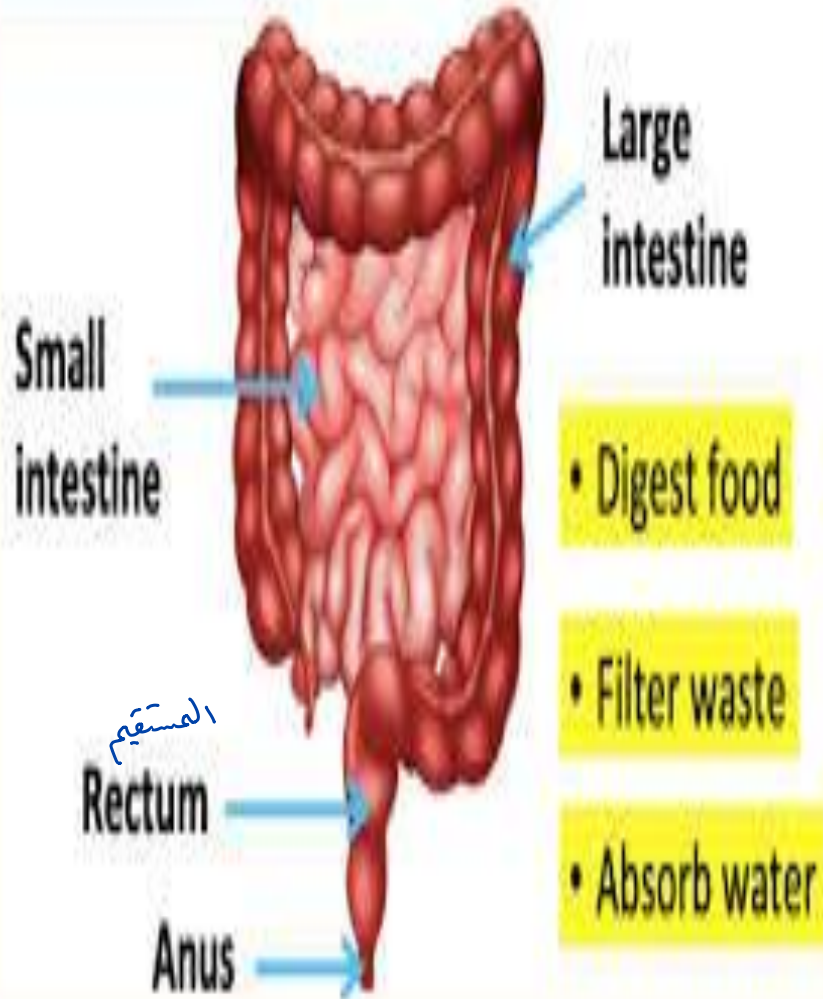
Bile Juice

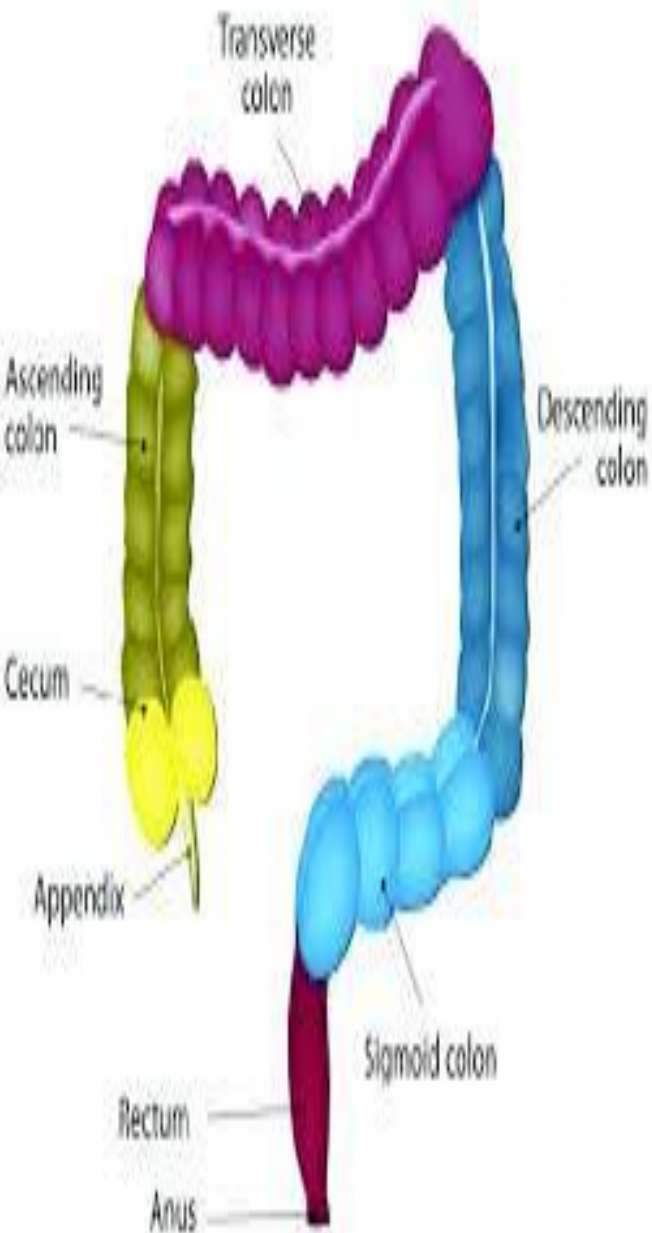
bile pigment

- Bile is a bitter-tasting, **dark green** to yellowish brown fluid, produced by the **liver** , it is stored in the **gallbladder** and upon eating is discharged into the duodenum. .
- The principal function of the gallbladder is to serve as a storage **reservoir** for bile.
- The main components of bile are **water**, **bile salts**, **bile pigments**, and **cholesterol**
- Bile salts act as **emulsifying agents** in the digestion and absorption of **fats**. **Cholesterol** and **bile pigments** from the **breakdown of hemoglobin** are excreted from the body in the **bile**.

تعمل fat لعواد
ذائبة بالماء
ليسهل امتصاصها

Intestines Anatomy & functions





Functions of large intestine

3 primary functions:

1. absorbing water and electrolytes,
2. producing and absorbing vitamins,
3. forming and propelling feces toward the rectum for elimination. Convert the liquid contents of the ileum into semisolid feces by absorbing water, salts, and electrolytes. It also stores and lubricates feces with mucus.

مضاط يساه في عملية الإخراج.

Which of these ions is present in saliva and is bactericidal?

Na (a)

K (b)

Cl (c)

Hco₃ (d)

Thiocyanate (e)

Which of these cells of gastric glands secretes HCL and intrinsic factor?

Peptic cell (a)

Parietal cell (b)

Mucus neck cell (c)

Enteroendocrine cell (d)

Surface mucus cell (e)

Which of these pancreatic enzymes acts to digest starch?

Trypsin (a)

Amylase (b)

Lipase (c)

Chymotrypsin (d)

Phospholipase (e)

The liver acts as an excretory organ for which of these substances?

Glycogen (a)

Fat soluble vitamins (b)

Water soluble vitamins (c)

Bile (d)

Iron (e)

Water is absorbed primarily by
which of these digestive organs?

Stomach (a)

Pancreas (b)

Liver (c)

Small and large intestine (d)

Esophagus (e)



Thank

You●