



تَوِير

BIOLOGY

Lec no :

File Title : Chapter 41 part 2

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

فَللَّهِ الْعِزَّةُ وَاللَّهِ أَكْبَرُ مَا تَعْلَمُونَ
بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

صَدَقَ اللَّهُ الْعَظِيمُ

Biology : chapter 41, part II

done by: Ileen Al-Ashraam

shaykhah 2023

Concept 41.3: Organs specialized for sequential stages of food processing form the mammalian digestive system

- The mammalian digestive system consists of an alimentary canal and accessory glands that secrete digestive juices through ducts
- Mammalian accessory glands are the salivary glands, the pancreas, the liver, and the gallbladder

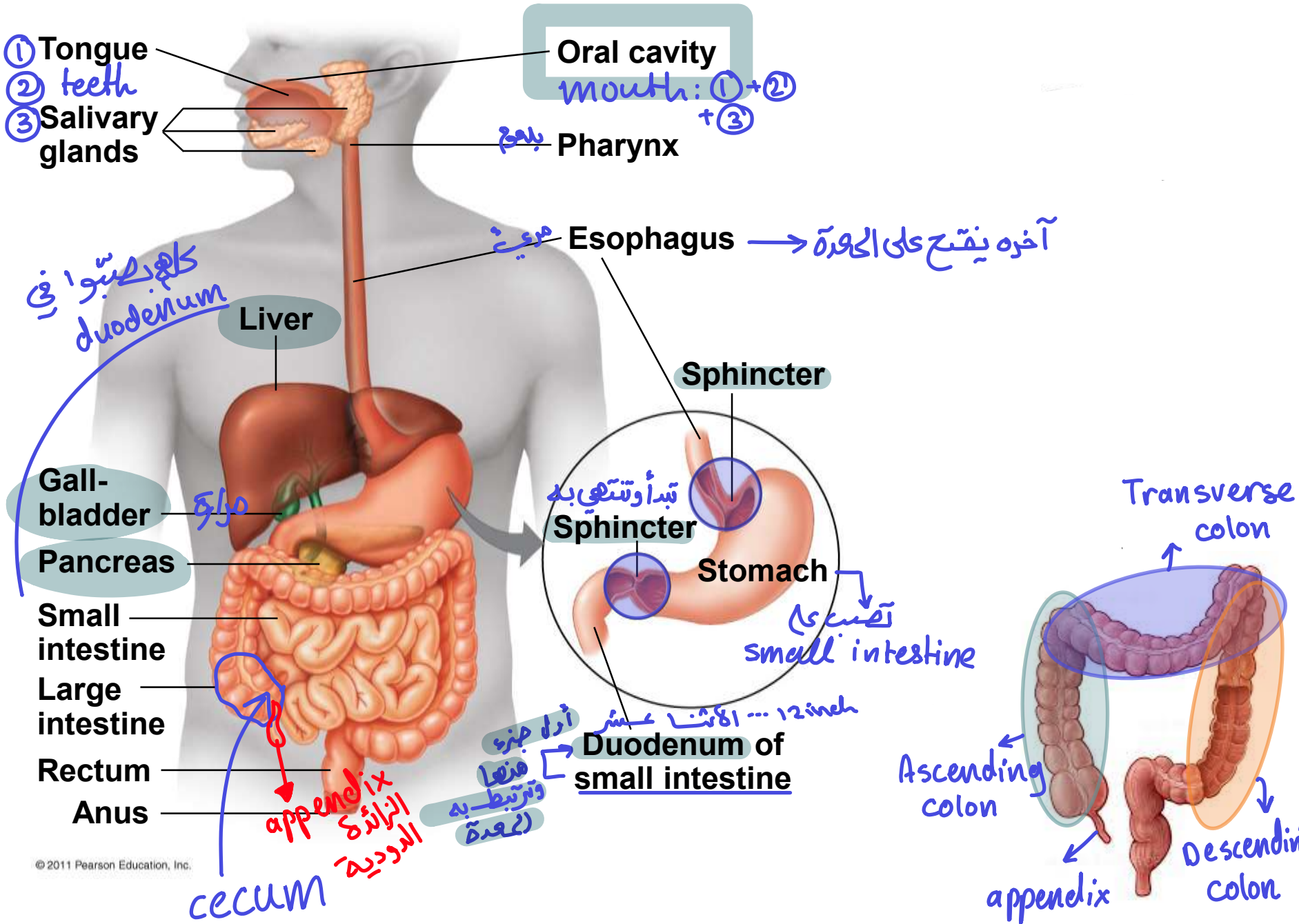
القناة
الهاضمة

لما يدخل الاكل من الفم ايش اللي بخليه يمشي باتجاه واحد فقط ولا يرجع بالاتجاه العكسي ؟

The digestive system consists of smooth muscles which make

- ① Food is pushed along by peristalsis, rhythmic contractions of muscles in the wall of the canal
الموتة الدورية → *تدريج الأكل*
- ② Valves called **sphincters** regulate the movement of material between compartments
صمام → *باتجاه فقط*

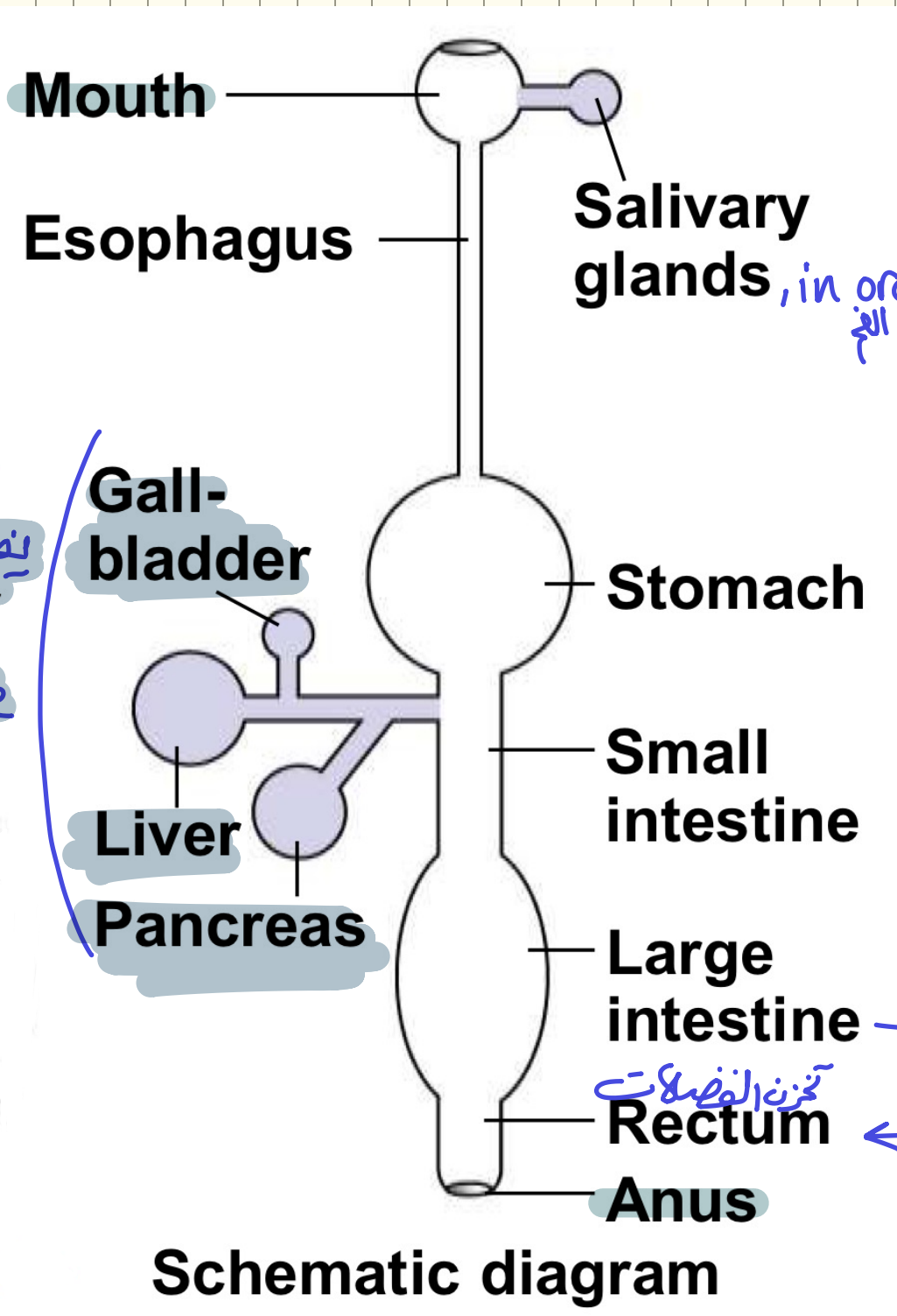
Figure 41.9



* Alimentary canal: القناة الهضمية → لونها أبيض

* Accessory gland: لونها رمادي → تفرز إنزيمات تساعد في الهضم

- two openings: complete digestive system



يضمروا في
small
intestine

تخزن فيها

The Oral Cavity, Pharynx, and Esophagus

- The first stage of digestion is mechanical and takes place in the **oral cavity**
chewing + tearing food up
- **Salivary glands** deliver saliva to lubricate food
لحاب → ① *تزييت الأكل* (increasing surface Area)
- Teeth *مضغ* chew food into smaller particles that are exposed to *②* salivary **amylase**, initiating breakdown of glucose polymers *to digest starch*
أي ان عملية هضم carb. شأ في الفم بواسطته *وتصبح مساحة السطح المعرضة لل saliva أكبر*
- *③* Saliva also contains **mucus**, a viscous mixture of water, salts, cells, and glycoproteins

اللغة [بتعبه]

- The tongue shapes food into a **bolus** and provides help with swallowing
- The throat, or **pharynx**, is the junction that opens to both the esophagus and the trachea
- The **esophagus** connects to the stomach
- The trachea (windpipe) leads to the lungs

throat البلعوم / الحلقه

esophagus & trachea are parallel to each other →

الربط

بينهم

Pharynx

↓
لكنه يُصل على
المعدة

↓
يُصل على
الرئة

هو المسؤول أن الأكل
يُدخل على esophagus ولذلك خطه البلع
فقط رج يسر trachea وينفذ النفس

- The esophagus conducts food from the pharynx down to the stomach by peristalsis
- Swallowing causes the epiglottis to block entry to the trachea, and the bolus is guided by the larynx, the upper part of the respiratory tract
- Coughing occurs when the swallowing reflex fails and food or liquids reach the windpipe

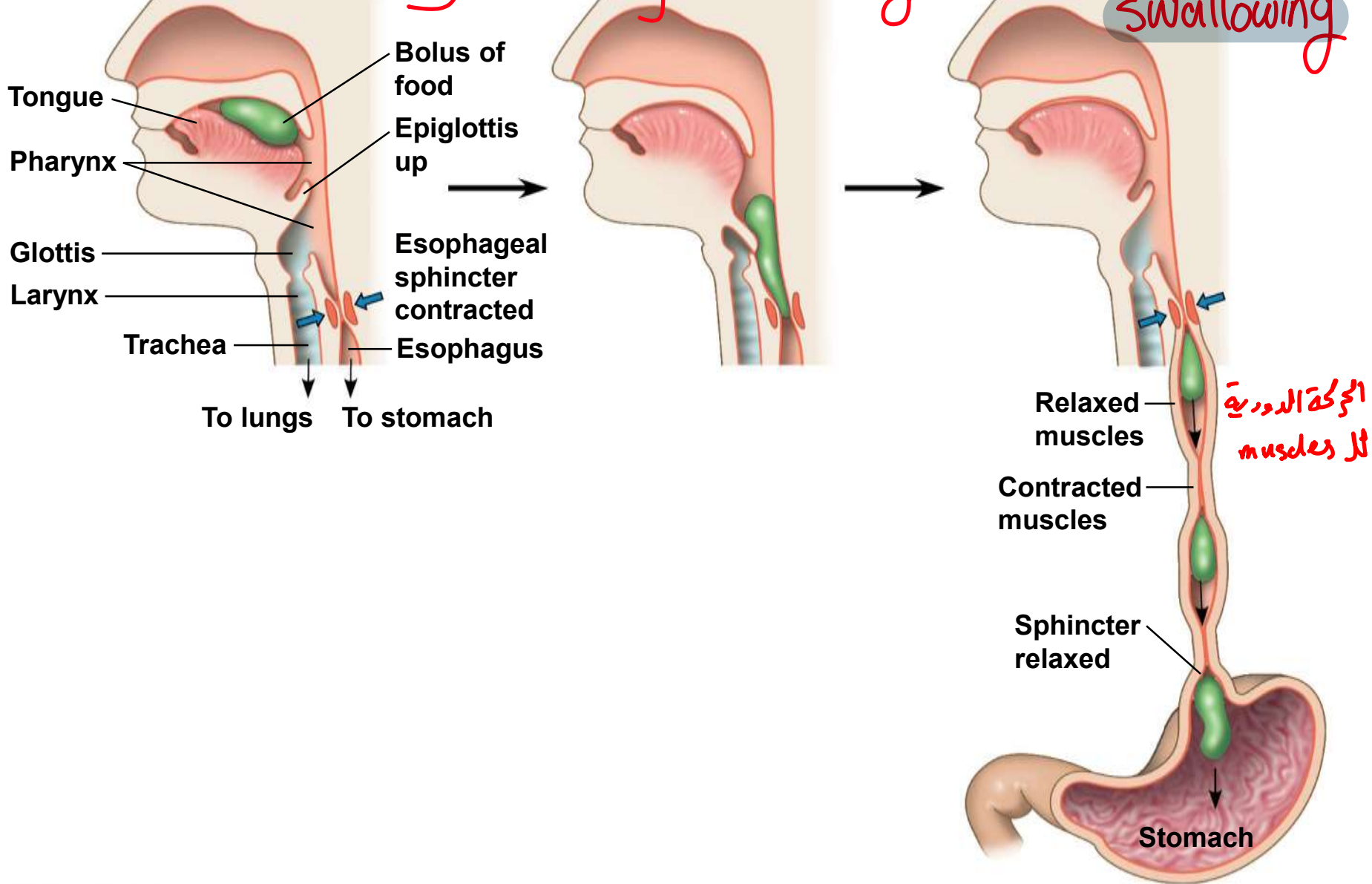
فيستولية
أكل دخل
على trachea

Figure 41.10-3

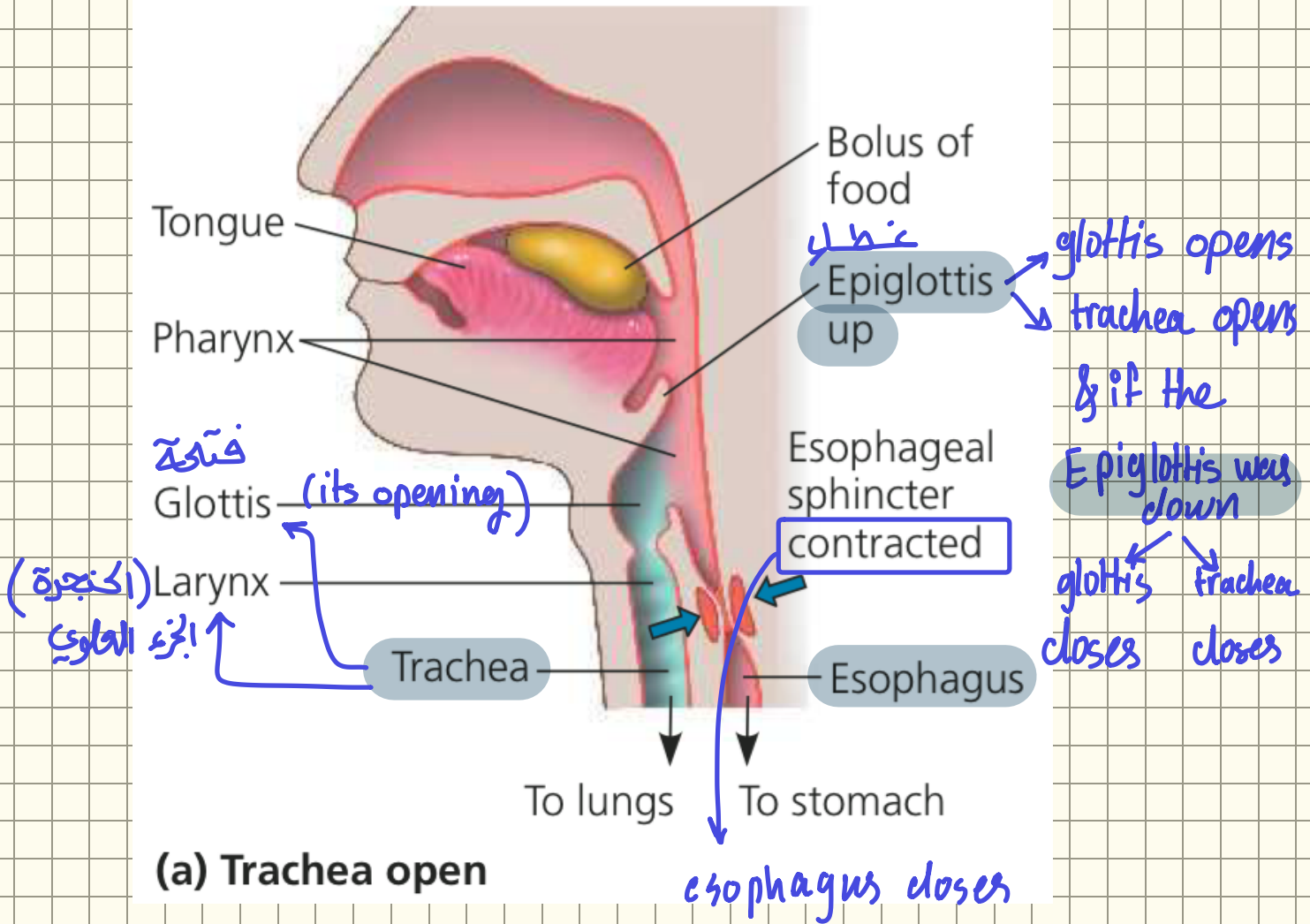
Before swallowing

during swallowing

After swallowing



Before swallowing



Swallowing reflex and esophageal peristalsis

1. When a person is not swallowing, esophageal sphincter muscle contracted, epiglottis up, glottis open, air flow to lung through trachea.

2. Swallowing reflex is triggered when bolus reaches pharynx *during swallowing*

3. Larynx moves up, epiglottis tips over glottis preventing food from entering trachea.

4. Esophagus sphincter relaxes, so bolus enters esophagus.

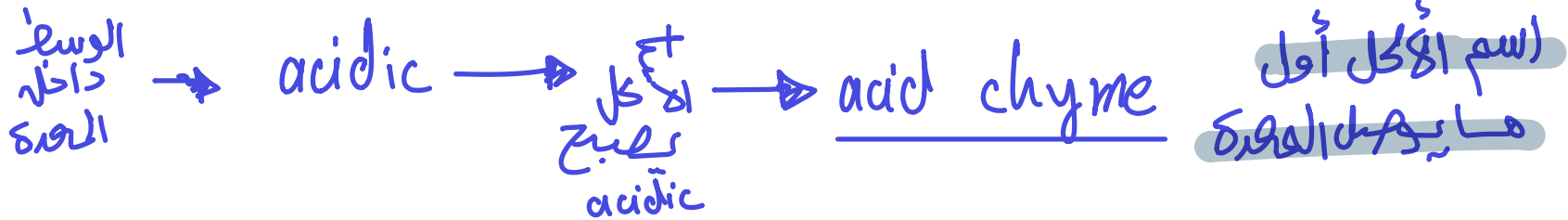
5. After food entered esophagus, larynx moves down ward & opens breathing passage. *esophagus contract to close again to forbid back ward movement of the bolus*

6. Waves of peristalsis move bolus through esophagus to the stomach.

Digestion in the Stomach

جدار المعدة بسهولة يتفرد ويقلصه

- 1. The **stomach stores** food and 2. **secretes gastric juice**, which converts a meal to **acid chyme**



Chemical Digestion in the Stomach

- Gastric juice has a low pH of about 2, which kills bacteria and denatures proteins
- Gastric juice is made up of hydrochloric acid (HCl) and **pepsin**
- Pepsin is a **protease**, or protein-digesting enzyme, that cleaves proteins into smaller peptides

تقطيع
وليس إلى
amino acids

Two components of gastric juice help liquefy food in the stomach.

First, hydrochloric acid (HCl) disrupts the extracellular matrix that binds cells together in meat and plant material. The concentration of HCl is so high that the pH of gastric juice is about 2, acidic enough to dissolve iron nails (and to kill most bacteria).

• This low pH denatures (unfolds) proteins in food, increasing exposure of their peptide bonds.

- Gastric juice is made up of hydrochloric acid (HCl) and pepsin

• Second: Pepsin is a protease, or protein-digesting enzyme, that cleaves proteins into smaller peptides

- Parietal cells secrete hydrogen and chloride ions separately into the lumen (cavity) of the stomach
- Chief cells secrete inactive pepsinogen, which is activated to pepsin when mixed with hydrochloric acid in the stomach

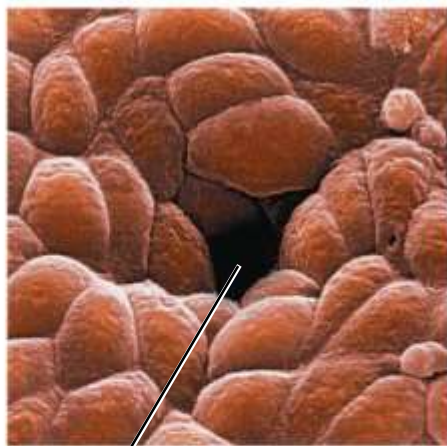
↓
لumen

HCl
الحمض الهيدروكلوريك
من
الخلايا
الغدية
الغدية
inactive → active
وتم
الخلايا
الغدية
lumen

Mucus protects the stomach lining from gastric juice

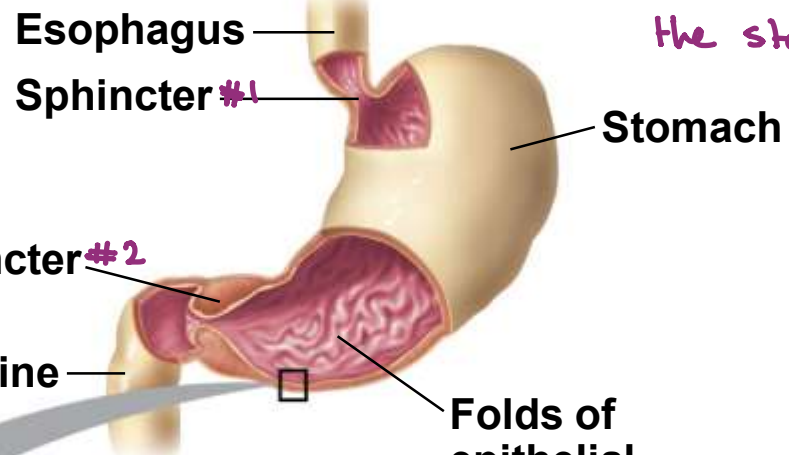
Why don't HCl and pepsin eat through the lining of the stomach? For one thing, mucus secreted by cells in gastric glands protects against self-digestion (see Figure 41.10).

Figure 41.11



10 μ m

structure of the stomach



Esophagus
Sphincter #1
Sphincter #2
Small intestine

Stomach

Folds of epithelial tissue

Epithelium

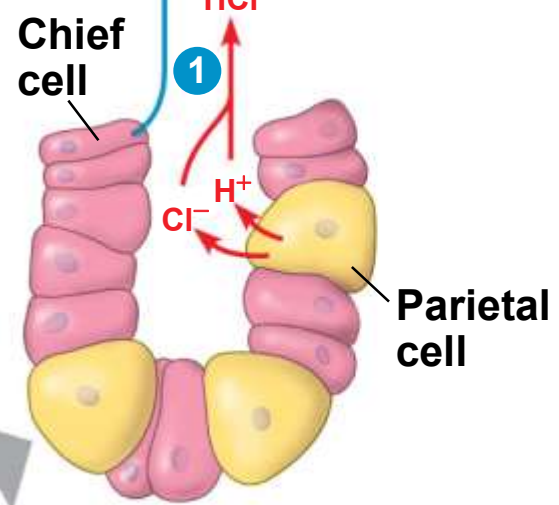
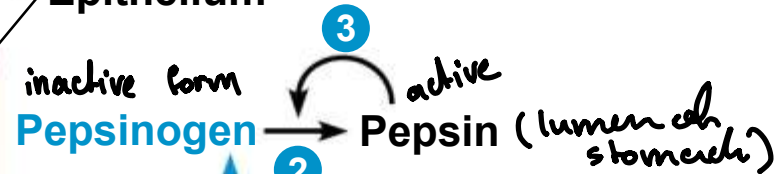
كأفها تقو بوا ولحزها ليست
Gastric pits on interior surface of stomach

غدد
Gastric gland includes: 1+2+3

① Mucous cell مع طريقة كتابتها
mucus → طاب

② Chief cell most common

③ Parietal cell



Chief cell

Parietal cell

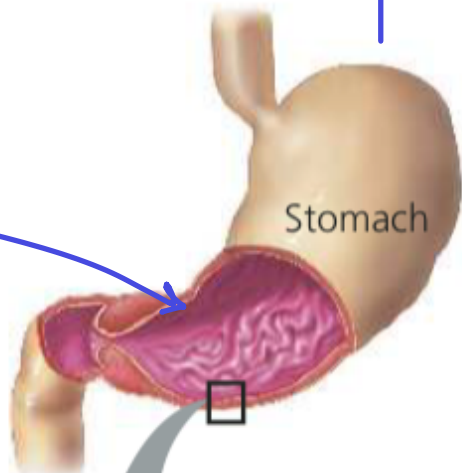
①
②
③
HCl
H⁺
Cl⁻

كل نوع من الخلايا يُفرز شيئاً معين
ALL cells are in Gastric Gland*

[2 openings/ 2 sphincters]
 one to esophagus & the other to duodenum

▼ Figure 41.10 The stomach and its secretions.

isn't smooth from inside, highly folded of Epithelium tissue
 ↓
 increases surface Area



Interior surface of stomach.
 The interior surface of the stomach wall is highly folded and dotted with pits leading into tubular gastric glands.

Gastric gland. The components of gastric juice are secreted by three types of cells of the gastric glands: mucous cells, chief cells, and parietal cells.

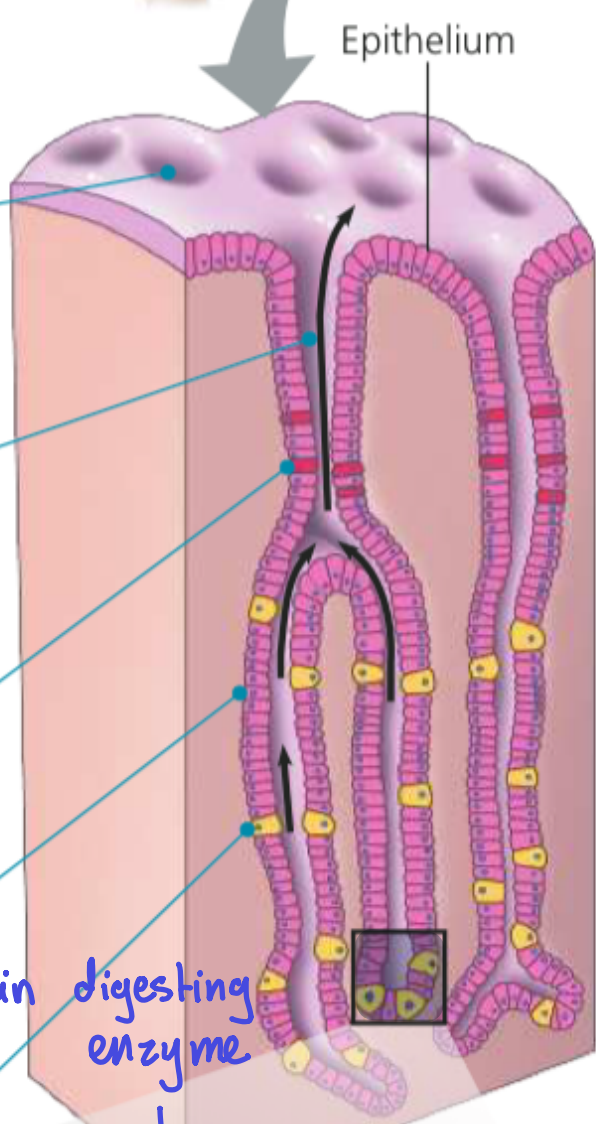
Mucous cells secrete mucus, which lubricates and protects the cells lining the stomach.

Chief cells secrete pepsinogen, an inactive form of the digestive enzyme pepsin.

Parietal cells produce the components of hydrochloric acid (HCl).

H^+ : By active transport to the lumen of stomach
 active pump
 Cl^- : passively by diffusion

main & 1st protein digesting enzyme
 ↓
 best environment is acidic pH

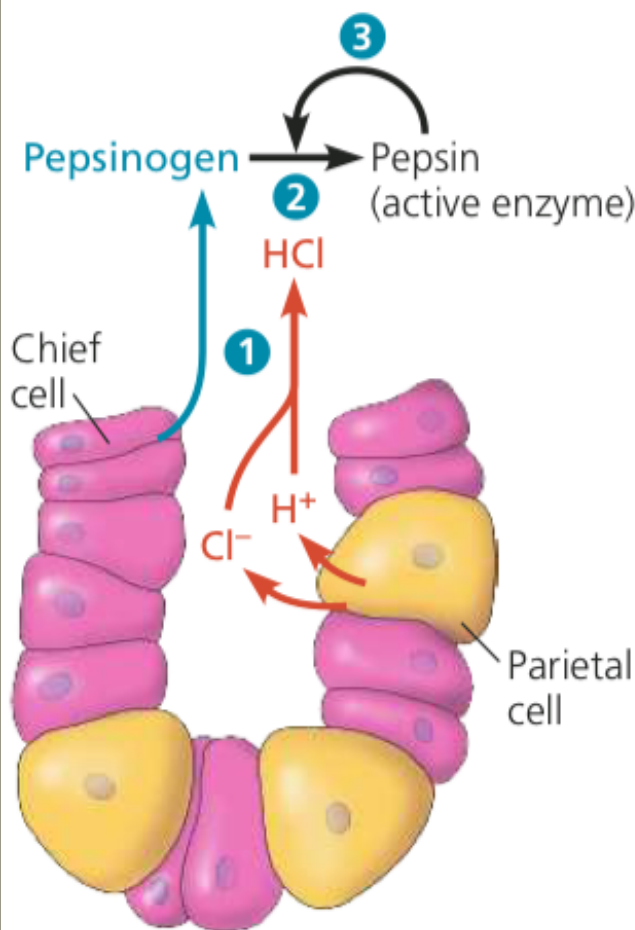


يجمعوا في
 stomach lumen

1- Parietal cells: uses ATP derived pumps to expel hydrogen ions into the lumen. At the same time, chloride ions diffuse into the lumen through specific membrane channels of the parietal cells. It is therefore only within the lumen that hydrogen and chloride ions combine to form HCl. so, secrete hydrogen and chloride ions separately into the lumen (cavity) of the stomach

• **2- Chief cells** secrete inactive pepsinogen, which is activated to pepsin when mixed with hydrochloric acid in the stomach

• **3- Mucus** protects the stomach lining from gastric juice



The production of gastric juice

- 1 Pepsinogen and HCl are introduced into the lumen of the stomach.
- 2 HCl converts pepsinogen to pepsin.
- 3 Pepsin then activates more pepsinogen, starting a chain reaction. Pepsin begins the chemical digestion of proteins.

positive feedback

Pepsin itself can help activate the remaining pepsinogen, this generates more pepsin, this is an example of positive feedback.

- ^{قُرحة المعدة} Gastric ulcers, lesions in the lining, are caused mainly by the bacterium *Helicobacter pylori*

المعدة التي تقدر تتكاثر في pH المعدة ← وإذا صارت تسبب قائله

Heartburns; an acid reflux caused by backflow of chyme from stomach to lower end of esophagus.

الكائنات البروتية يكون في اسفلة في sphincter

Stomach Dynamics

- Coordinated contraction and relaxation of stomach muscle churn the stomach's contents
- Sphincters prevent chyme from entering the esophagus and regulate its entry into the small intestine

Digestion in the Small Intestine

في الأجزاء
[duodenum / jejunum /
ileum] الأجزاء

- The **small intestine** is the longest section of the alimentary canal

It is the major organ of digestion and absorption

الأمعاء
التي
توجد
في
Intestine.

①
duodenum
الأمعاء

②
jejunum
ileum

من جودا
epithelial tissue
يساعد في عملية

الكبد + البنكرياس

liver / pancreas / gall

bladder

من خلية
bile duct
قنوات
صفراوية

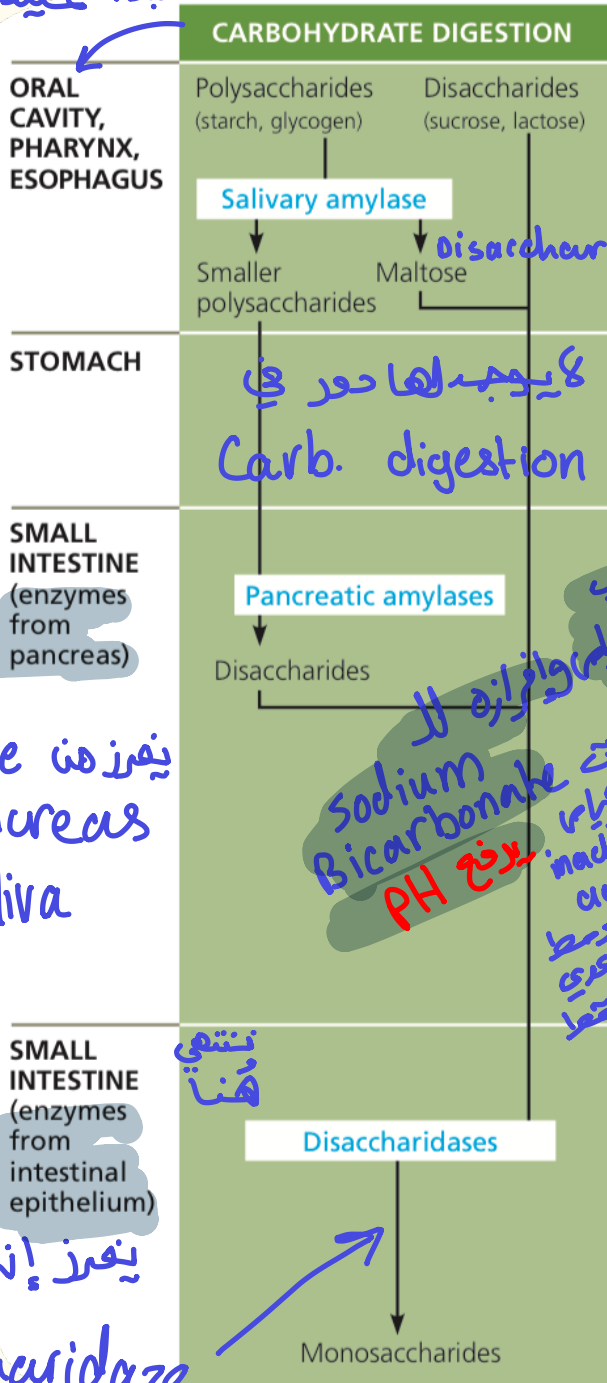
- The first portion of the small intestine is the **duodenum**, where chyme from the stomach mixes with digestive juices from the pancreas, liver, gallbladder, and the small intestine itself

تبدأ عالية هضمه في

Figure 41.11 Chemical digestion in the human digestive system. The timing and location of chemical breakdown are specific to each class of nutrients.

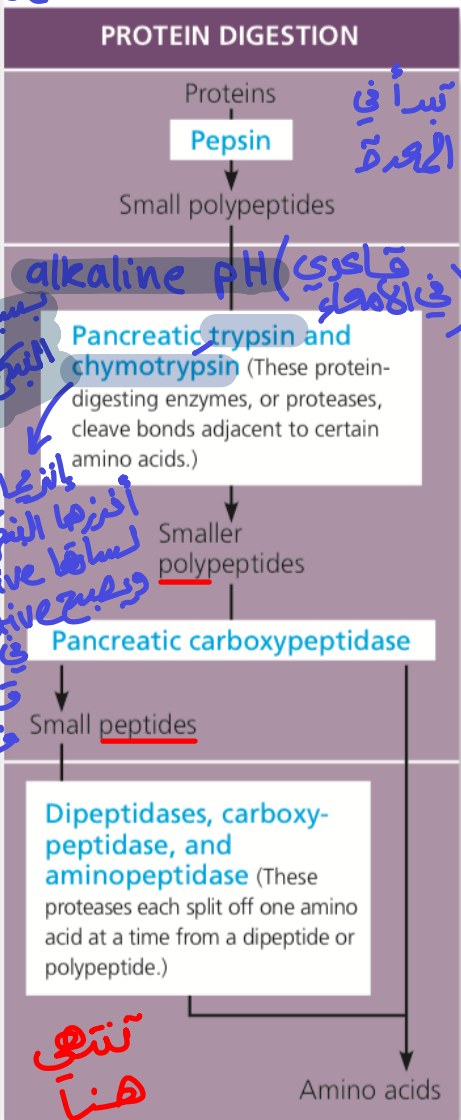
? Pepsin is resistant to the denaturing effect of the low pH environment of the stomach. Thinking about the different digestive processes that occur in the small intestine, describe an adaptation shared by the digestive enzymes in that compartment.

Animation: Digestive System Function



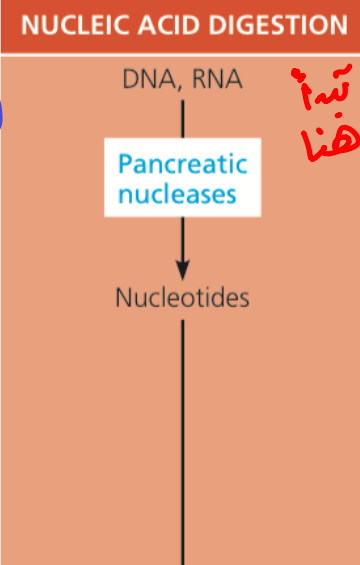
يفرز من Amylase
1. pancreas
2. saliva

يفرز! انزيم يسمى
disaccharidase

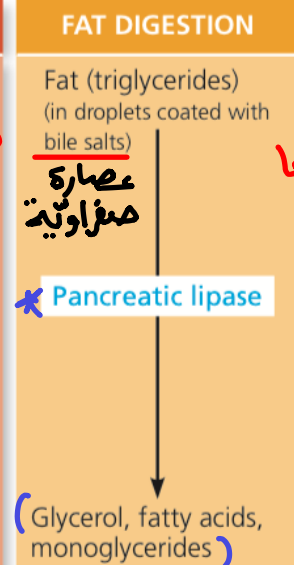


سبب البكتيريا وانزيمه لل
انزيمات التكرار لسهاها النكرياس في وسط قاعدي فقط
sodium Bicarbonate يرفع PH

بلسنت وانتهت للم small intestine



تنتهي هنا



بها وقت كمتساويها على ايديها مفعلة

تبدأ وتنتهي في duodenum

Pancreatic Secretions

- The **pancreas** produces proteases trypsin and chymotrypsin that are activated in the lumen of the duodenum
- Its solution is alkaline and neutralizes the acidic chyme

Its solution is alkaline (rich in bicarbonate ion from the pancreas) and neutralizes the acidic chyme and acts as a buffer for the chemical digestion.

Bile Production **by** *the Liver*

- In the small intestine, **bile** aids in digestion and absorption of fats

 Bile is made in the ^{الكبد} liver and stored in the gallbladder  _{مخزن}

- Bile also destroys nonfunctional red blood cells

* duodenum *

I- In the small intestine, bile aids in digestion and absorption of fats (emulsifiers; detergents) that break apart fat and lipid → ويصبح لونها أبيض globules

• Bile is made in the liver and stored in the gallbladder.

• Bile salts are a major component of bile

• 2- Bile also destroys nonfunctional red blood cells:

- The destruction of RBC that are no longer fully functional.

مفعولها مفعول
مفعول
detergents
الدهون
they act as
detergents

بعد الجسم لها recycling
بناء خلايا دم جديدة ...
الصبغات التي فيها تذهب في
fetus ← وهي تطيرها لونها
في حال وجود مرض في
liver وخصوصا لدى
الأمهات، تنصب
هذه الصبغات
إلى الكبد، يصبح
لون الكبد أصفر

↓ they don't
have nucleus!
don't divide
↓
تحتوي
20 days
في وقت
تتخلص
منها

-Pigments released during RBC disassembly are incorporated into bile pigments, which are eliminated from the body with the feces. In some liver and blood disorders, bile pigments accumulate in the skin, resulting in a yellowing called jaundice