- اللَّهُمَّ أَرِنِى حَقِيقَةَ الْاَشْيَآءَ كَمَا هِىَ

"O Allah! Show me the reality of all things as it (really) is.."

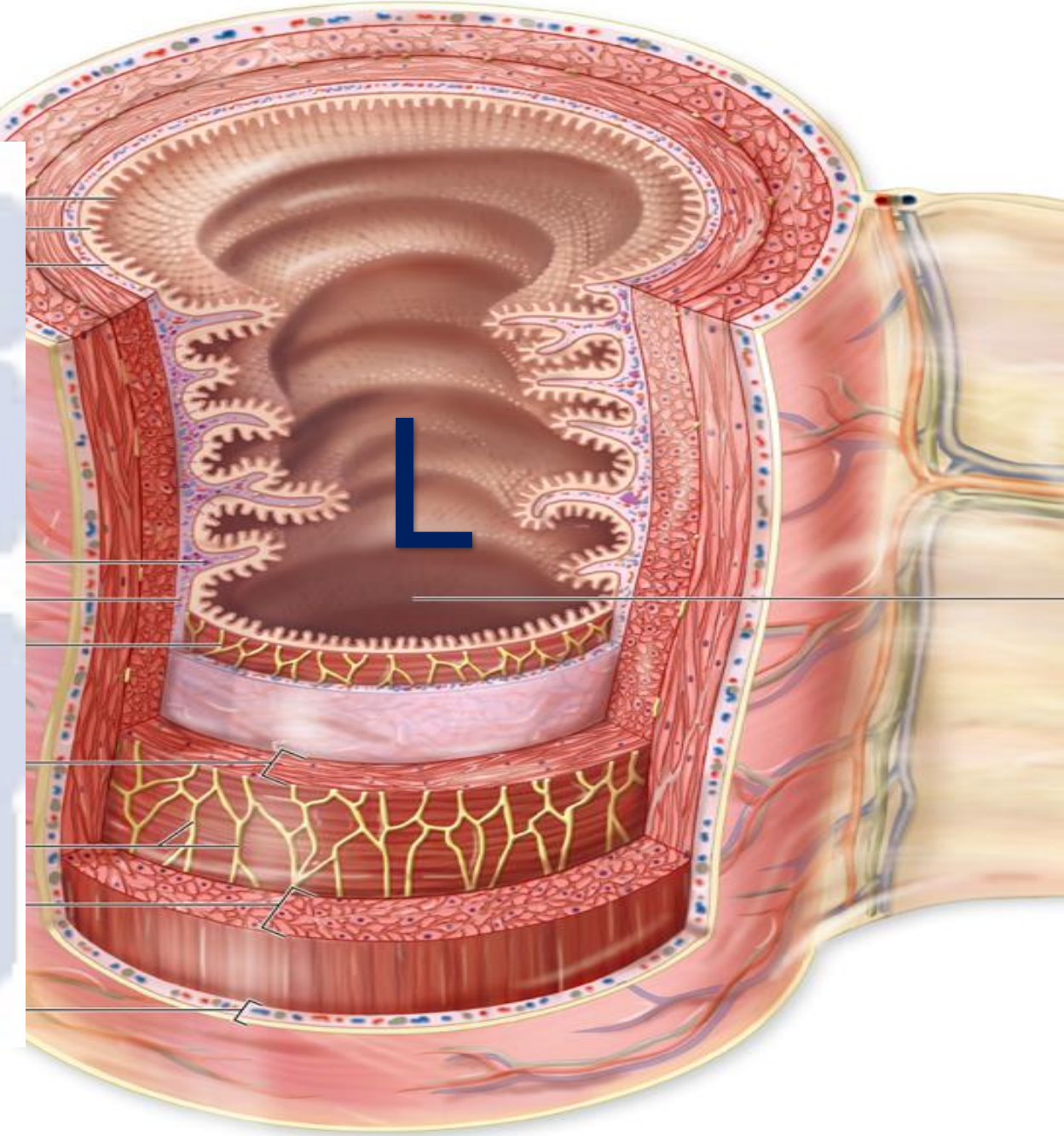
GIT Physiology

Tayyab Hamid (MBBS, PhD)

LECTURER in Physiology

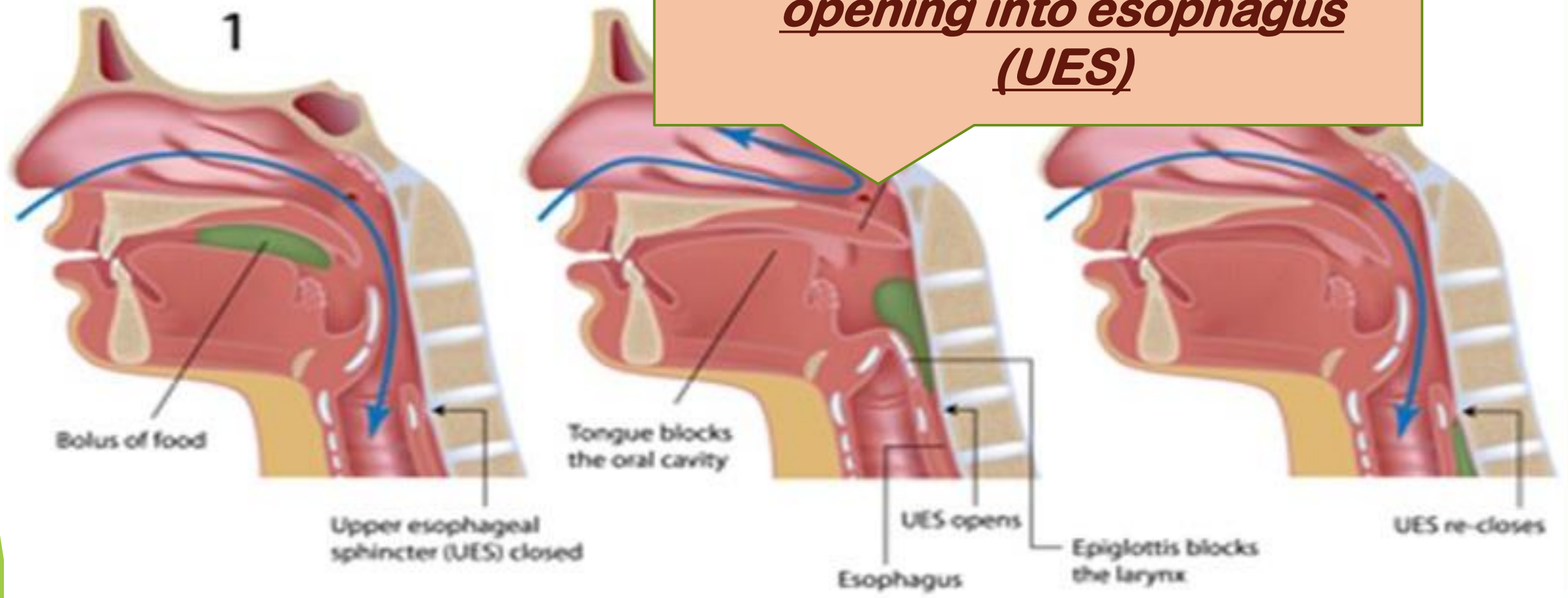
Contents

mucosa	• Epithelial lining • Lamina propria • Muscularis mucosa
submucosal	• Connective tissue • Submucosal plexus of autonomic nerve (meissner)
Musuclaris	• Muscle layer : inner :circular outer longitudinal • Myenteric nerve plexus (Auerbach)
Serosa	• Thin layer of connective tissue



How is Food Swallowed after Ingestion?

1. Soft Palate
2. Palatopharyngeal folds
3. Vocal Cords
4. Epiglottis
5. Larynx raised enlarges opening into esophagus (UES)



GIT PHYSIOLOGY

3 STAGES OF SWALLOWING

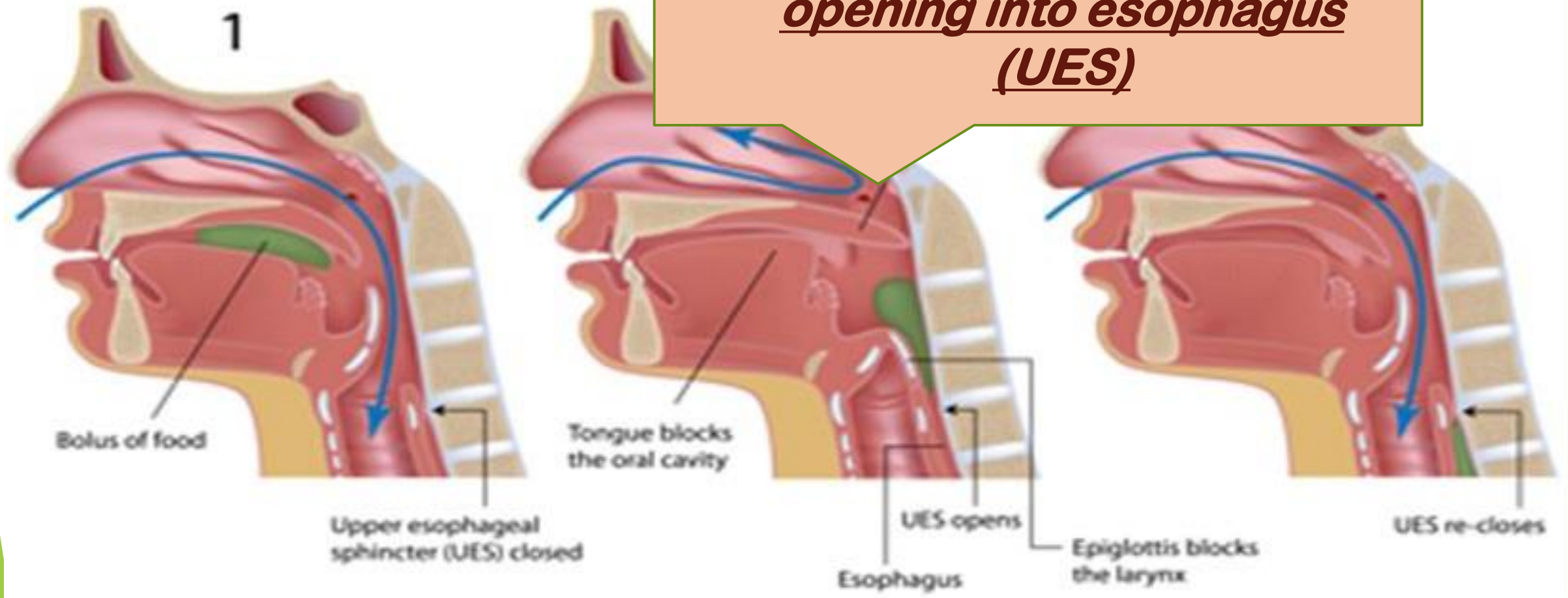
Oral stage

Pharyngeal Stage

(Prevent food passage into trachea & Nose)

Esophageal stage

1. Soft Palate
2. Palatopharyngeal folds
3. Vocal Cords
4. Epiglottis
5. Larynx raised enlarges opening into esophagus (UES)



➢ ROLE of Palatopharyngeal folds In deglutition?

GIT PHYSIOLOGY

NEURAL CONTROL OF GIT

ENTERIC NERVOUS SYSTEM

- SUBMUCOSAL PLEXUS (SECRETION)
- MYENTERIC PLEXUS (MOTILITY)

SYMPATHETIC (T5-L2) AND PARASYMPATHEIC (Vagus Nerve)

GIT smooth muscle Electrophysiology

Slow Waves

1. Interstitial Cells of Cajal
2. Do NOT elicit contraction
3. membrane potential between -50 and -60 mV
4. The frequency of slow waves depends on the section of GIT

Spike Potentials

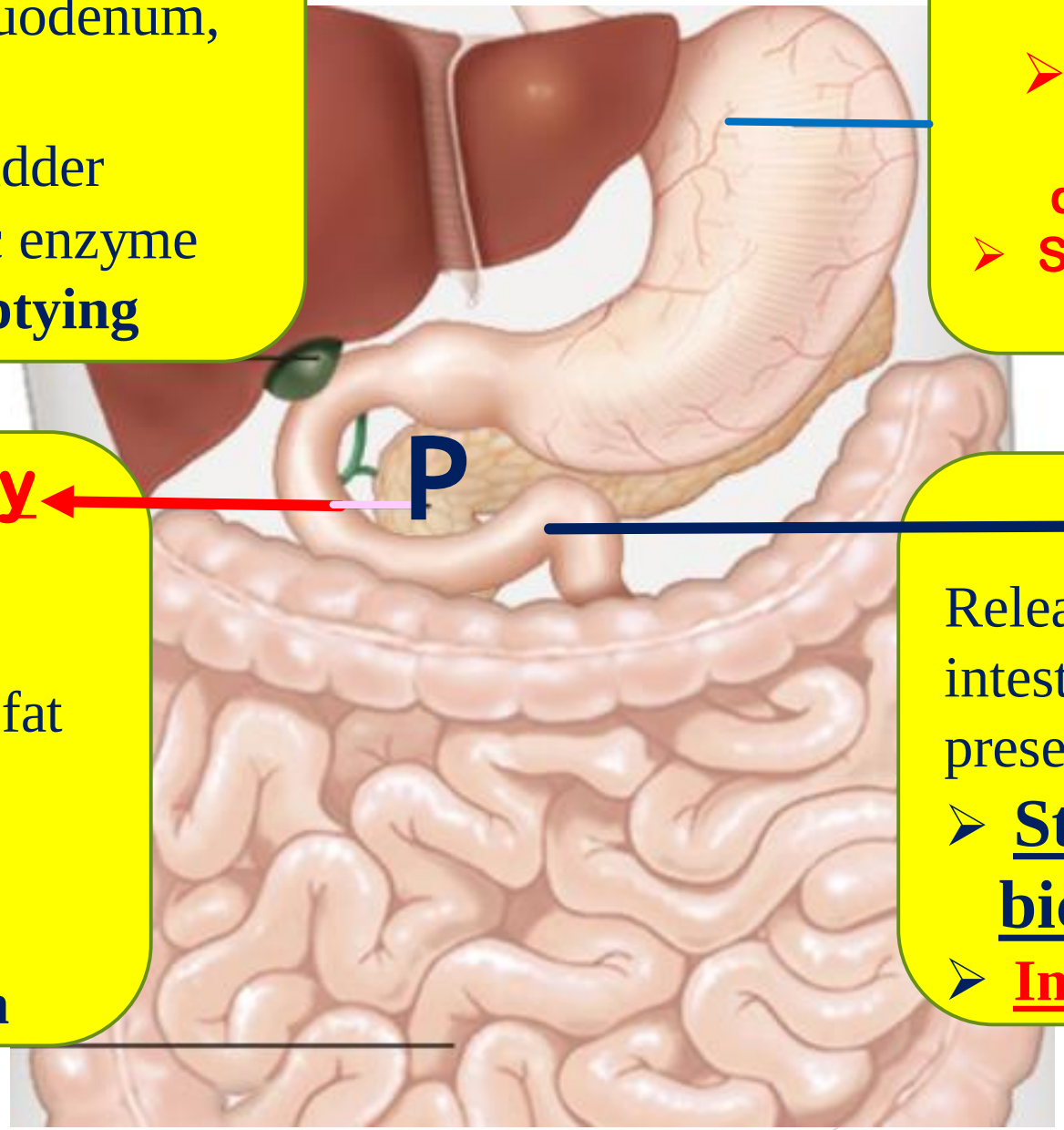
1. occur only at the crests of slow waves
2. elicit muscle contraction.
3. exposure to neurotransmitters released in their vicinity by neurons of the **enteric nervous system**

CCK

- Released by I cells (duodenum, jejunum)
- **Stimulates** Gall Bladder contraction, Pancreatic enzyme
- **Inhibits** **Gastric Emptying**

Gastrin

- **Released by G cells of antrum in response to distension, GRP by nerve**
- **Stimulates acid production & gastric motility**



Gastrin Inhibitory Peptide

- Released by K cells (duodenum); protein & fat presence
- **Stimulates** **Insulin** secretion
- **Inhibits** **acid secretion**

Secretin

Released by S cells (small intestine); protein & fat presence

- **Stimulates bicarbonate secretion**
- **Inhibits** **acid secretion**

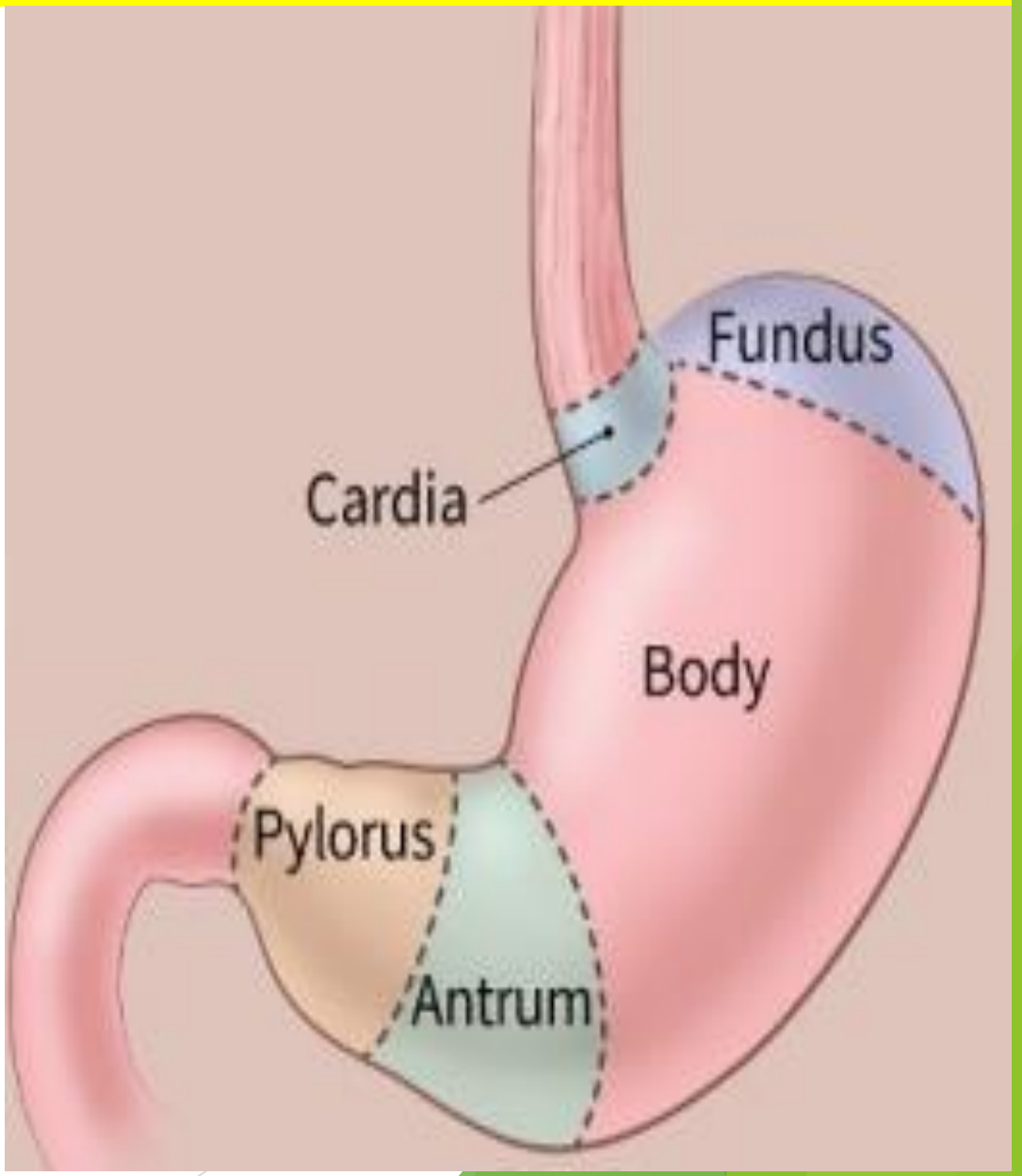
GIT Physiology – Motor Functions of Stomach

1. Storage

2. Mixing (Chyme)

(gastric glands secretions except lesser curvature)

3. Gastric Emptying

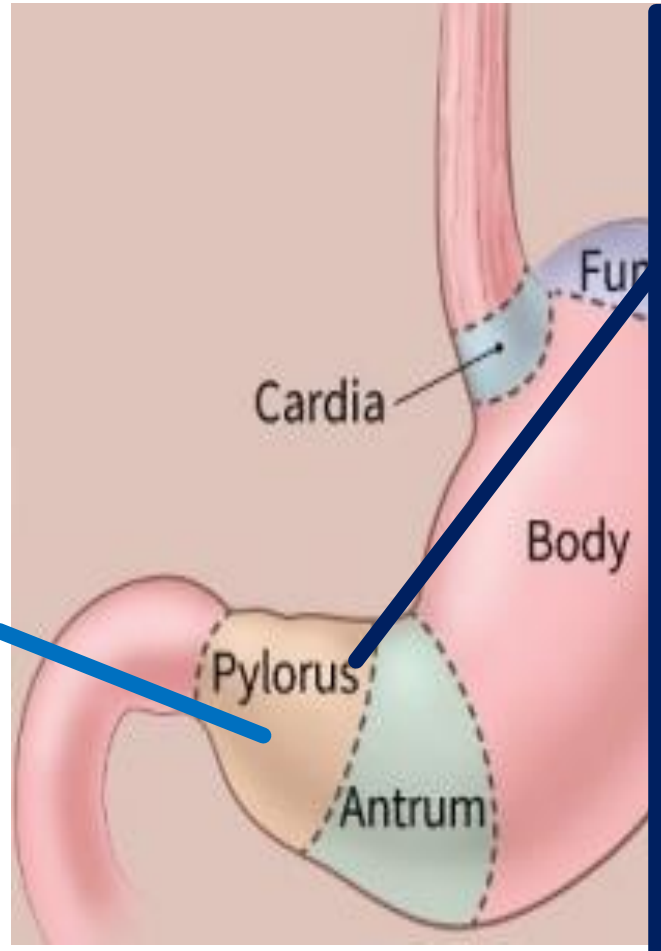


GIT Physiology – Motor functions of Stomach

3. Gastric Emptying (Pylorus)

Factor that Promote gastric Emptying

1. Gastrin
2. Food Volume



Factor that Inhibit gastric Emptying

1. Enterogastric nervous reflexes
2. CCK
3. Secretin
4. GIP

- ***Hunger contractions***

vs

Gastric Peristaltic contractions?

- ***any precipitating factor for hunger contractions?***

GIT PHYSIOLOGY

MOVEMENTS OF SMALL INTESTINE

MIXING MOVEMENTS

PROPULSIVE MOVEMENTS

1. Peristaltic waves

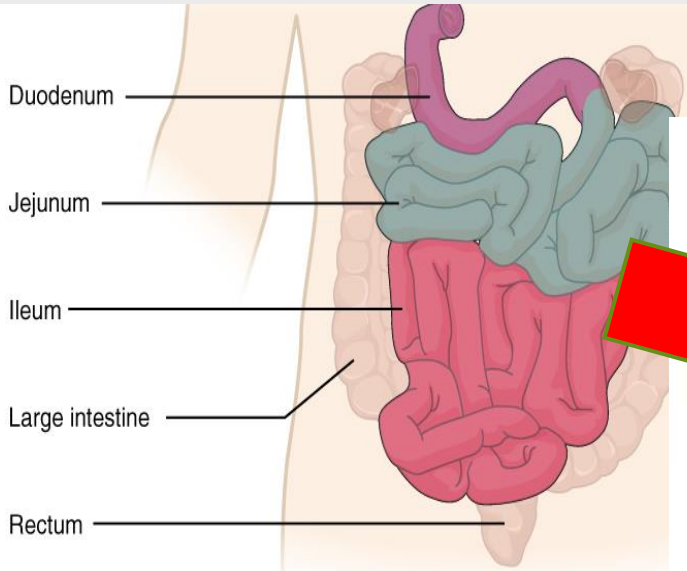
(Peristaltic rush?)

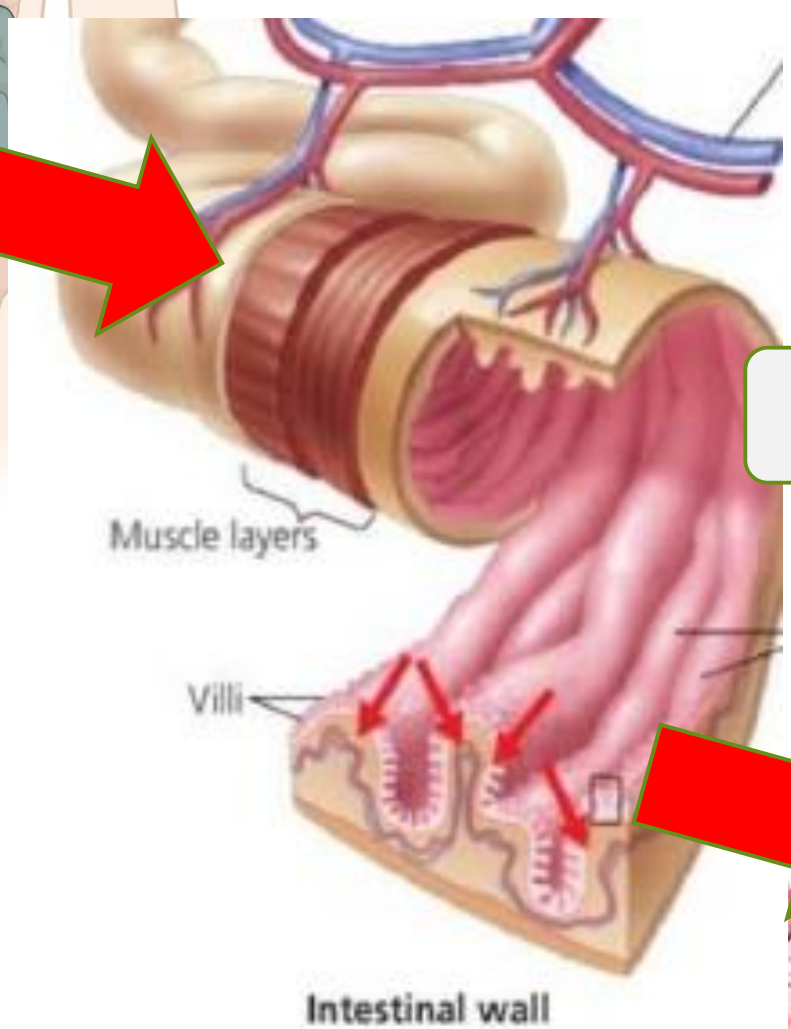
2. Villi

Three distinct feature in wall of small intestine

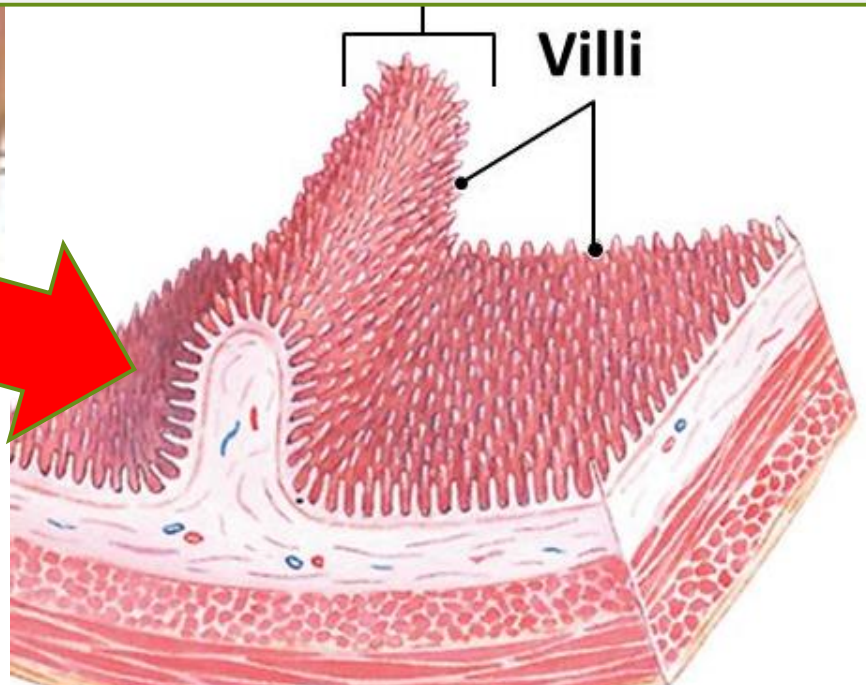
1. Circular Folds
2. Villi
3. Microvilli

SMALL INTESTINE

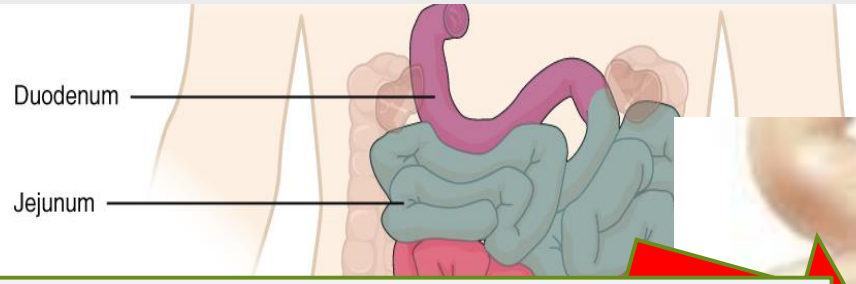




CIRCULAR FOLD



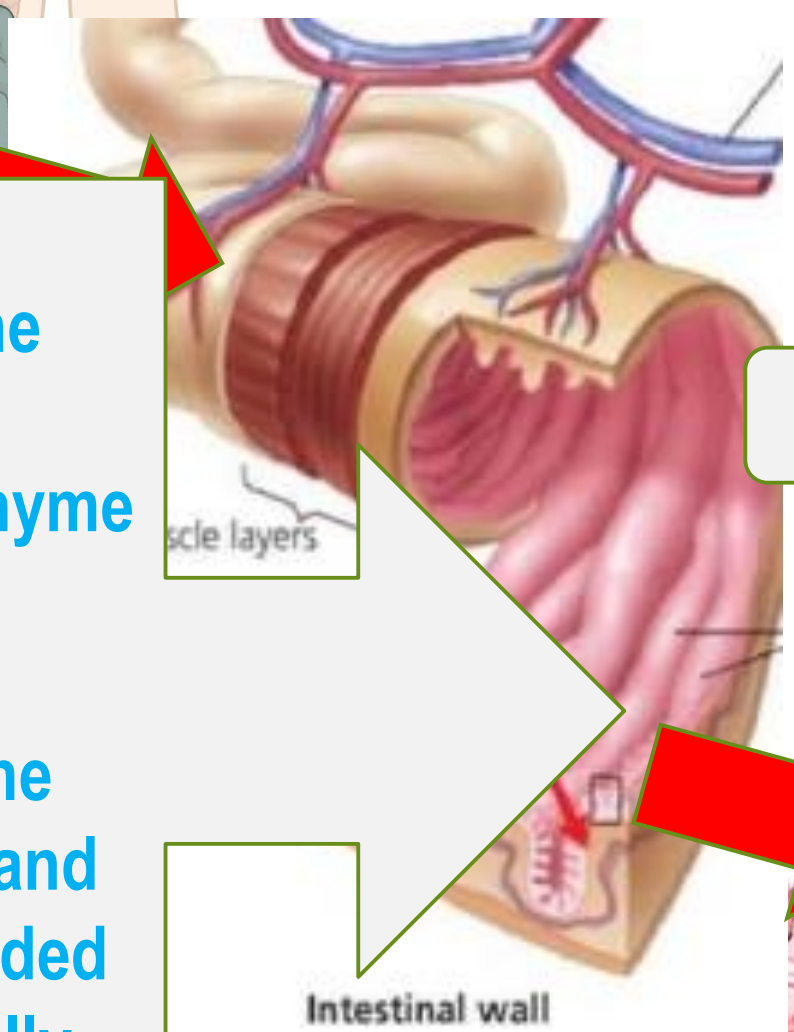
SMALL INTESTINE



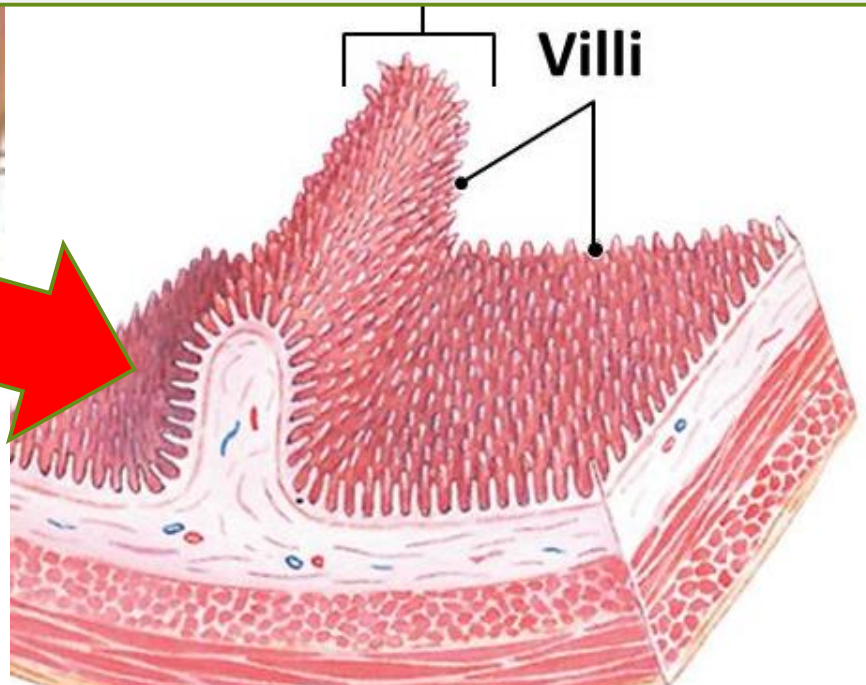
Circular Fold

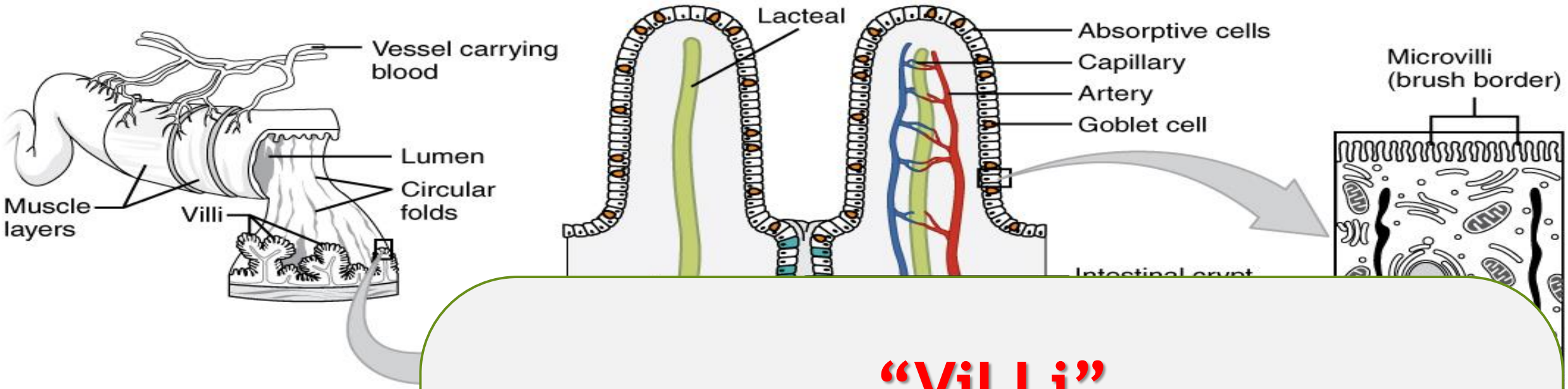
1. a deep ridge in the mucosa
2. shape causes the chyme to spiral,

3. Spiraling slows the movement of chyme and provides the time needed for nutrients to be fully absorbed.



CIRCULAR FOLD

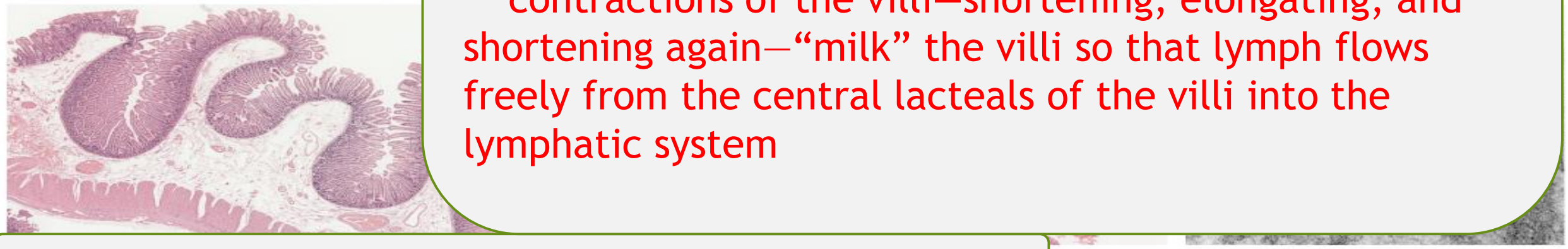




"ViLLi"

1. **increase the surface area exposed to the *chyme?***
2. contain masses of unstriated muscle fibers

contractions of the villi—shortening, elongating, and shortening again—"milk" the villi so that lymph flows freely from the central lacteals of the villi into the lymphatic system



(d)

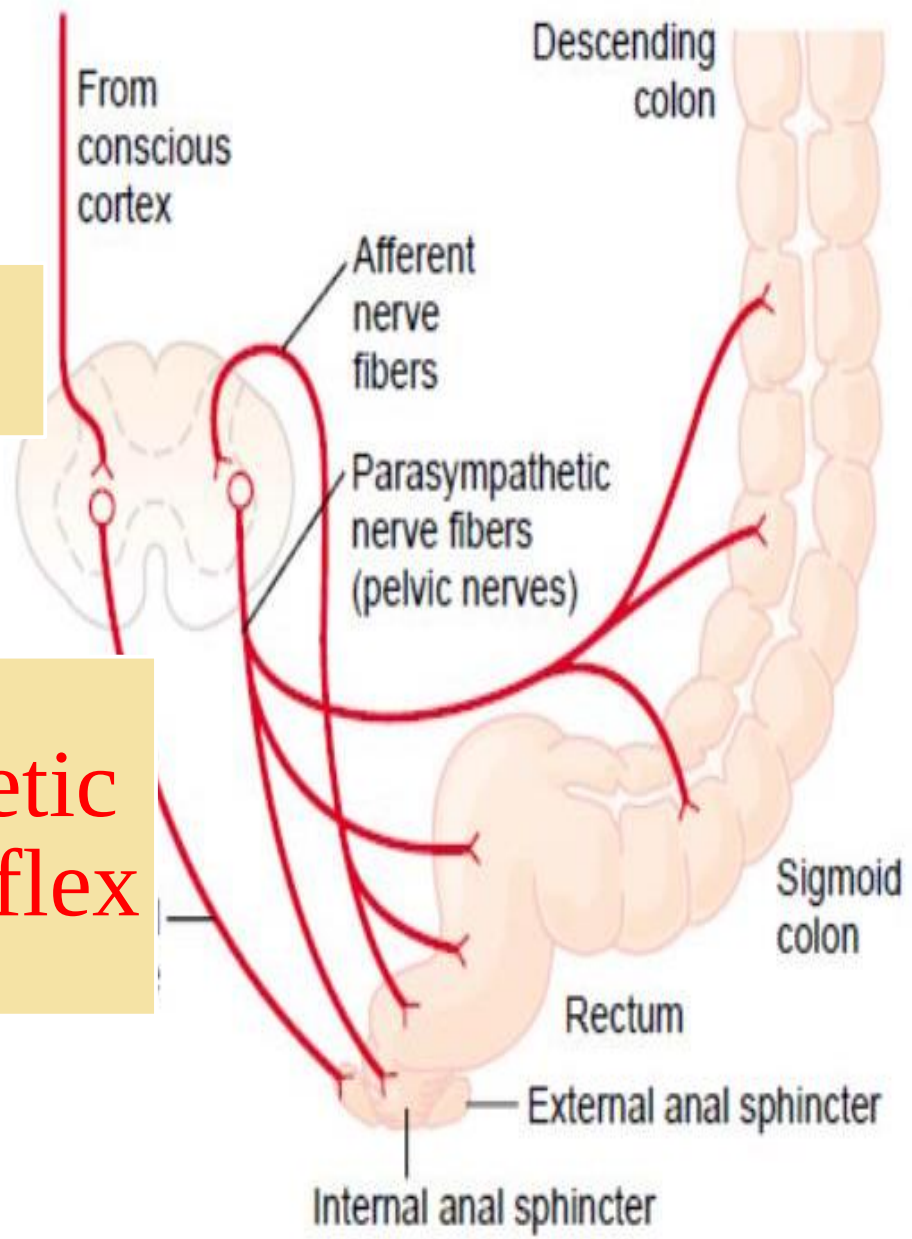
- The ileum joins the cecum, the first portion of the large intestine, at the **ileocecal sphincter** (or valve).
- ***Movements in Large intestine?***
- ***Haustrations?***

GIT PHYSIOLOGY

DEFECATION REFLEX

Myenteric defecation reflex

Parasympathetic defecation Reflex

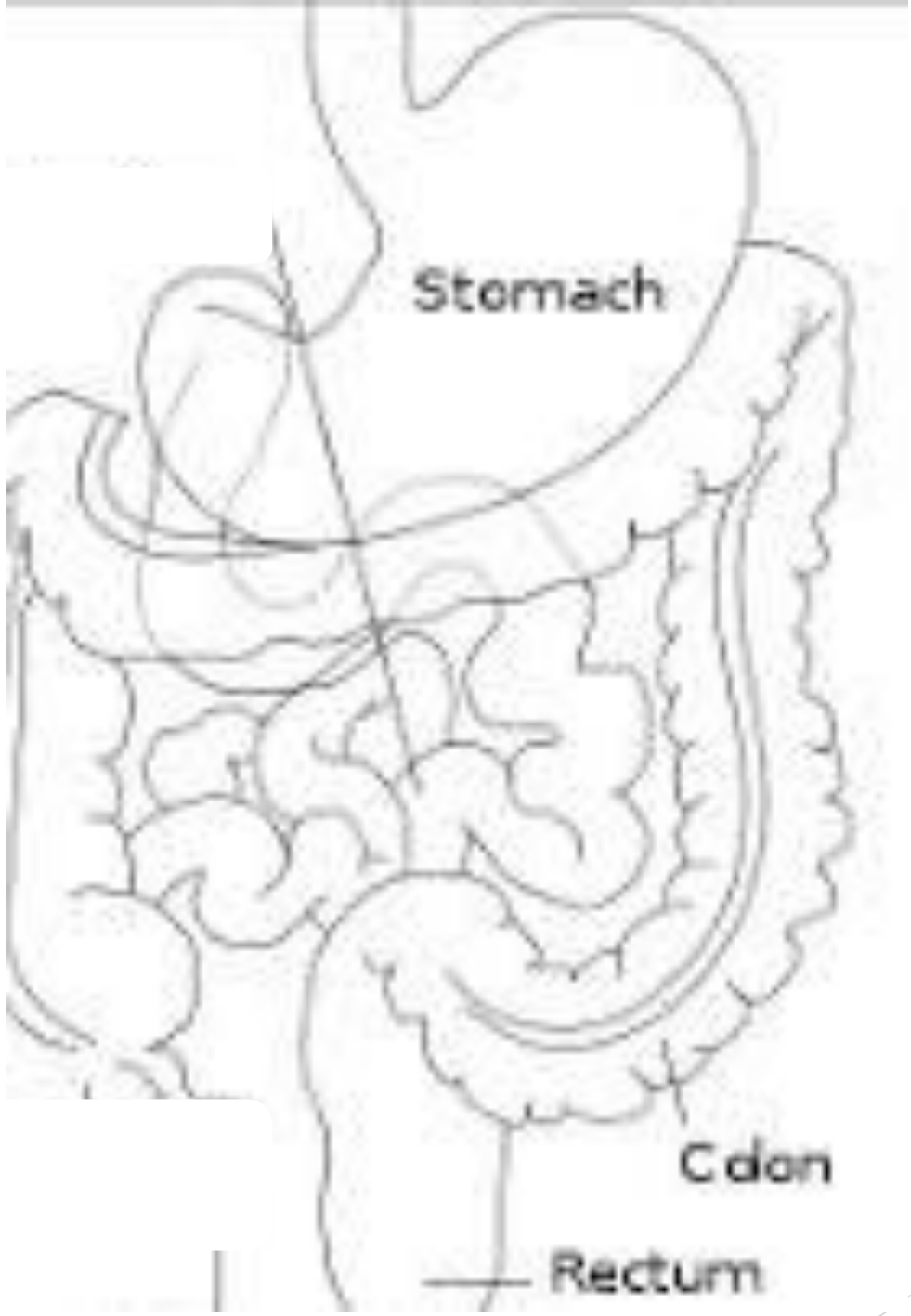


GIT PHYSIOLOGY

MOTILITY IN LARGE INTESTINE

HAUSTRAL CONTRACTIONS

MASS MOVEMENTS


Stomach
Colon
Rectum

GIT PHYSIOLOGY - Stomach

GASTRIC SECRETION PHASES

Cephalic phase

- Sight & smell
- Activates Appetite center in hypothalamus and signals to vagus nerve

Gastric phase

- Vagovagal reflex
- Enteric reflex
- Gastrin (G cells?)

Intestinal phase

- gastrin?
- Enterogastric reflex
- secretin, GIP

SECRETORY FUNCTION OF GIT

- Glands (mucous, oxyntic glands, salivary glands, pancreas)
- Role of parasympathetic stimulation, sympathetic
- control of saliva secretion is NEURAL only.

HISTAMINE & Gastric Acid Secretion

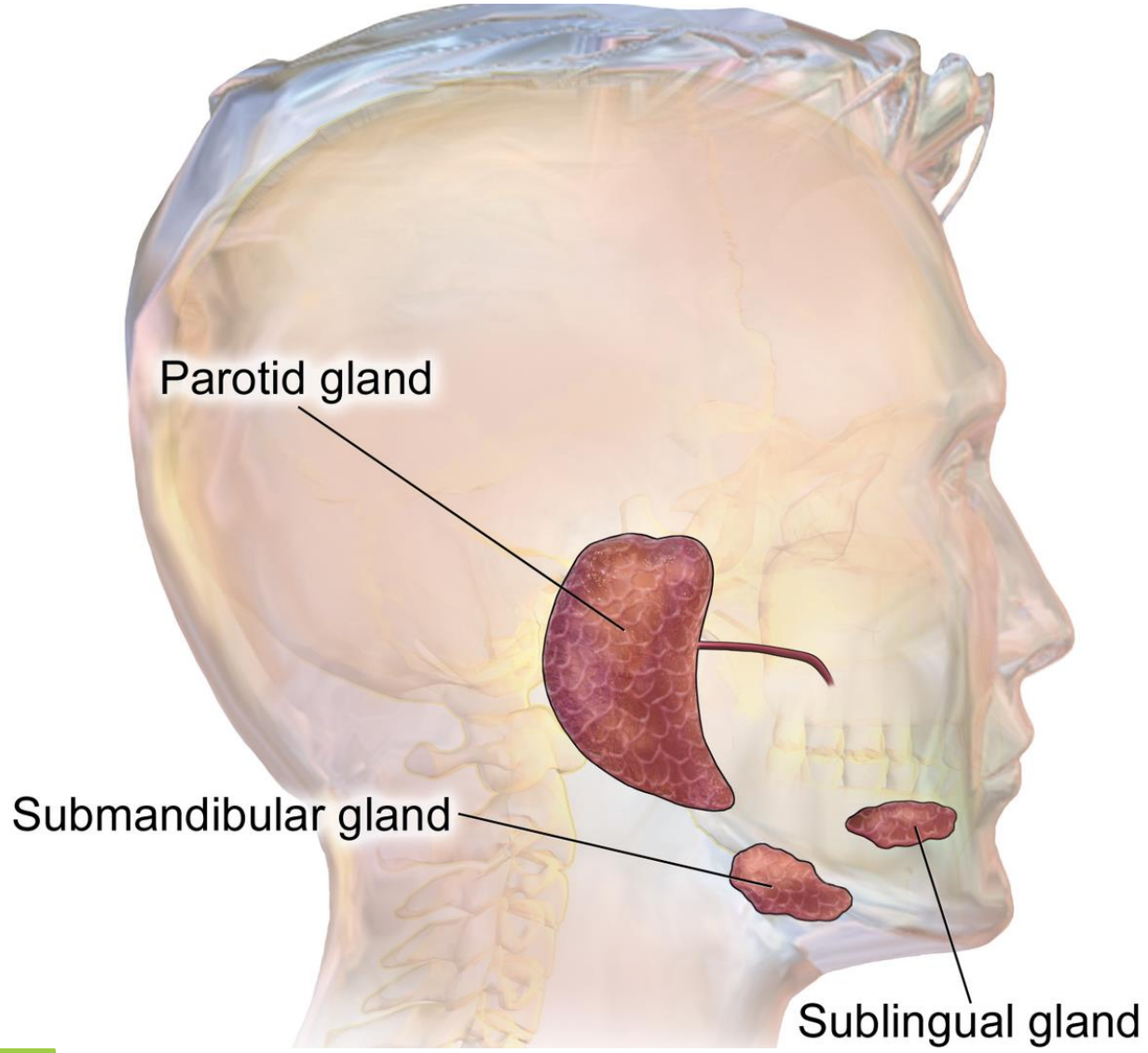
- *Gastrin* → *enterochromaffin-like cells*, to secrete *histamine*

- secretion of HCl by the parietal cells is directly related to the amount of histamine secreted by the ECL cells

MUCUS

- on the surface of the epithelium in most parts of GIT are billions of *single cell mucous glands*, sometimes *goblet cells* because they look like goblets
- extrude *mucus* directly onto the epithelial surface
- adherent properties, lubricant, mucosa protection
- contains moderate quantities of bicarbonate ions, which specifically neutralize acids

SALIVARY GLANDS



- Approx. 1.0–1.5 litres of saliva secreted each day
- consisting of water, electrolytes, antimicrobial compounds, enzymes
- *facilitate speech, mastication, swallowing. In addition, it protects the oral mucosa and the teeth*

MECHANISM OF SALIVARY SECRETION

Two stage salivary gland secretion model.

In stage 1:

- Acinar cell secrete a NaCl-rich fluid called primary saliva - isotonic

In stage 2:

- The primary saliva - modified - passage along the ductal tree (reabsorbing NaCl and secreting $KHCO_3$).
- Ductal epithelium - poorly permeable to H_2O
- Final saliva - hypotonic.

composed of two epithelial cell types, the

1. acinar cells

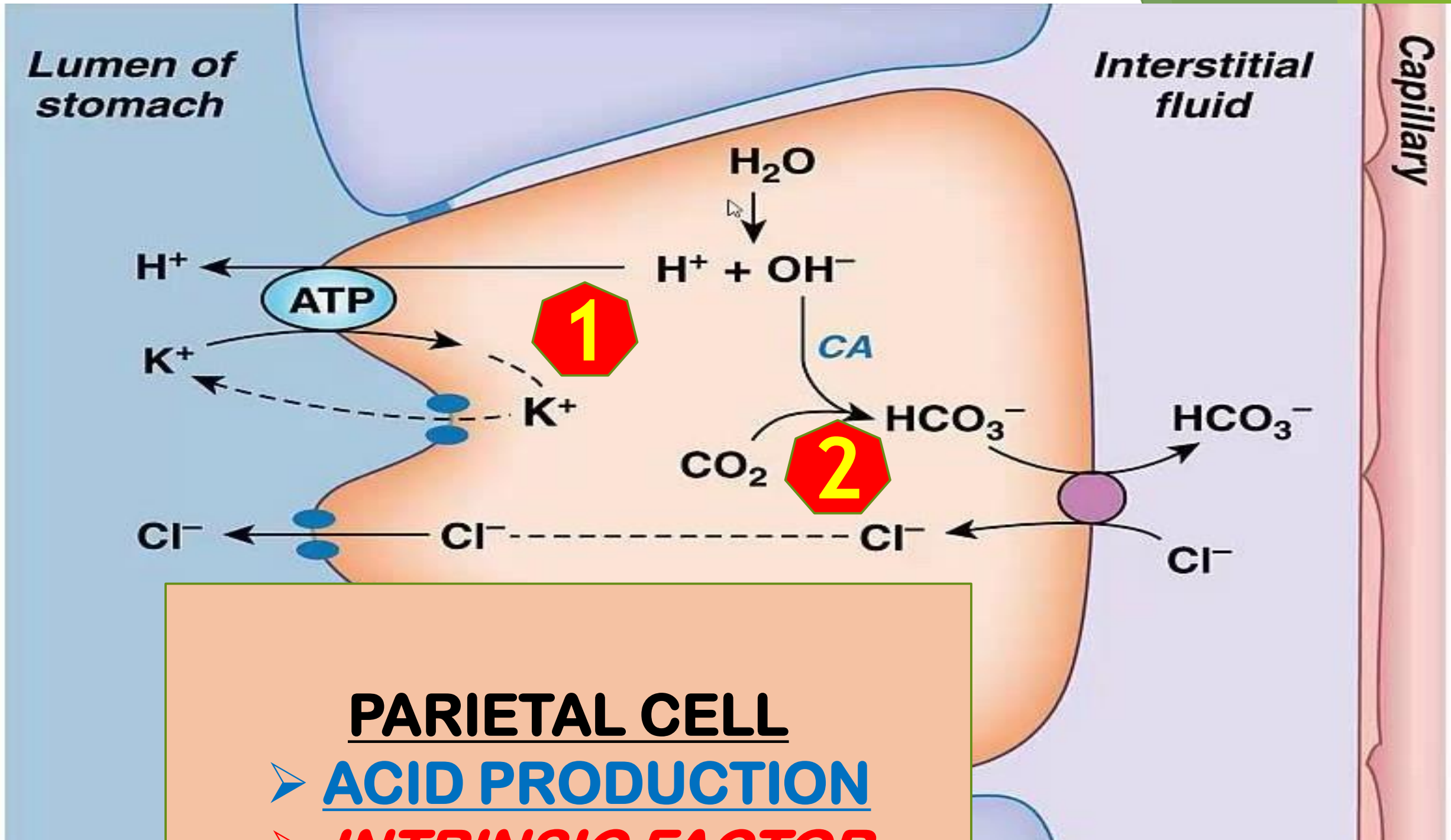
2. the ductal cells

GASTRIC GLAND

Mucous neck cell

Parietal cell

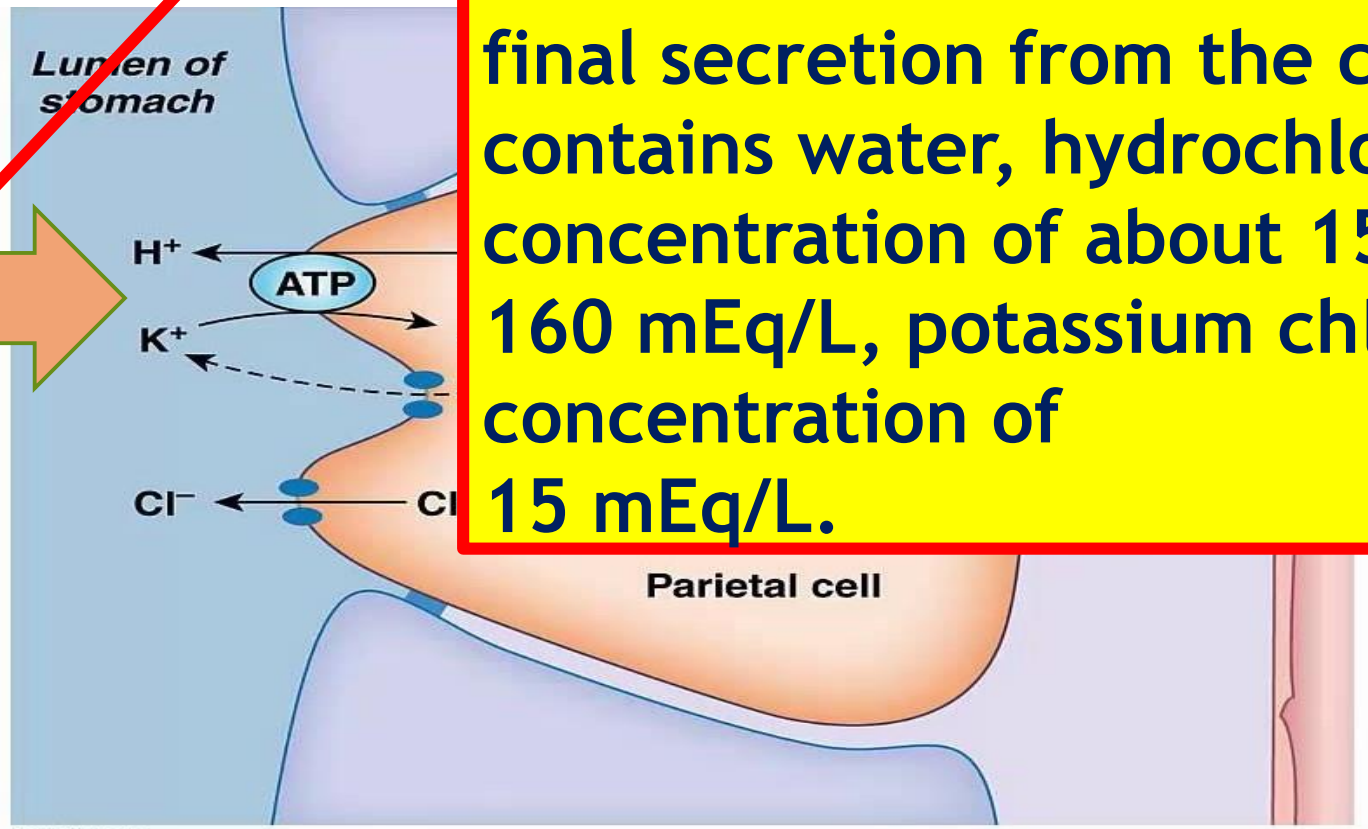
Chief cell



PARIETAL CELL

- ACID PRODUCTION

GASTRIC GLAND



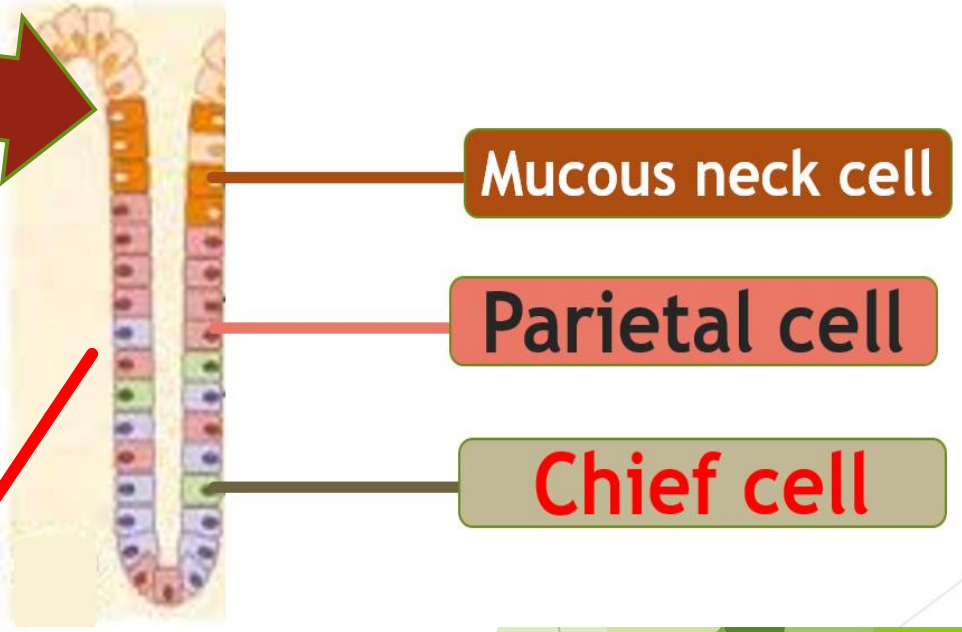
The HCl is then secreted outward through the open end of the canaliculus into the lumen of the gland.

final secretion from the canaliculus contains water, hydrochloric acid at a concentration of about 150 to 160 mEq/L, potassium chloride at a concentration of 15 mEq/L.

1. What factors influence gastrin secretion?

2. What stimulates pepsinogen secretion? pH stomach association?

GASTRIC GLAND

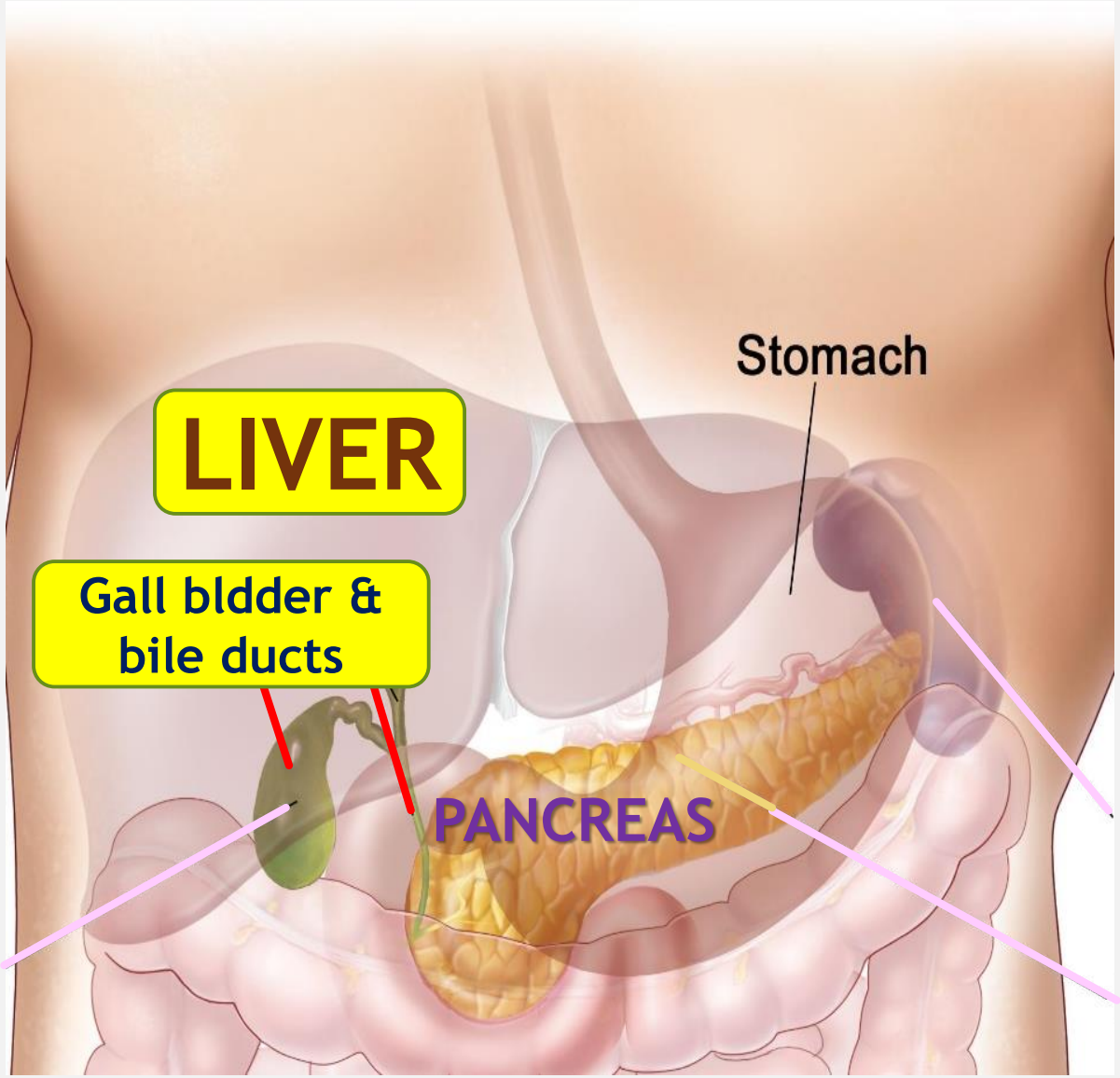


Chronic Gastritis may lead to loss of gastric glands.

Consequences??

PANCREATIC Secretions

- Pancreas – Acinar And ductal cells
- *Amylase, Trypsinogen* And Pancreatic Fluid
- ✓ Trypsin Inhibitor
- ***acute pancreatitis***



GIT PHYSIOLOGY

PANCREATIC SECRETION PHASES

Cephalic phase

Gastric phase

Intestinal phase

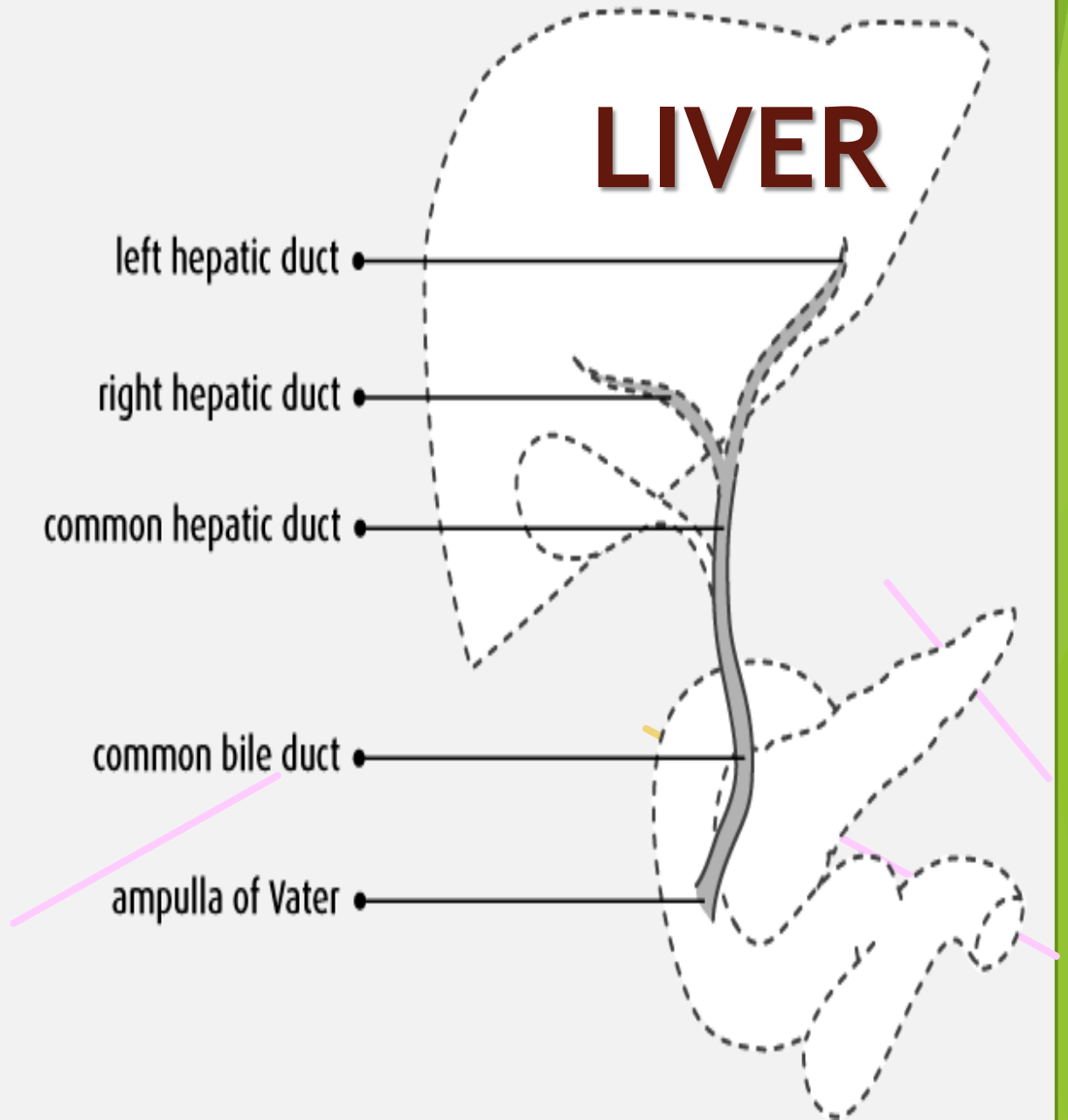
- secretin?

FACTORS INFLUENCING PANCREATIC SECRETION

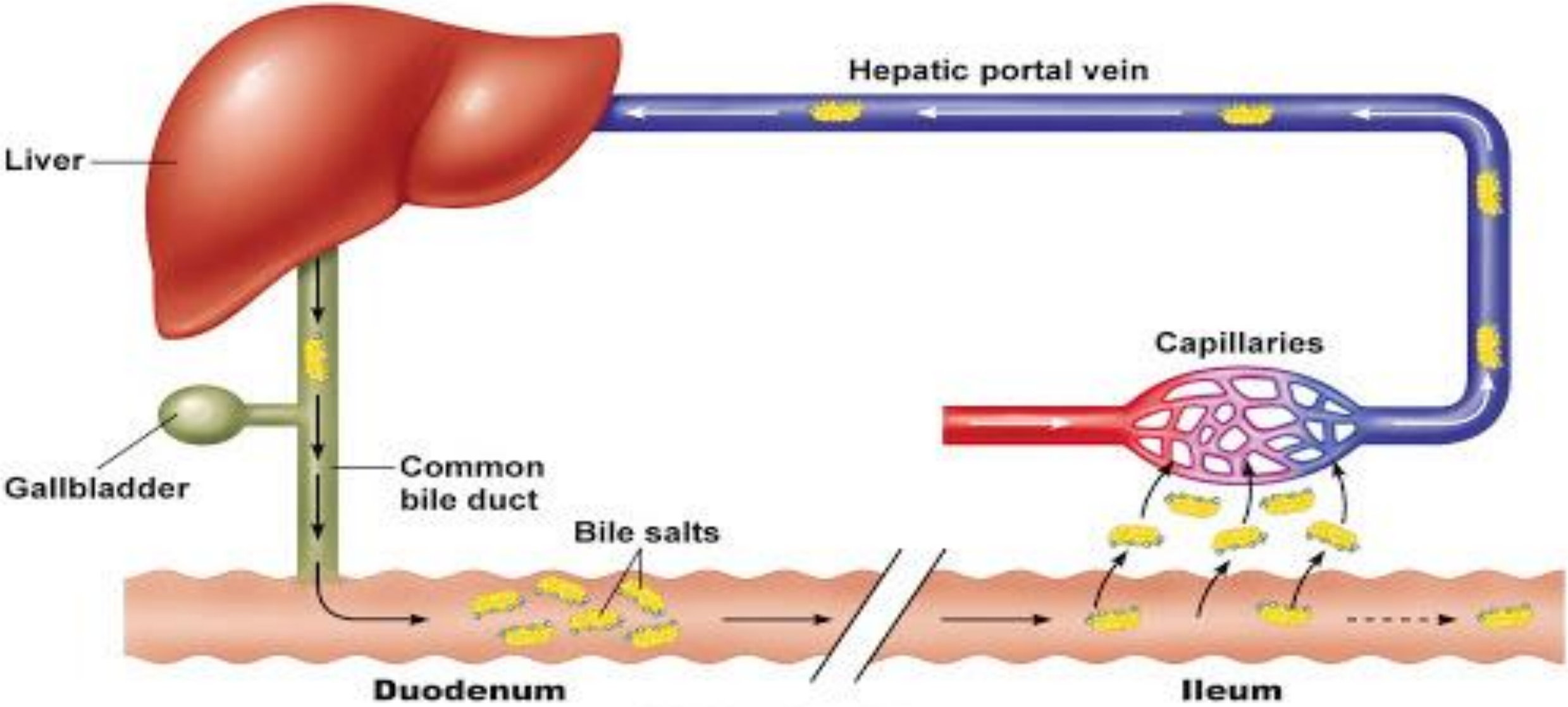
- Ach
- CCK
- Secretin

BILE AND BILE DUCTS

- Bile synthesis and composition
- Bile cancliculi, hepatic duct, Cystic duct and CBD
- Fat , CCK and bile secretion



BILE AND BILE DUCTS



BILE AND GALL BLADDER

- After gall bladder removal, will there be production and secretion of bile??