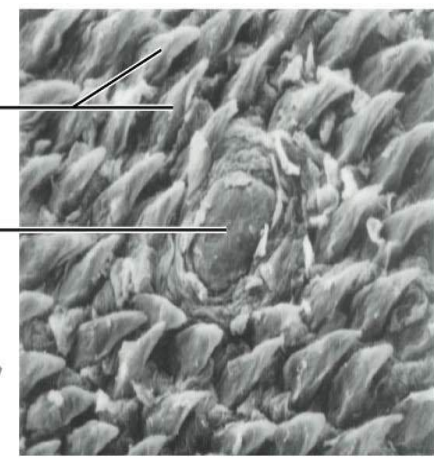
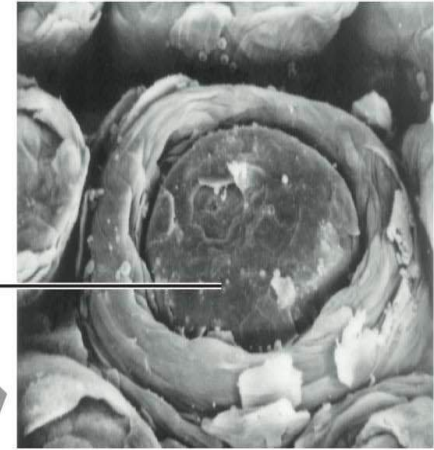
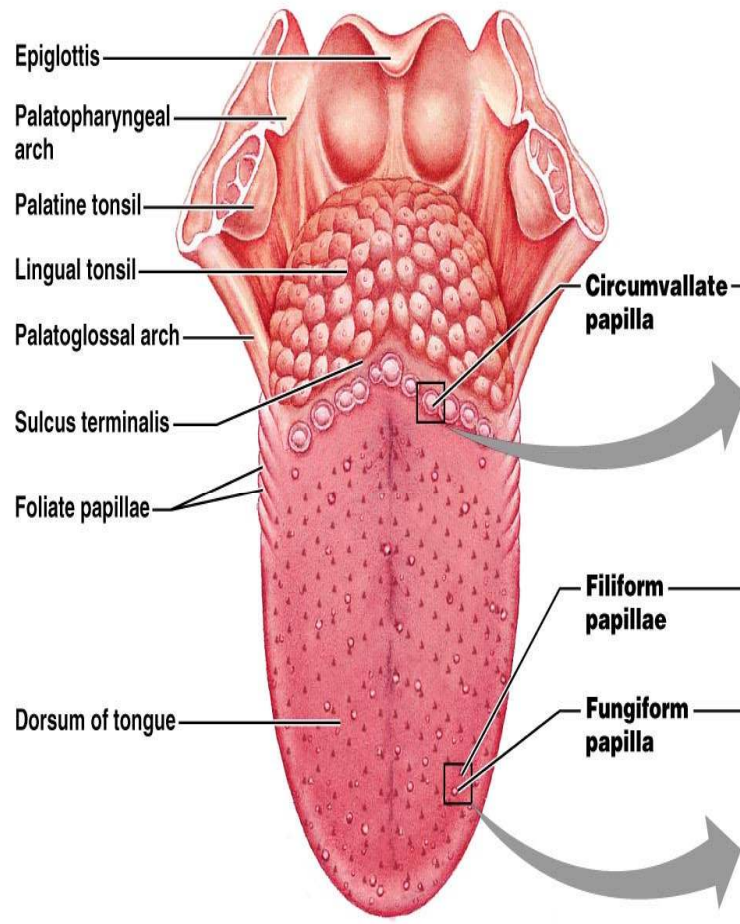
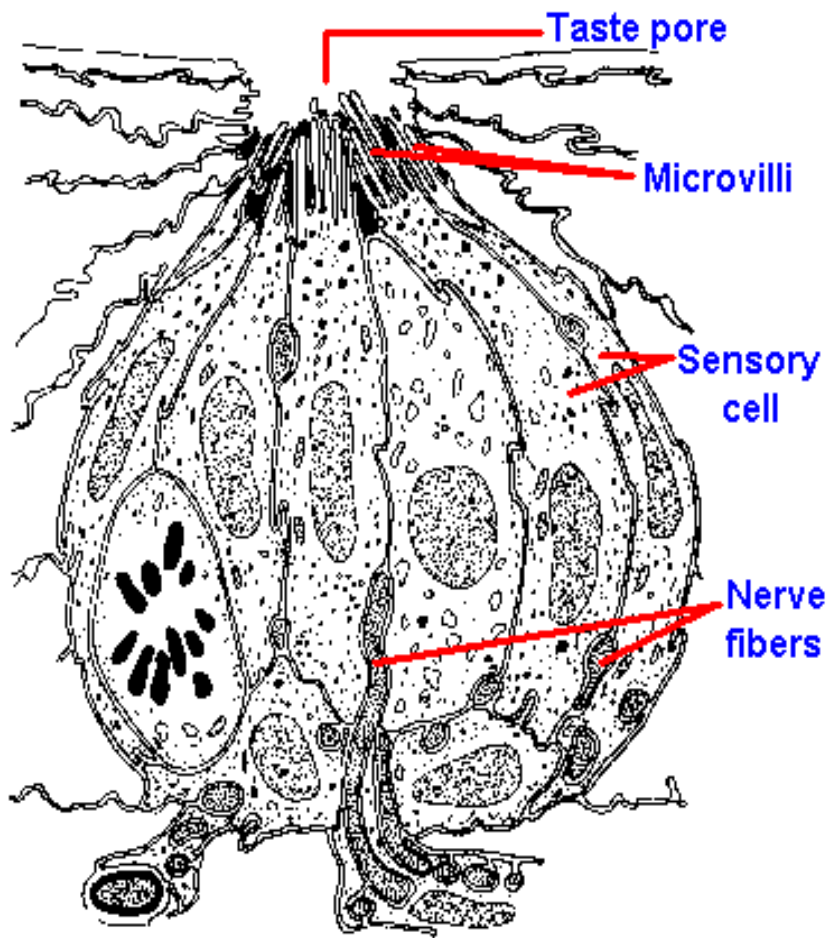


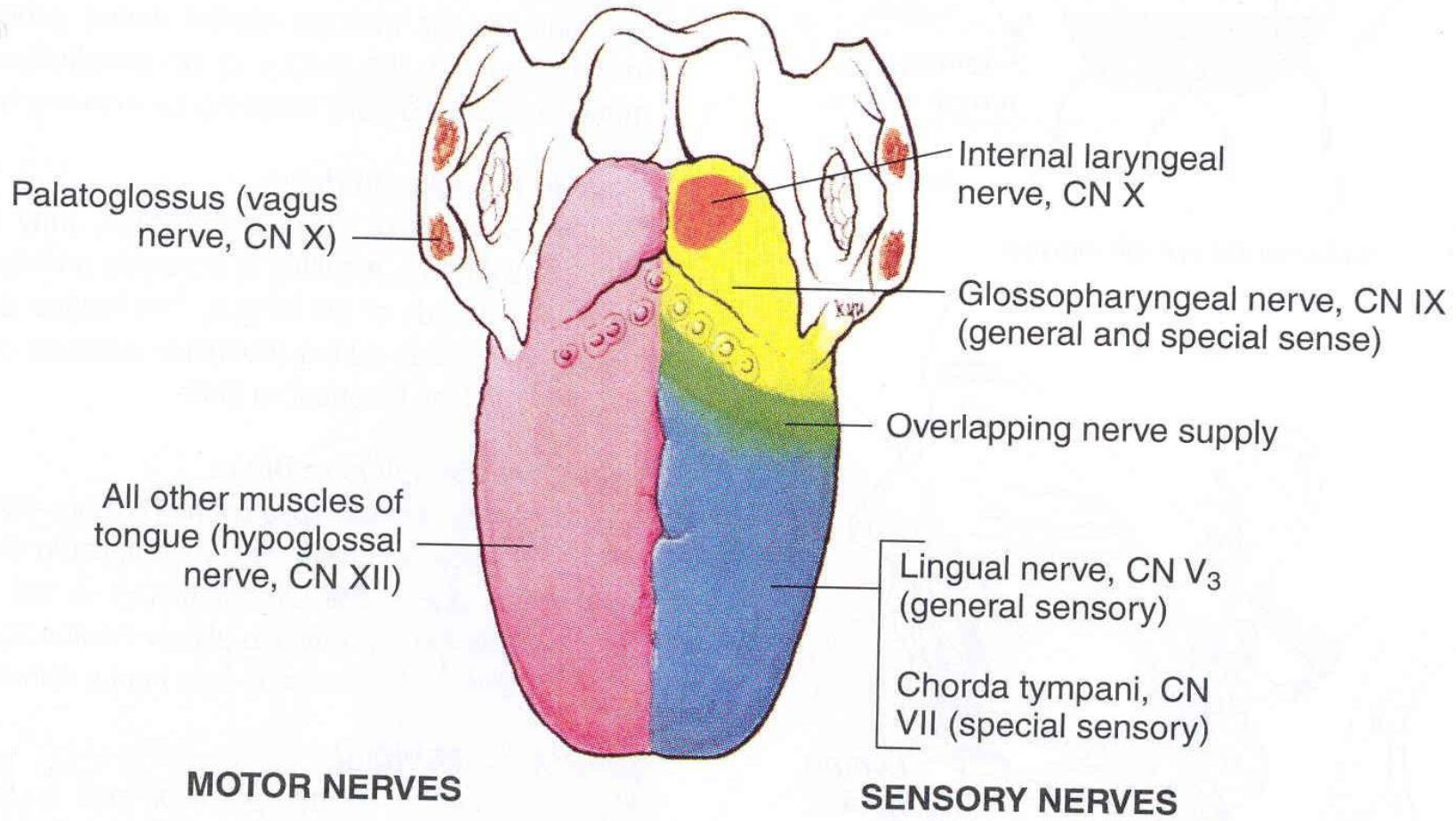


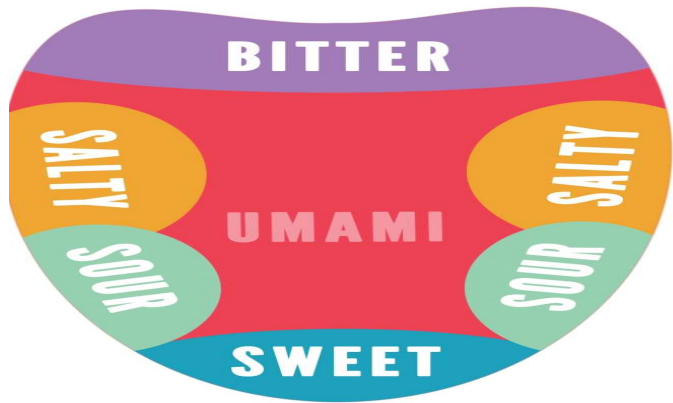
A COMPILATION

MODELS GI





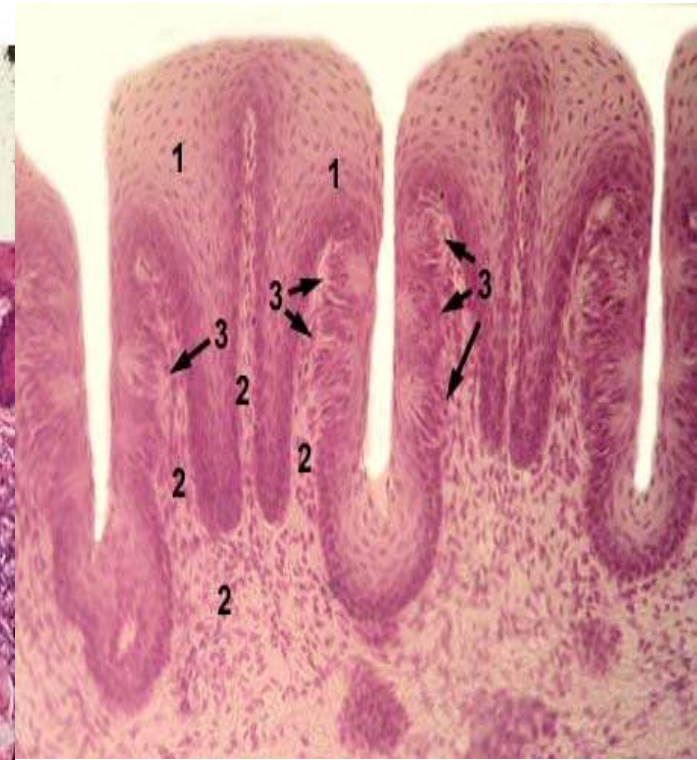
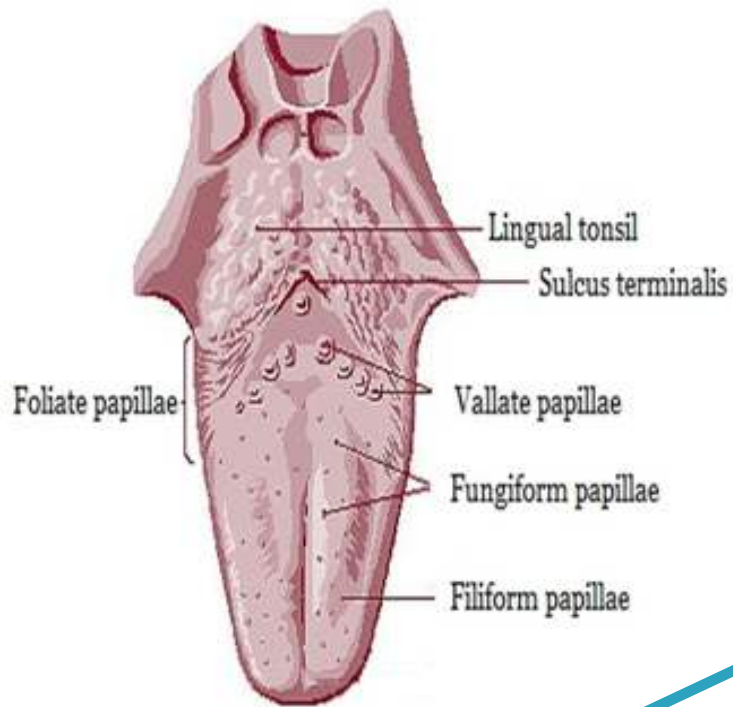




Taste areas on the human tongue



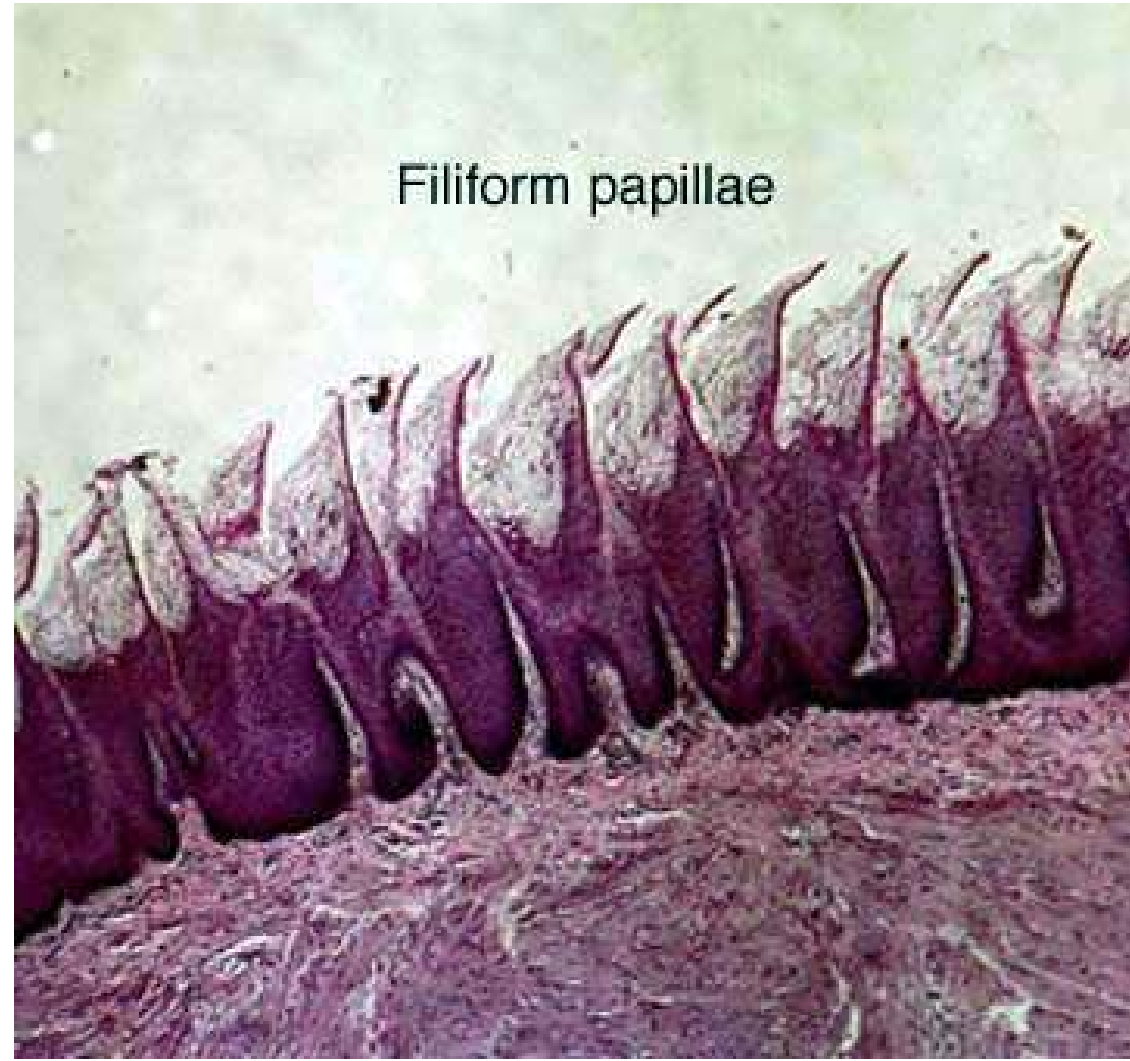
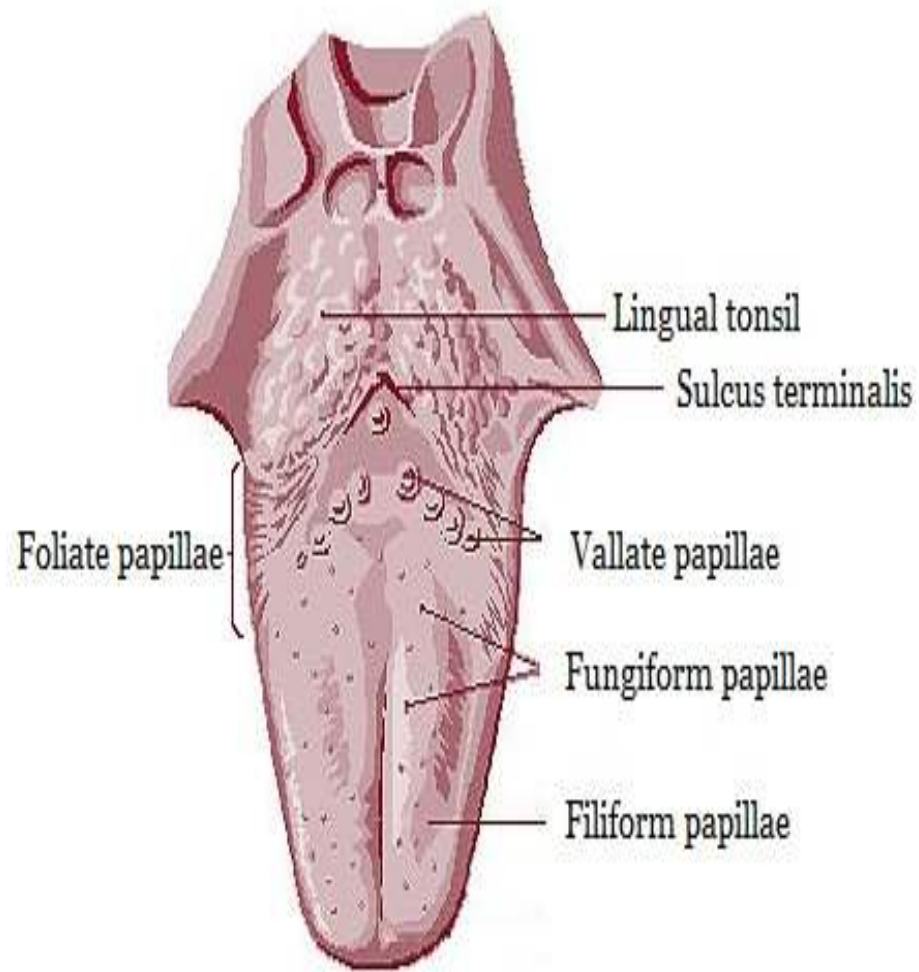
Histology Lab Part 13: Slide 36



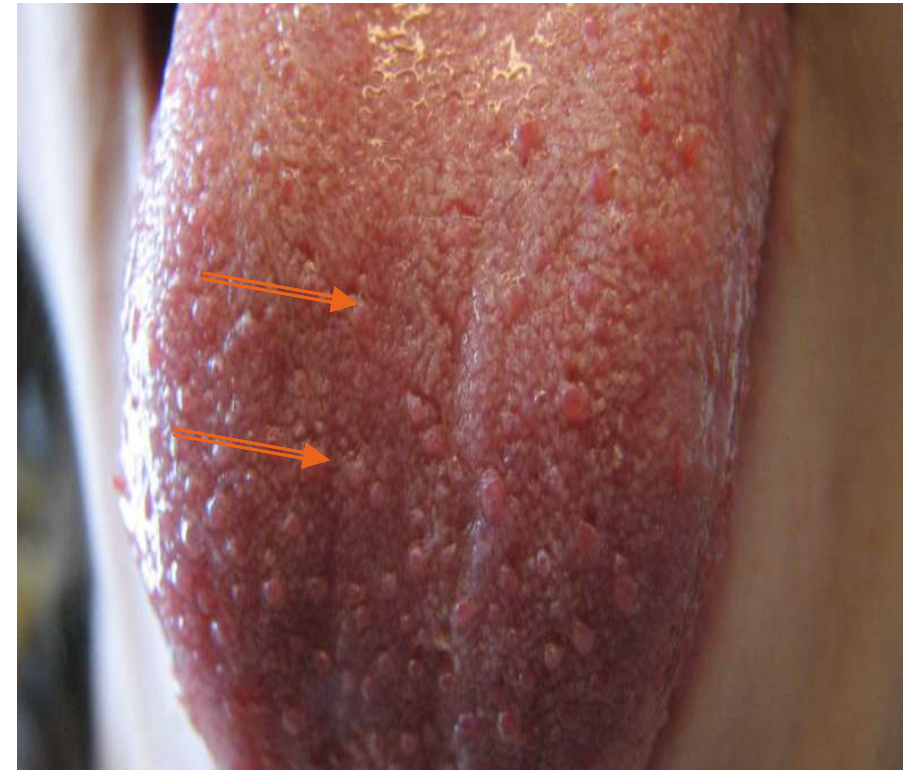
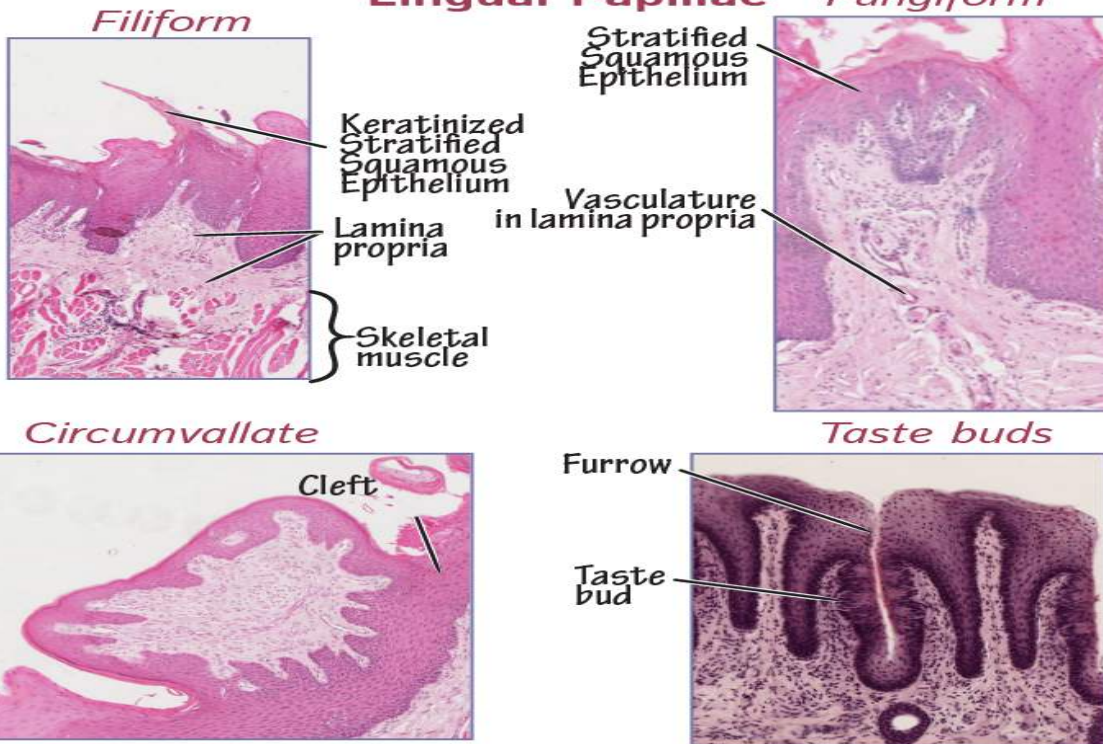
LEAF SHAPED PAPILLAE OF THE TONGUE Stained with haematoxylin and eosin

- 1 - epithelium covering papilla (stratified squamous nonkeratinizing)
- 2 - core of the papilla (lamina propria of the mucosa of dorsal surface of the tongue)
- 3 - taste bud

Detail of circumvallate papilla, showing pale taste buds opening into the lumen of the furrow that surrounds the papilla.



Lingual Papillae



They have a core of **connective tissue** and the **seventh cranial nerve** innervates them.

Fungiform papilla
fungiform papillae (large bumps)
scattered among filiform papillae (small bumps).

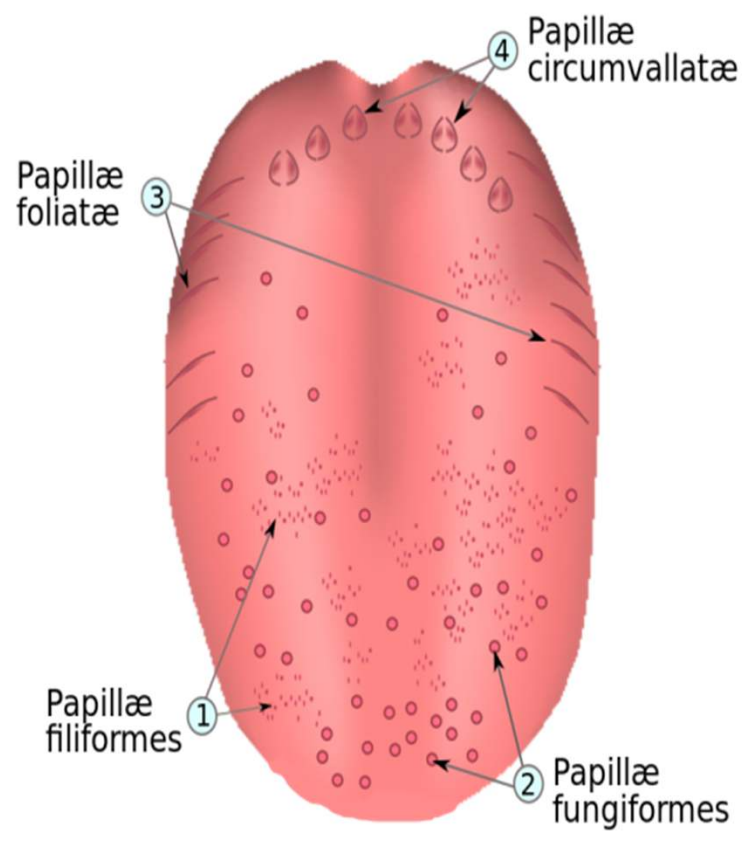
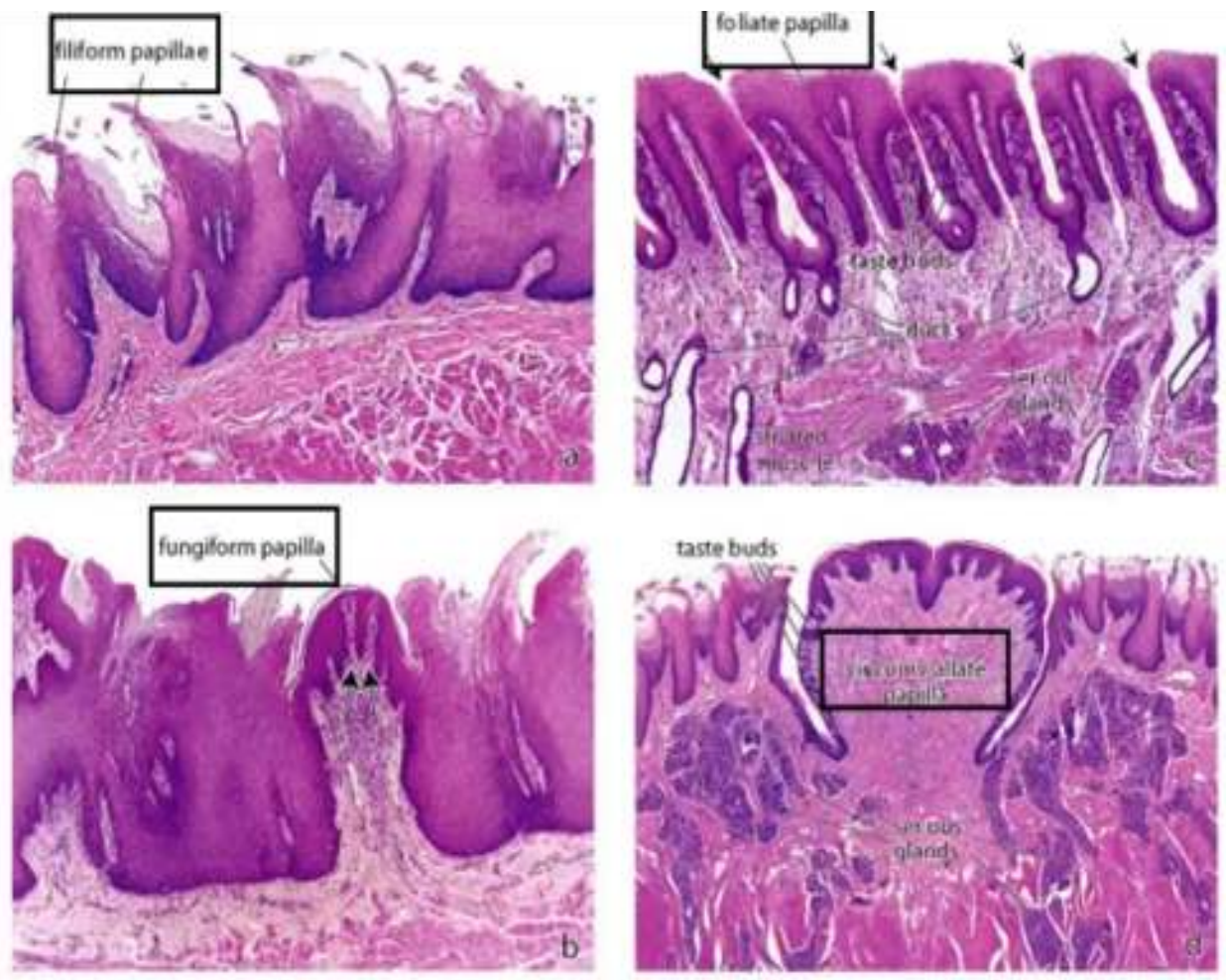


Figure 15.4. Features of the human tongue and distribution of papillae. a-d, X45.



Fungiform papilla

Villate papilla

Mucous gland

Striated muscle

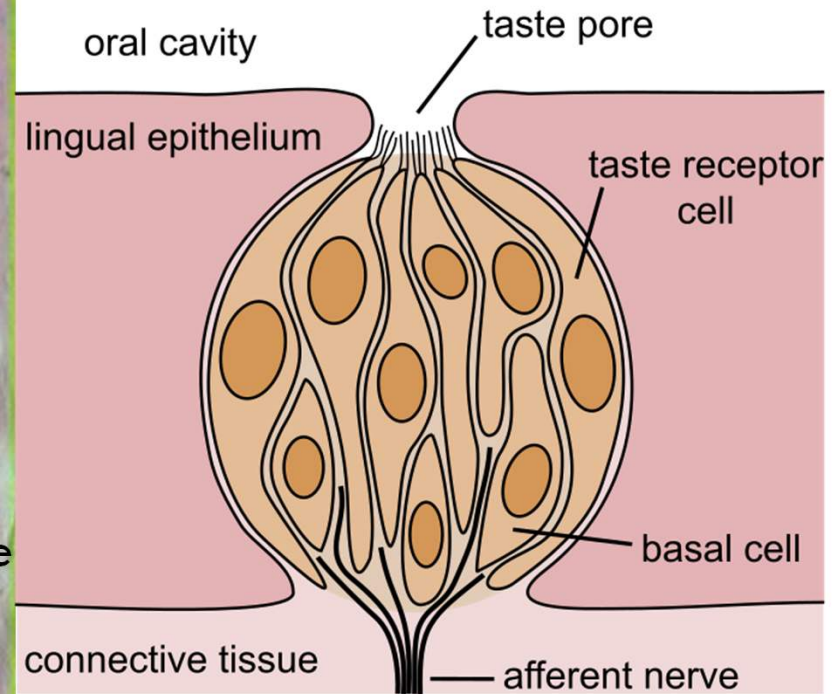
Fat cells



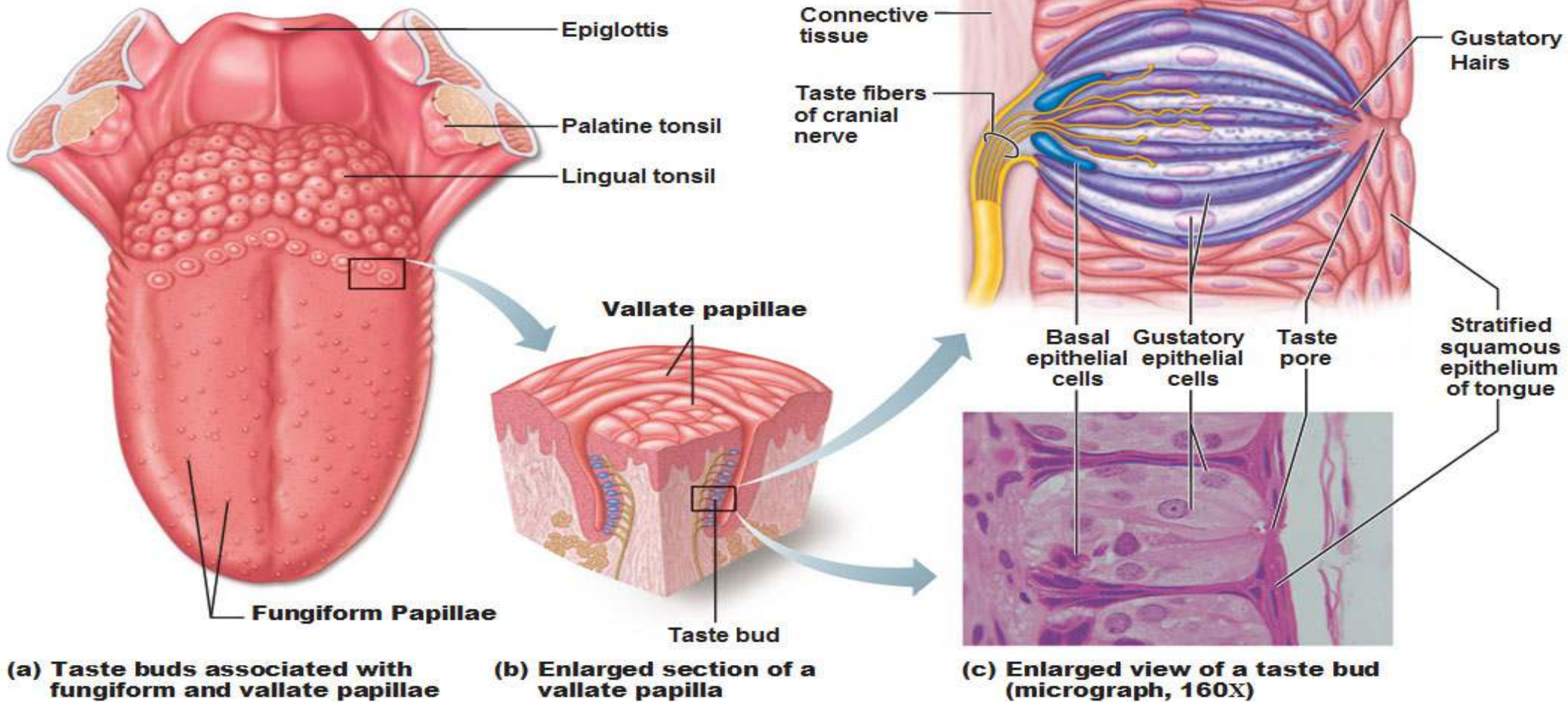
Filiform papilla

Artifact

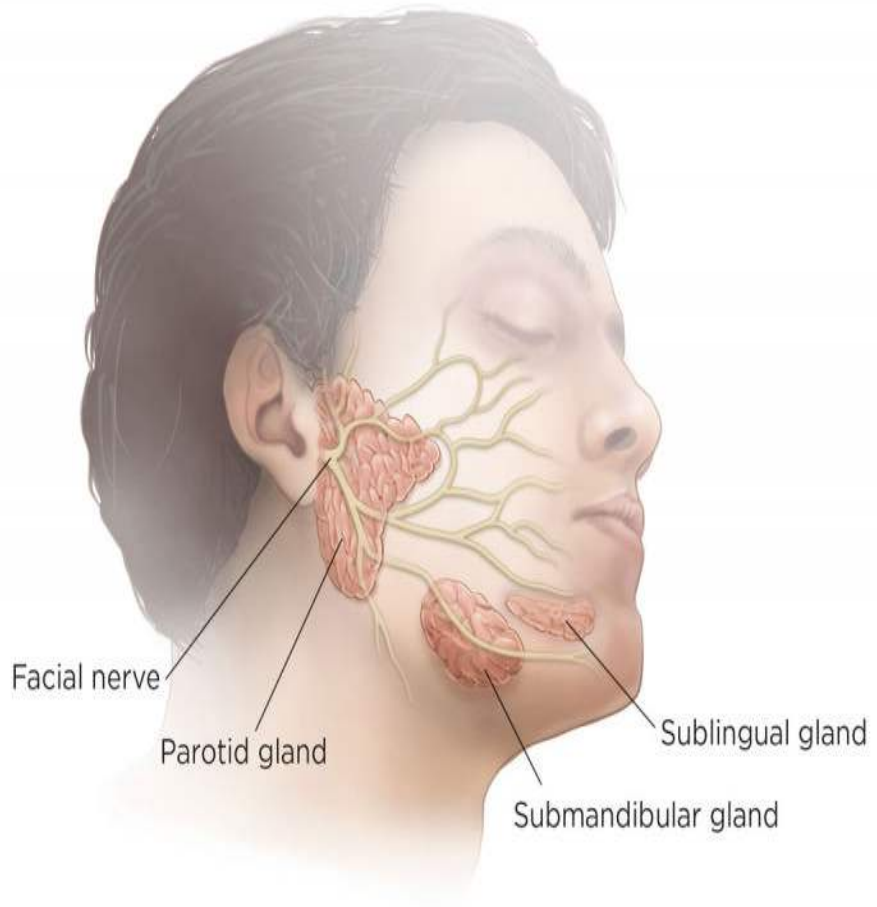
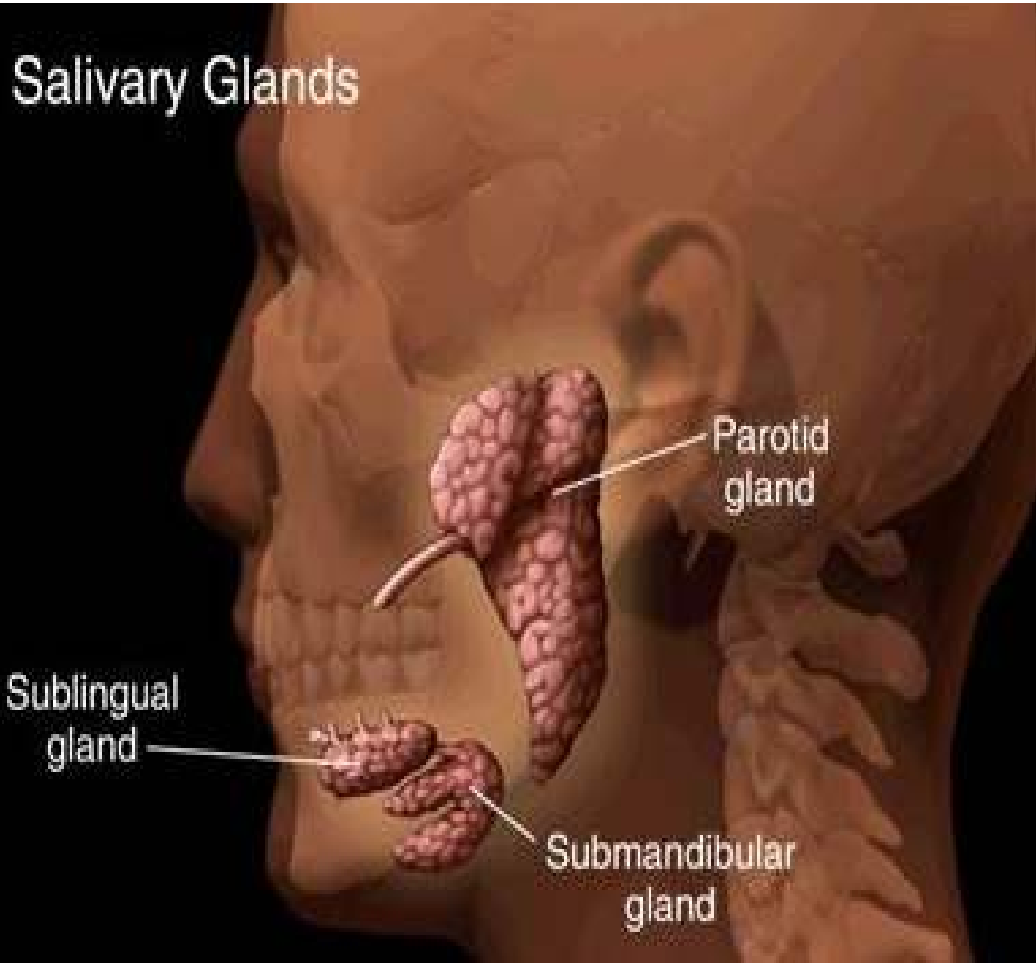
Striated muscle cross and longitudinal section

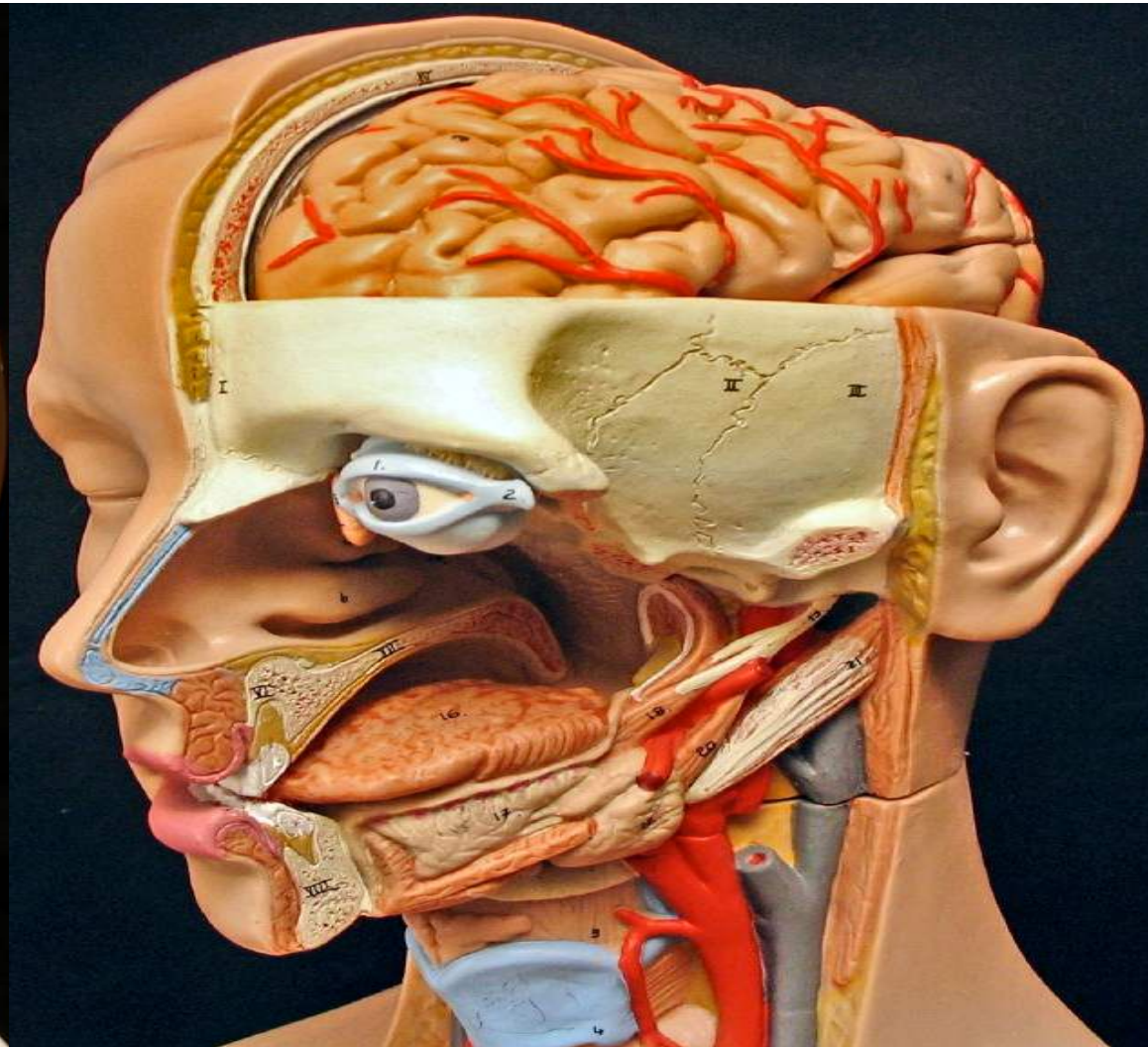
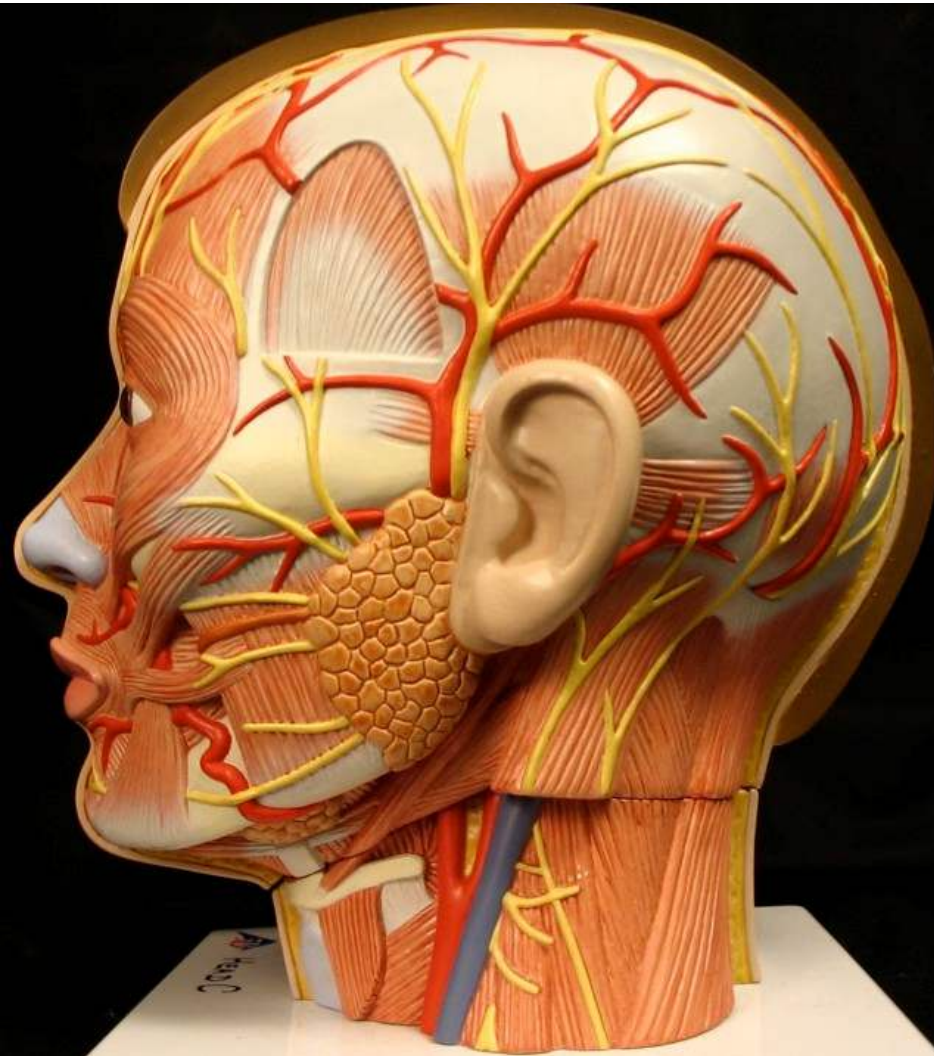


Taste Buds



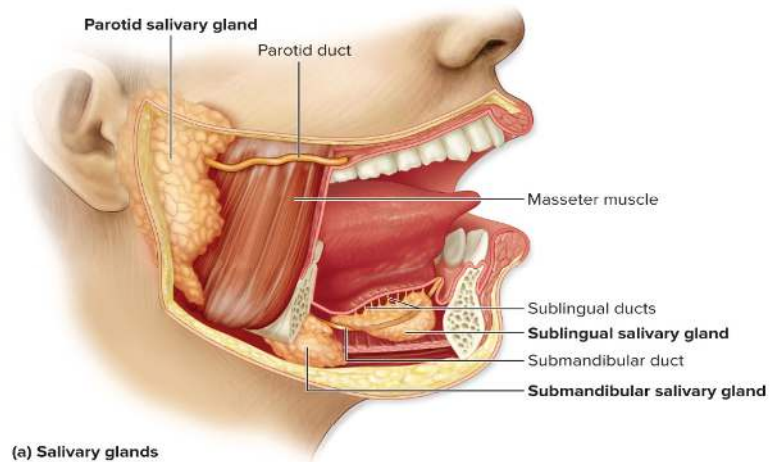
Salivary Glands



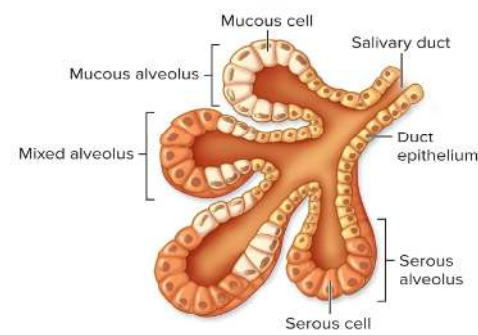




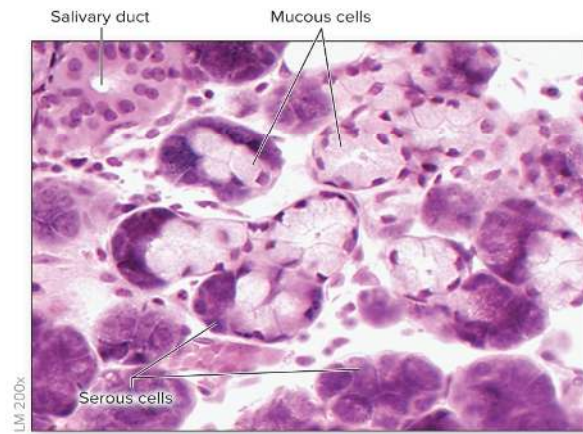
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(a) Salivary glands



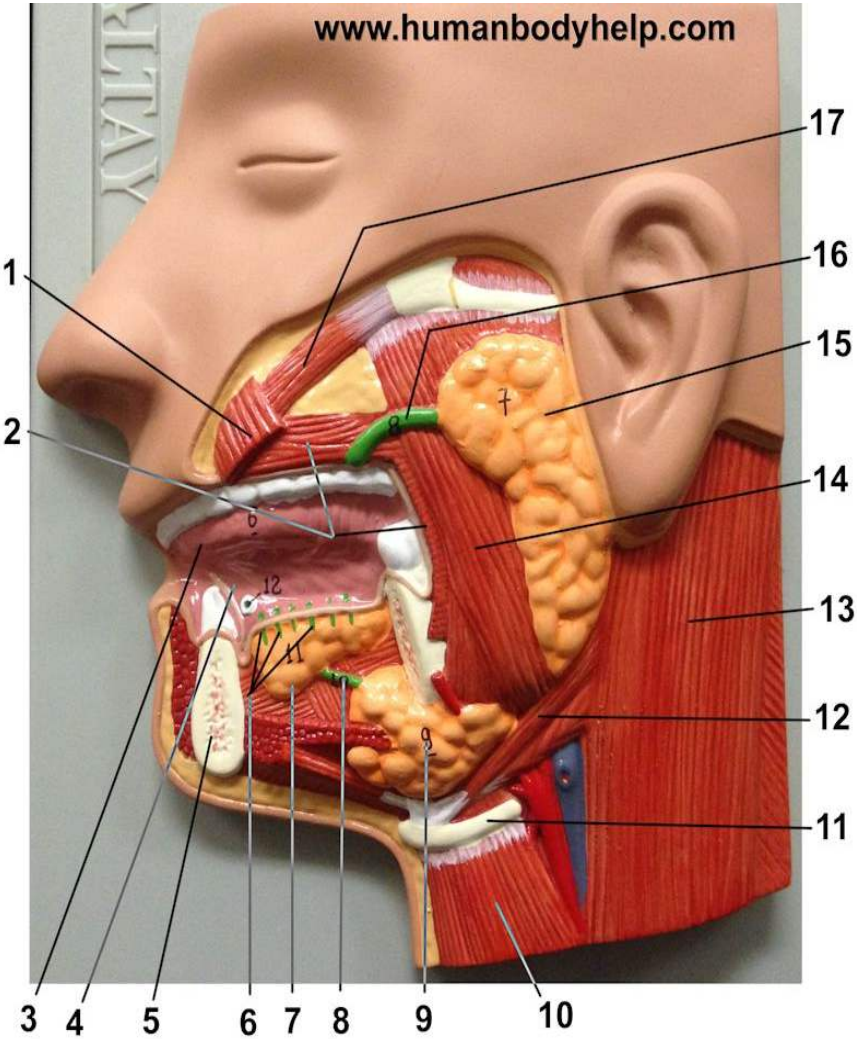
(b) Salivary gland histology



LM 200x

(c) Submandibular salivary gland

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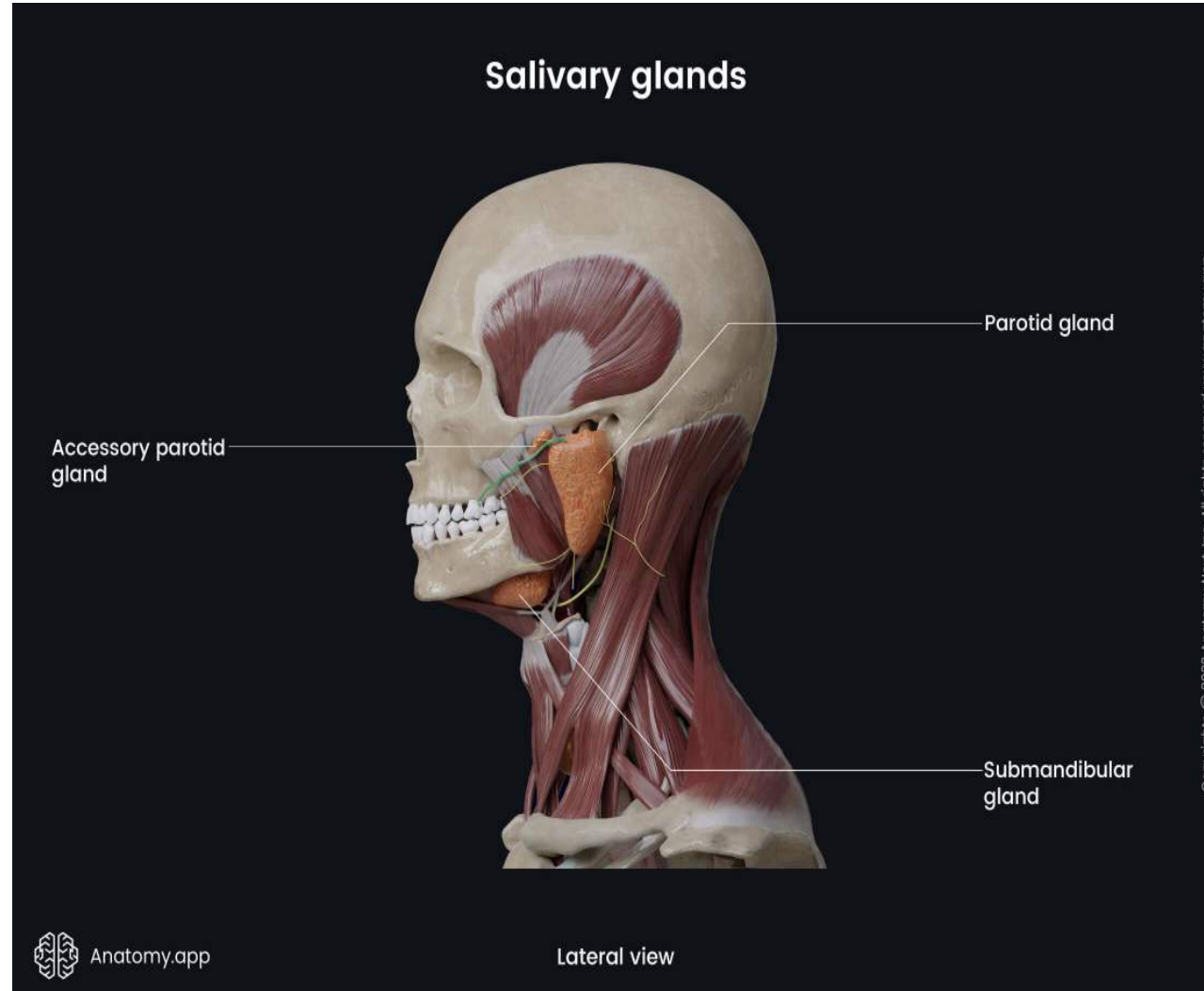
- 1.Orbicularis oris
- 2.Buccinator (cut)
- 3.Tongue
- 4.Frenulum
- 5.Mandible
- 6.Sublingual gland ducts
- 7.Sublingual gland
- 8.Submandibular gland duct
- 9.Submandibular gland
- 10.Infrahyoid muscles
- 11.Hyoid bone
- 12.Digastric muscle (posterior belly)
- 13.Sternocleidomastoid m.
- 14.Masseter m.
- 15.Parotid gland
- 16.Parotid gland duct
- 17.Zygomaticus minor

Minor salivary glands

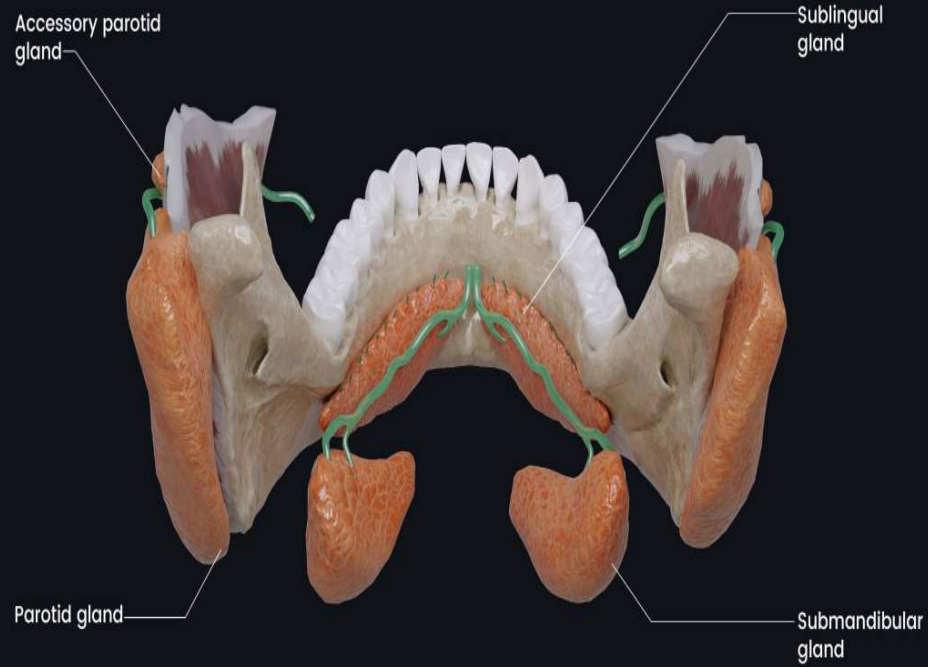
- **Labial** salivary glands in the lips
- **Buccal** salivary glands in the cheeks
- **Palatine** salivary glands in the palate (subdivided into glands of the hard and soft palate)
- **Lingual** salivary glands in the tongue

Major salivary glands

- **Parotid glands**
- **Submandibular glands**
- **Sublingual glands**

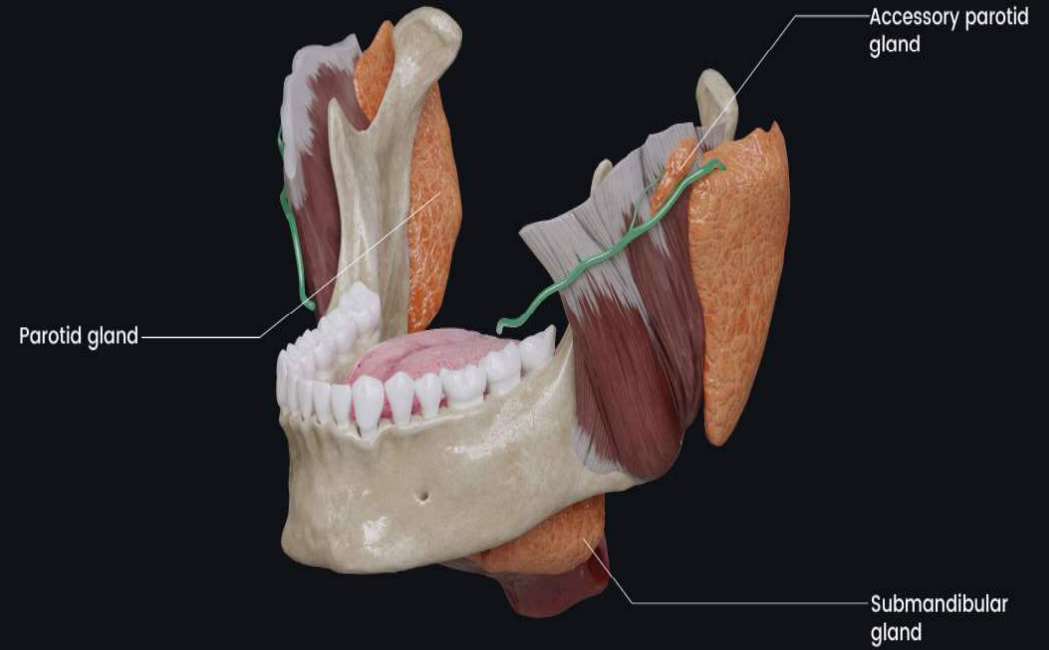


Salivary glands



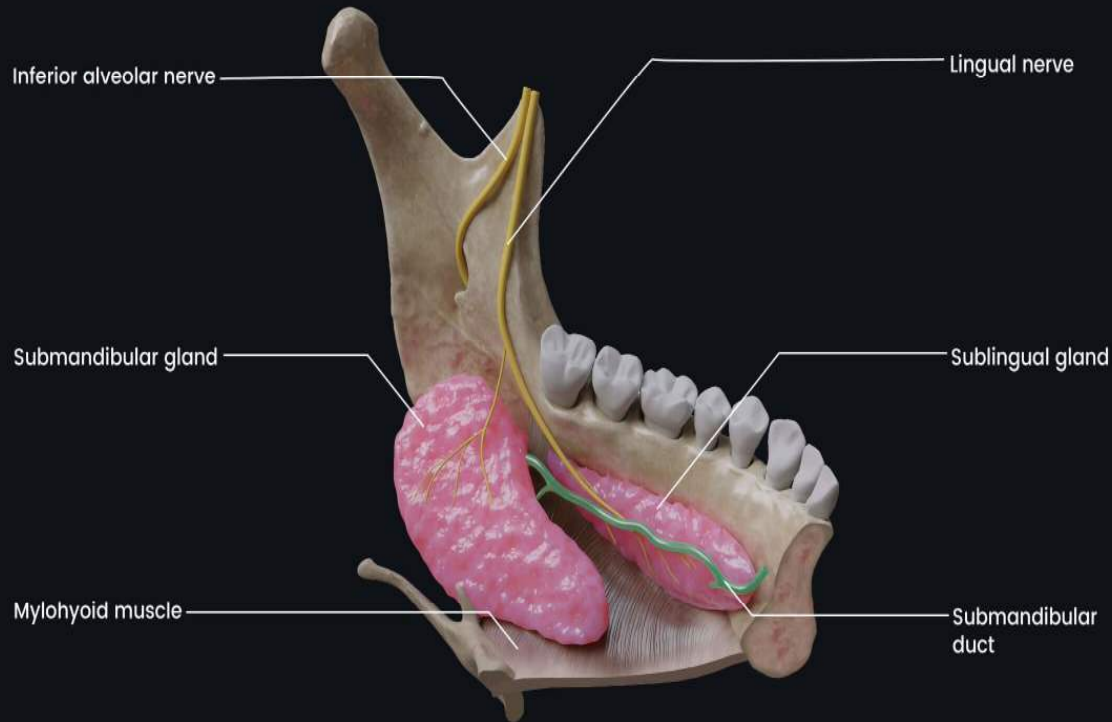
Posterior view

Salivary glands

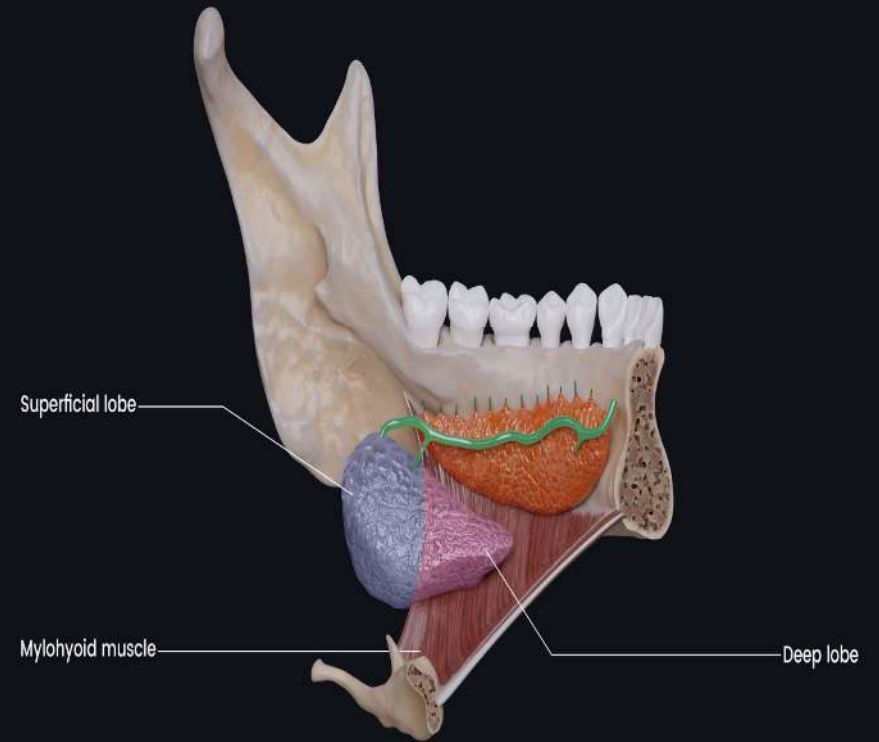


Anterolateral view

Submandibular gland



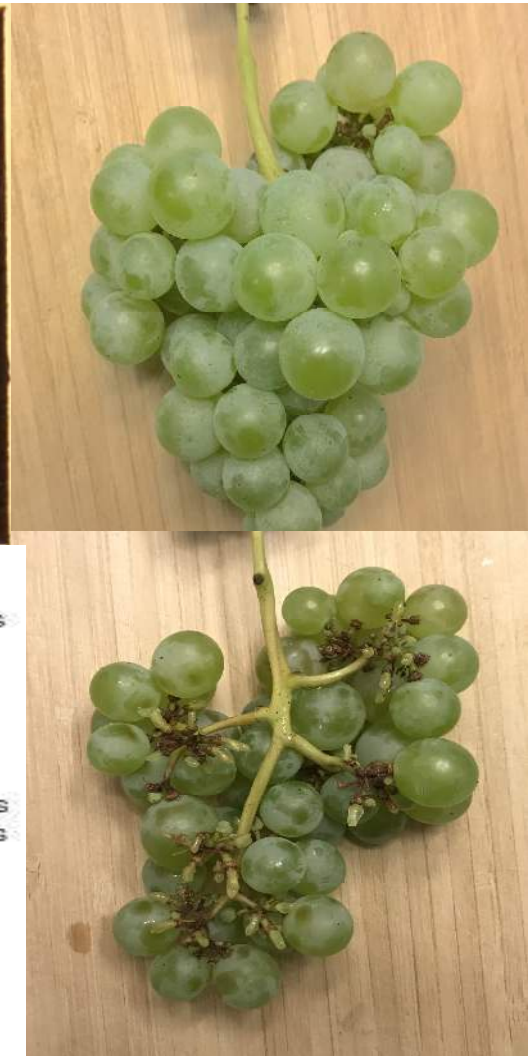
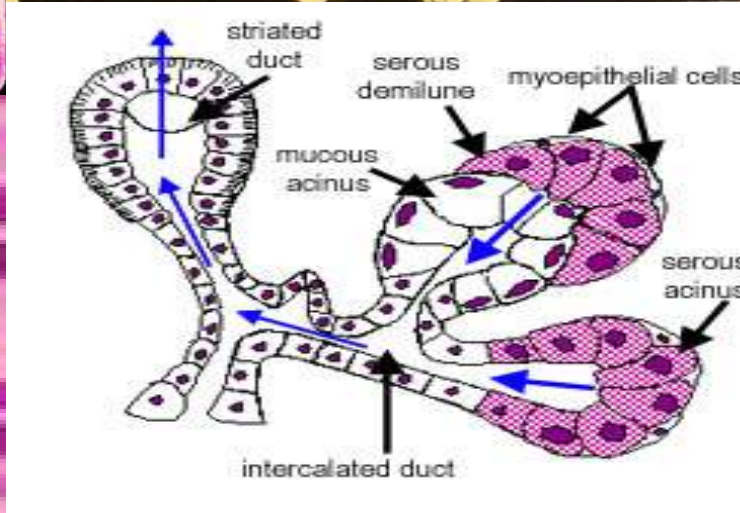
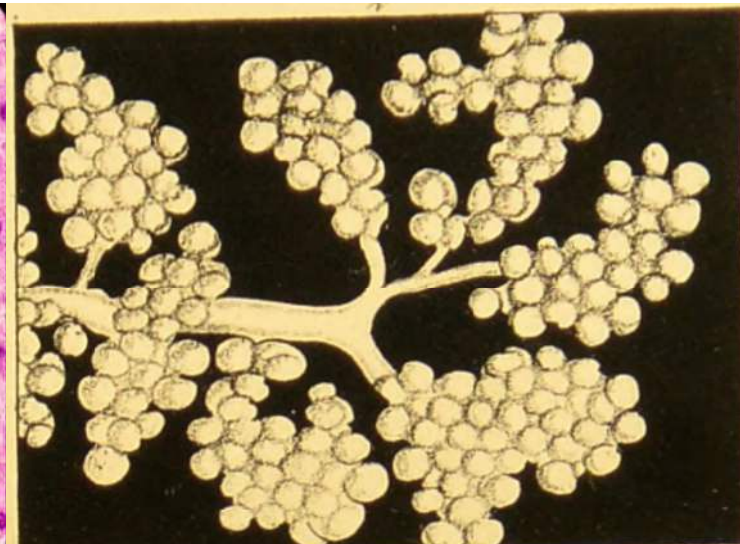
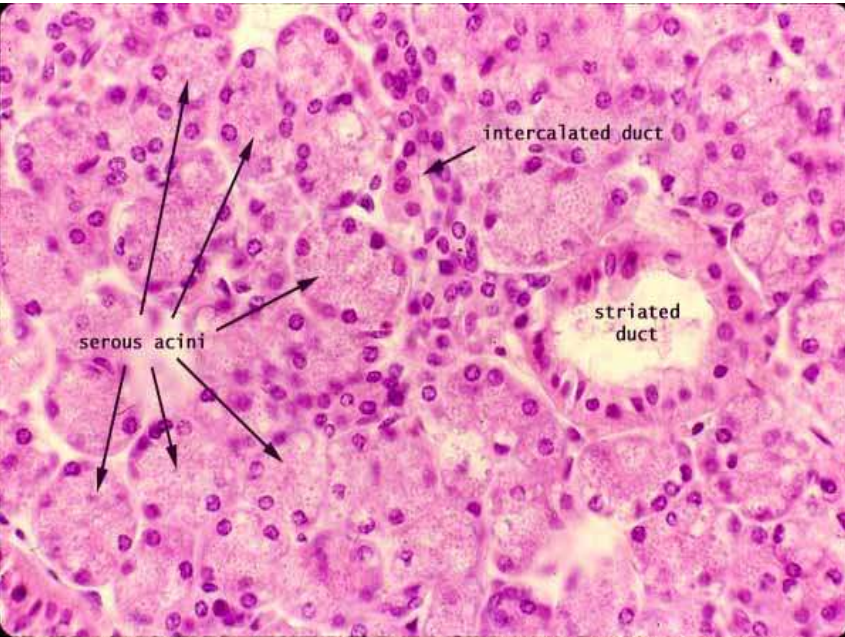
Lobes of submandibular gland

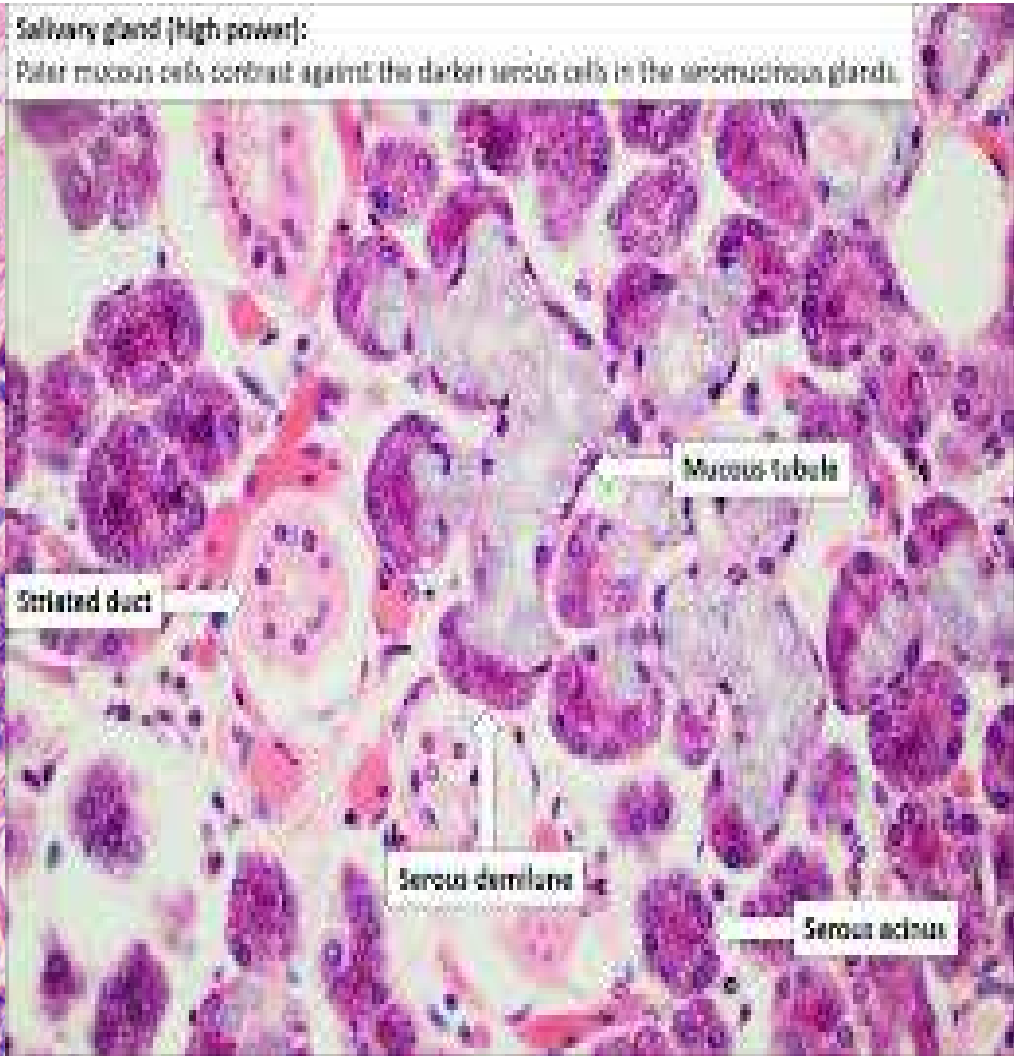
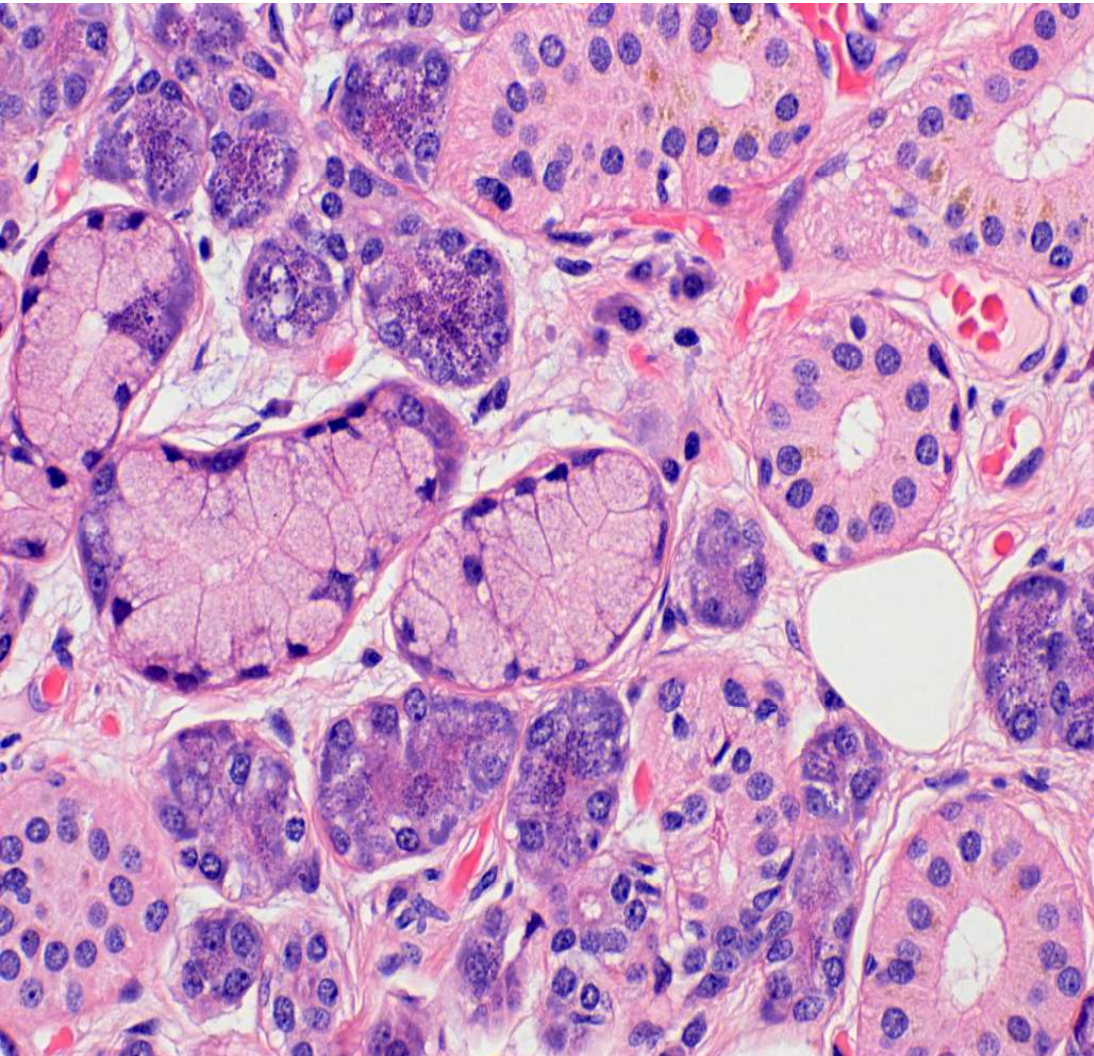


Medial view

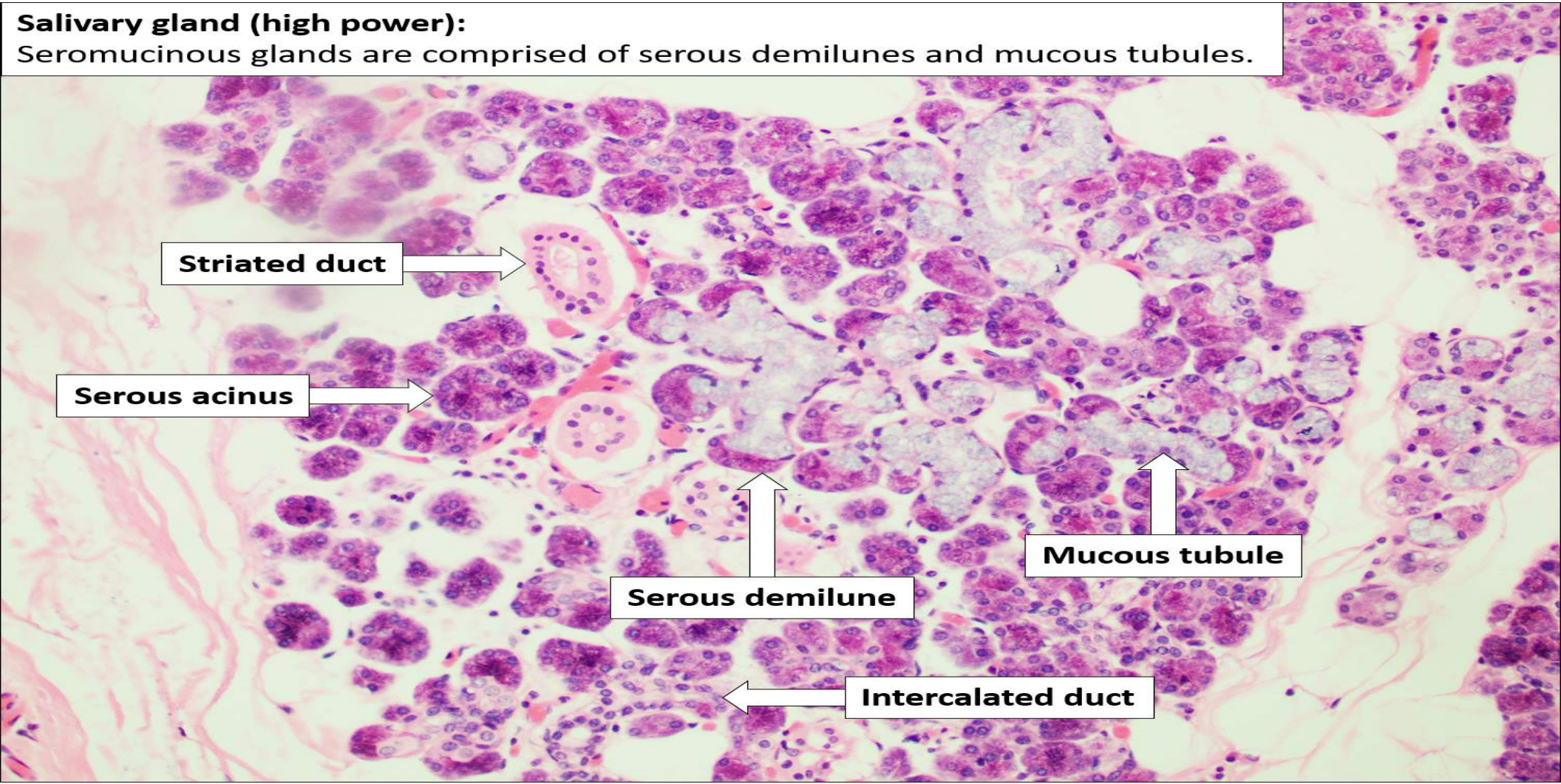
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Salivary gland (high power):
Seromucinous glands are comprised of serous demilunes and mucous tubules.



Striated duct

Serous acinus

Serous demilune

Mucous tubule

Intercalated duct

Parenchyma of salivary glands

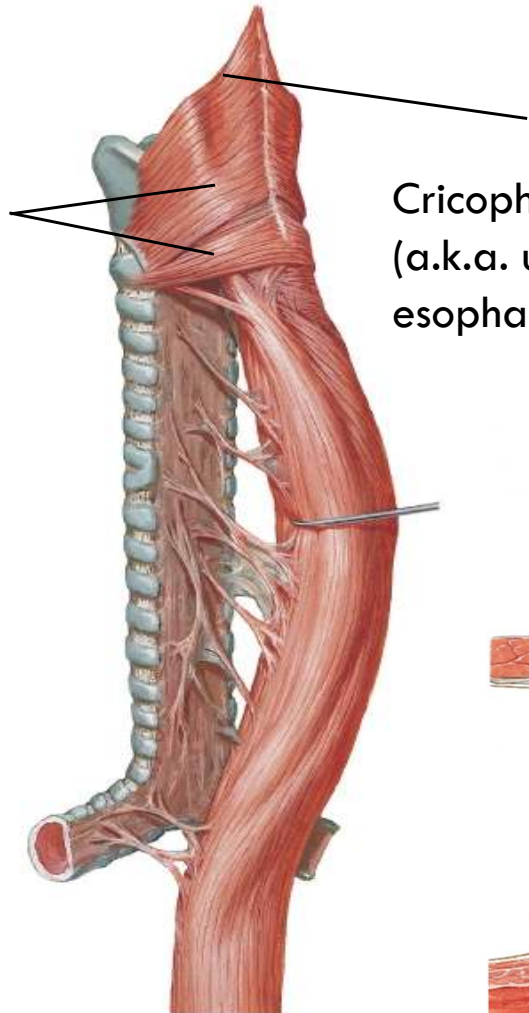
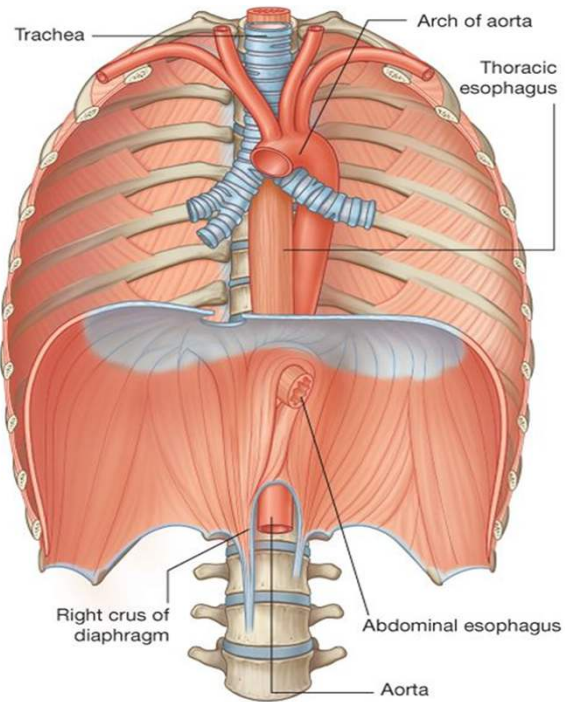
- The terminal secretory unit of the salivary glands is called the **acinus**.
- An acinus is also a functional unit of the salivary glands, and **it contains mucous, serous or mixed** cells depending on the type of saliva they produce.
- All glands have many **myoepithelial cells** - contracting cells that help in the excretion process by emptying the ducts from saliva.
- **Saliva can be either serous, mucous or mixed. Mucous saliva is rich in carbohydrates and mucins, while serous saliva is rich in proteins.**
- The **alveolar (acinar)** configuration of acini is associated with the **serous cells**, and alveolar glands contain sac-like secretory portions.
- **The tubular configuration** is associated with the **mucous cells**, and tubular glands have tube-like acini.
- Minor salivary glands mostly contain mucous cells, and they have tubular acini.

All salivary glands produce about 1 - 1.5 liters of saliva per day.

- Saliva regulates **the balance of acids and alkalines** in the **oral cavity**.
- When a person ingests very acidic food, saliva neutralizes the acid and protects the **enamel of the teeth**.
- As saliva maintains a constant pH, it is also **responsible for the presence of normal oral microflora**.
- It **moistens and lubricates ingested food and the mucosa** of the oral cavity.
- **Saliva protects the mucosa from the mechanical forces and helps in bolus (chewed food mixed with the saliva) formation.**
- **Food lubrication allows for more efficiently swallowing.**
- Lubrication also has a protective role as lubricated mucosa makes it harder for bacteria to attach to the epithelium.
- Saliva contains an **enzyme called amylase that splits carbohydrates**. Therefore, it starts the chemical food procession in the oral cavity.
- It contains **proteins, mucus, electrolytes and inorganic substances such as minerals**. **Therefore, saliva supplies the teeth with minerals (it contains calcium salts).**
- **Saliva prepares food for taste buds**. In order to taste the food, substances within it must be dissolved in saliva, so saliva acts as a solvent.
- It **regulates food temperature and makes hot food easy to digest**. When hot food is mixed with saliva, food temperature decreases.
- .

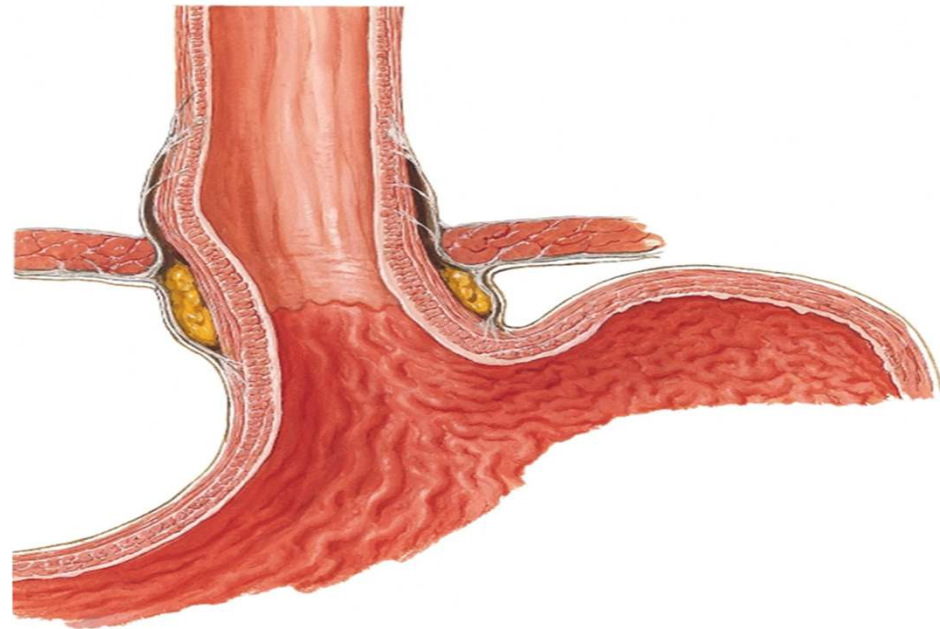
- Saliva provides dental hygiene and protection by washing away food remains from the teeth after digestion.
- It contains substances such as lysozyme, IgA and secretory protein complexes providing antibacterial protection.
- Saliva releases mercury and iodine in case of poisoning. Therefore, healthcare professionals inspect saliva to diagnose disorders.
- During embryological development, saliva stimulates the growth of taste buds and odontoblast differentiation

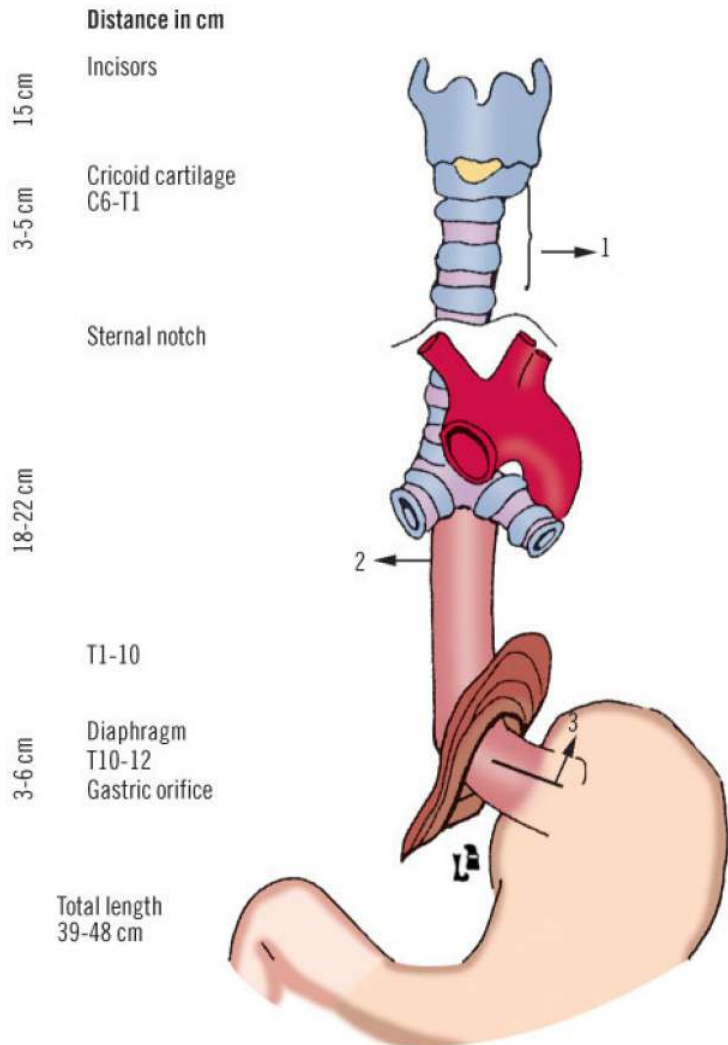
Inferior pharyngeal constrictor



Cricopharyngeus (a.k.a. upper esophageal sphincter)

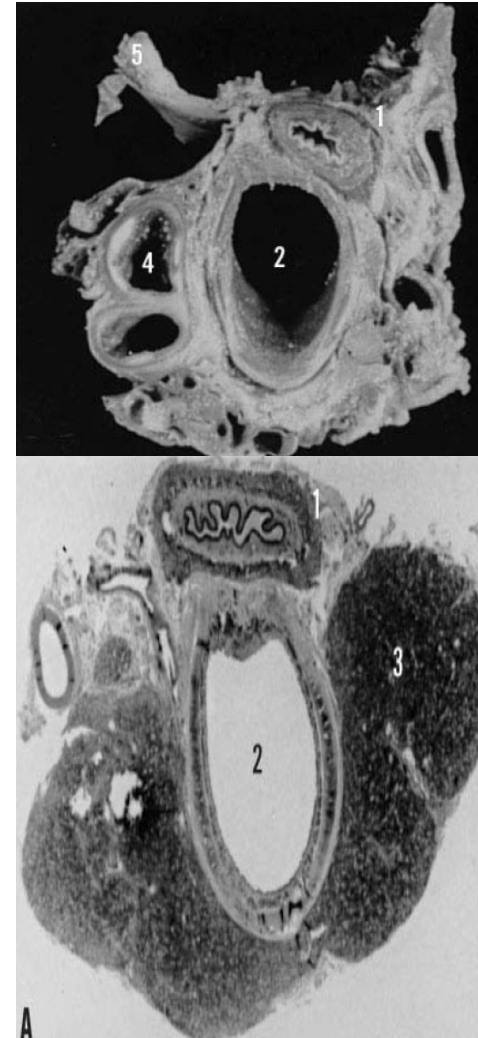
Lower esophageal sphincter

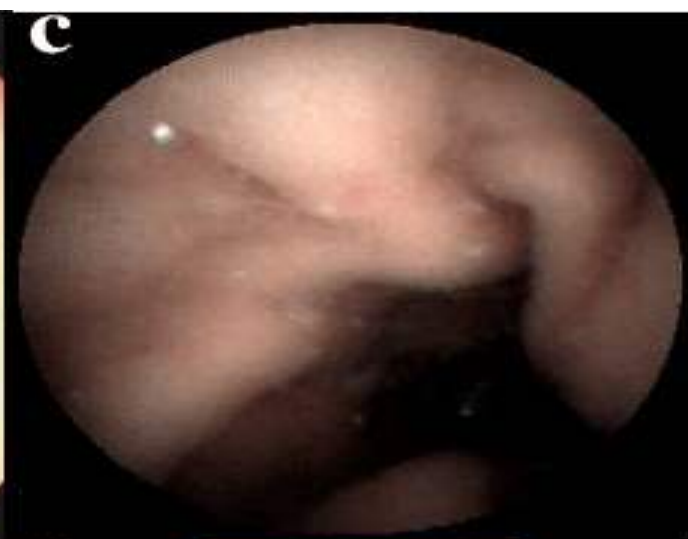




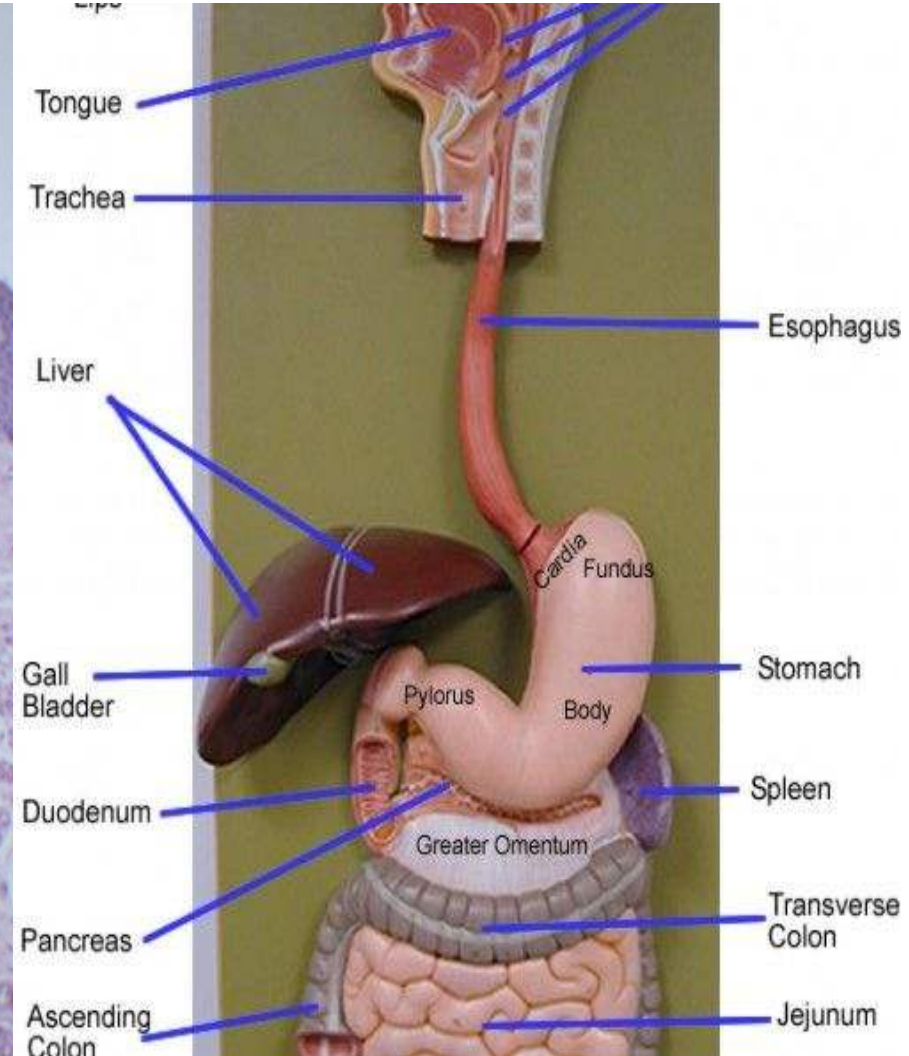
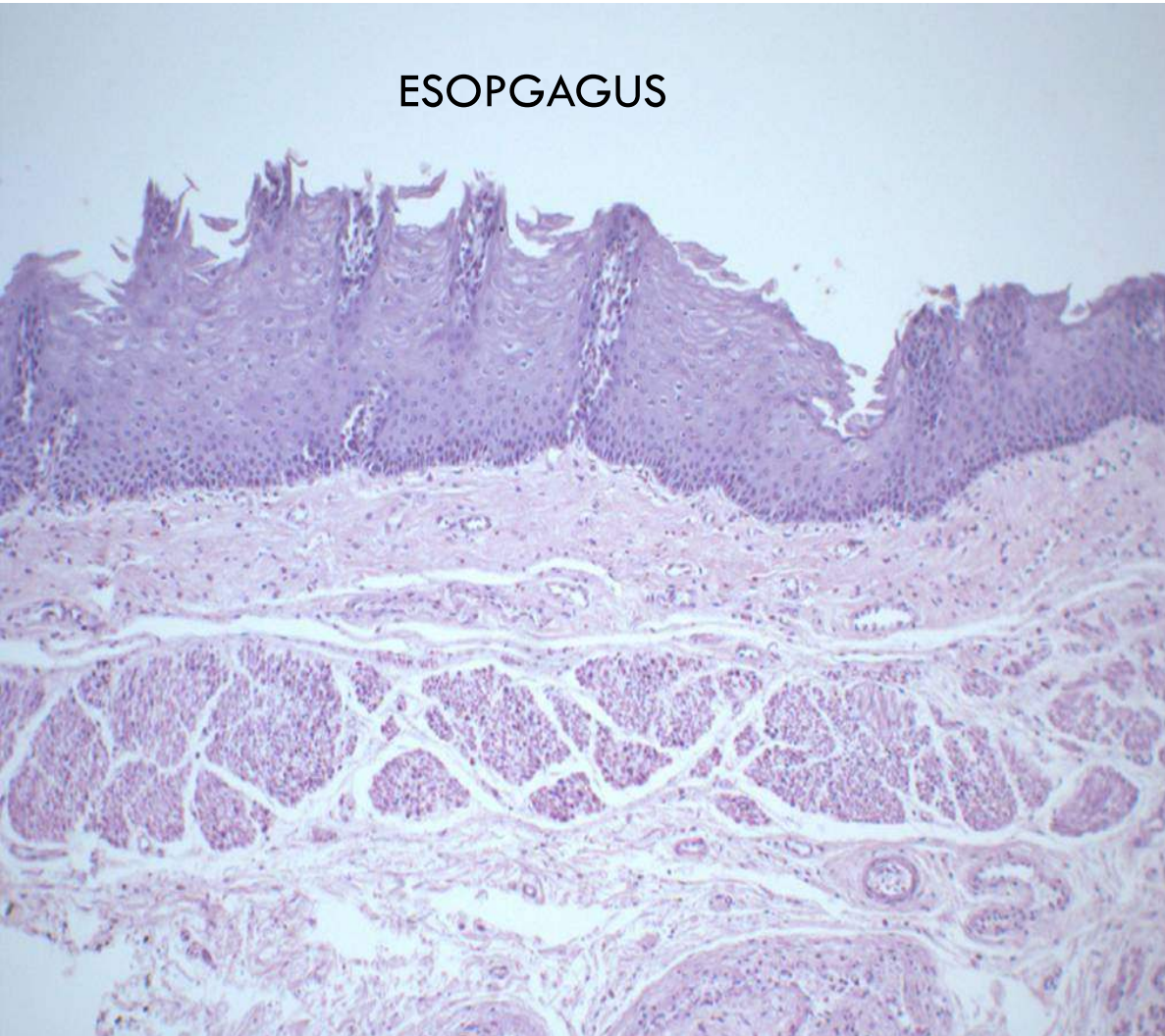
Terminology of esophageal sections in regard to

Anatomy ↓	Function ↓	Surgery ↓
cervical (1)	UES	proximal
thoracic (2)	tubular	cervical thoracic
(3) abdominal	LES	distal thoracic abdominal

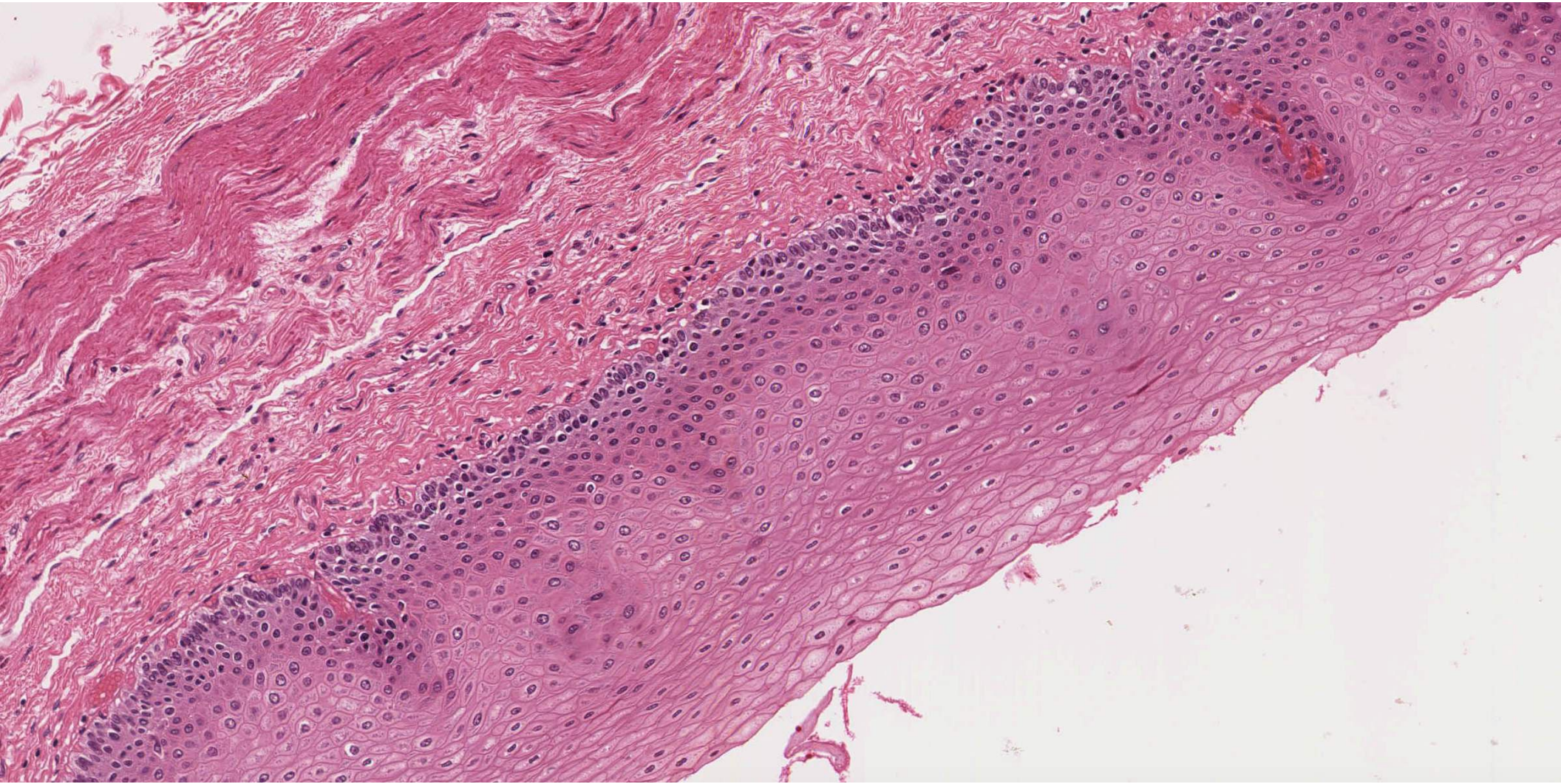


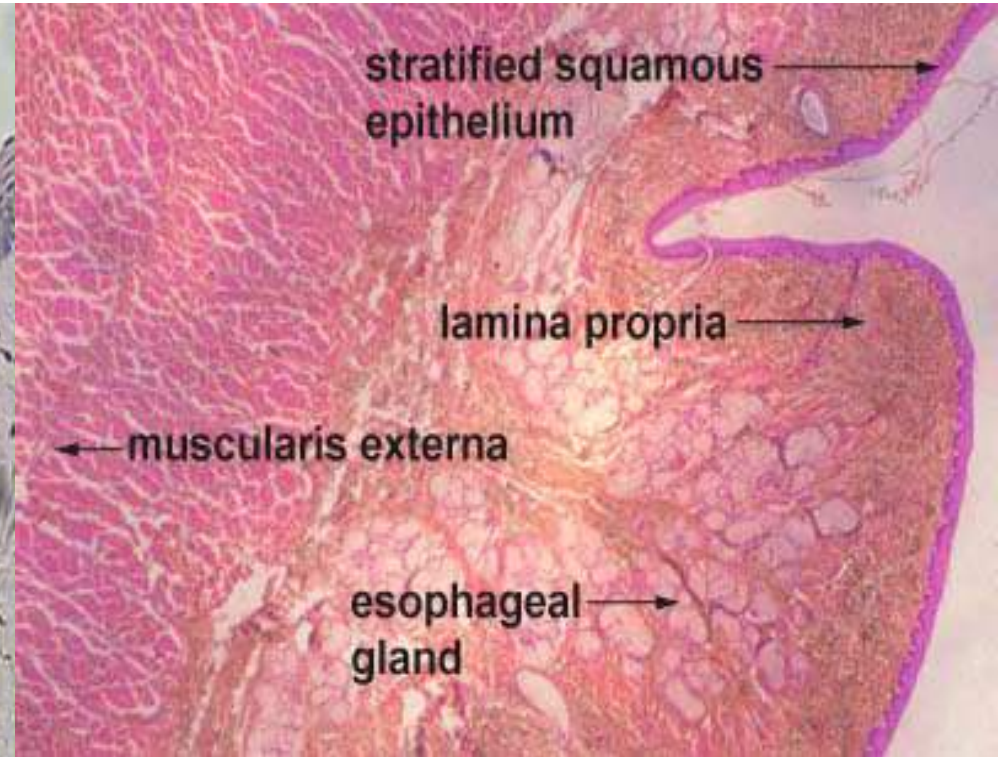
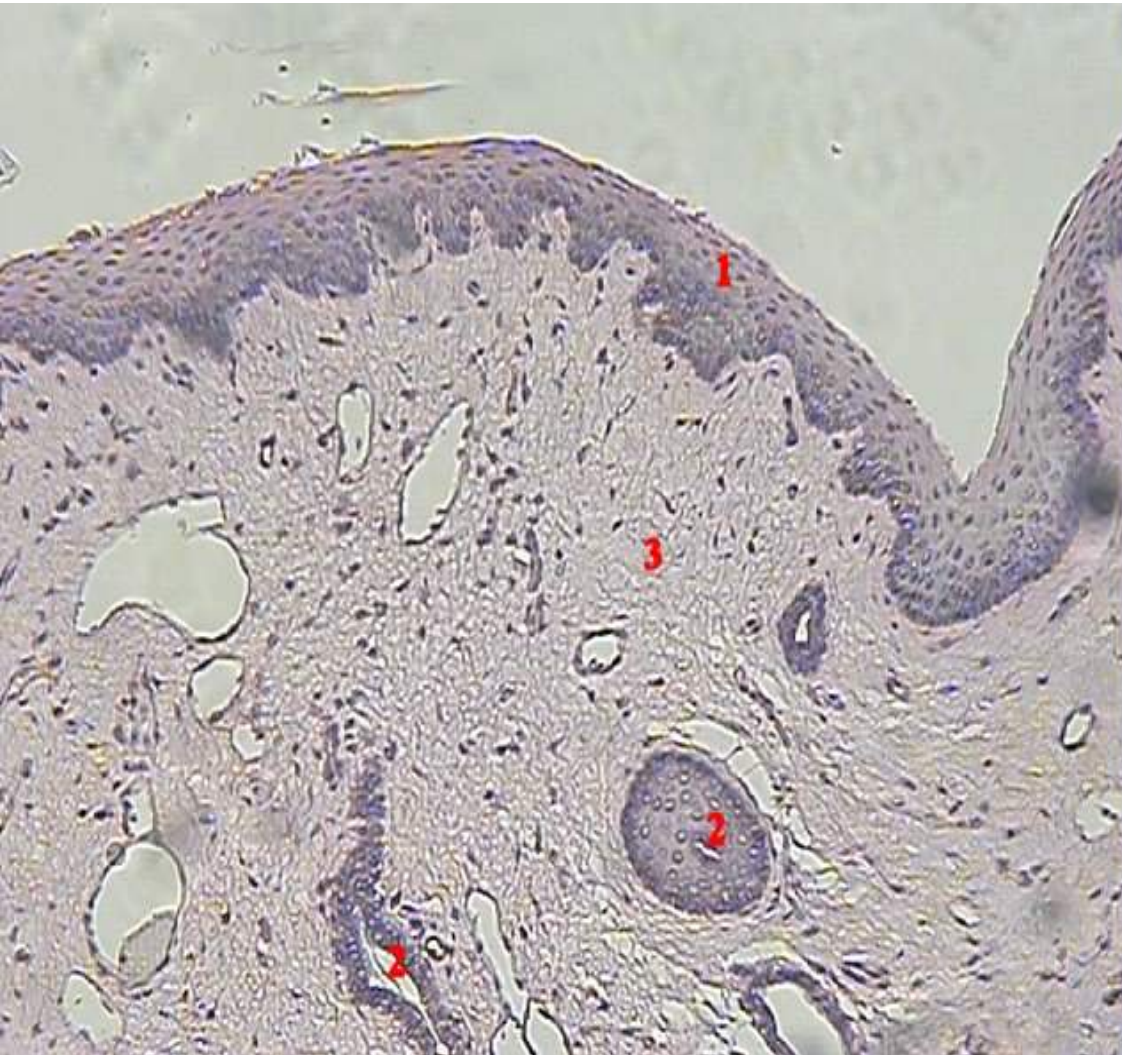


ESOPHAGUS





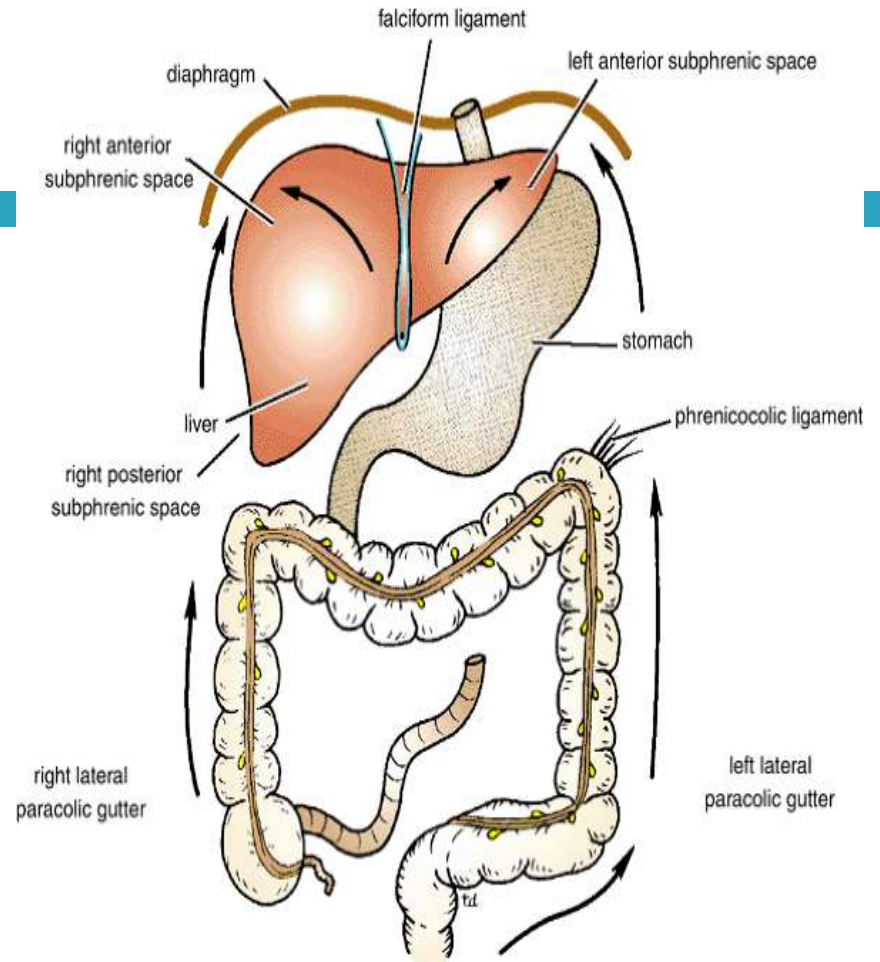




1. Stratified squamous epithelium
2. Mucous glands
3. Lamina propria

PERITONEAL CAVITY

Normal direction of flow of the peritoneal fluid from different parts of the peritoneal cavity to the subphrenic spaces



Intraperitoneal vs. Retroperitoneal

- Stomach
- Part 1 of duodenum
- Jejunum, Ileum
- Cecum, Appendix
- Transverse colon
- Sigmoid colon
- Liver, Gallbladder
- Tail of pancreas
- Spleen

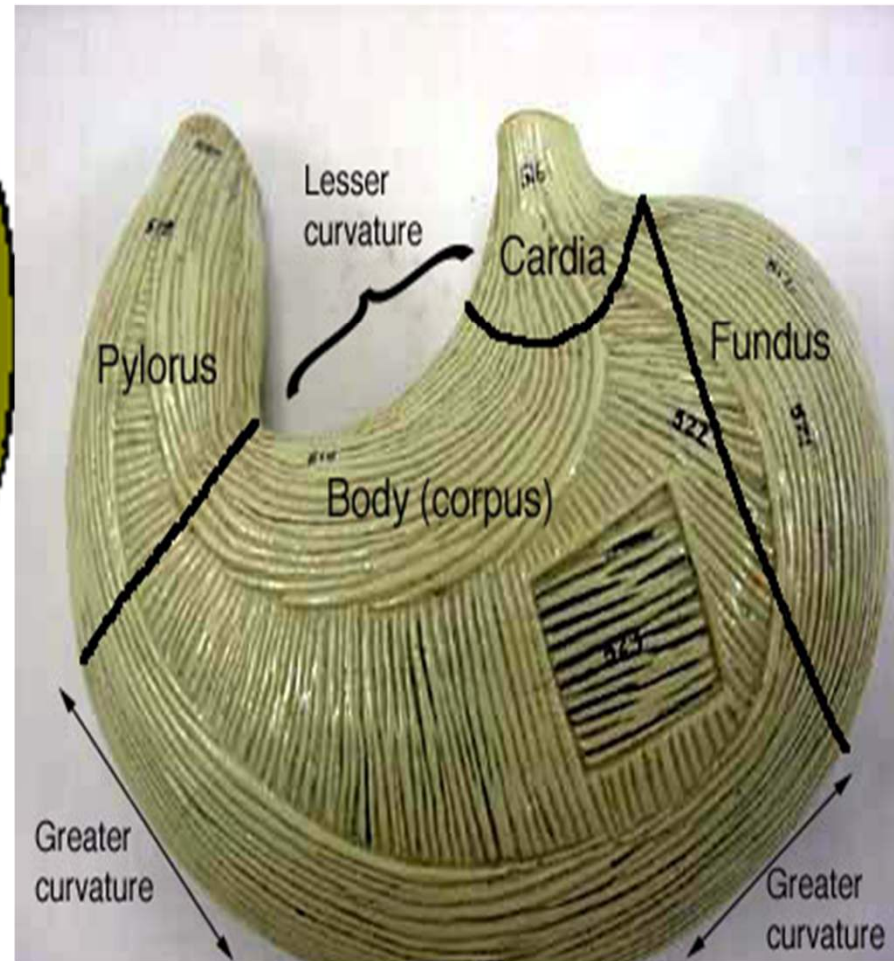
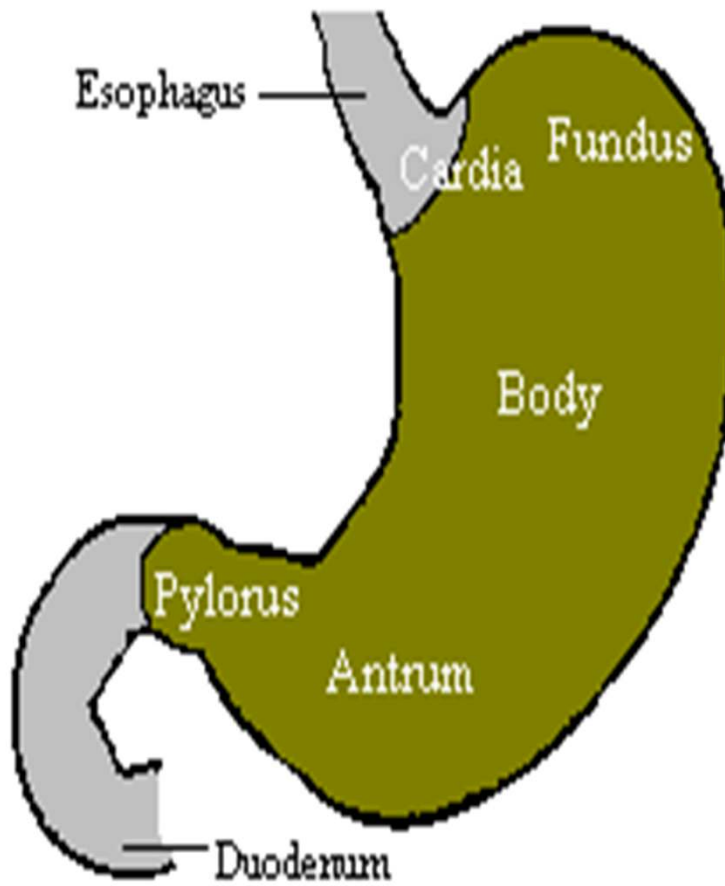
- Parts 2,3,4 duodenum
- Ascending, Descending colon
- Rectum
- Head, neck, body of pancreas
- Kidneys, ureters
- Suprarenal gland
- Abdominal Aorta
- Inferior vena cava

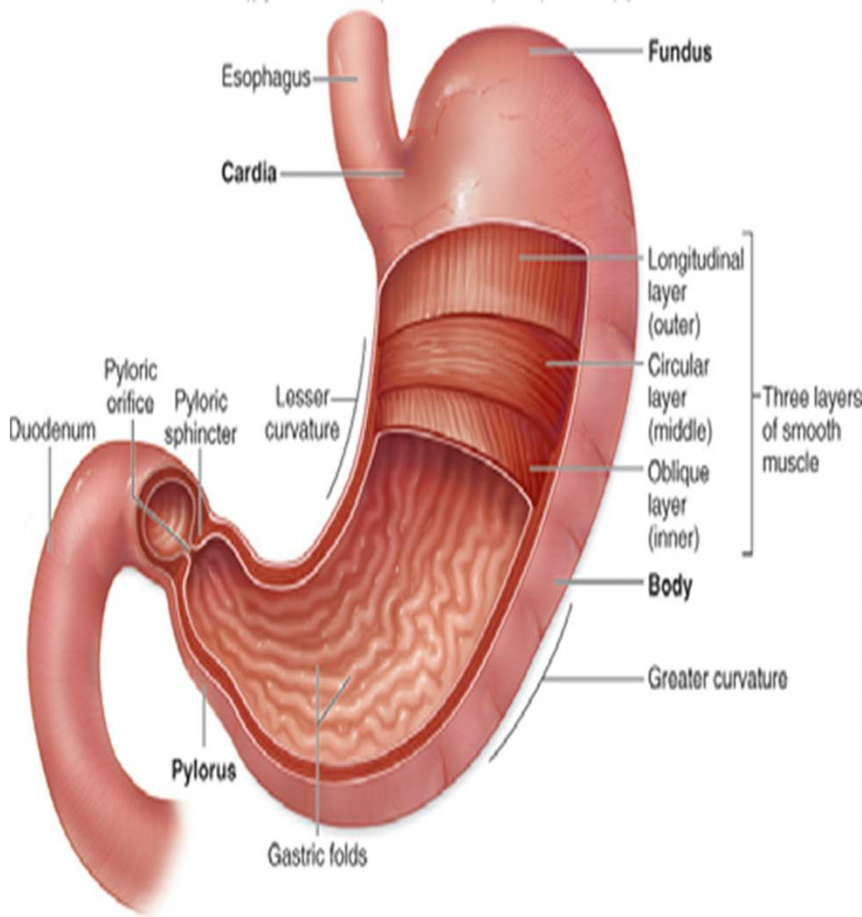
***Rule of Thumb:

If it has a mesentery or mesogastrium component => Intraperitoneal

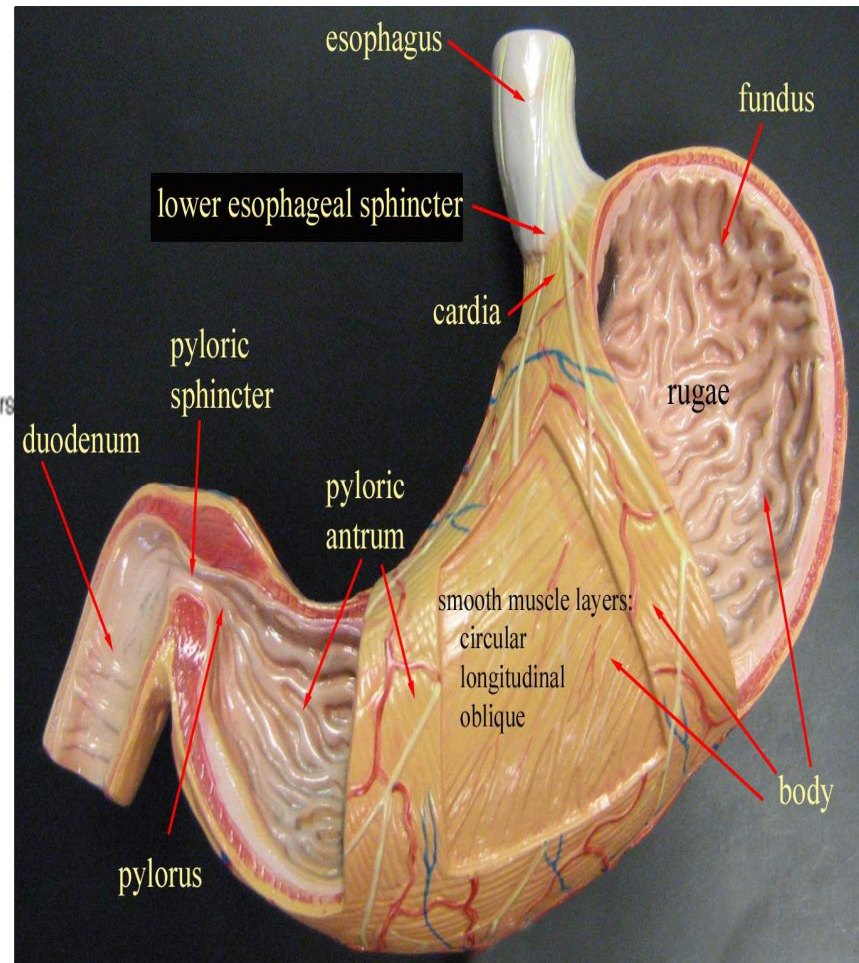
Abdominal quadrants

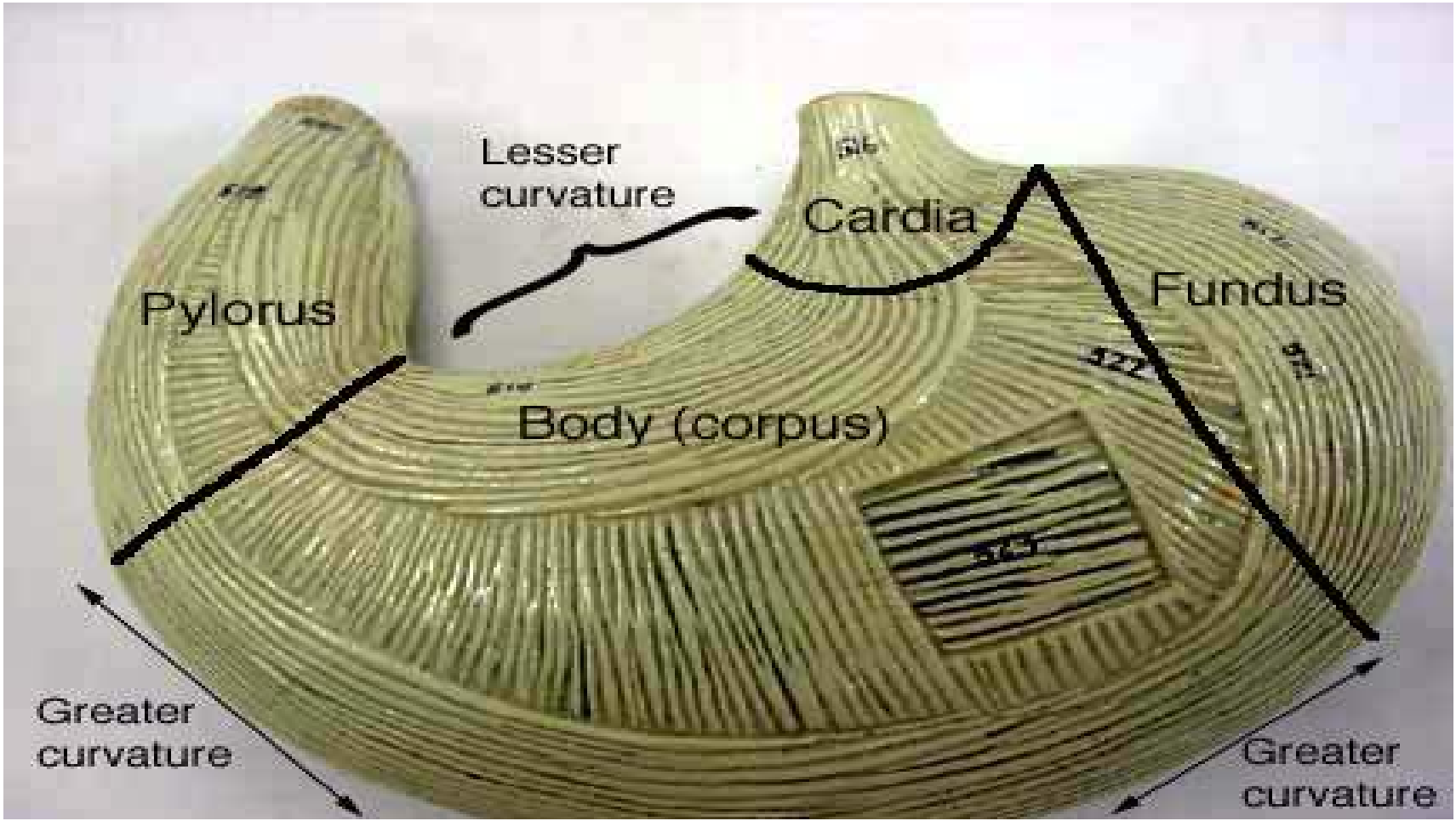
Right upper quadrant	Left upper quadrant
<p>Liver right lobe Gallbladder, stomach, pylorus, duodenum, Pancreas head, R suprarenal gland, R kidney, R colic flexure, Ascending colon superior part, Transverse colon R half.</p>	<p>Liver left lobe Spleen, stomach, jejunum, prox ileum, pancreas body and tail, left kidney, L suprarenal, left colic flexure, Transverse colon left part, descending colon superior part.</p>
Right lower quadrant	Left lower quadrant
<p>Cecum, Appendix, Ileum, Asc. Colon, R ovary, R uterine tube, R ureter, R spermatic cord, Uterus, Urinary bladder (full)</p>	<p>Sigmoid colon, Desc. Colon, L ovary, L uterine tube, L ureter, L spermatic cord, Uterus enlarge, Urinary bladder (full).</p>





(a)





Pylorus

Lesser curvature

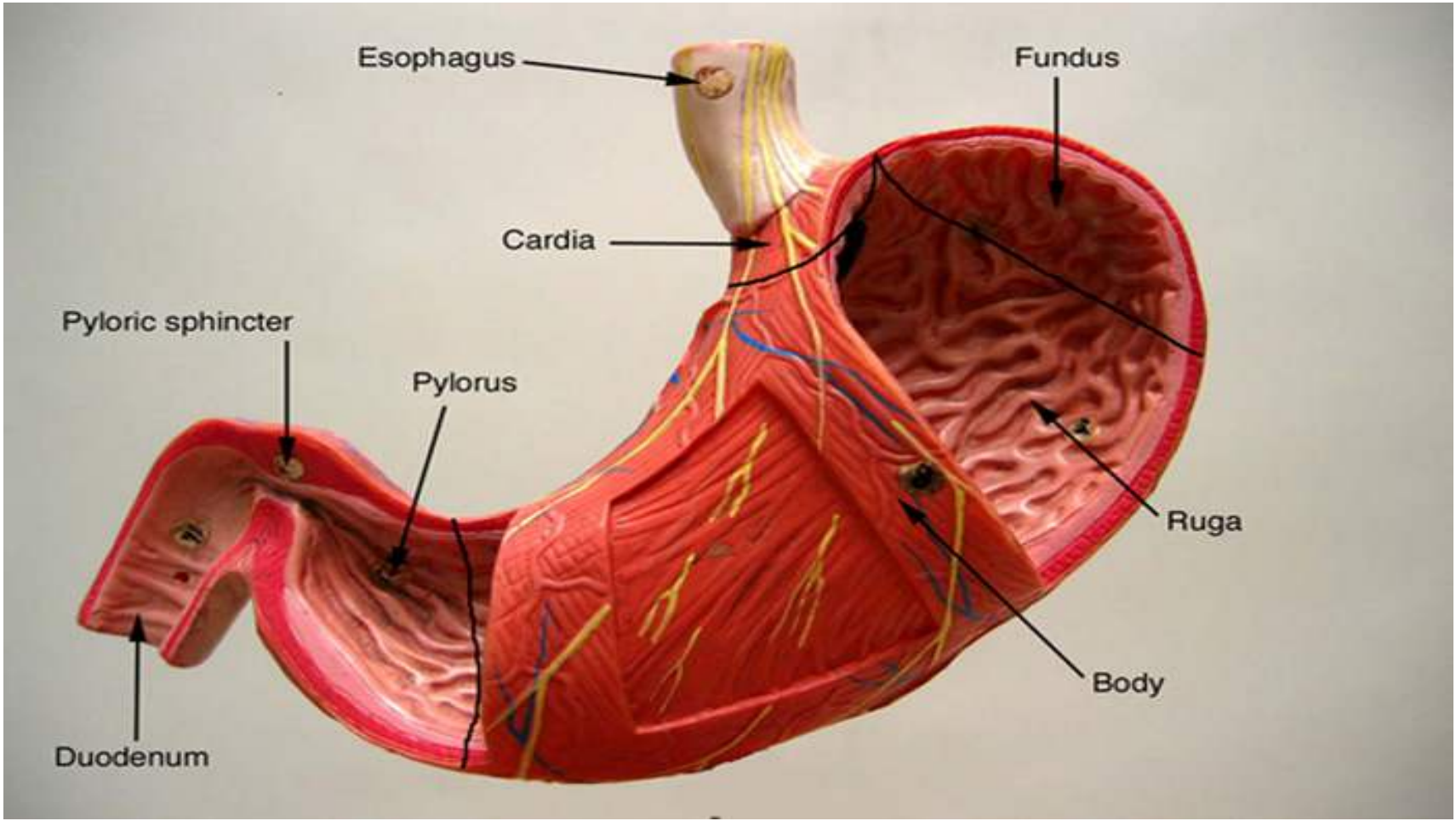
Cardia

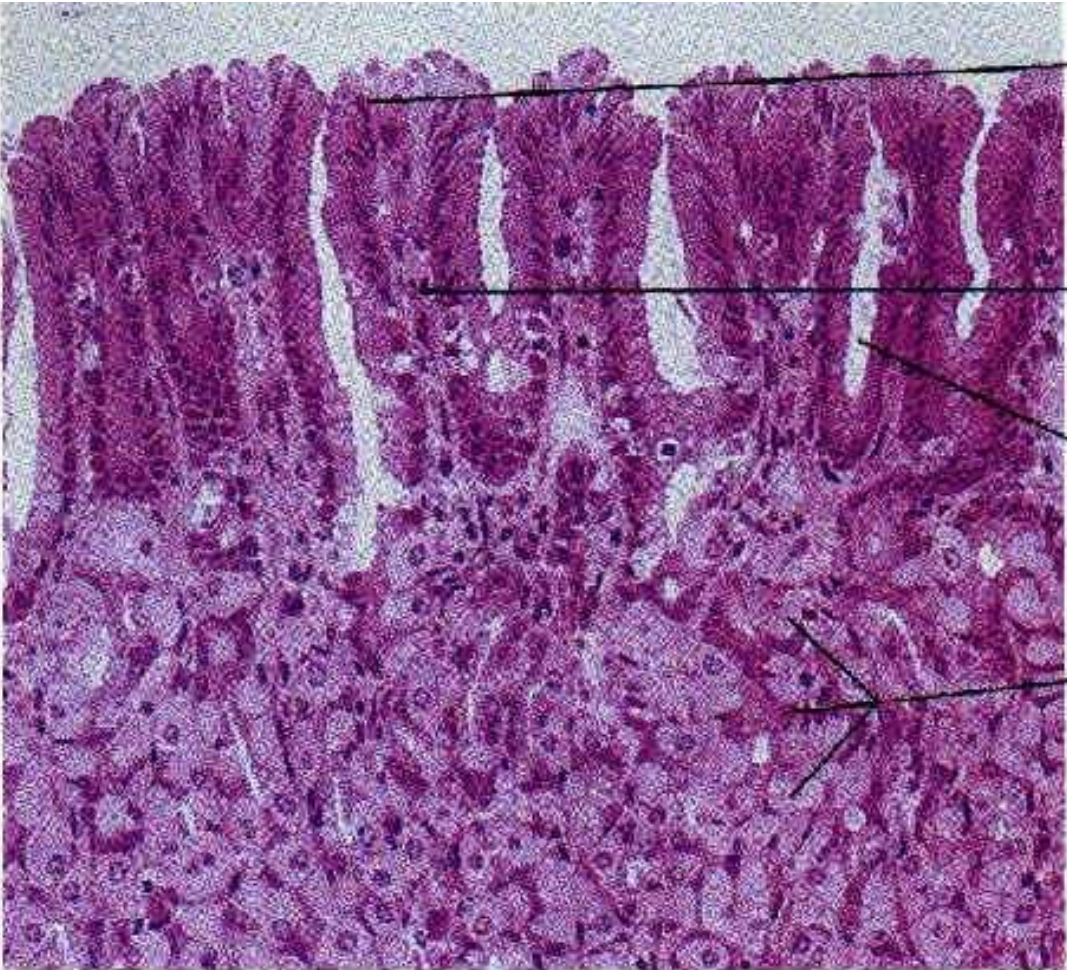
Fundus

Body (corpus)

Greater curvature

Greater curvature





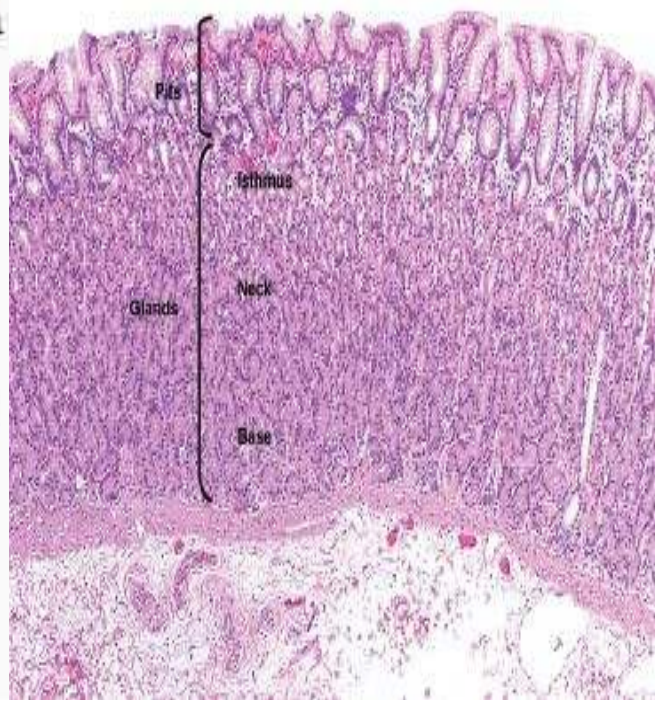
Simple columnar epithelium

Lamina propria

Gastric pit

Gastric glands

Stomach pits



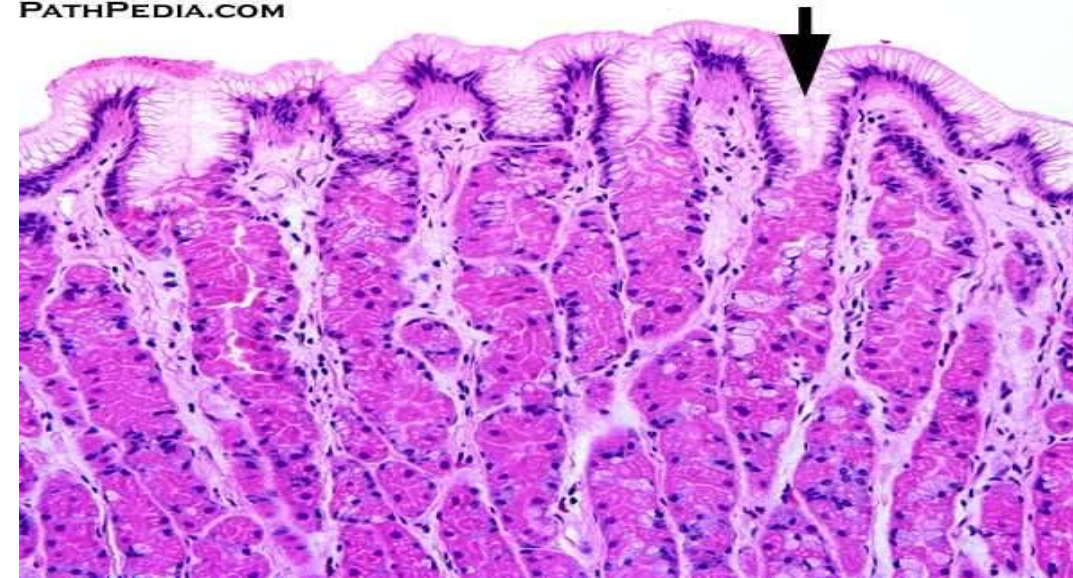
Pits

Isthmus

Neck

Base

Glands



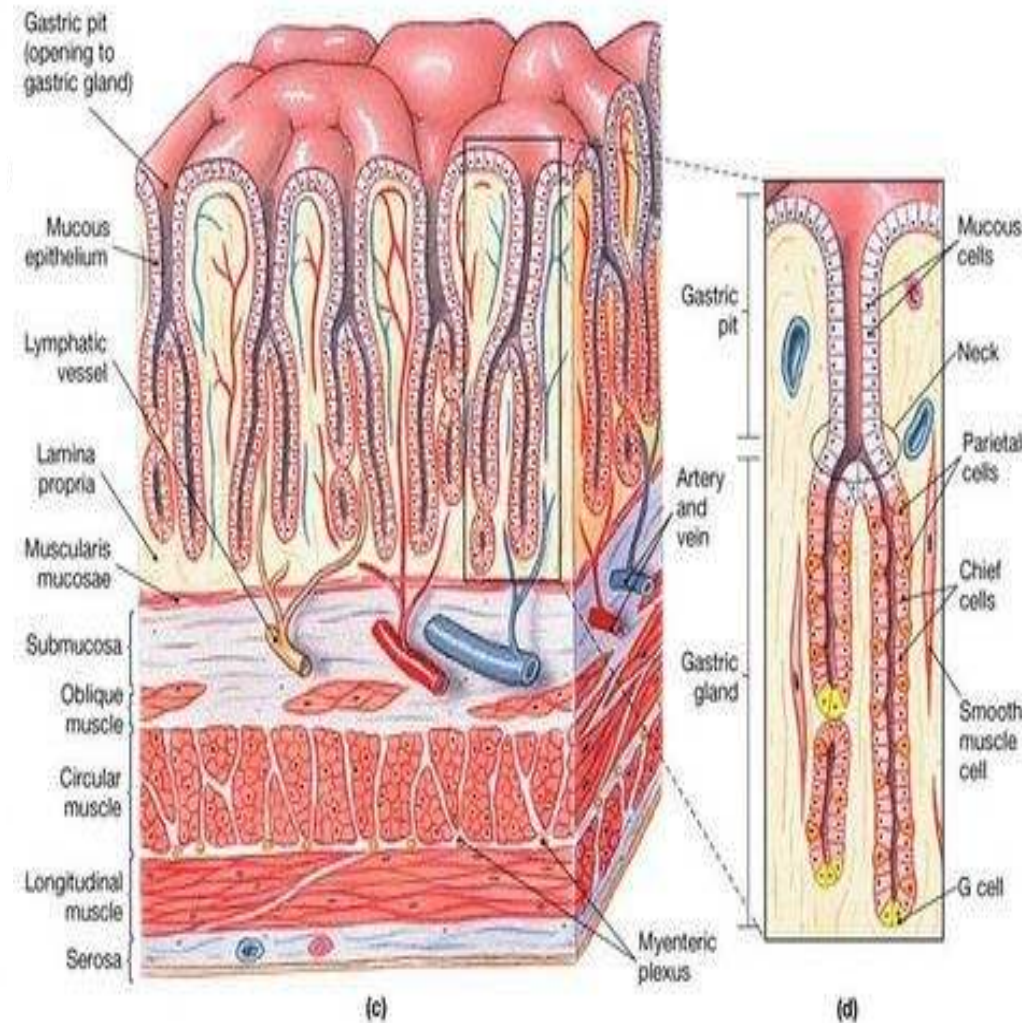
Four major types of secretory epithelial cells cover the surface of the stomach and extend down into gastric pits and glands:

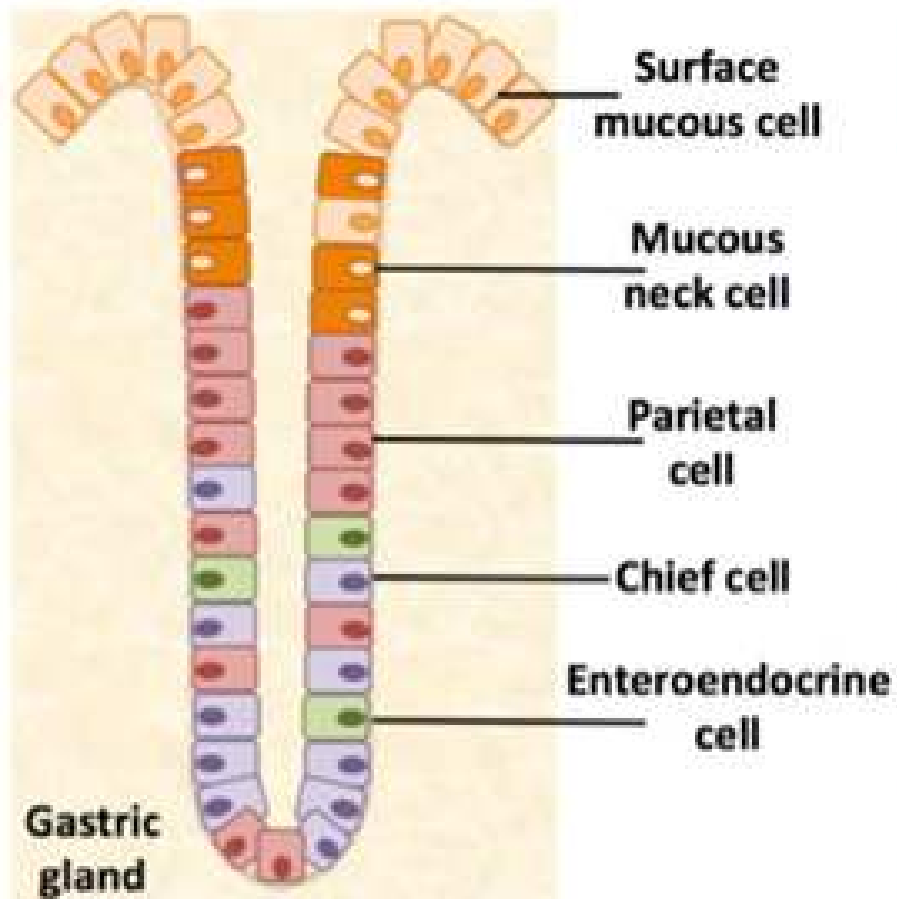
Mucous cells: secrete an alkaline mucus that protects the epithelium against shear stress and acid

Parietal cells: secrete hydrochloric acid

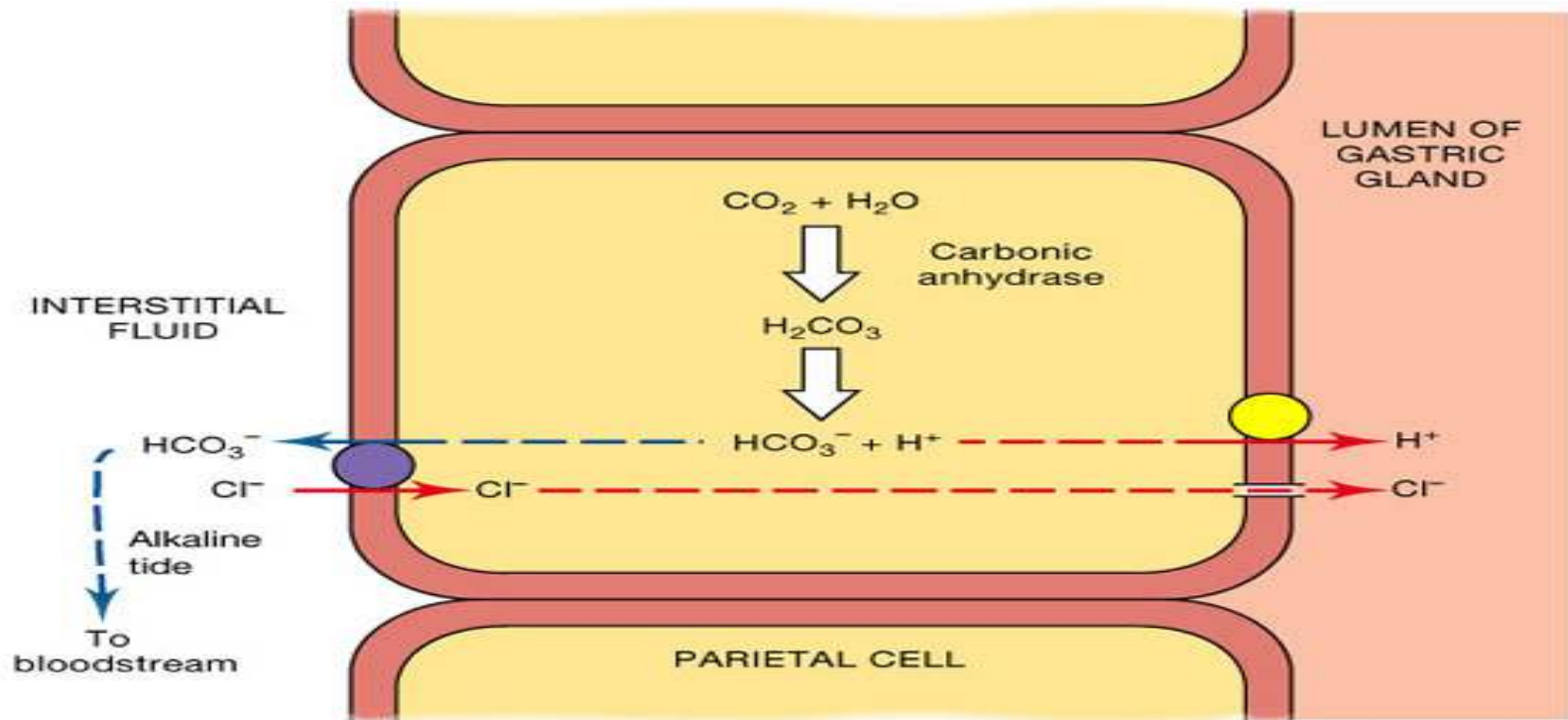
Chief cells: secrete pepsin, a proteolytic enzyme

G cells: secrete the hormone gastrin

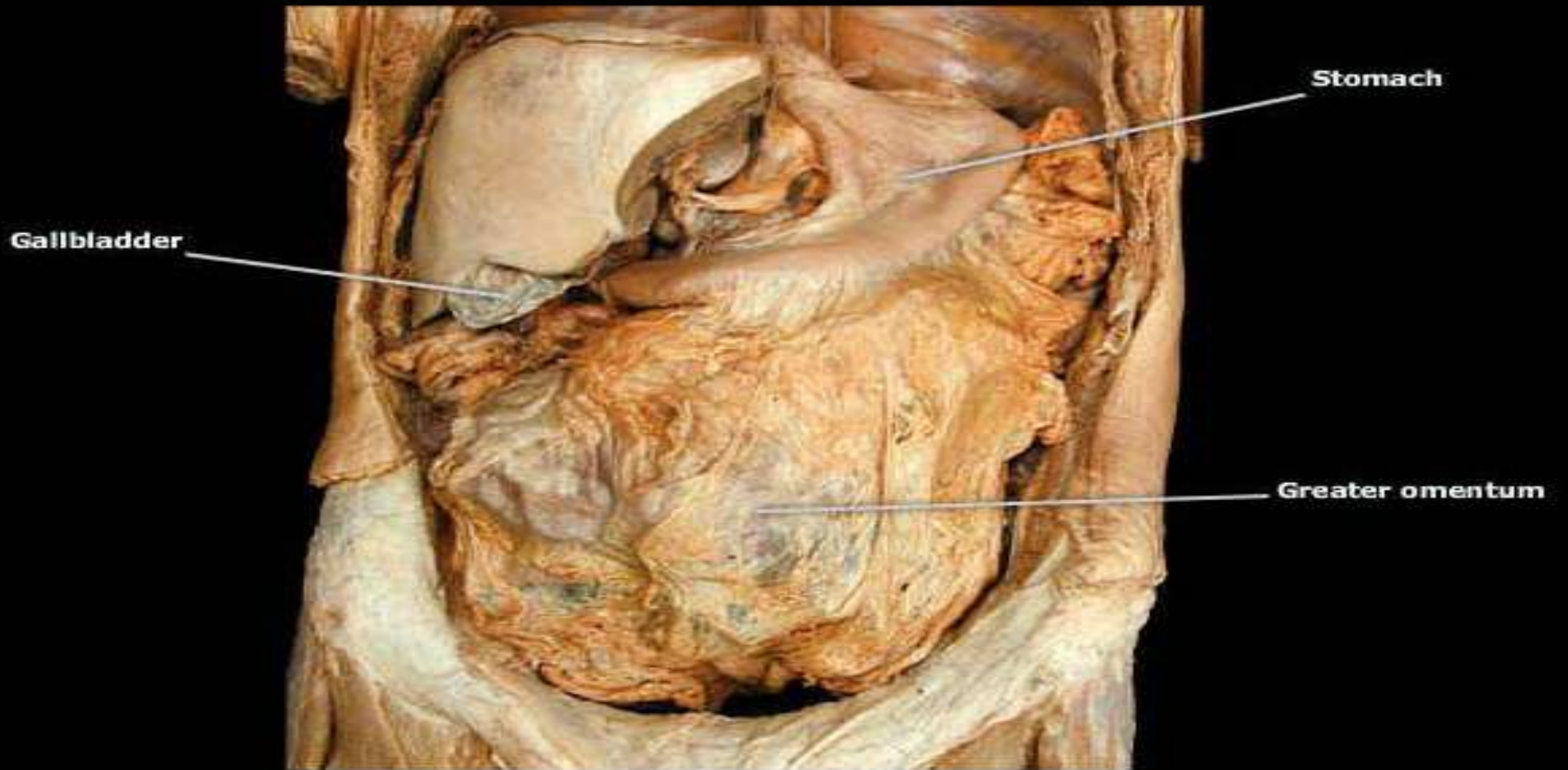




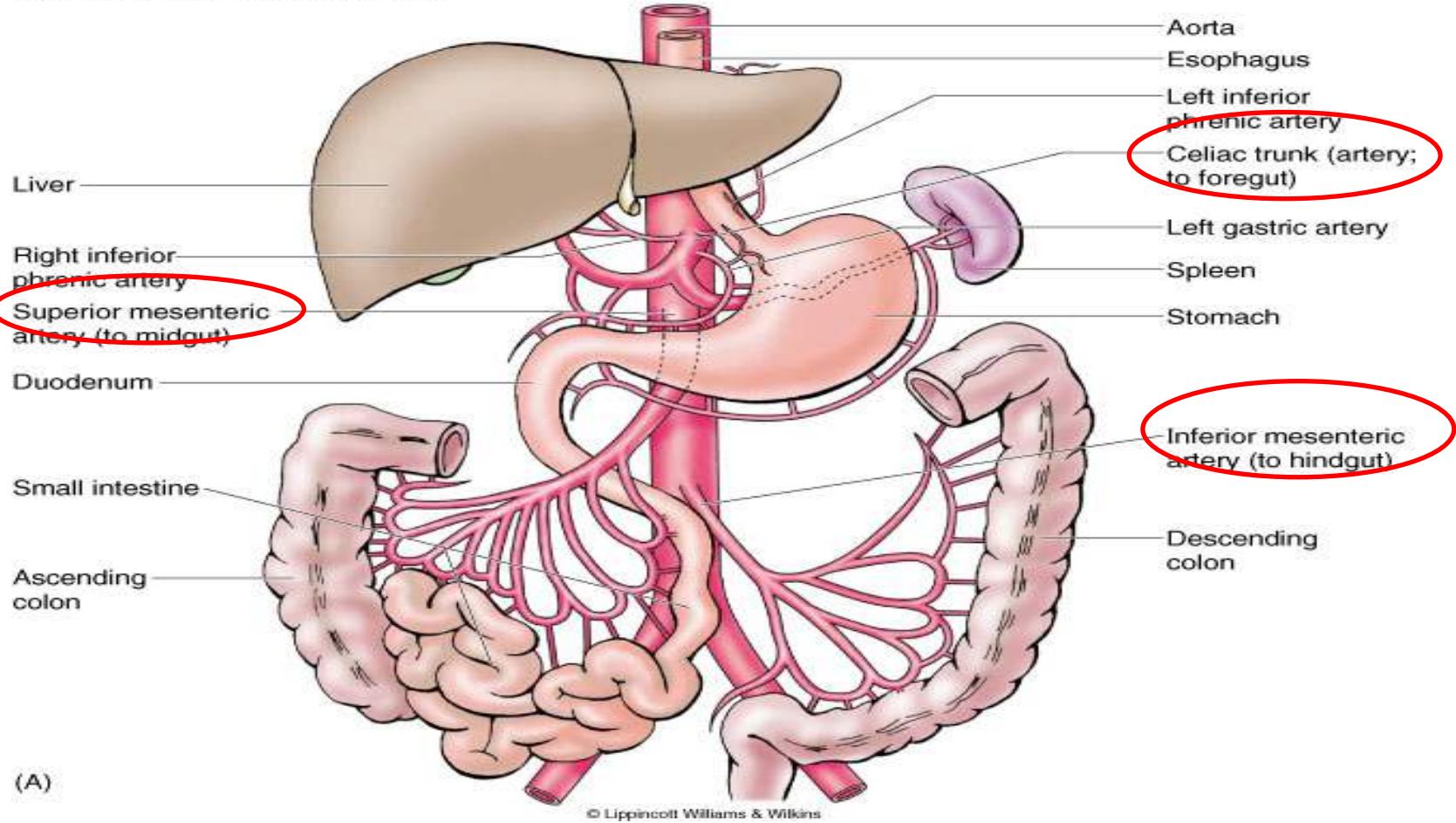
Cells of the gastric glands	Secretory products
Surface mucous cells	Mucin in an alkaline fluid
Mucous neck cells	Mucin in an acidic fluid
Parietal cells	HCl & intrinsic factor
Chief cells	Pepsinogen & lipase
G cells/enteroendocrine cells	Gastrin



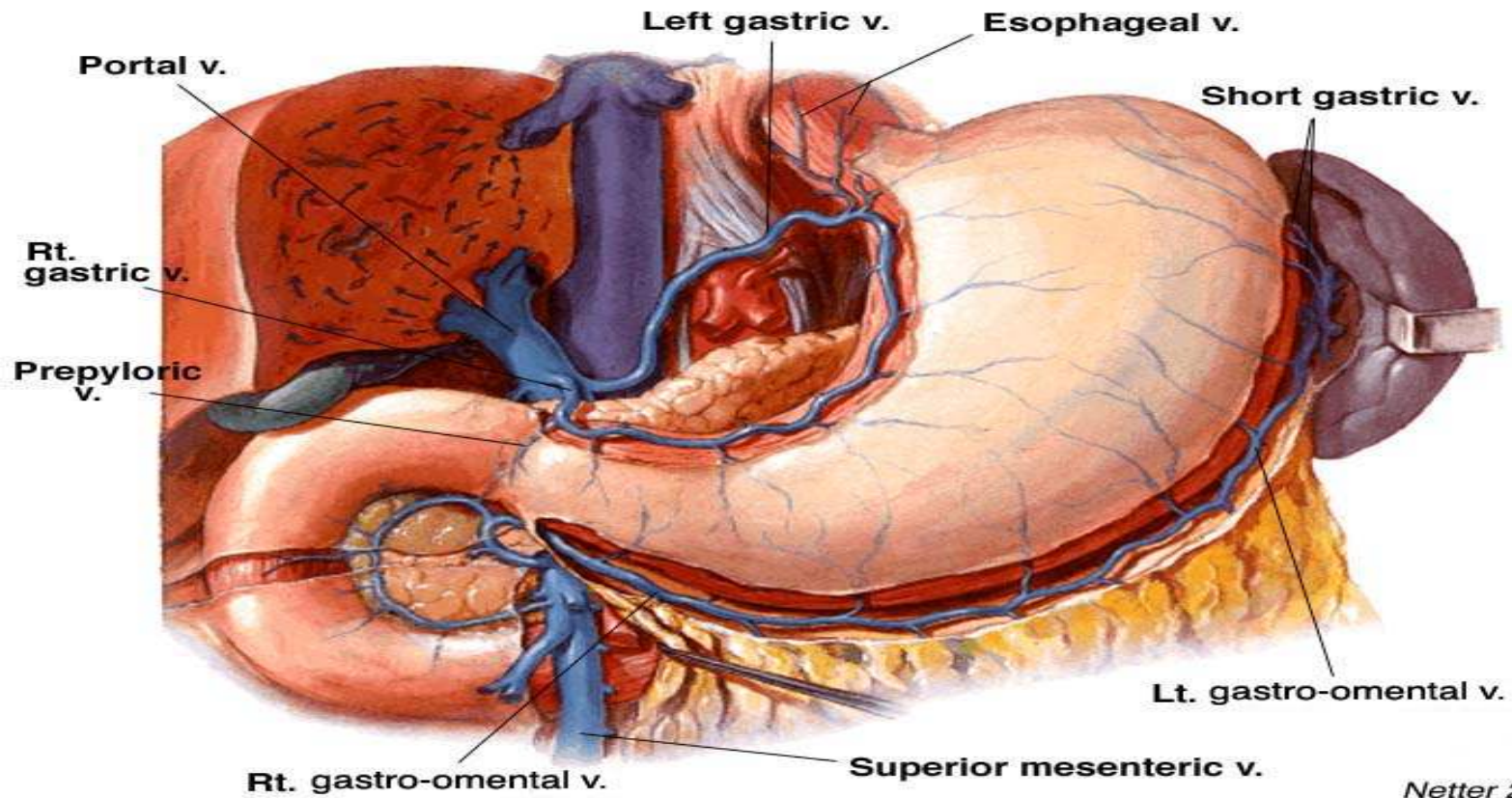
Stomach and greater omentum



2.28. Arterial supply of the GI tract.

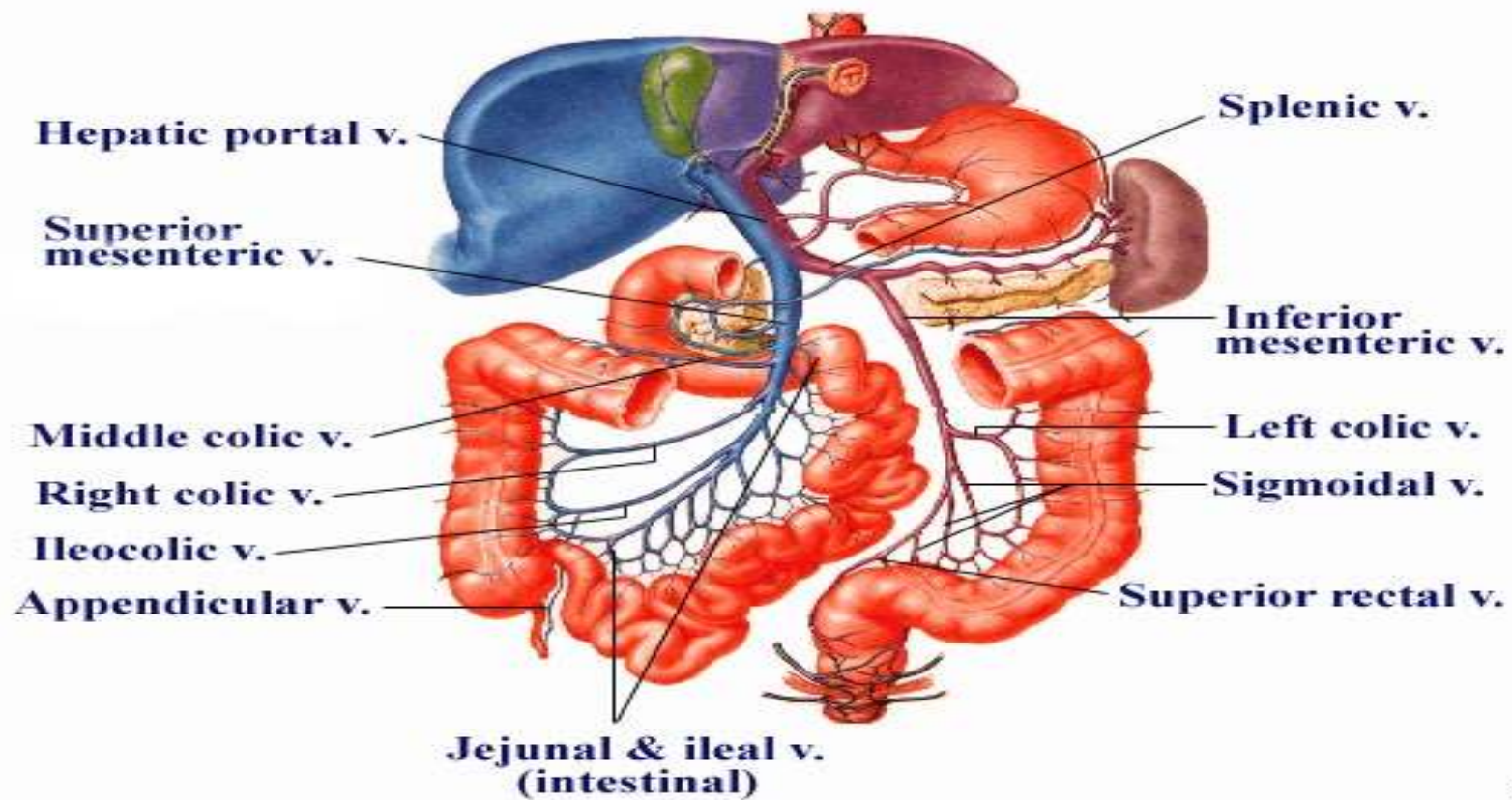


Veins of the stomach:

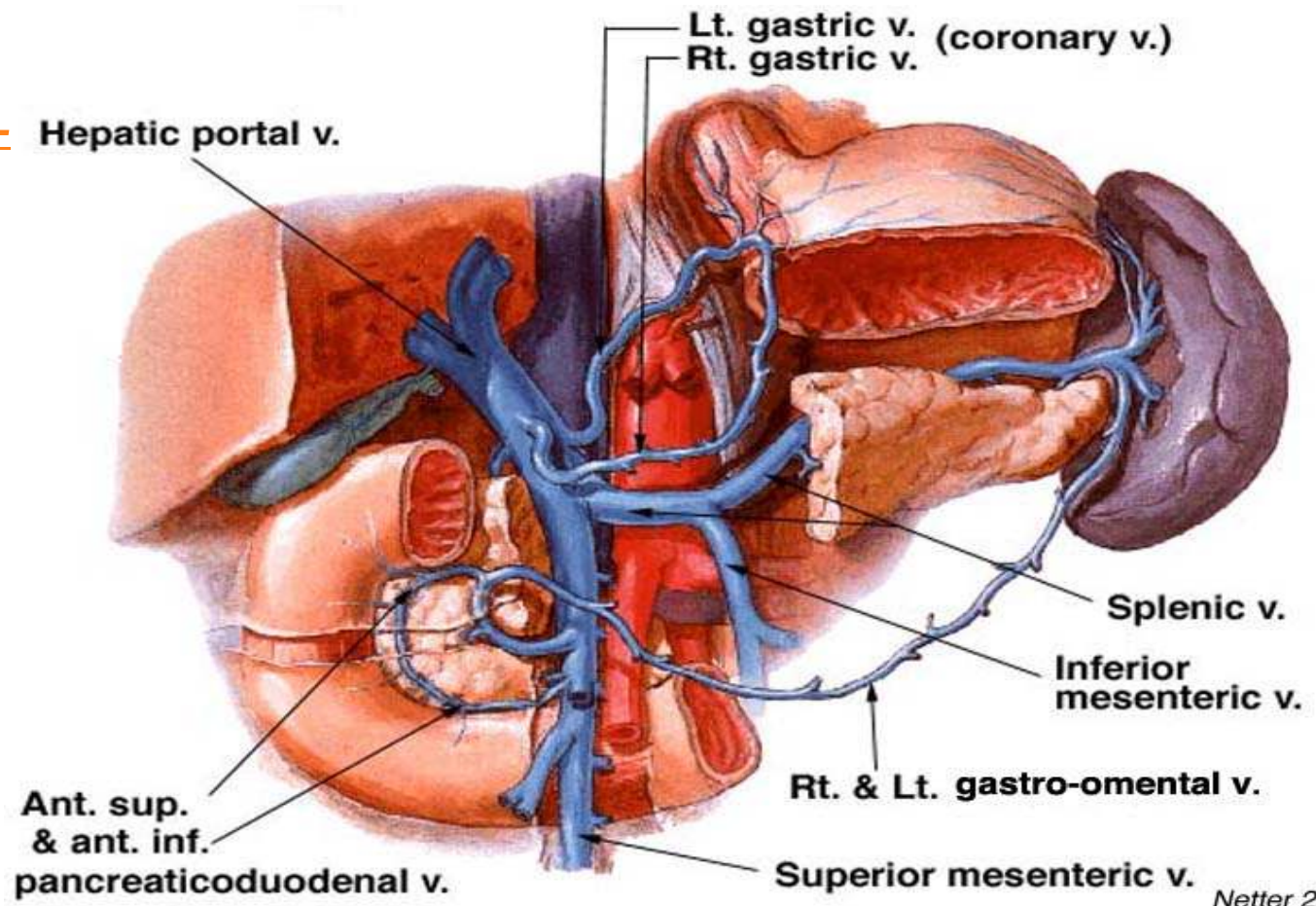


Netter 290A

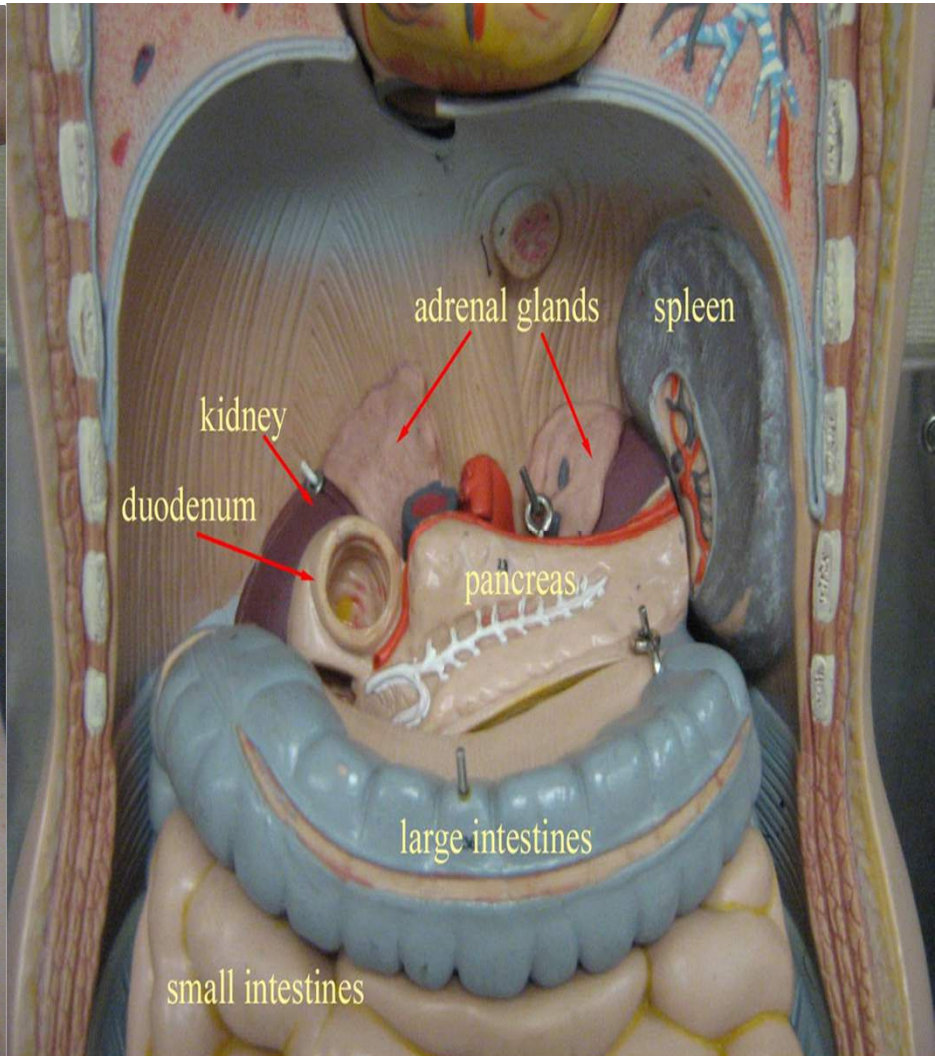
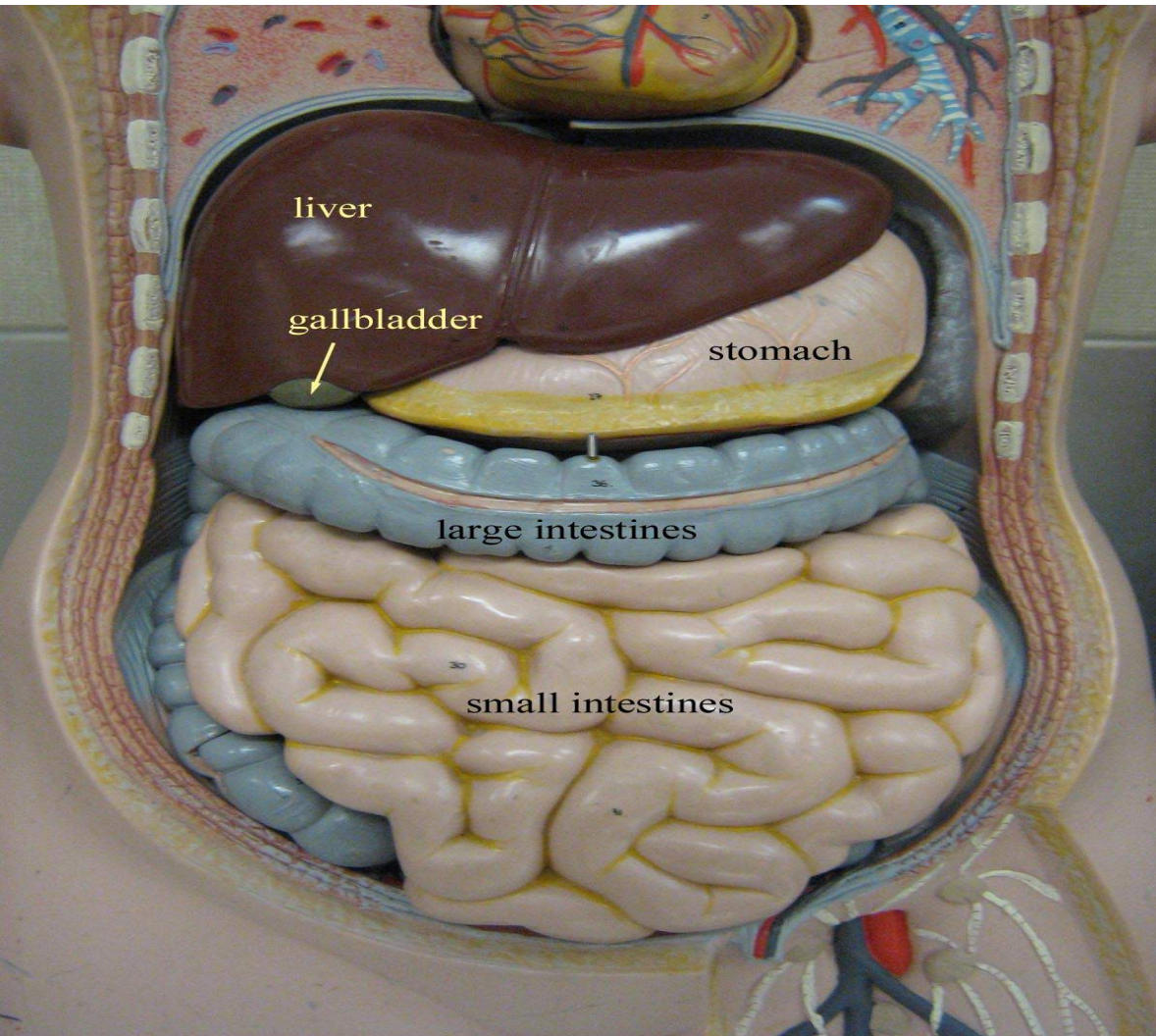
Veins of small and large intestines

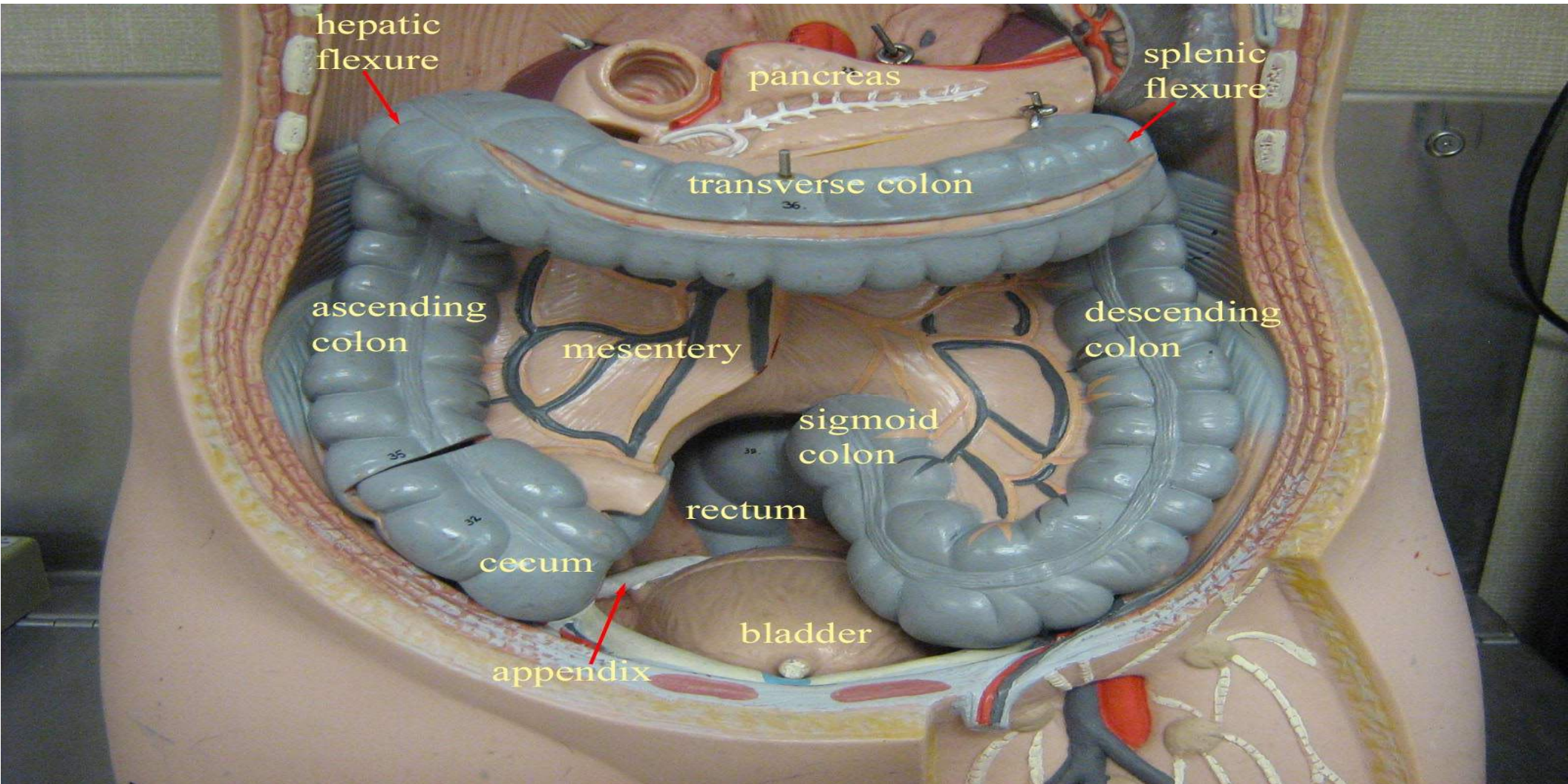


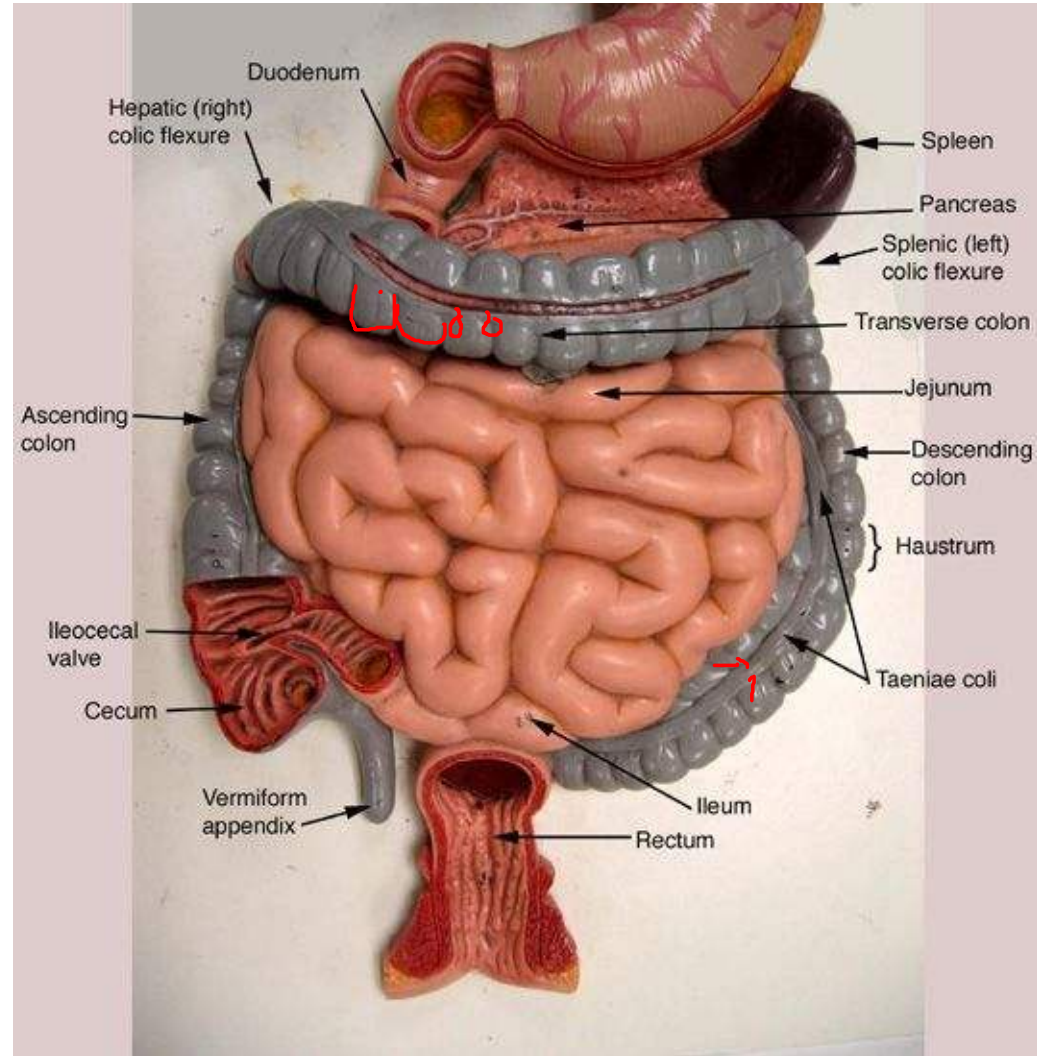
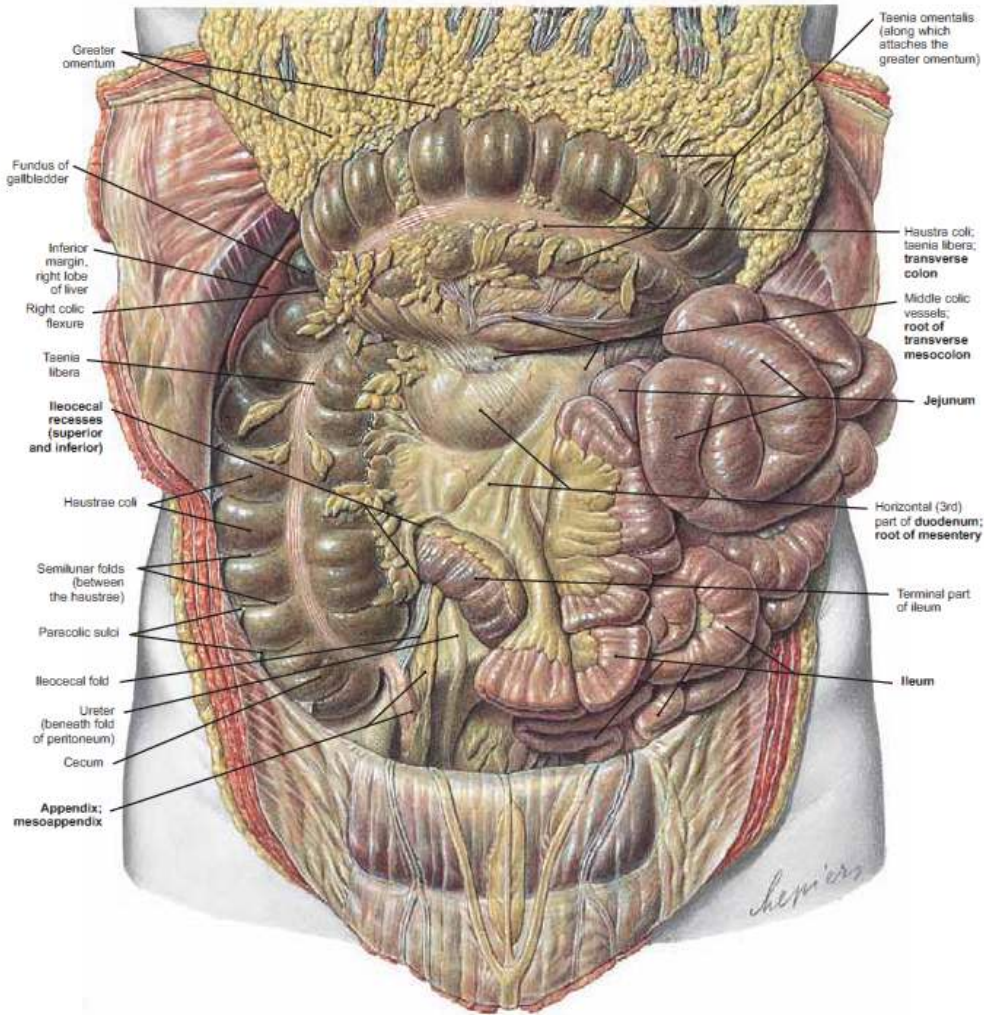
Portal vein :-



Netter 290B



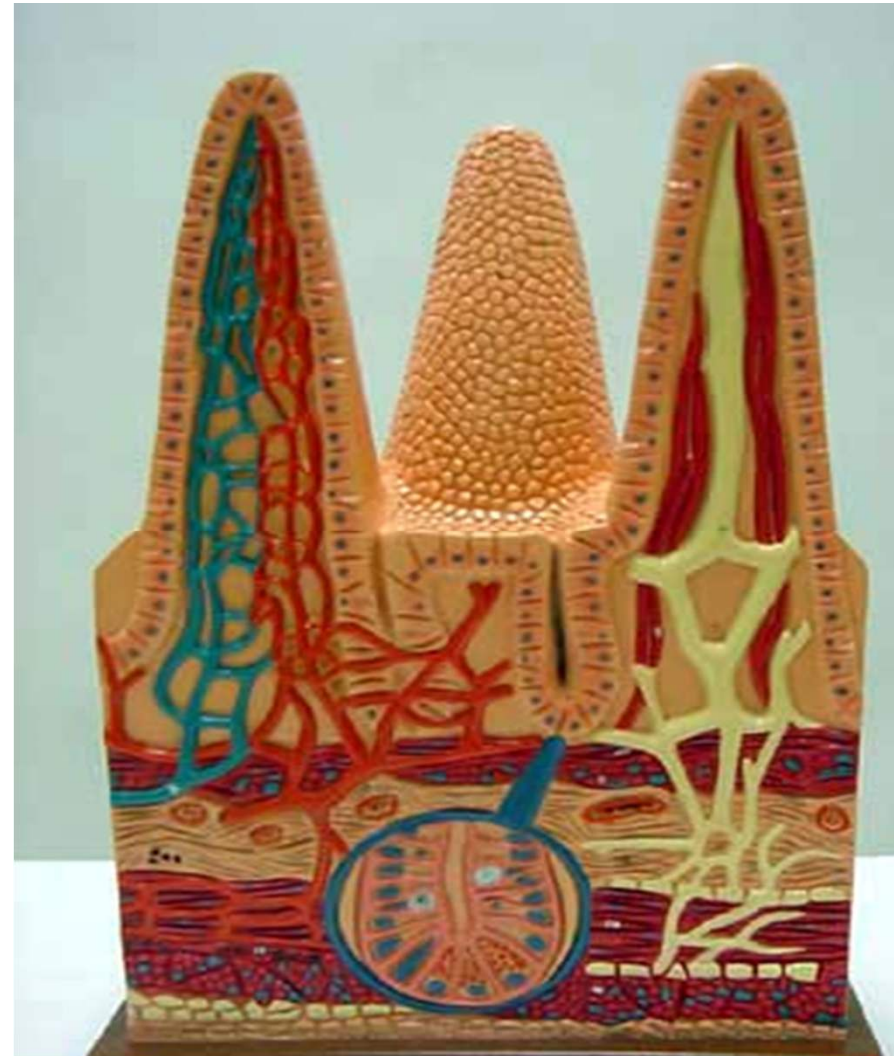
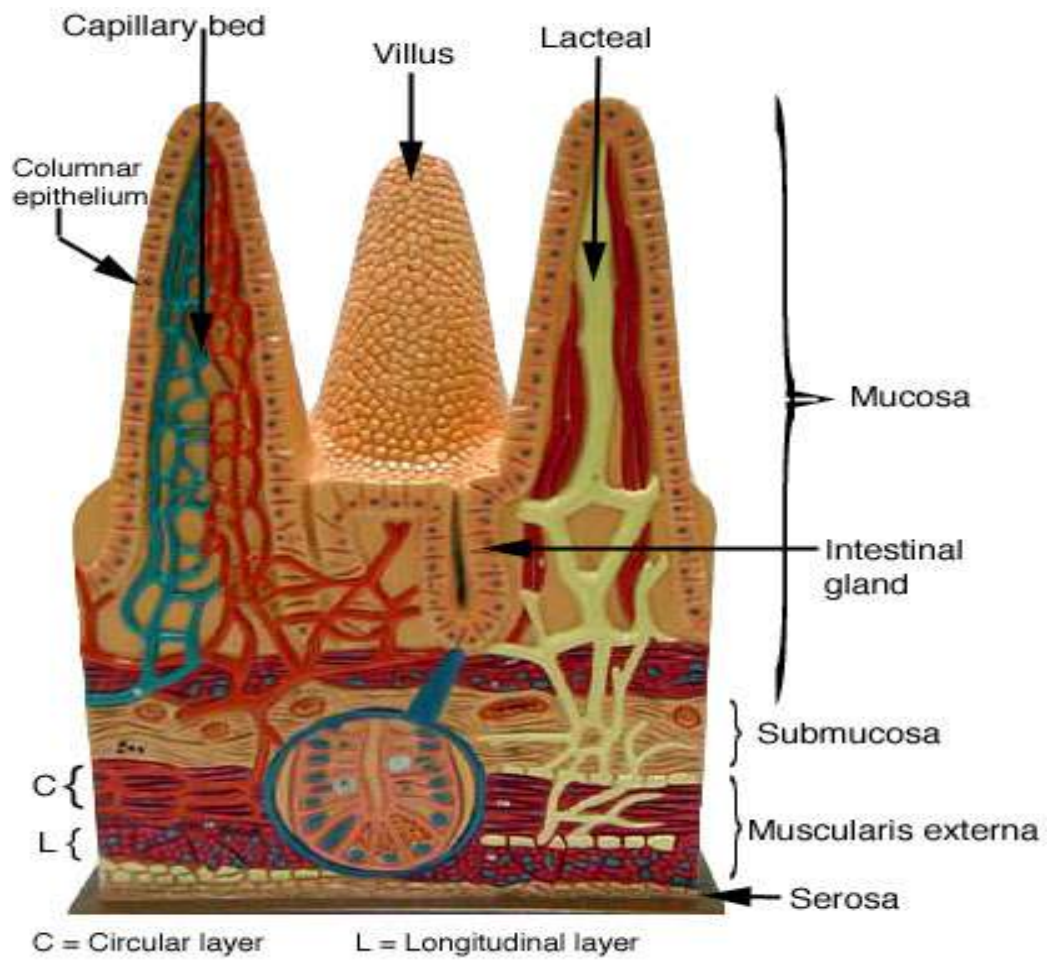


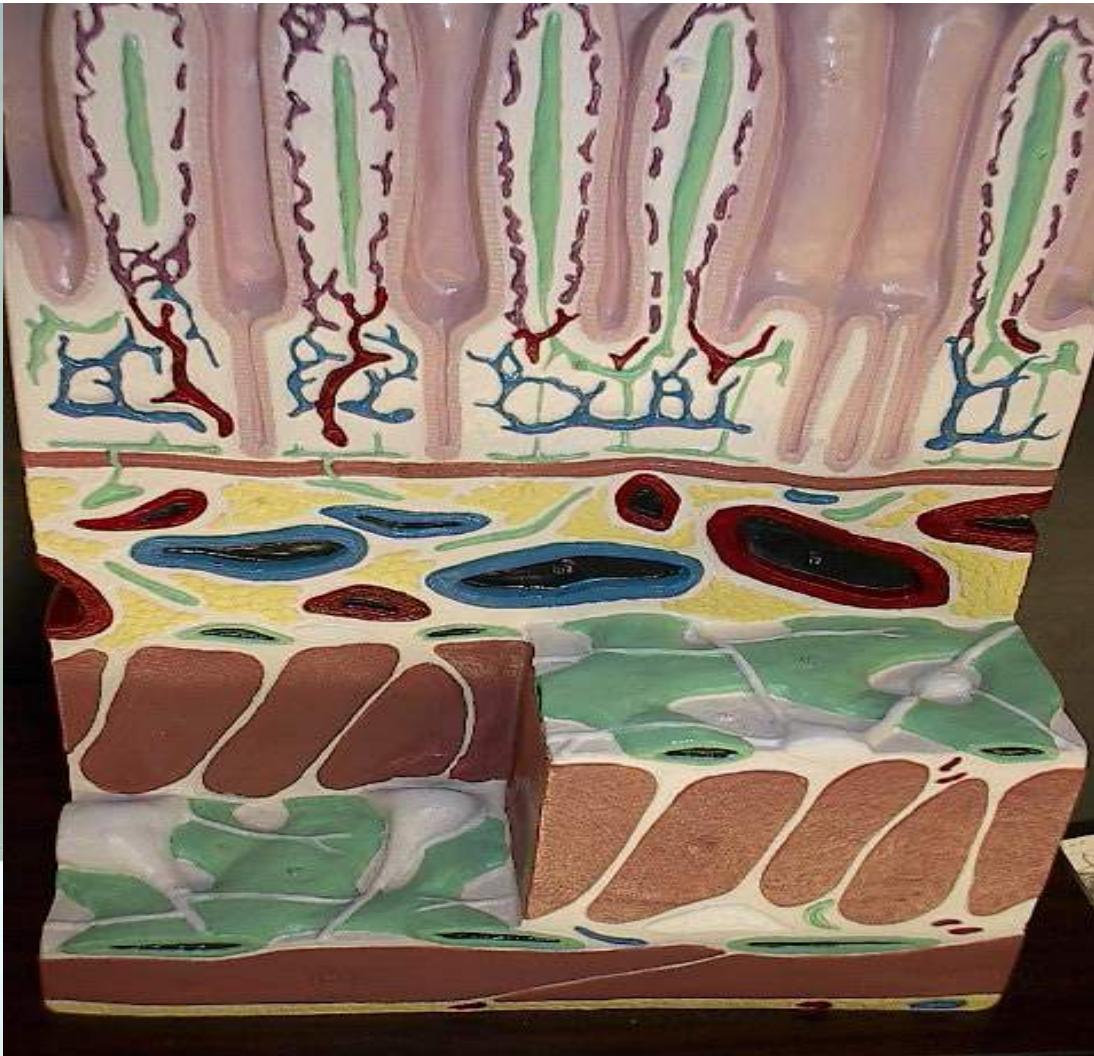


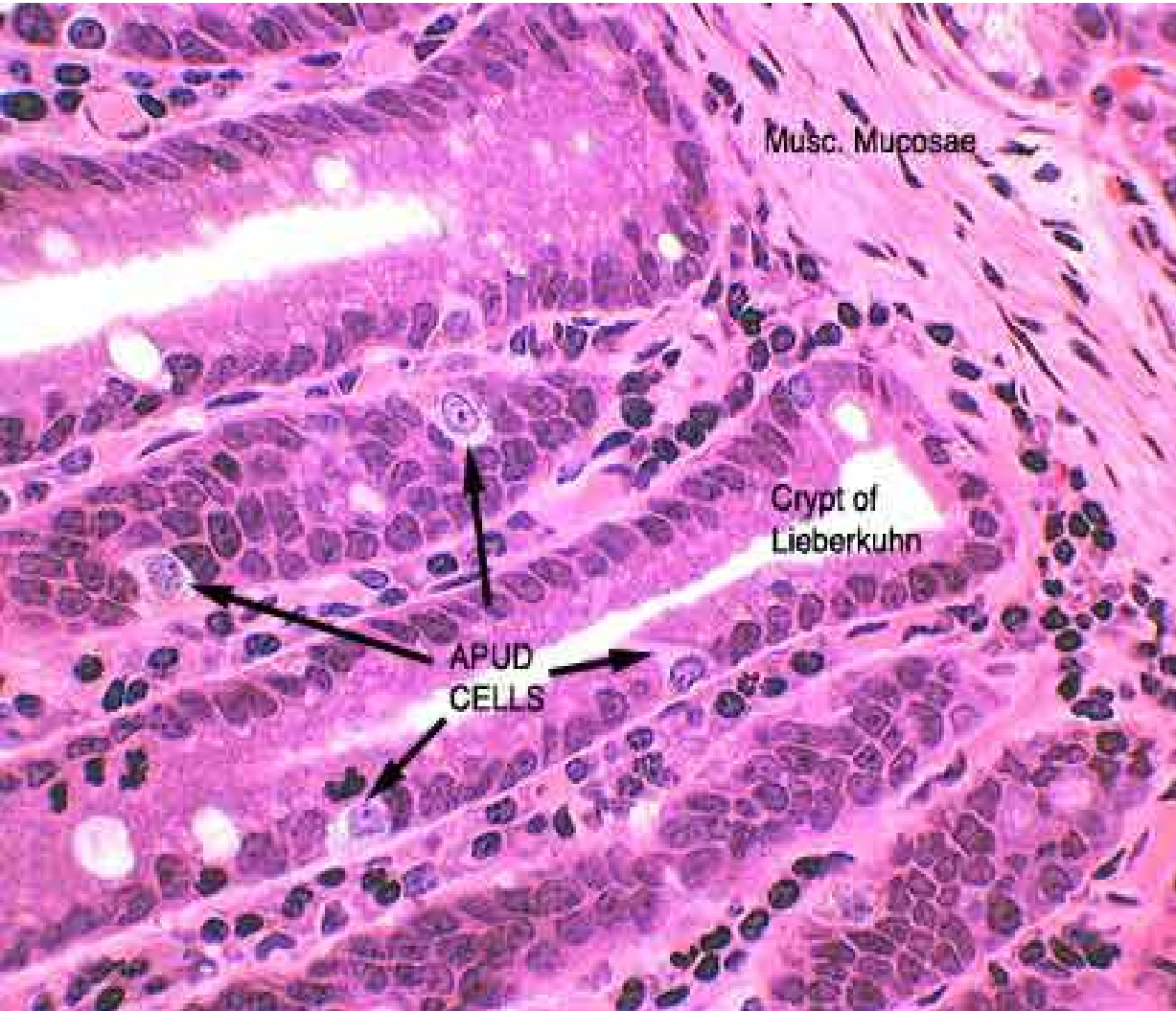


- 1 Diaphragm
- 2 Costal margin
- 3 Transverse colon
- 4 Ascending colon with haustra
- 5 Free taenia of cecum
- 6 **Ileum**
- 7 **Cecum**
- 8 **Falciform ligament of liver**
- 9 Liver
- 10 Stomach
- 11 Gastrocolic ligament
- 12 Jejunum
- 13 Sigmoid colon
- 14 **Vermiform appendix**
- 15 Terminal ileum
- 16 **Mesoappendix**
- 17 Mesentery

Abdominal organs in situ. The greater omentum has been removed.







Helpful Hint

There are specific features to look for when attempting to identify a particular portion of the small intestine:

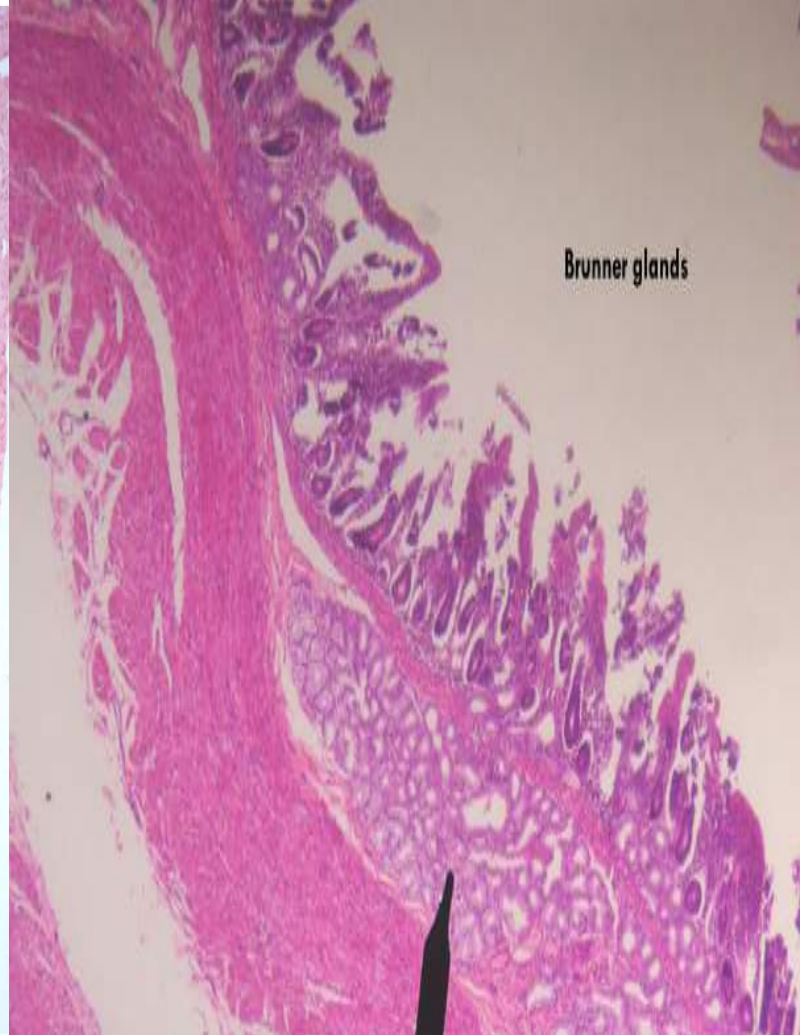
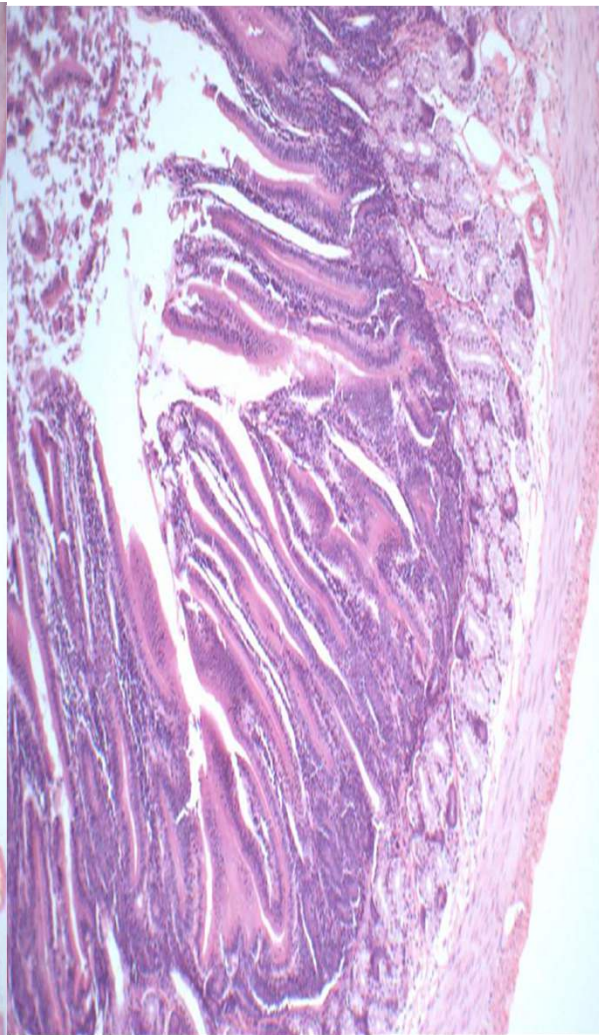
Duodenum - Brunner's glands in submucosa, some Goblet Cells

Jejunum - large plicae with many villi, more Goblet Cells

Ileum - aggregates of Peyer's patches, even more Goblet Cells

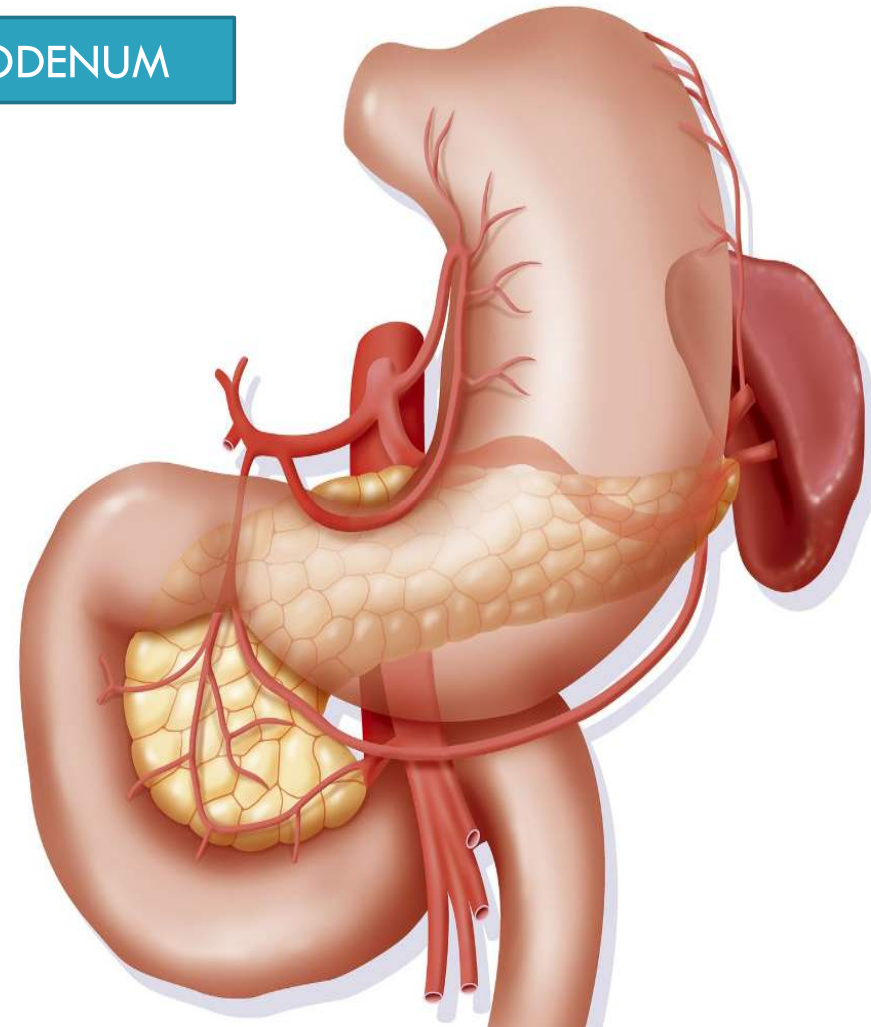


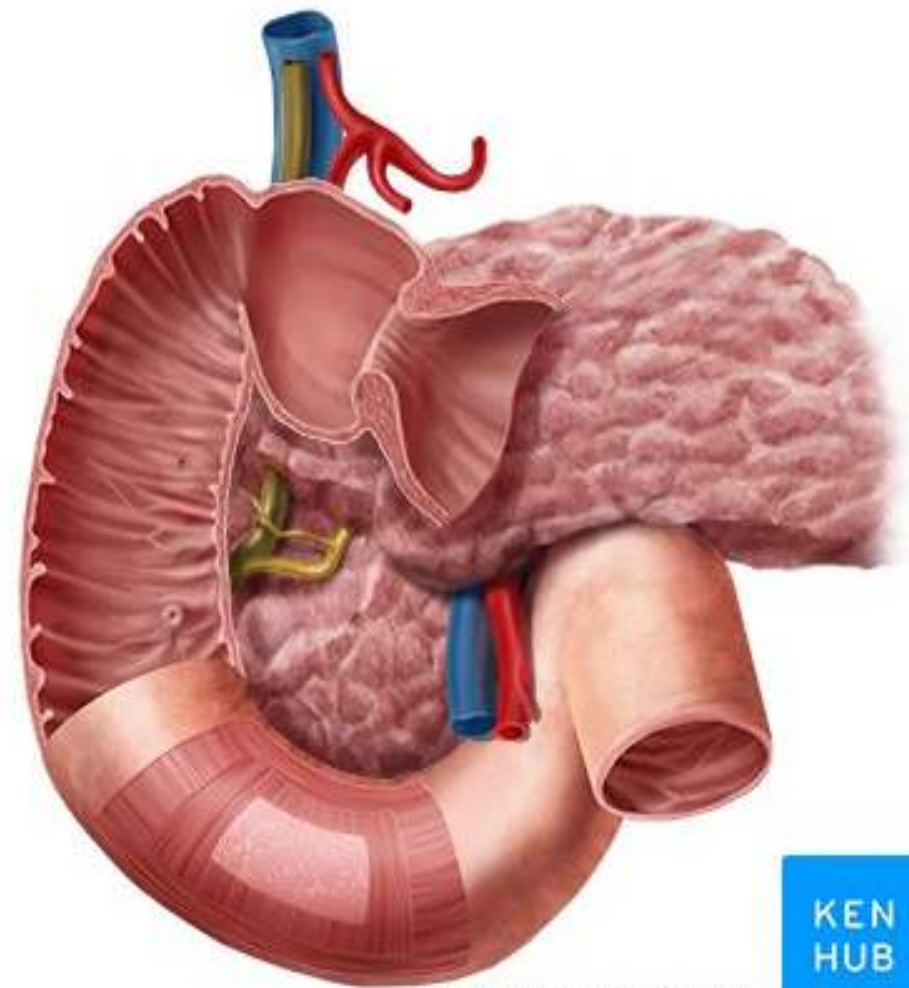
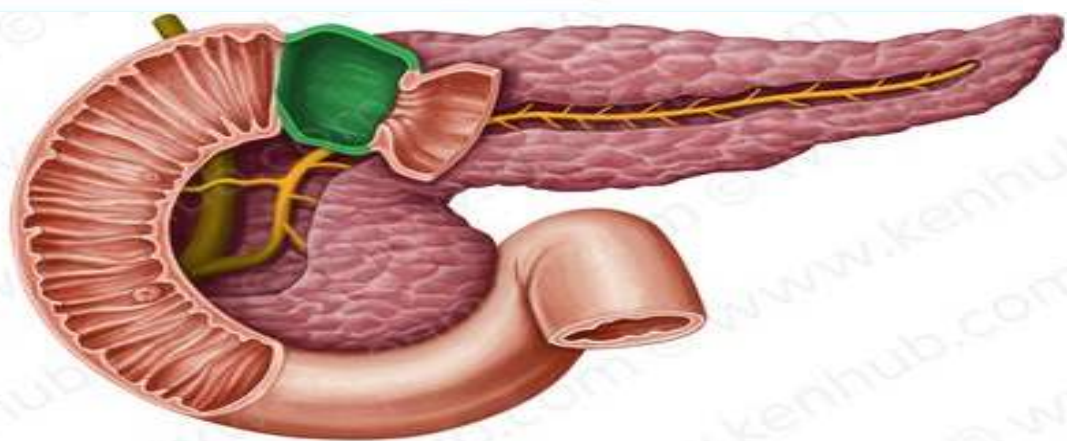
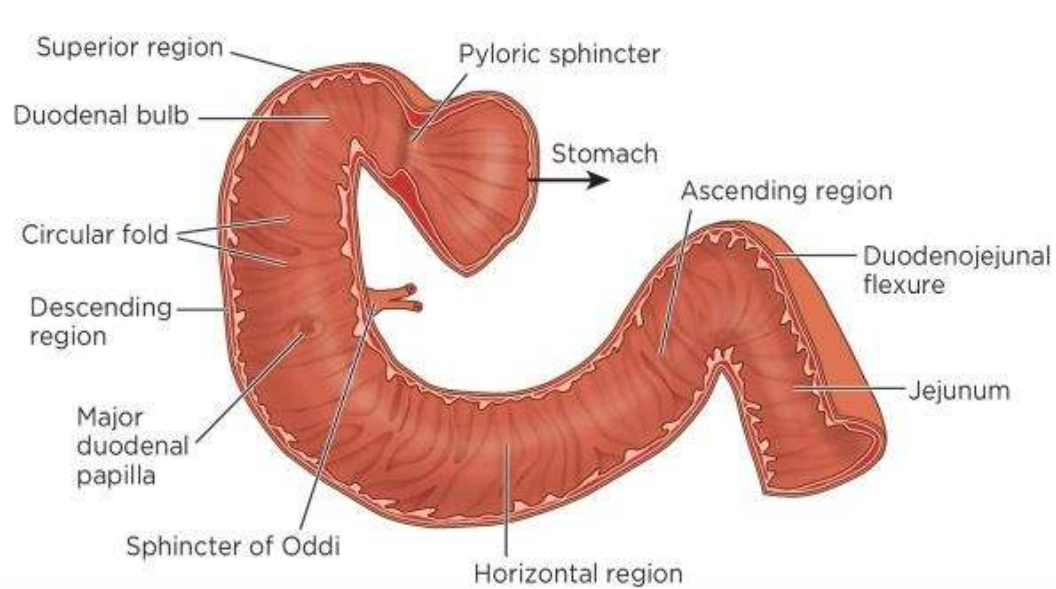
DUODENUM



Brunner glands

DUODENUM

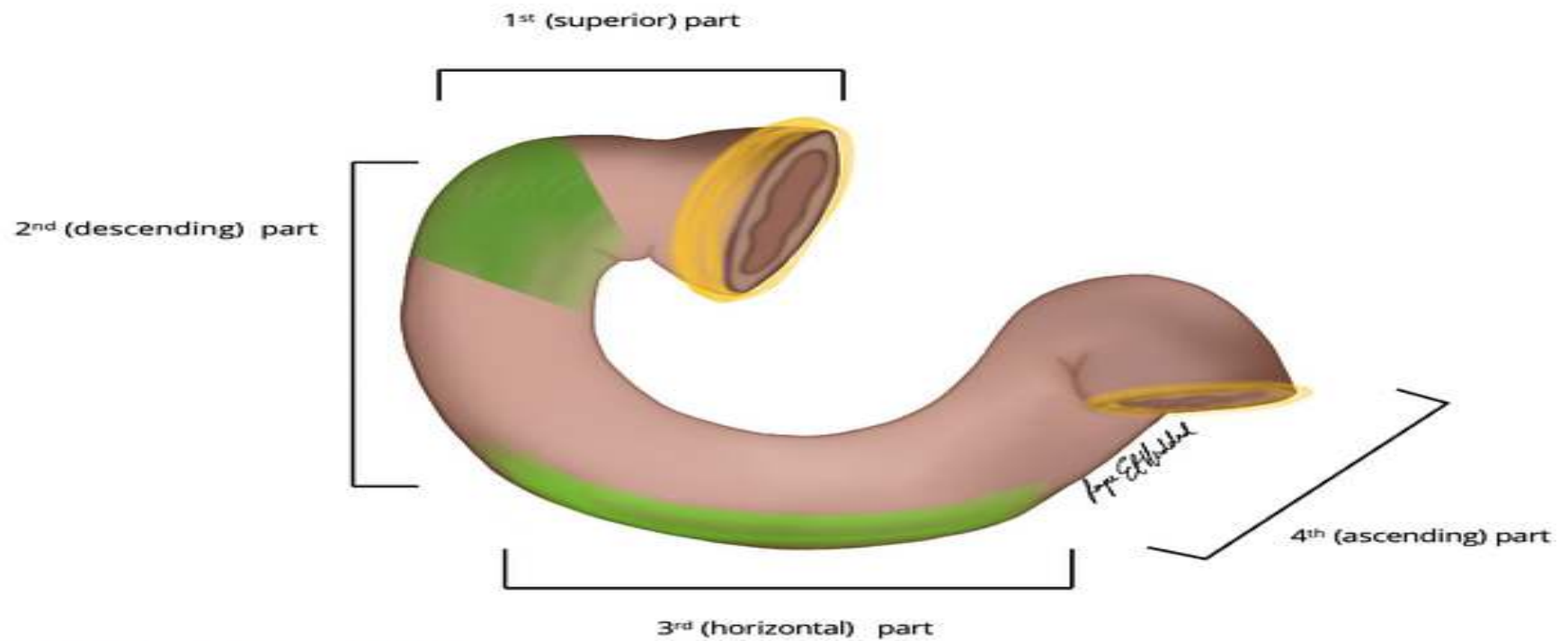




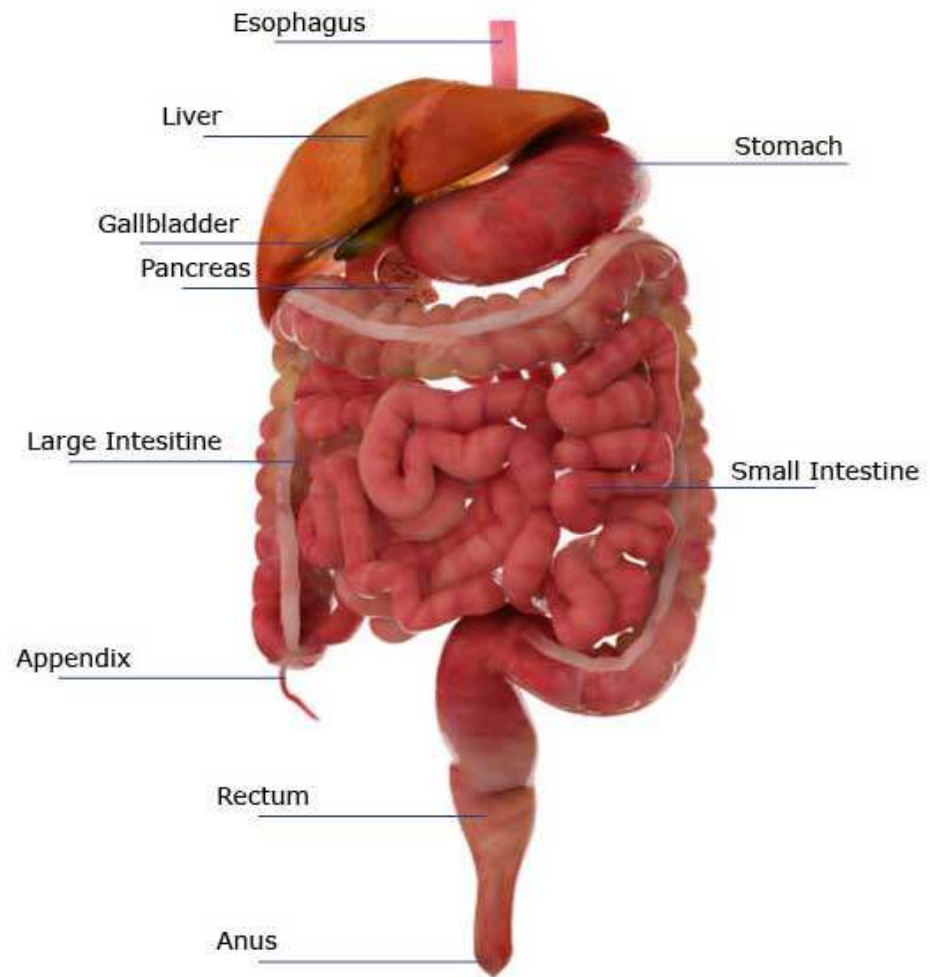
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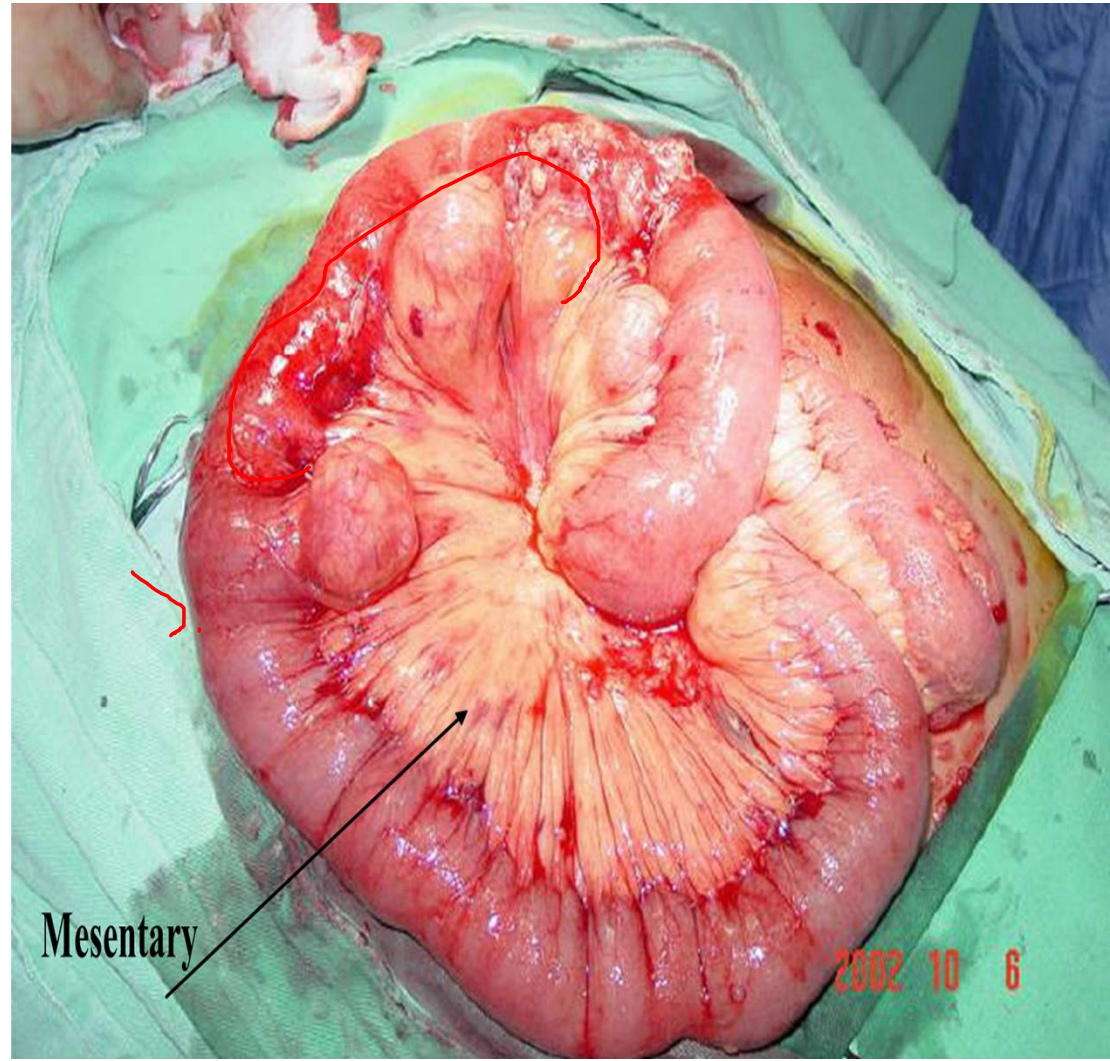
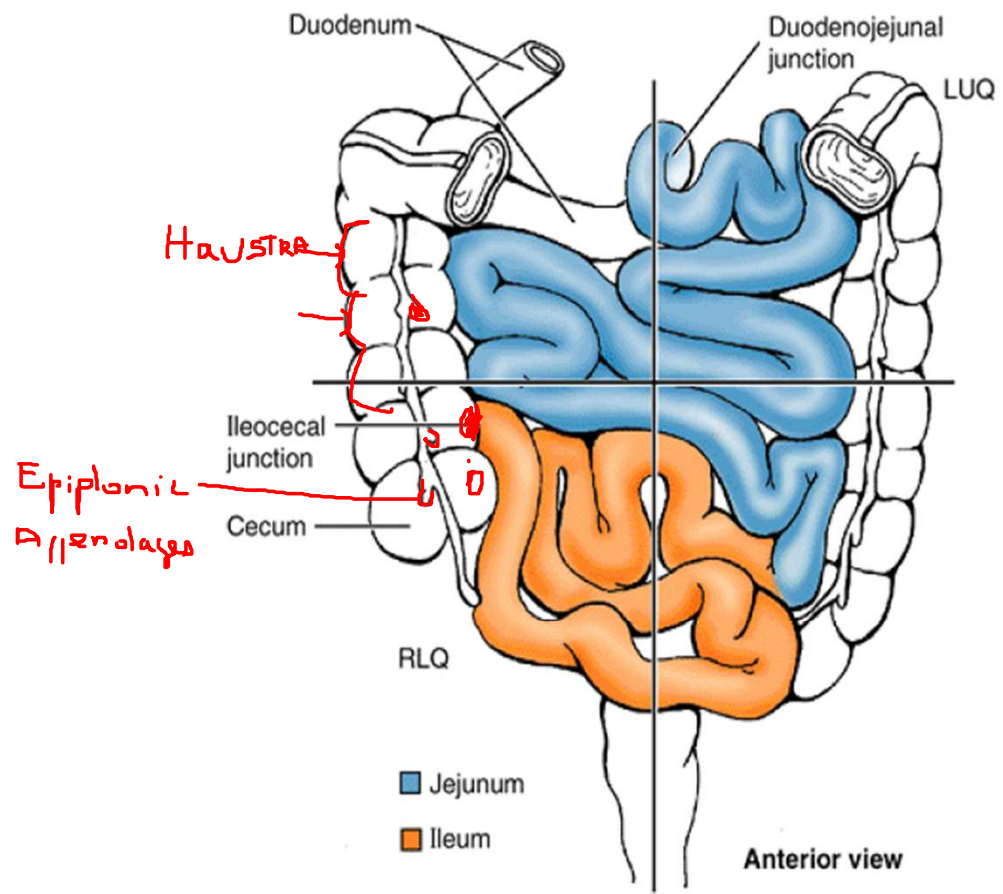


Peritoneal coverings of the duodenum

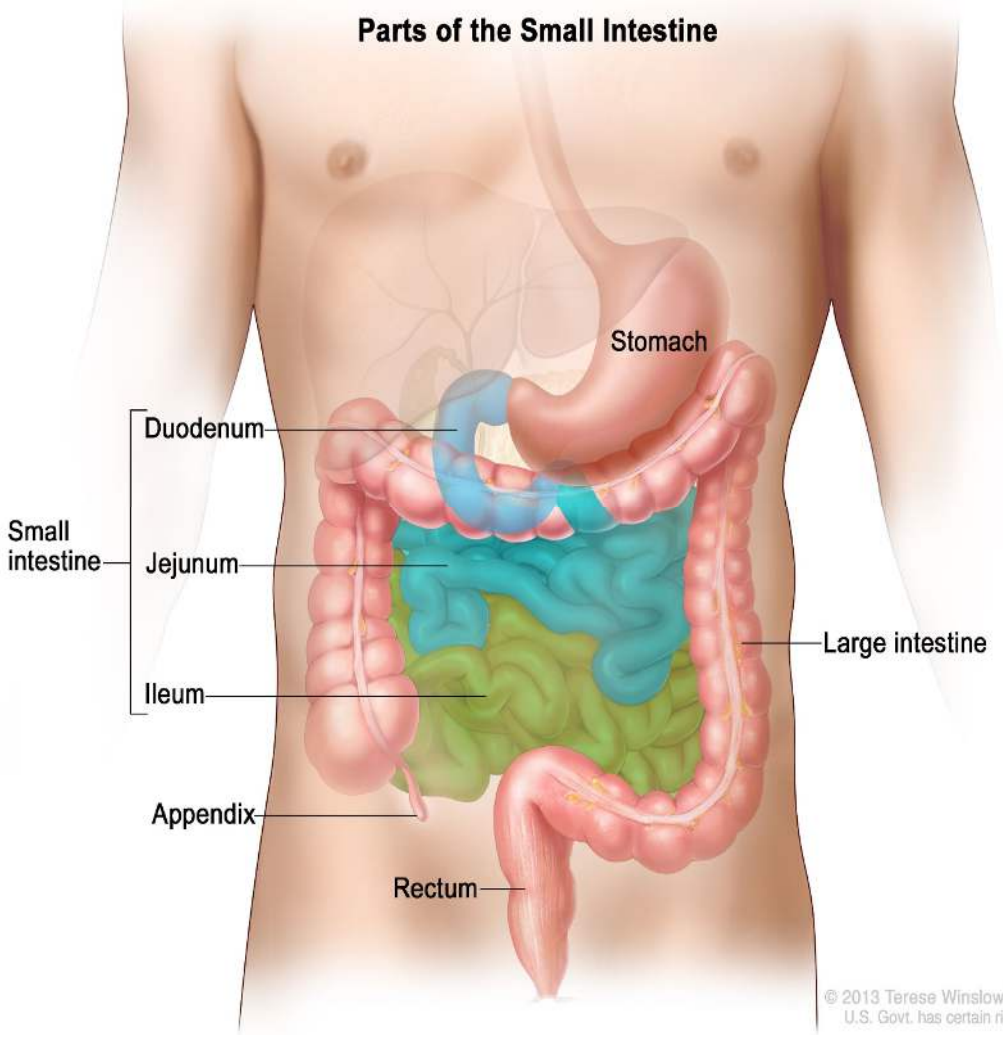


Surface is covered by
peritoneum
Intraperitoneal



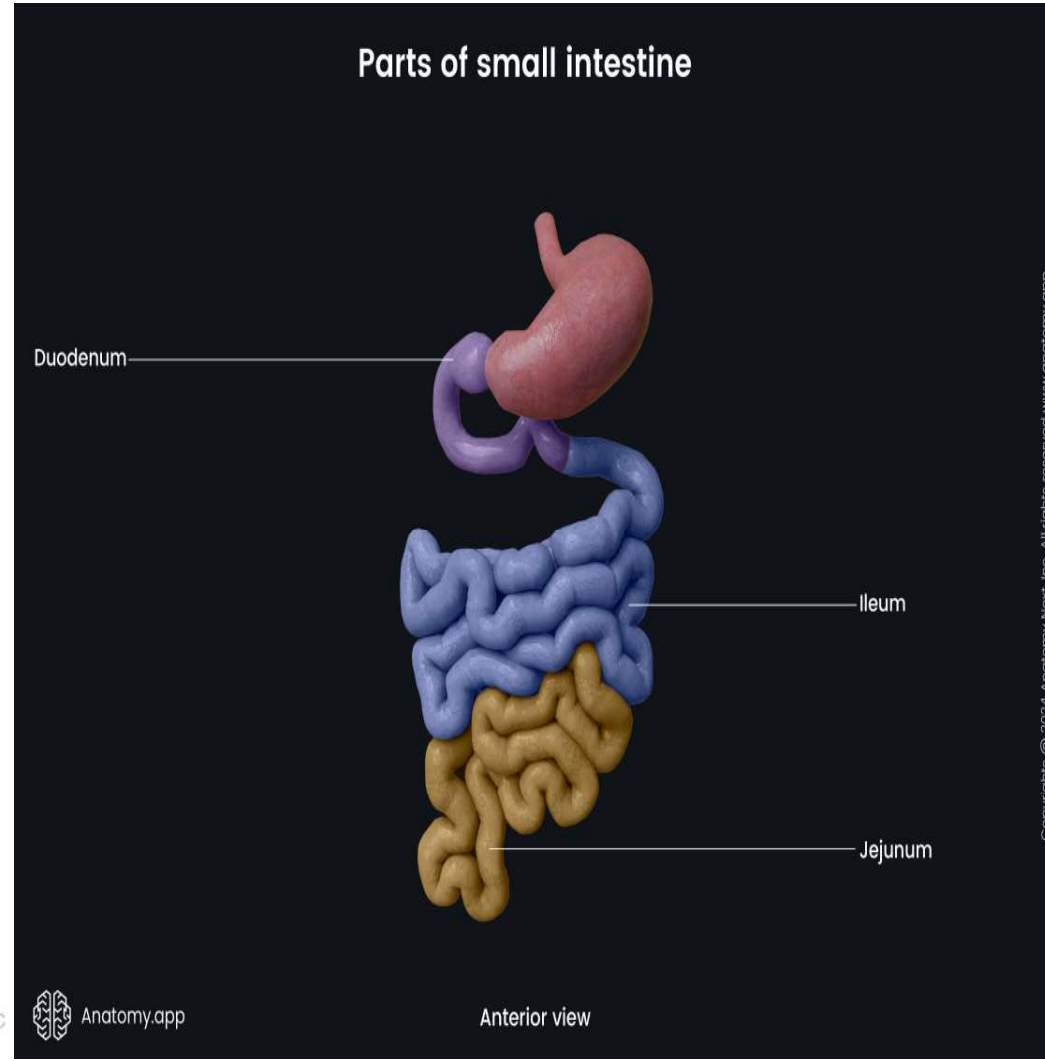


Parts of the Small Intestine



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Parts of small intestine



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Circular folds
(plicae circulares)

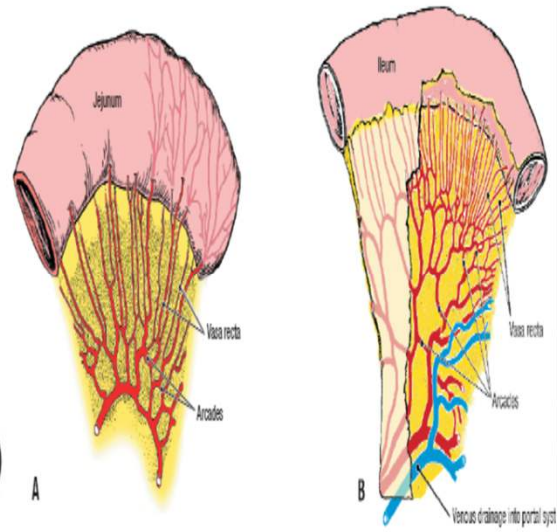
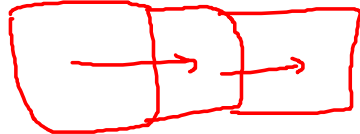
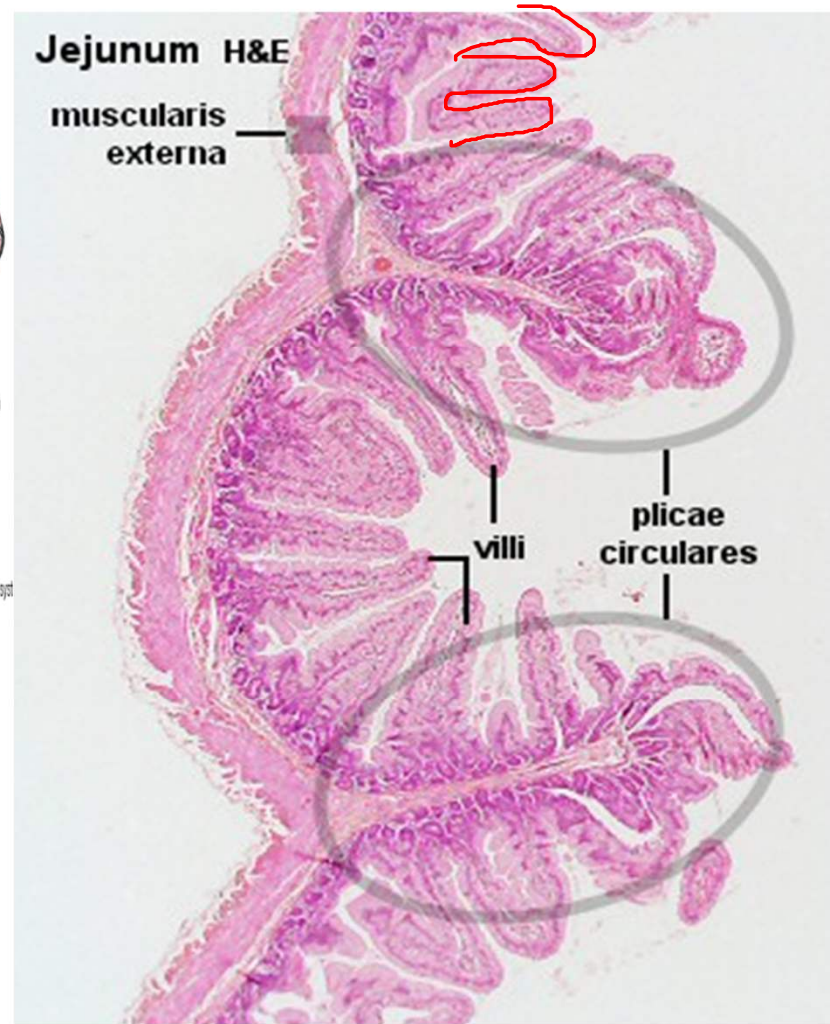


Figure 4.36. Comparison of intestinal arteries. A. Arteries of the jejunum. B. Arteries of the ileum.



(b) Internal anatomy of the jejunum





ILEUM

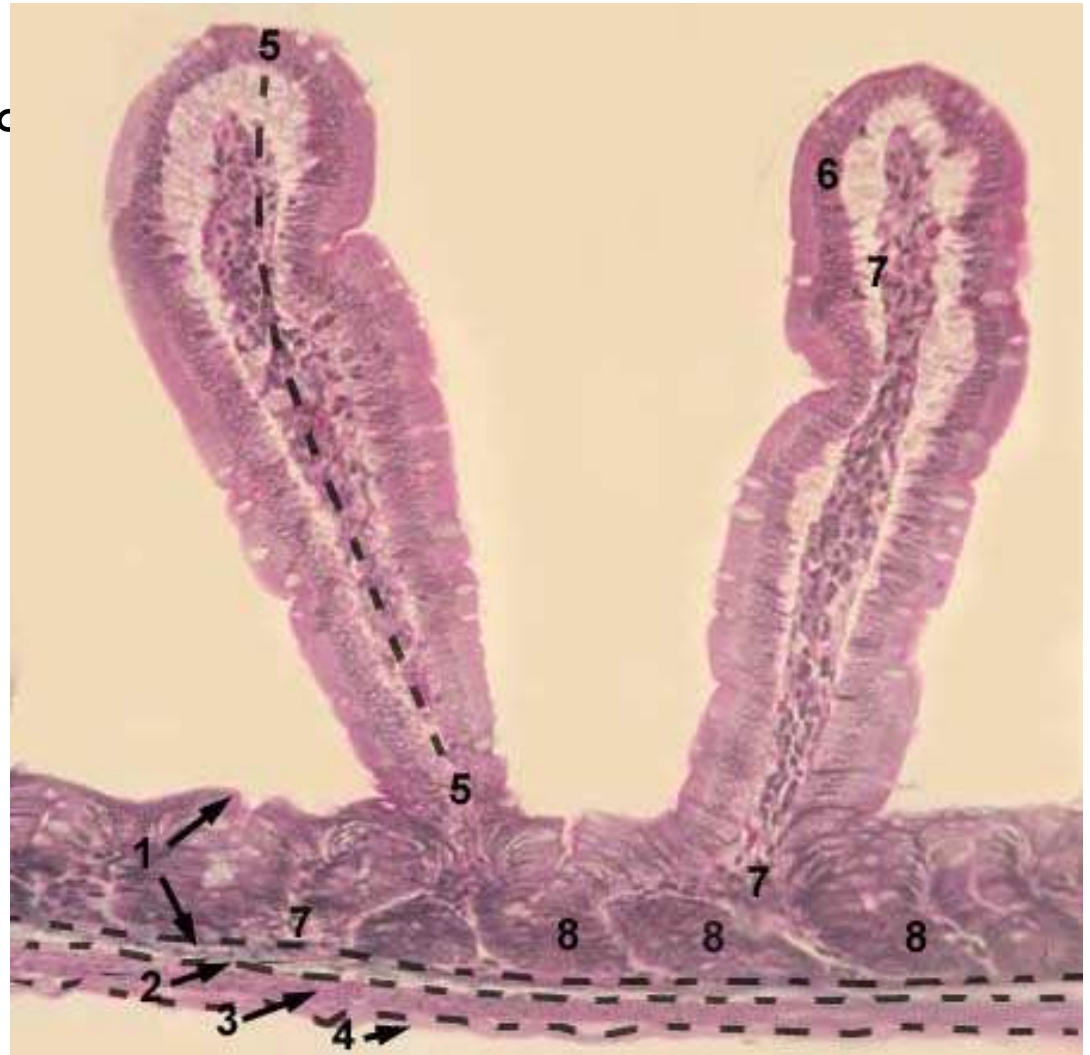
↙
Goblet + P

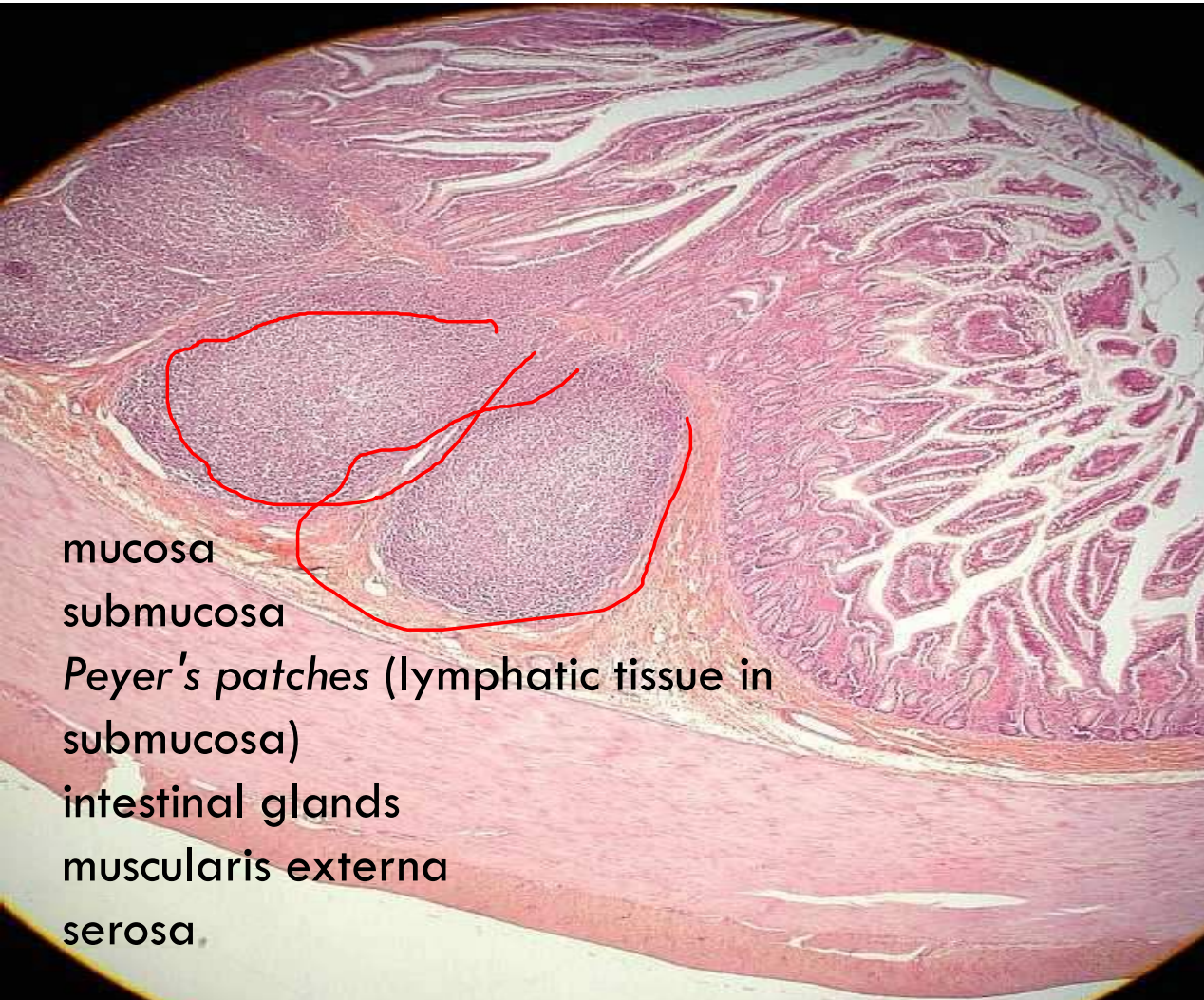
1. Villus
2. Lamina propria of a villus
3. Cluster of goblet cells
4. Intestinal gland
5. Submucosa
6. Peyer's patch

ILEUM

Stained with haematoxylin and eosin

- 1 - tunica mucosa
- 2 - tunica submucosa
- 3 - tunica muscularis propria
- 4 - tunica serosa
- 5 - villi
- 6 - epithelium of the mucosa
(covers villi)
- 7 - connective tissue of the lamina
propria of the mucosa
- 8 - glands (crypts) in the lamina
propria of the mucosa





mucosa

submucosa

Peyer's patches (lymphatic tissue in submucosa)

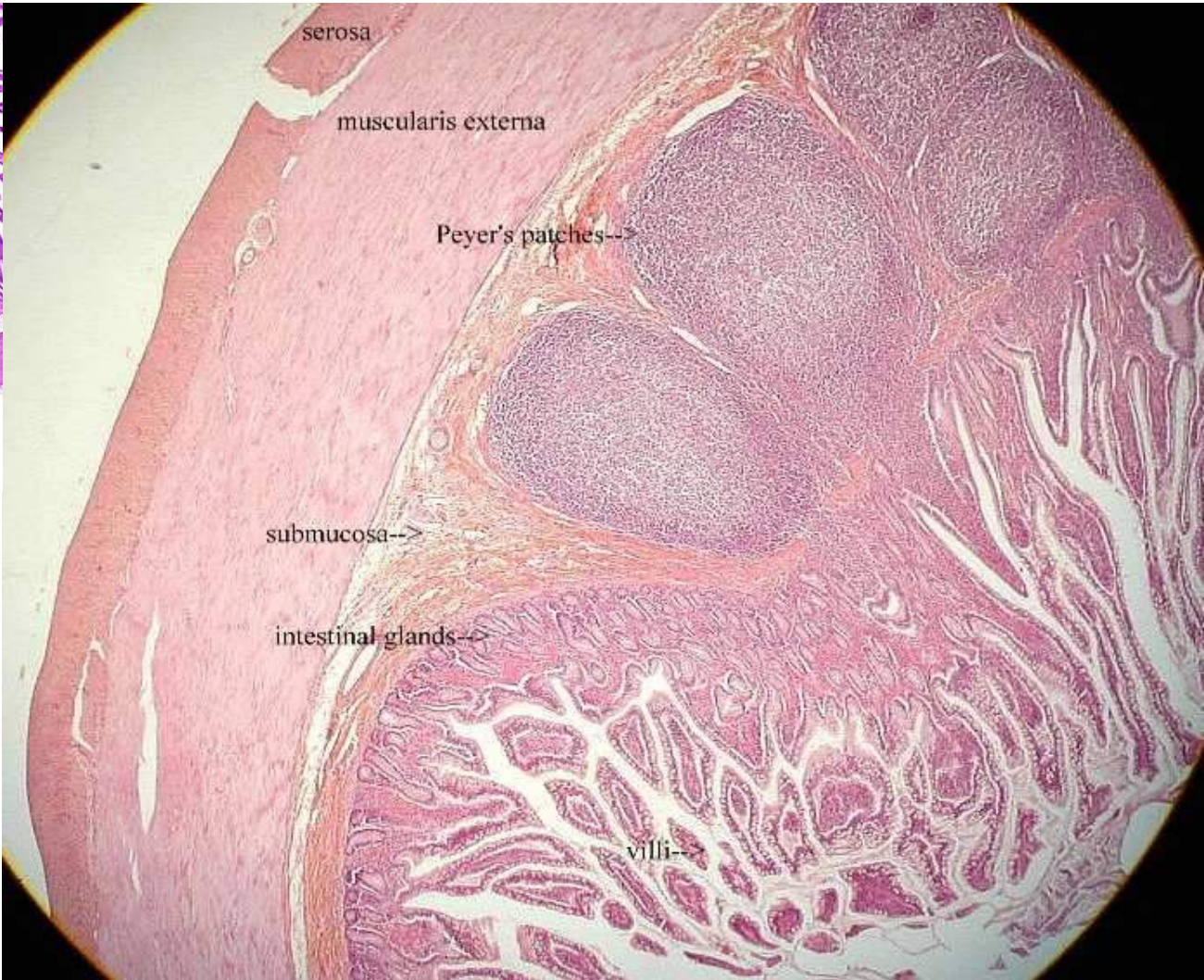
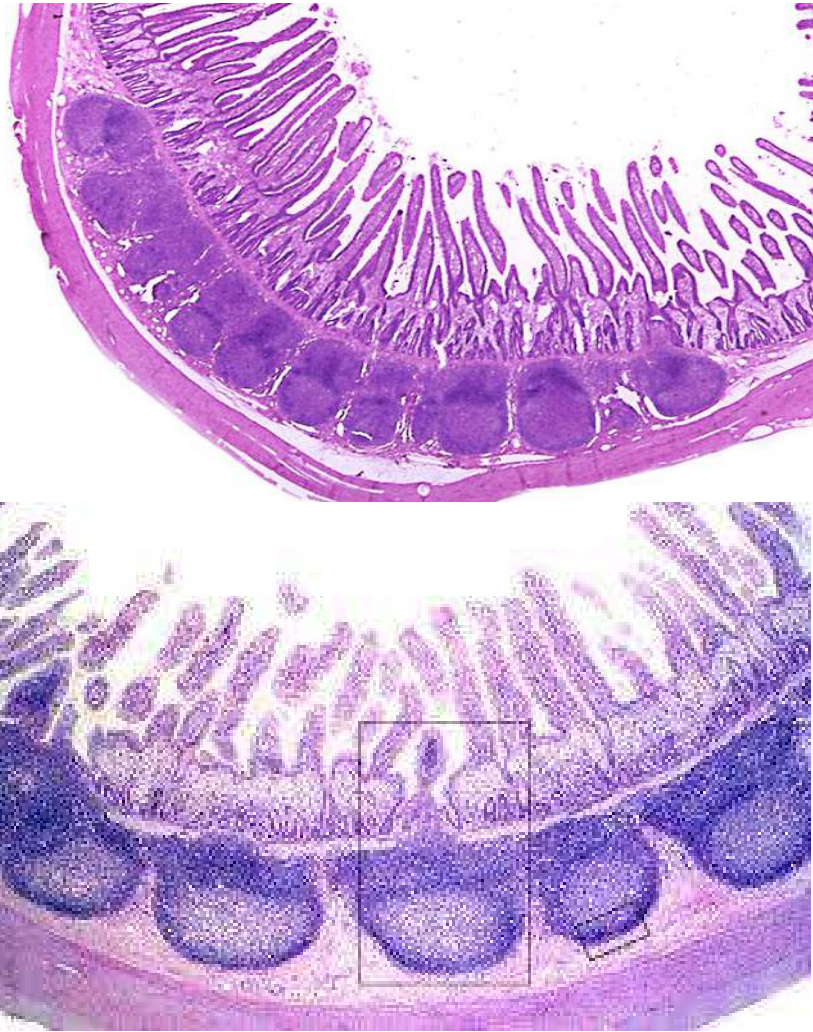
intestinal glands

muscularis externa

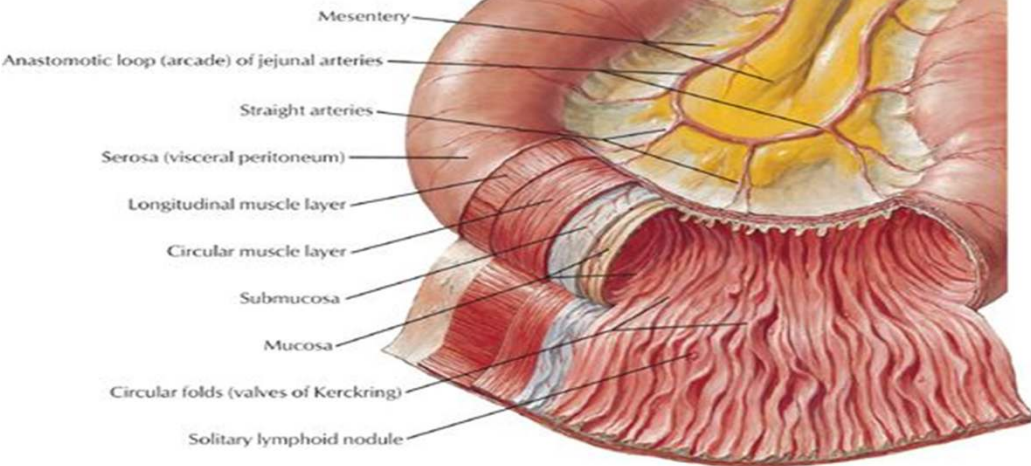
serosa.

Normal Terminal Ileum

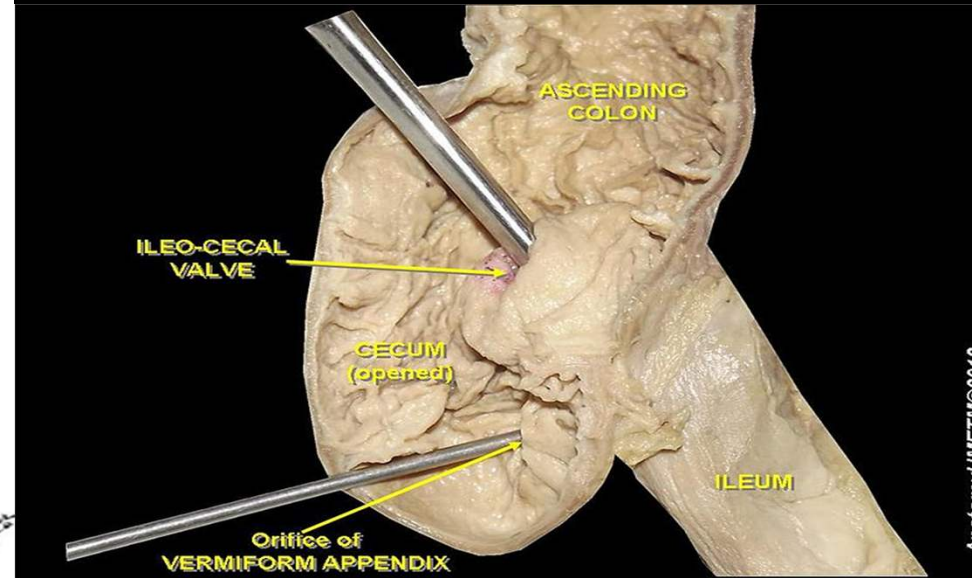
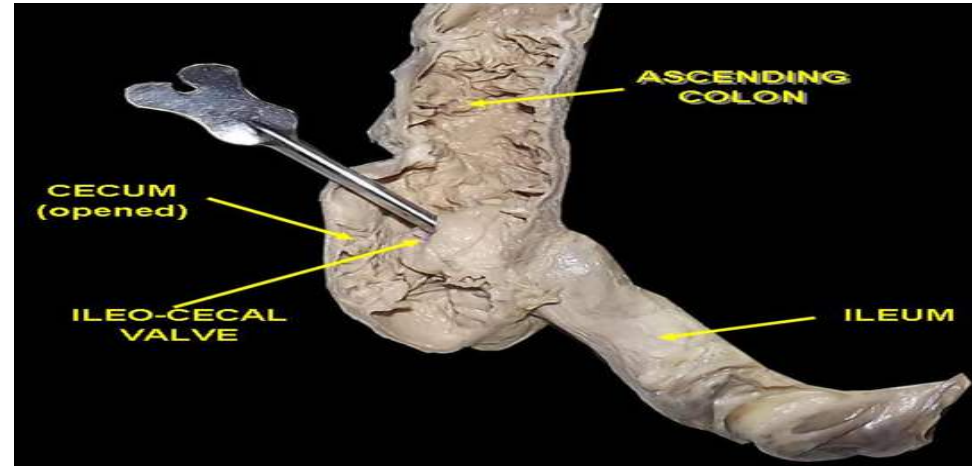
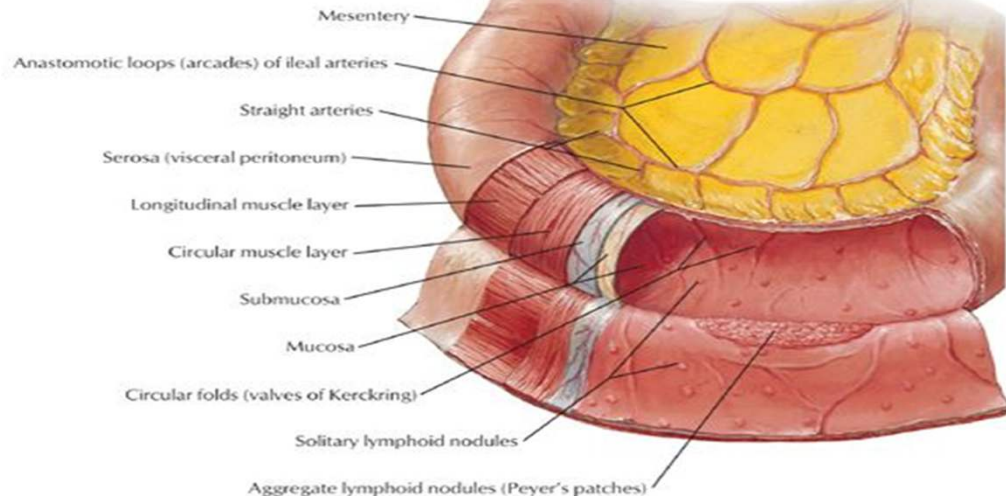




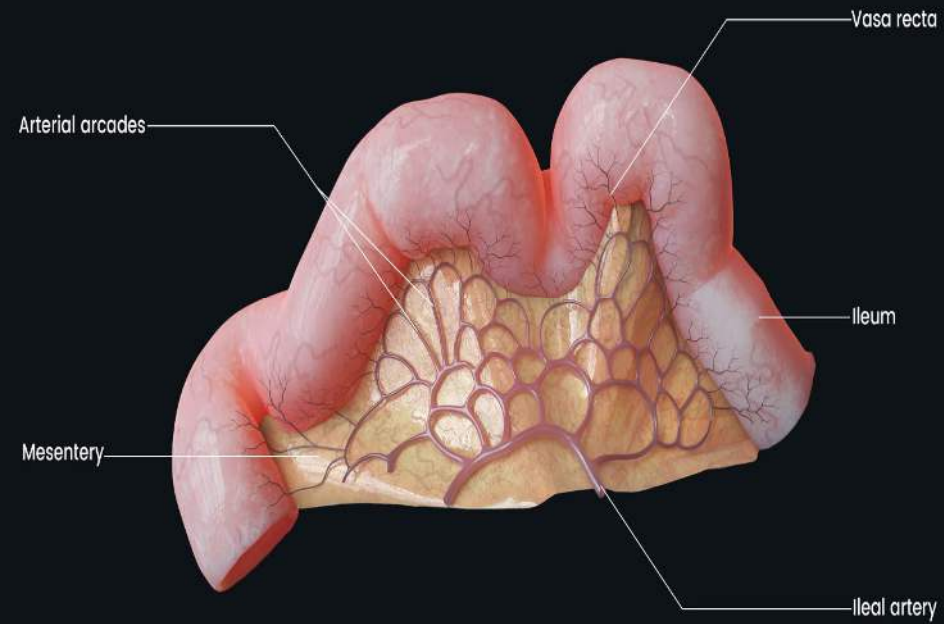
Jejunum



Ileum

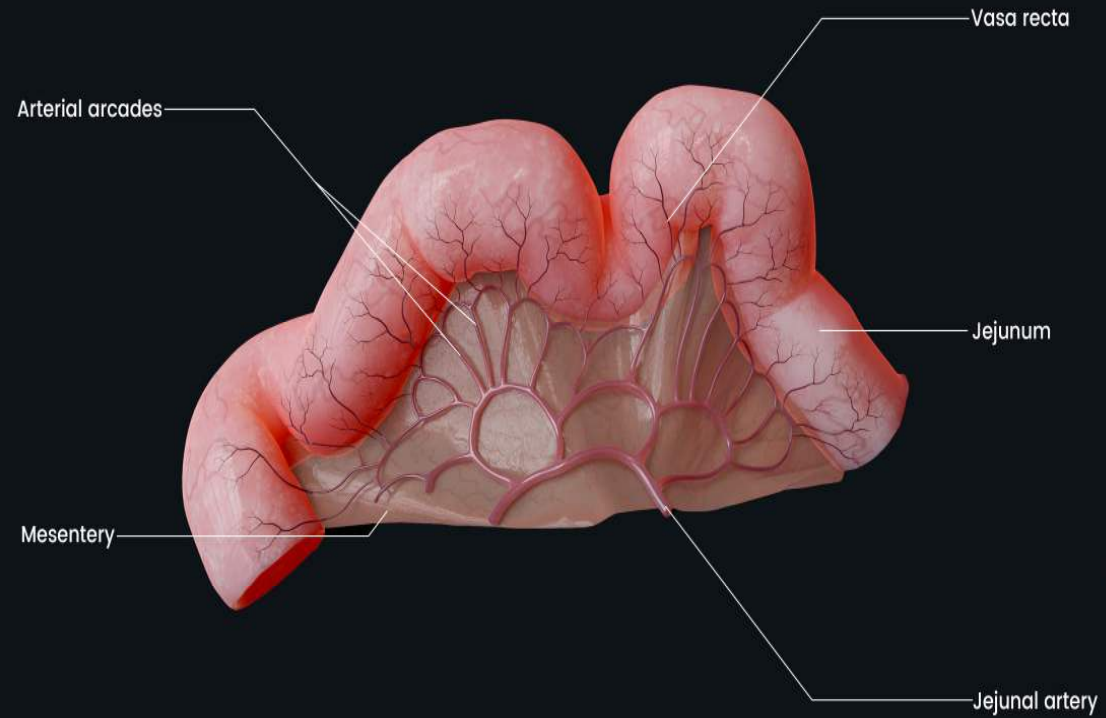


Vasa recta of ileum



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Vasa recta of jejunum



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Distinguishing Characteristics of Jejunum and Ileum in Living Persons

Characteristic	Jejunum	Ileum
Color	<u>Deeper red</u>	<u>Paler pink</u>
Caliber	2~4 cm	2~3 cm
Wall	Thick and heavy (all)	Thin and light (vit B12) ← Intrinsic factor
Vascularity	Greater	Less
Vasa recta	Long	Short
Arcades	A few large loops	Many short loops
Fat in mesentery	Less	More
Circular folds (<i>L. plicae circulares</i>)	Large, tall, and closely packed	Low and sparse; absent in distal part
Lymphoid nodules (Peyer patches)	Few	Many

(H₂O)

↑
Parietal

cells

← Intrinsic factor



The main **functions of the jejunum and ileum** include the **absorption of nutrients** (proteins, fats, carbohydrates, vitamins and minerals) **and water** from partially digested food and **transportation** of unabsorbed and waste products to the large intestine.

- Amino acids, small peptides and monosaccharides are absorbed in the bloodstream, but fats and fatty acids into the lymph and only partially into the bloodstream.

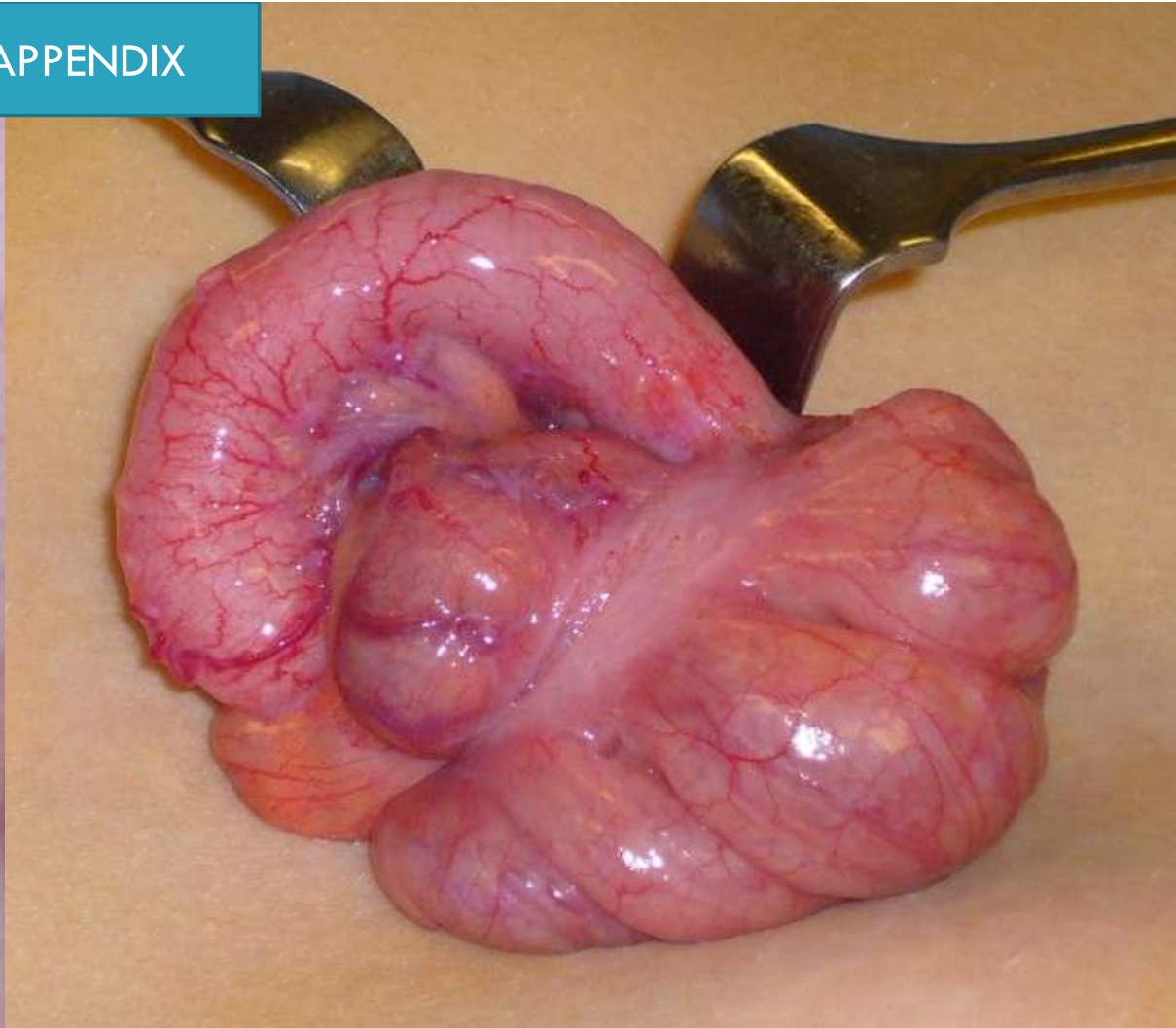
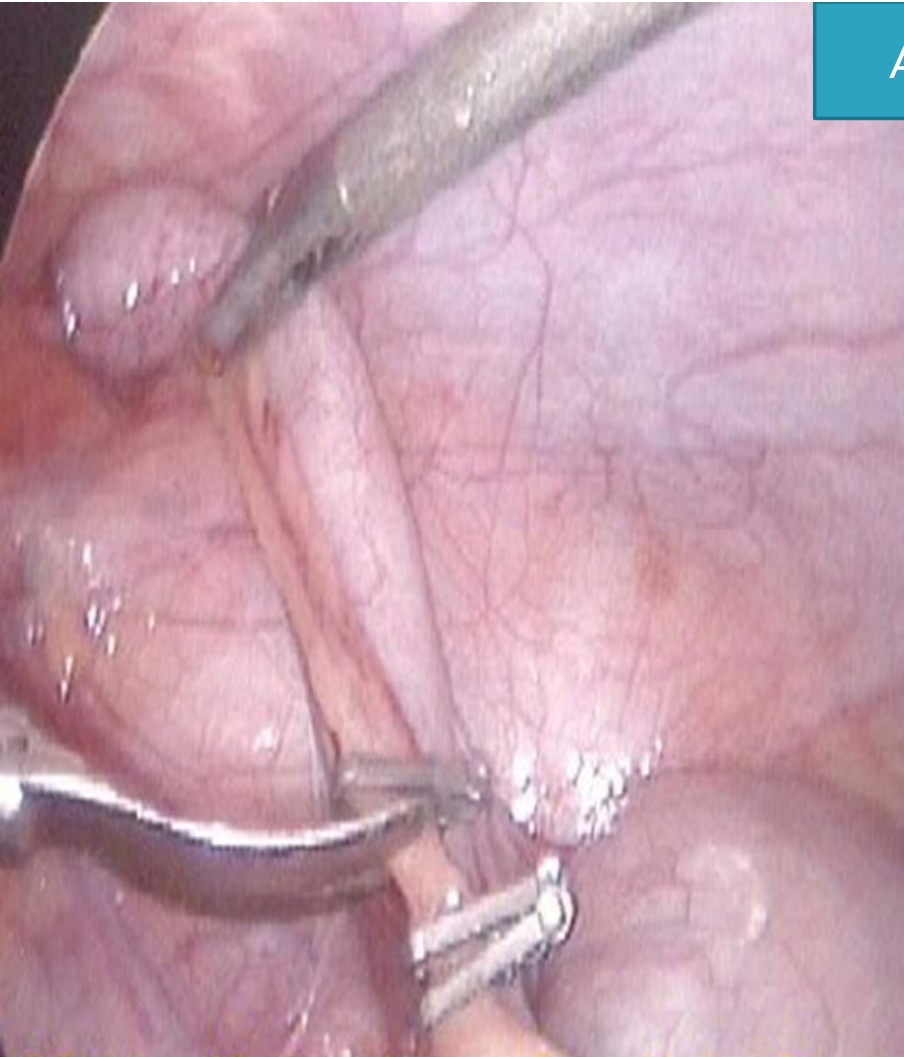
- The jejunum absorbs amino acids, fatty acids and sugars, fat-soluble vitamins (K, E, D, A), cholesterol, various microelements and other vitamins. It also absorbs significant amounts of water.

- The ileum absorbs the remaining nutrients that are unabsorbed by the jejunum. It absorbs vitamin B12 with the help of the stomach-produced intrinsic factor. **The ileum also absorbs bile salts and acids.**

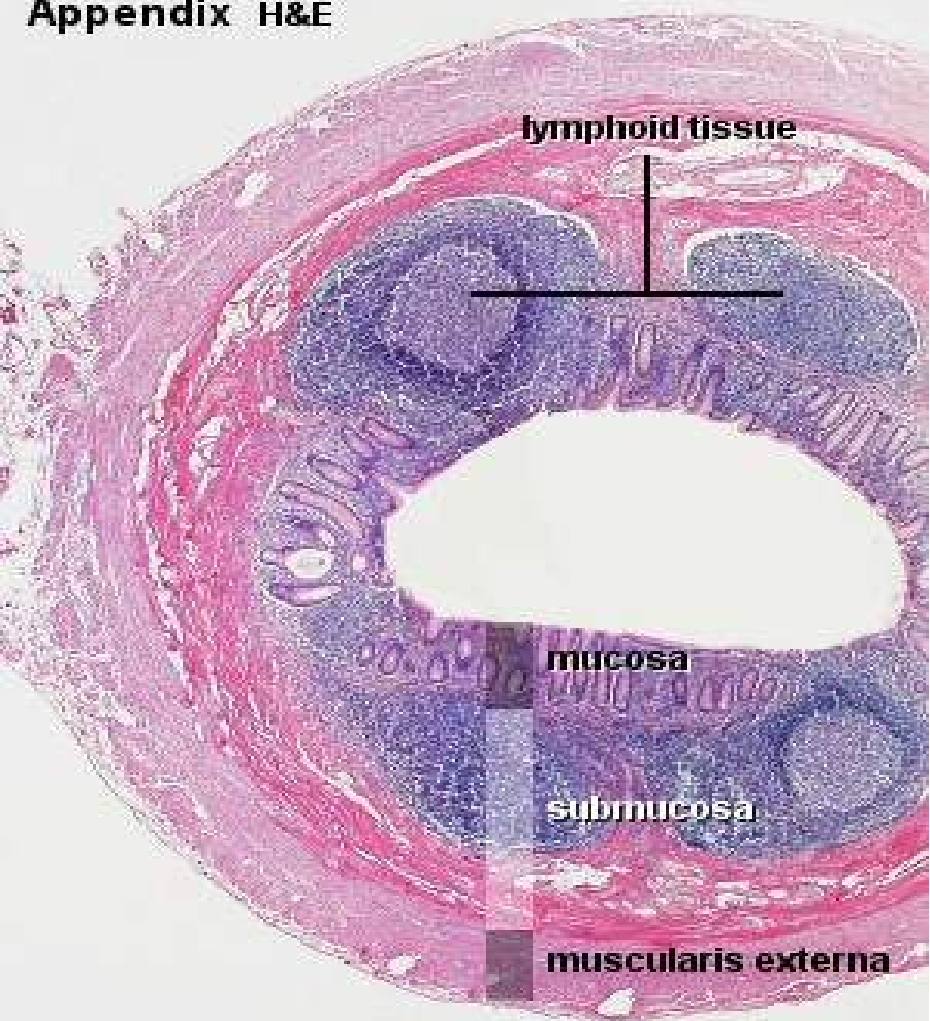
- The small intestine contains lymphatic tissue aggregates (Peyer's patches) and Paneth cells that protect against various microbes and antigens.

- Mainly the ileum provides the **immunological function** as it has Peyer's patches.

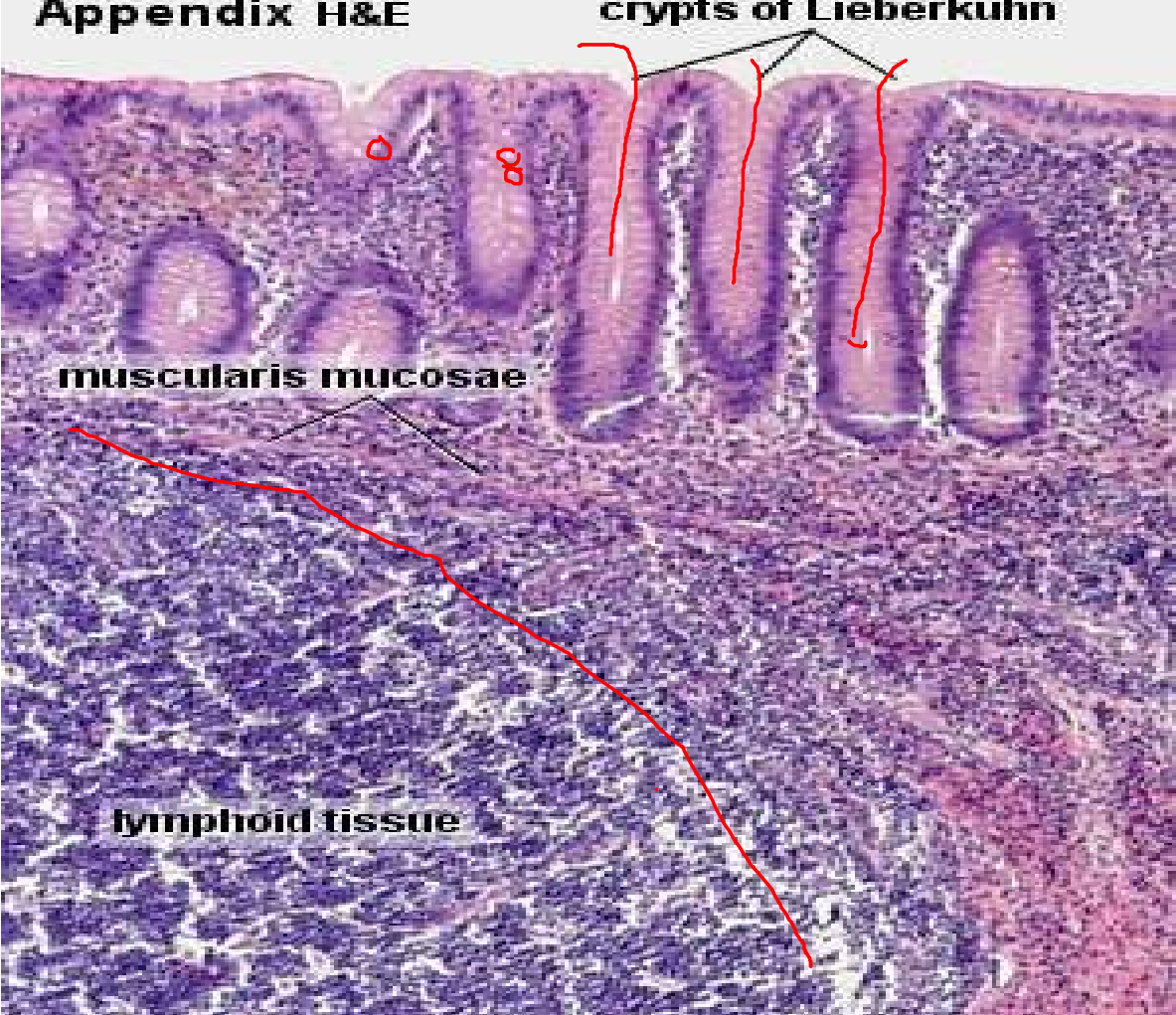
APPENDIX



Appendix H&E



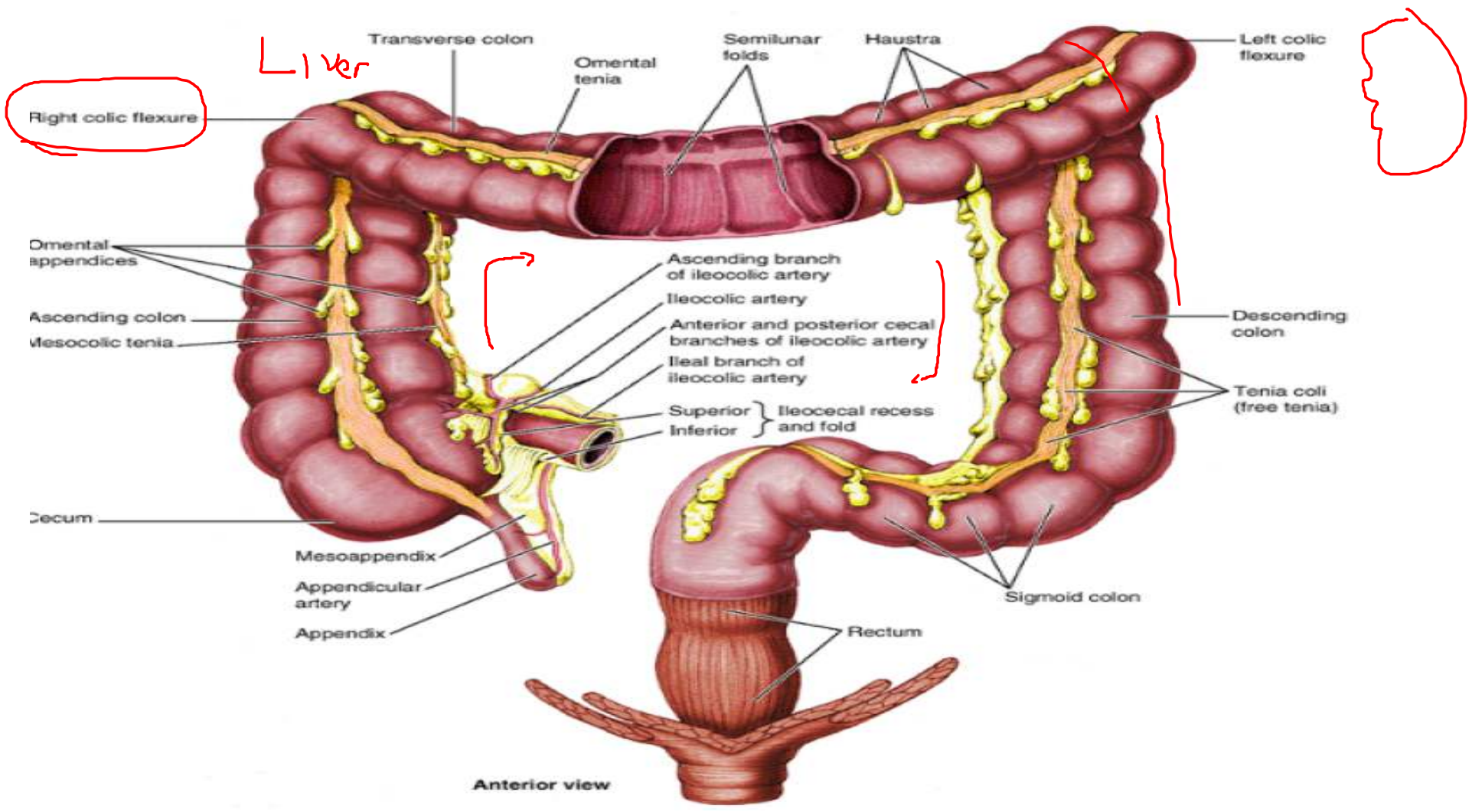
Appendix H&E

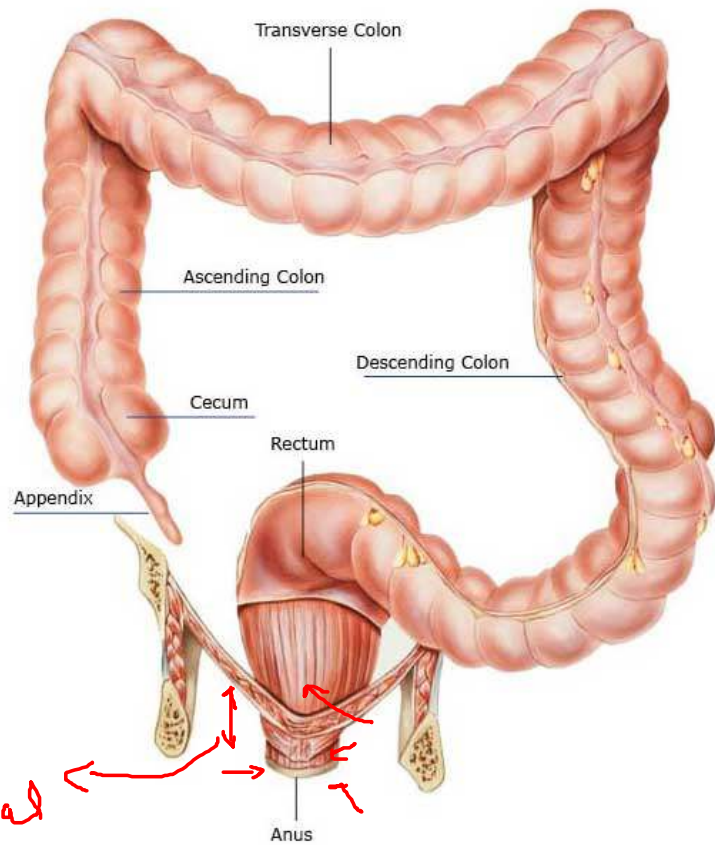


COLON

□ EXTERNAL MORPHOLOGY:

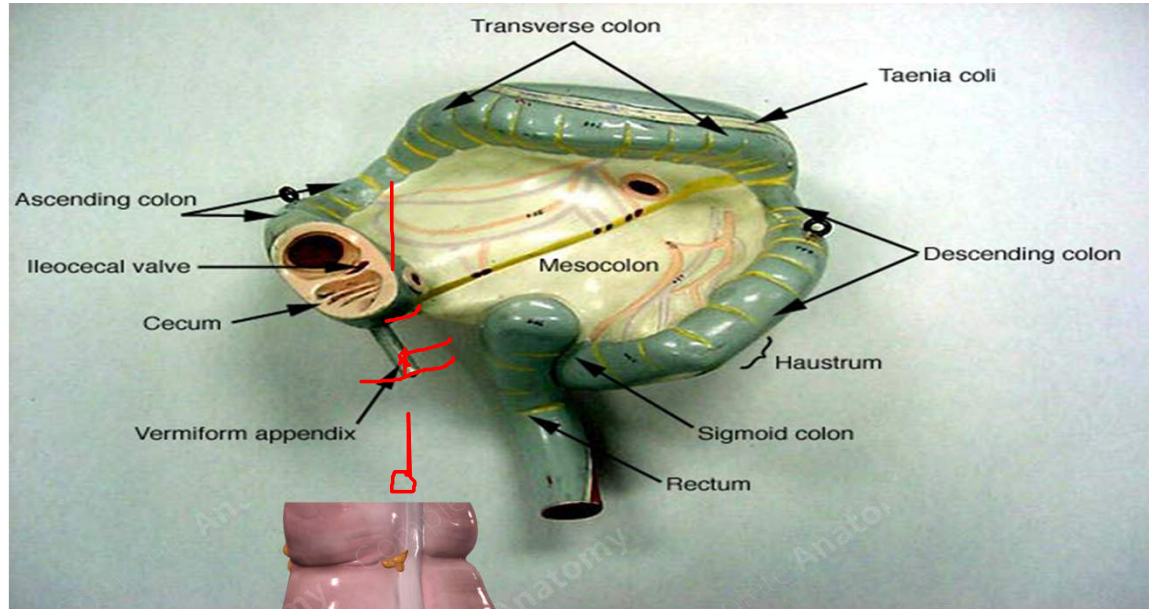
- • Order of Sections:
 - o **Cecum / Ileocecal Junction:** Intraperitoneal, for the most part.
 - **Vermiform Appendix:** Can be intraperitoneal or retro. The appendix extends down over the pelvic brim.
 - o **Ascending Colon:** Retroperitoneal.
 - o **Transverse colon:** Intraperitoneal, covered by transverse mesocolon. Hence it is mobile.
 - o **Descending Colon:** Retroperitoneal
 - o **Sigmoid Colon:** Intraperitoneal, covered by sigmoid mesocolon. Hence it is mobile.
- • **Tenia Coli:** Three longitudinal muscles that run the length of the large intestine.
- o **Rectosigmoid Junction:** A complete expansion of the longitudinal muscles at the end of the colon, where it can have a muscular force.
- • **Sulci:** Periodic indentations in the large intestine, on the external surface.

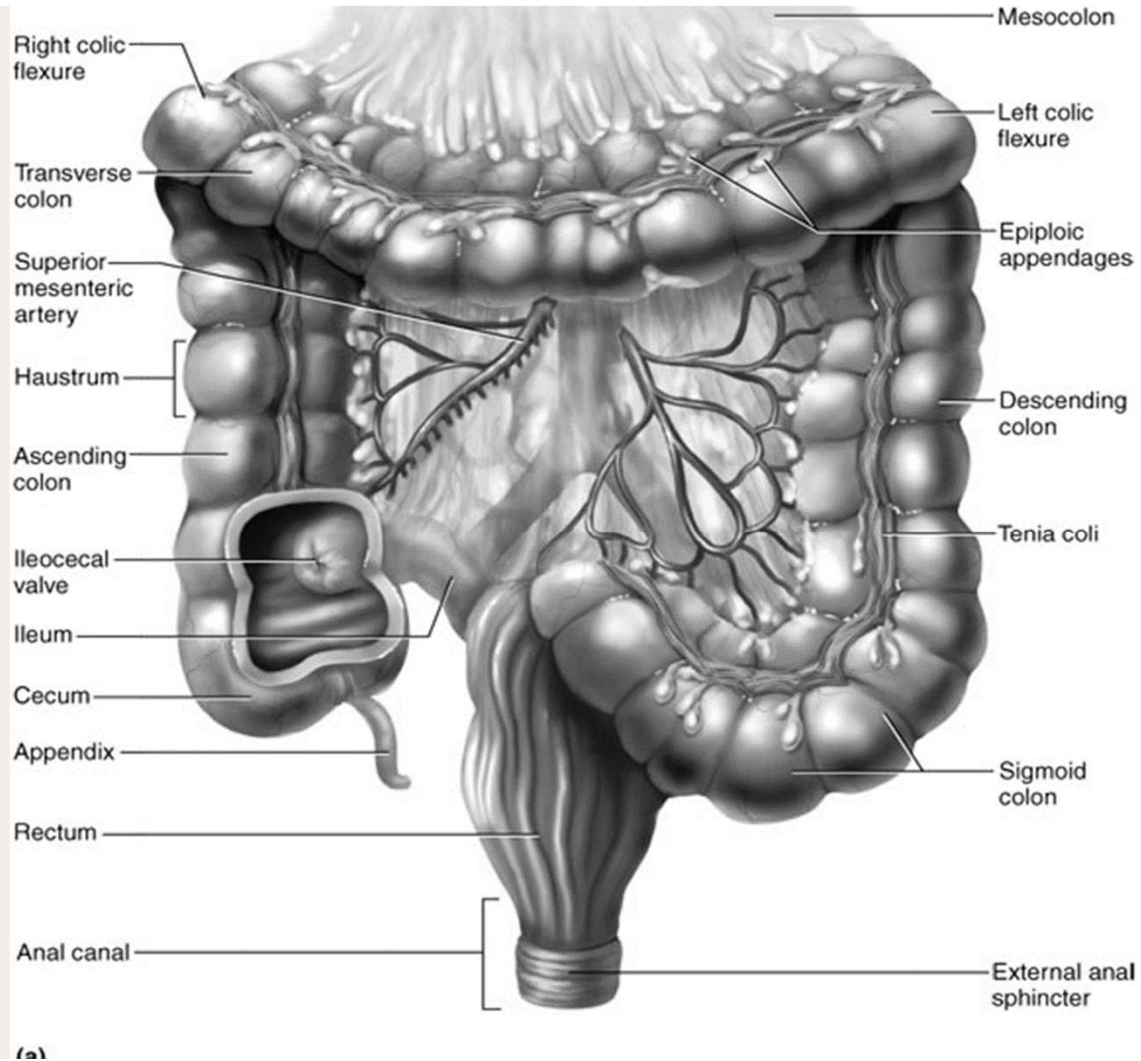
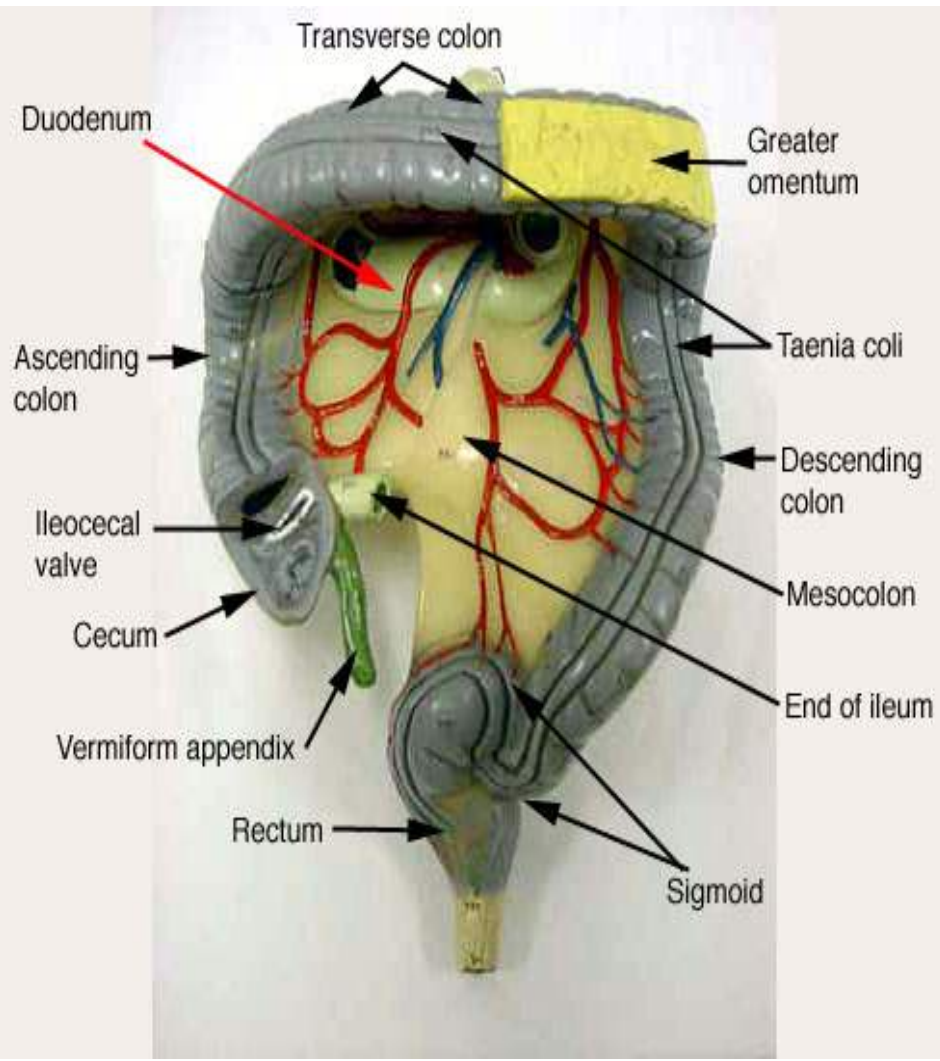




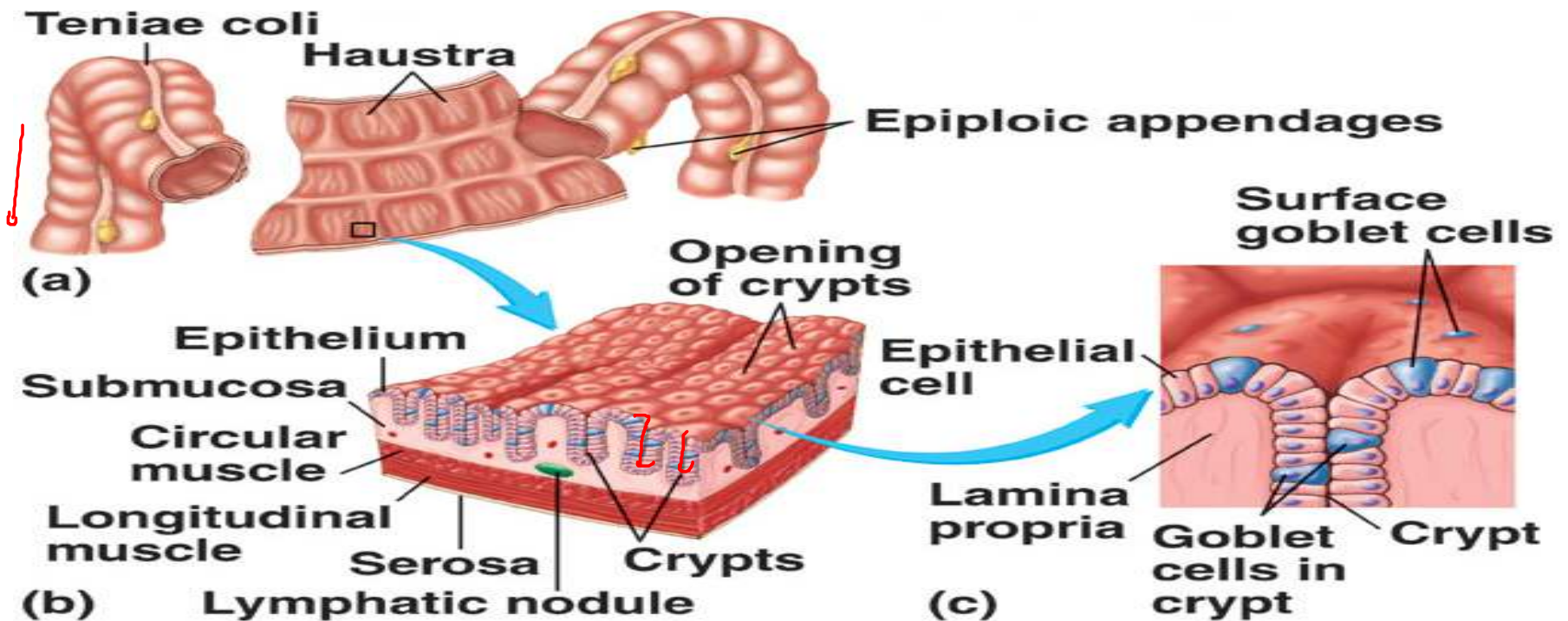
Rectoanal Junction

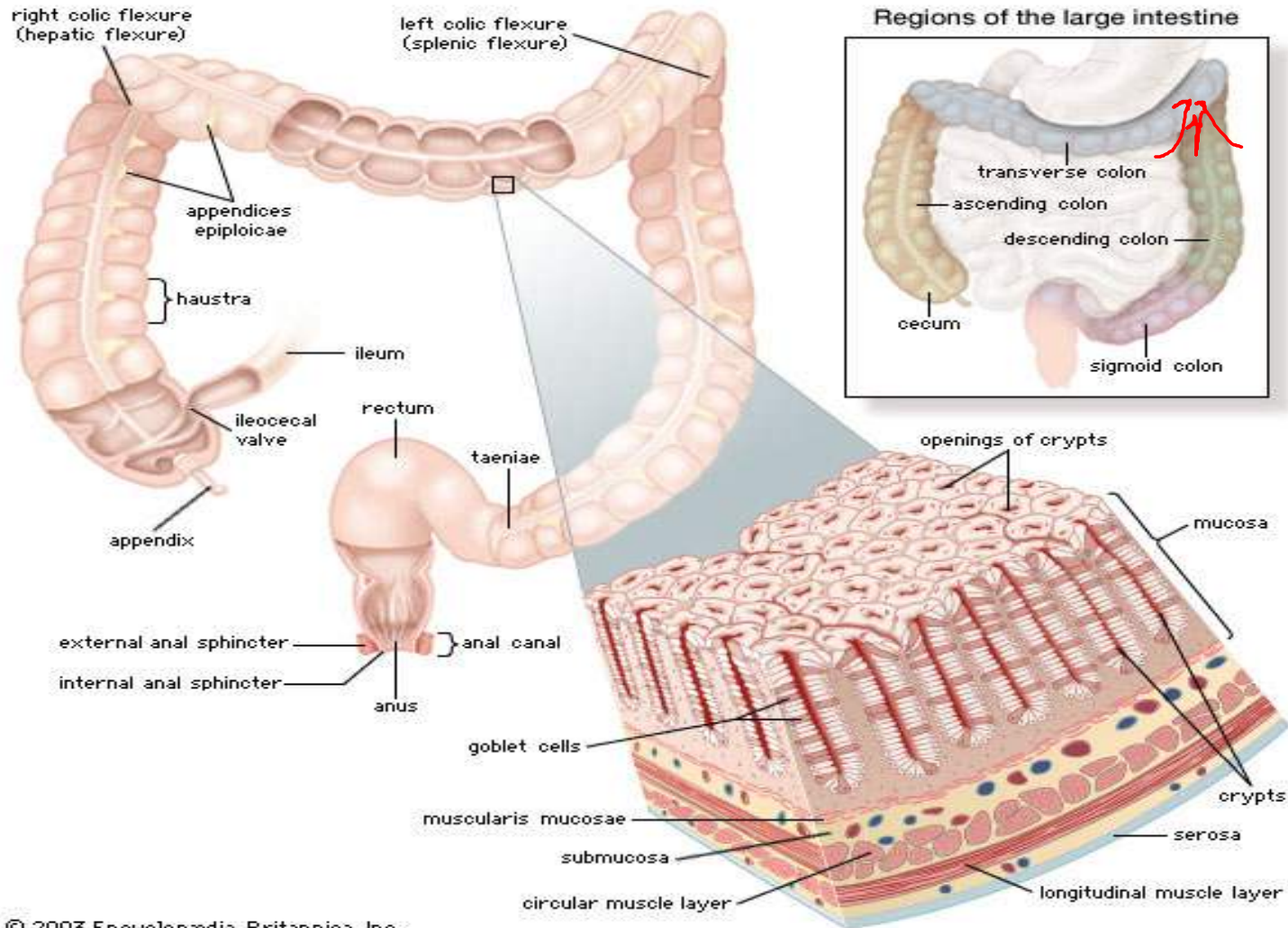
Large Intestine



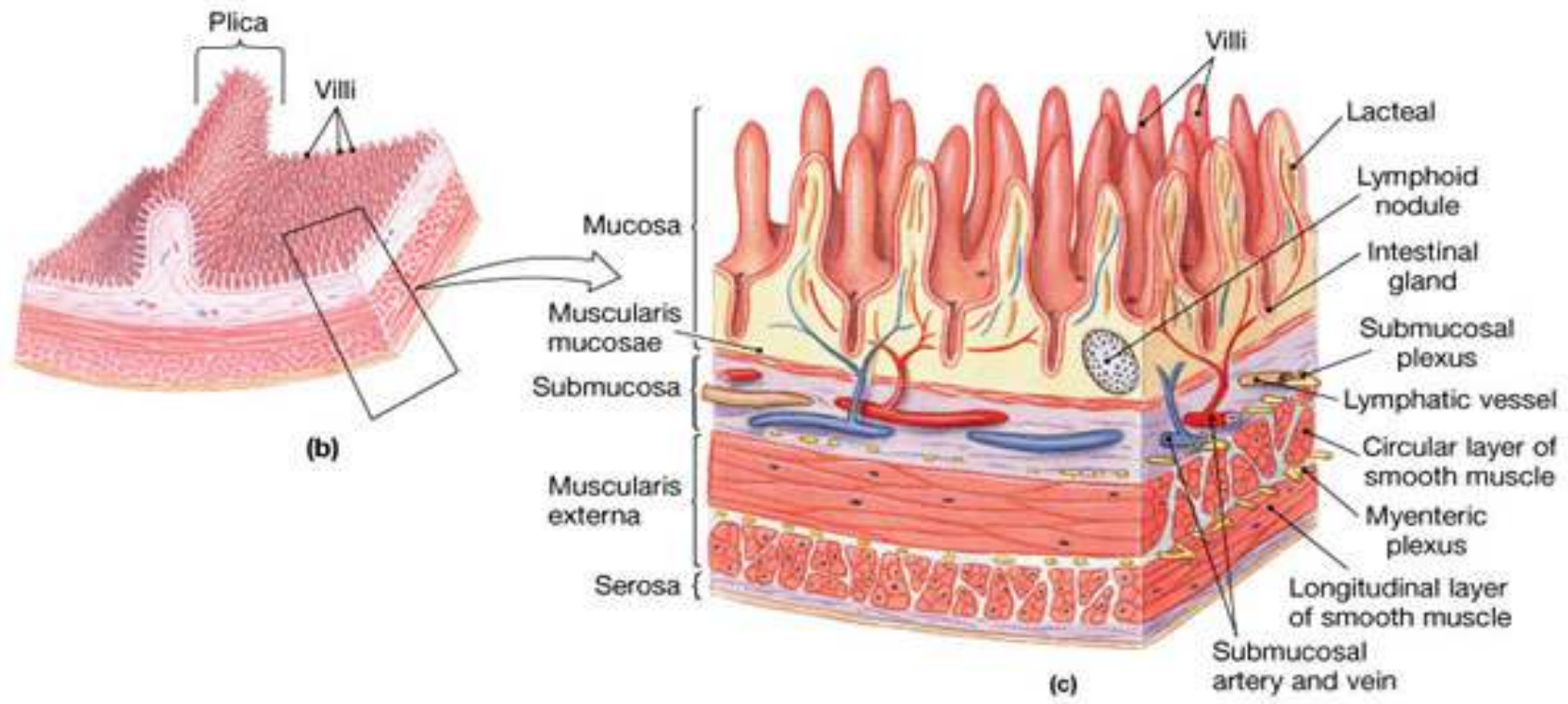


- Teniae coli:** three thickened bands of longitudinal muscle fibers.
- Haustra:** sacculations or pouches of the colon between the teniae.
- Omental appendices:** small, fatty appendices (projections) of colon.
- Caliber:** the internal diameter is much larger.





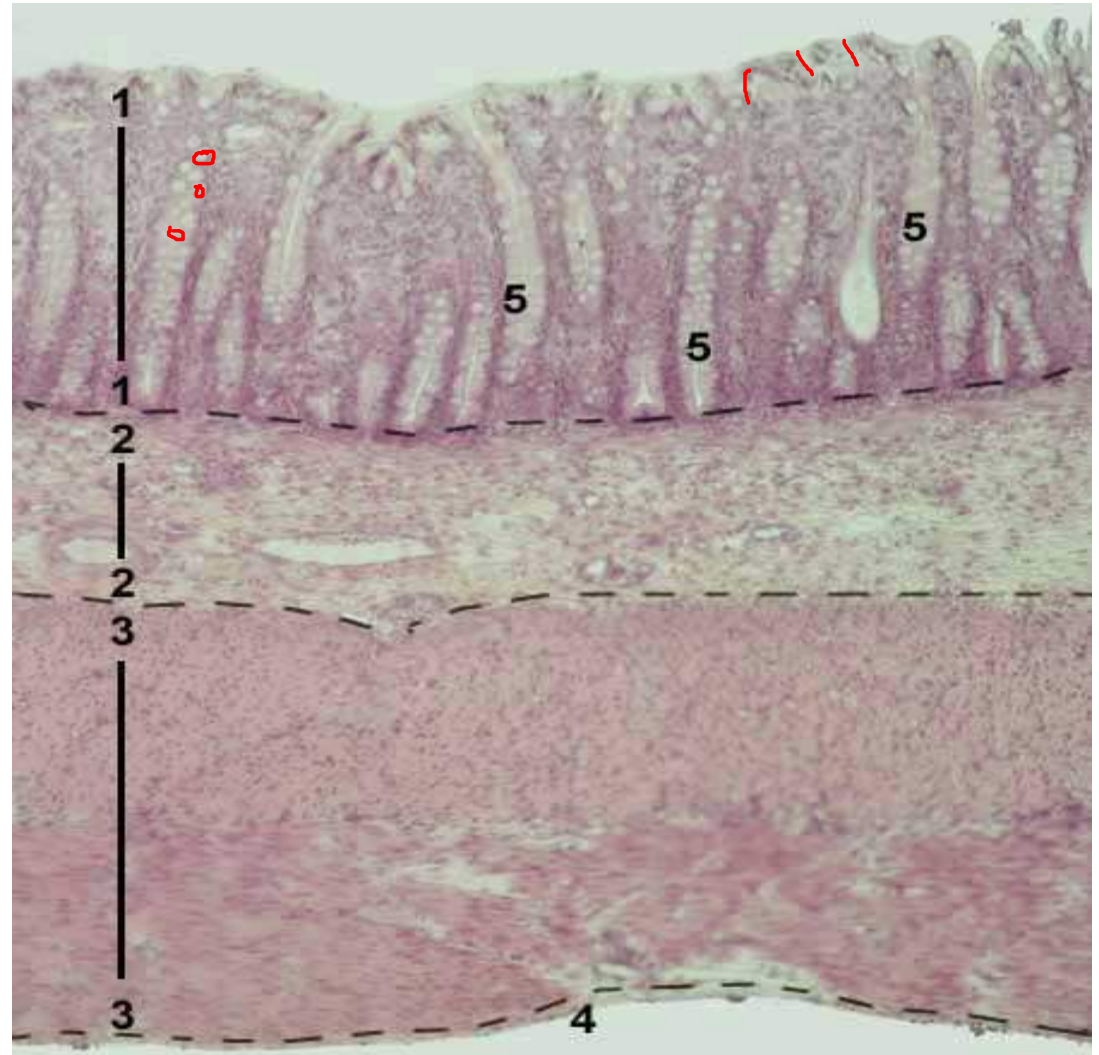
القولون



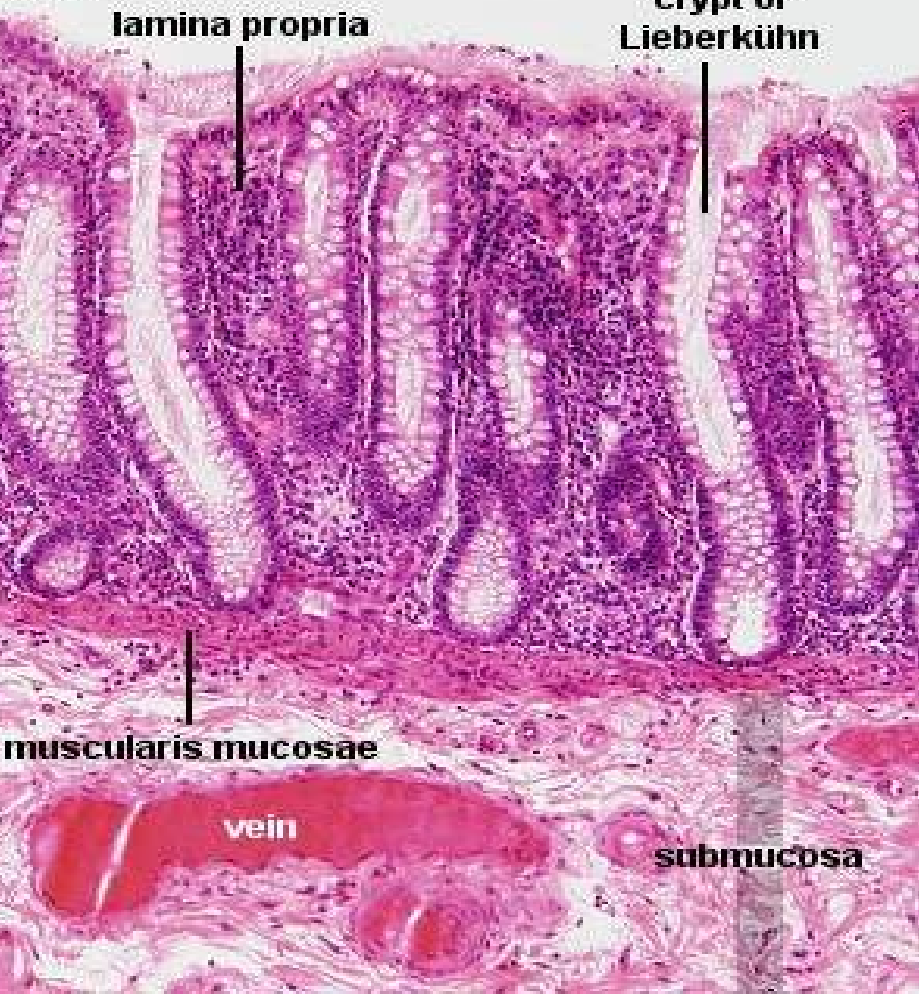
COLON

Stained with haematoxylin and eosin

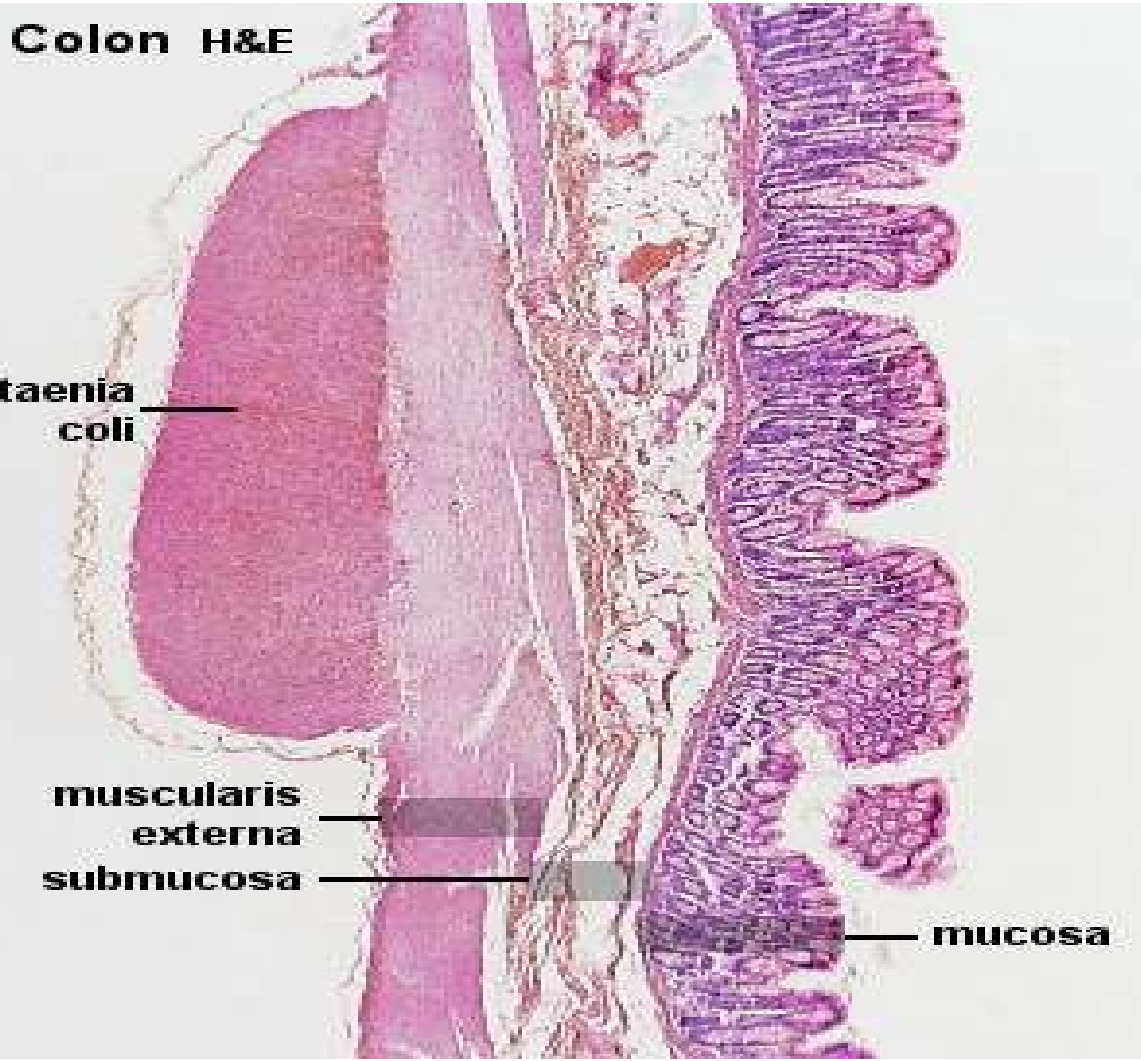
- 1 - tunica mucosa
- 2 - tunica submucosa
- 3 - tunica muscularis propria
- 4 - tunica serosa
- 5 - glands (crypts) in the lamina propria of the mucosa

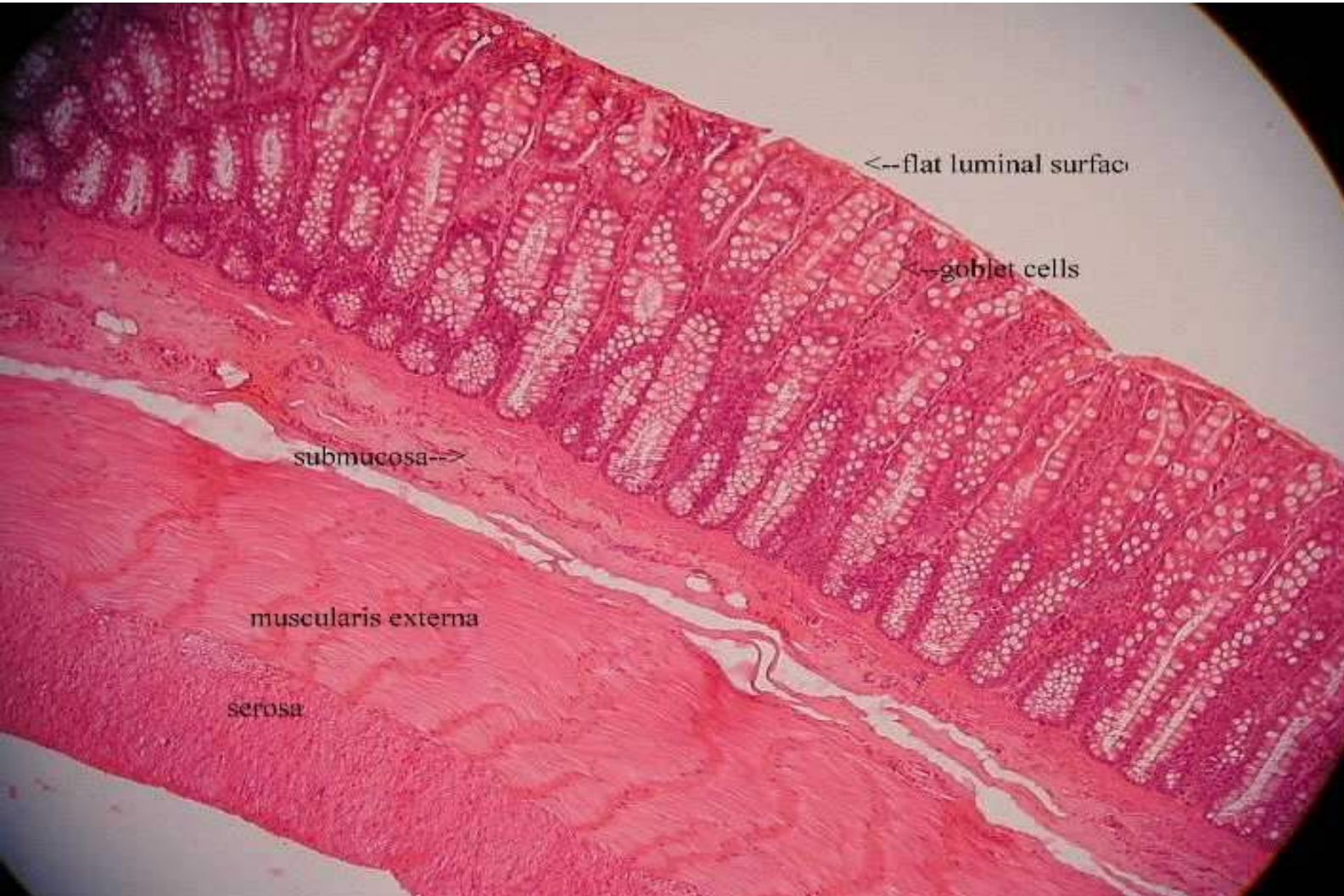


Colon H&E



Colon H&E





mucosa (flat
luminal surface)
goblet cells
submucosa
lymph nodes (if
present)
muscularis
externa
serosa

Crypts

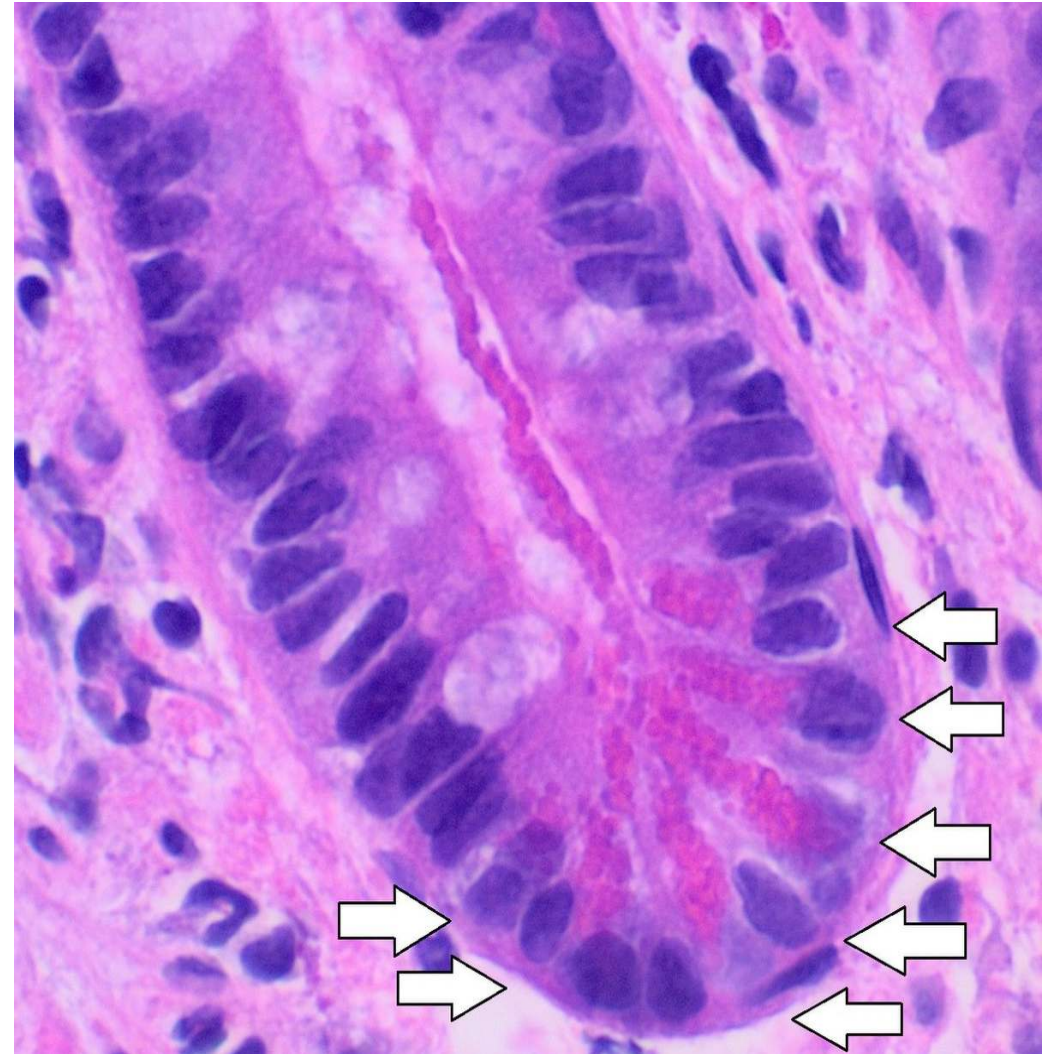
The crypts additionally contain

- **Paneth cells** (at the base of the crypts) - they have a defensive function, and stain intensely eosinophilic, due to secretory granules of antimicrobial peptides called defensins, as well as lysozyme and phospholipase A. These cells last for several weeks.

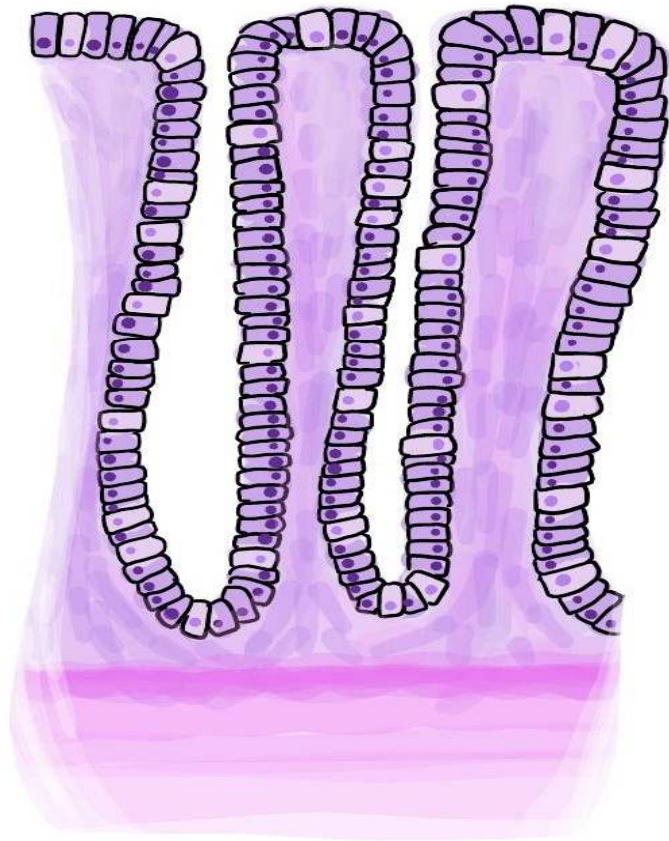
- **Endocrine cells**, (also eosinophilic) which produce secretin, somatostatin, enteroglucagon and serotonin. One type of endocrine cell for each type of hormone.

- **Stem cells**, found at the base of the crypts, which divide continuously to replace enterocytes (every 2-3 days), goblet cells, paneth cells and neuroendocrine cells.

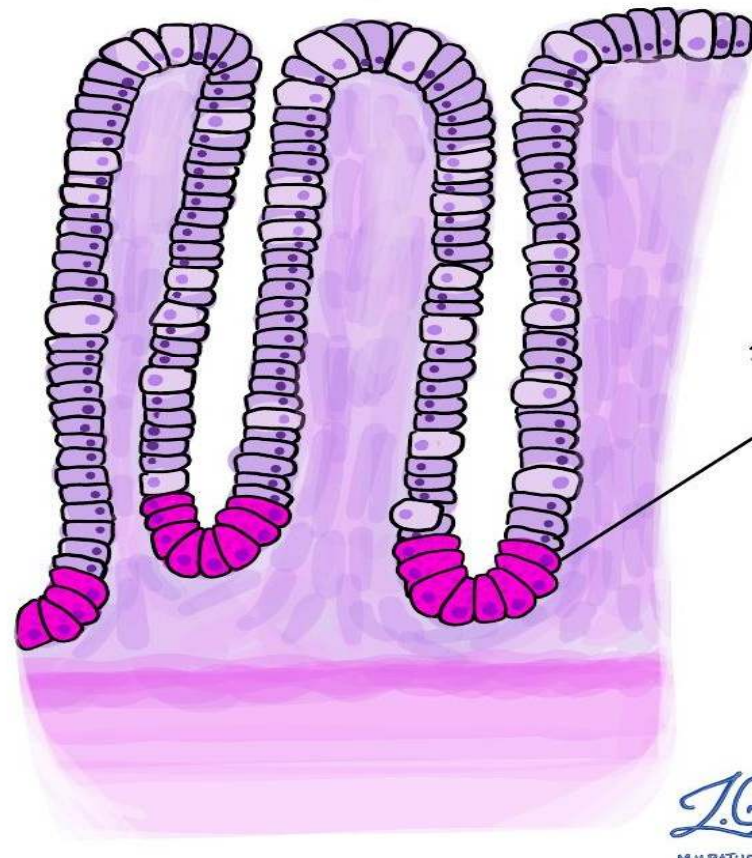
Intraepithelial lymphocytes (mostly T-cells).



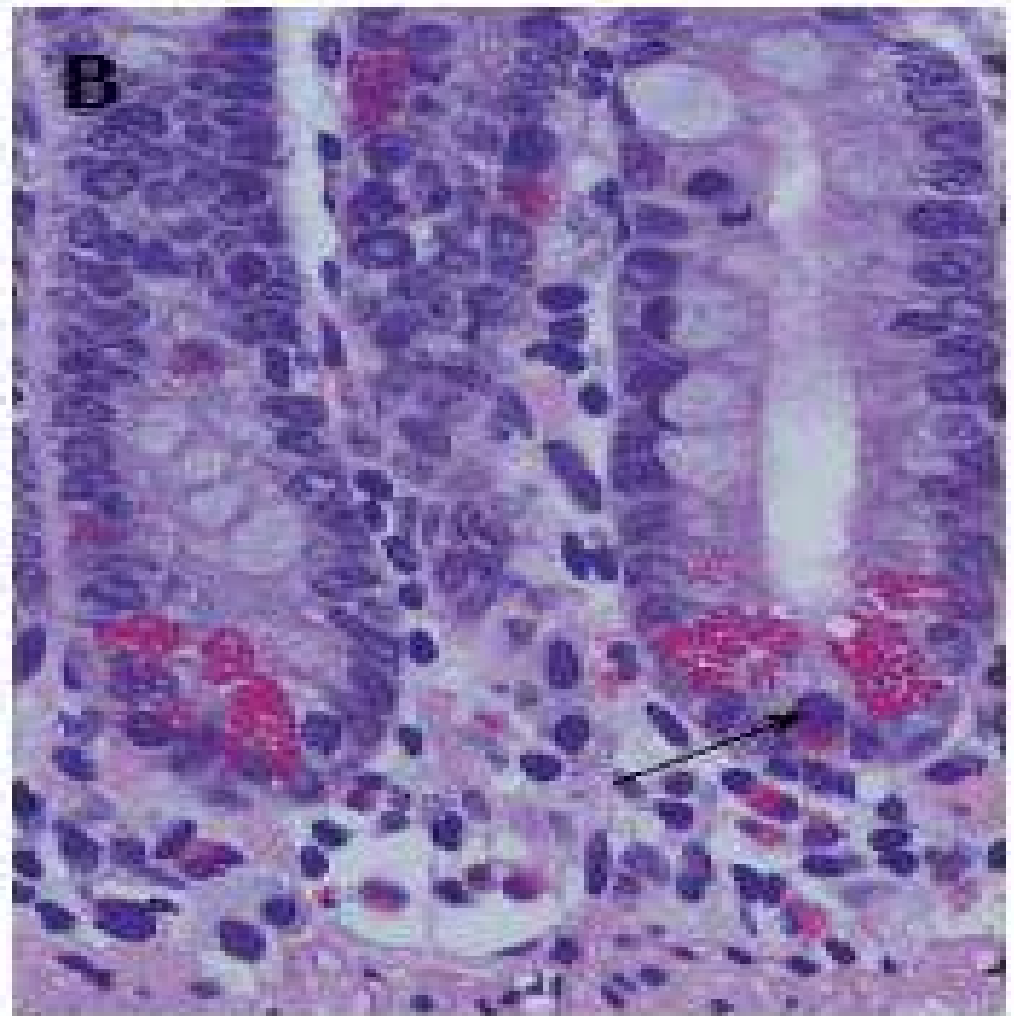
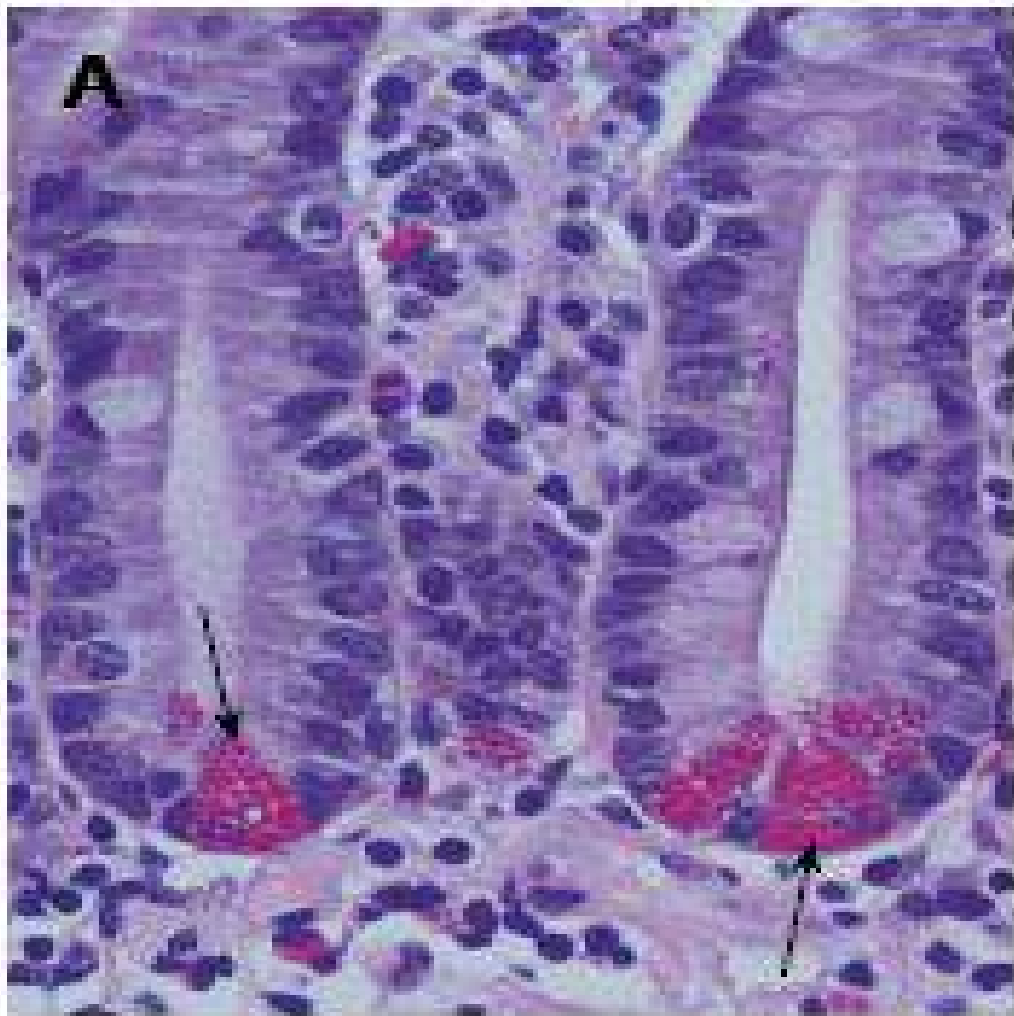
NORMAL COLON



PANETH CELL METAPLASIA



PANETH CELLS

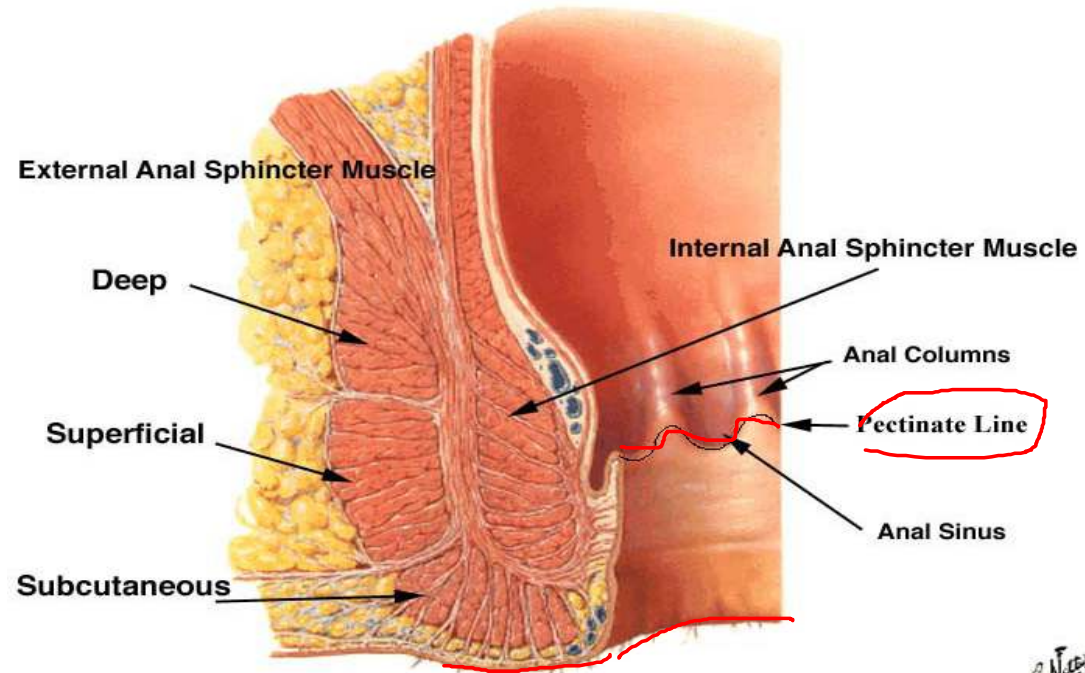
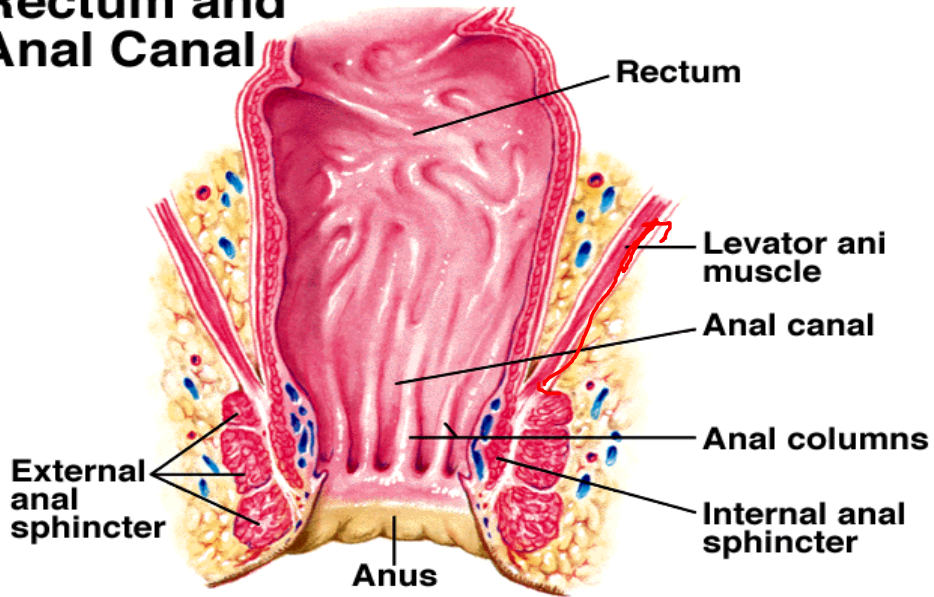


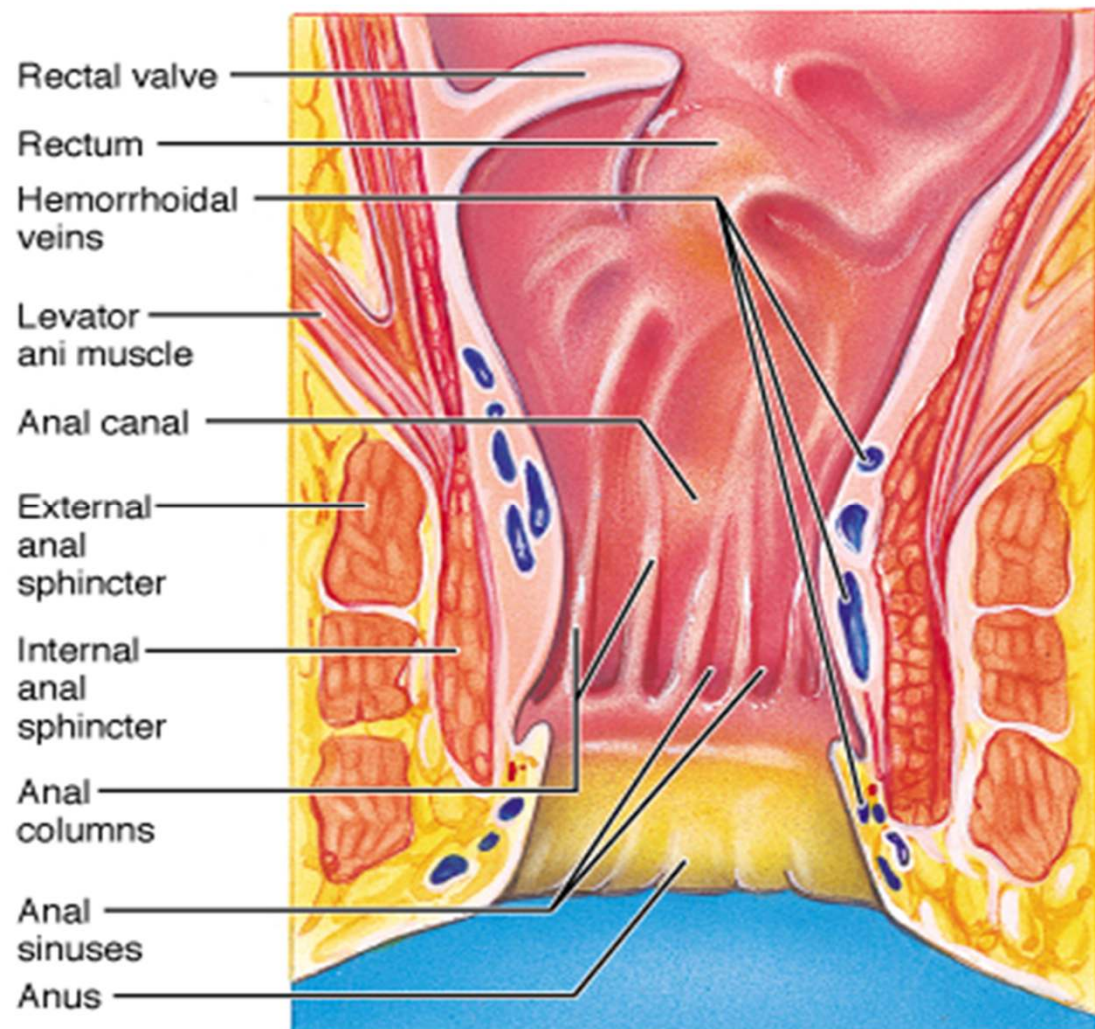
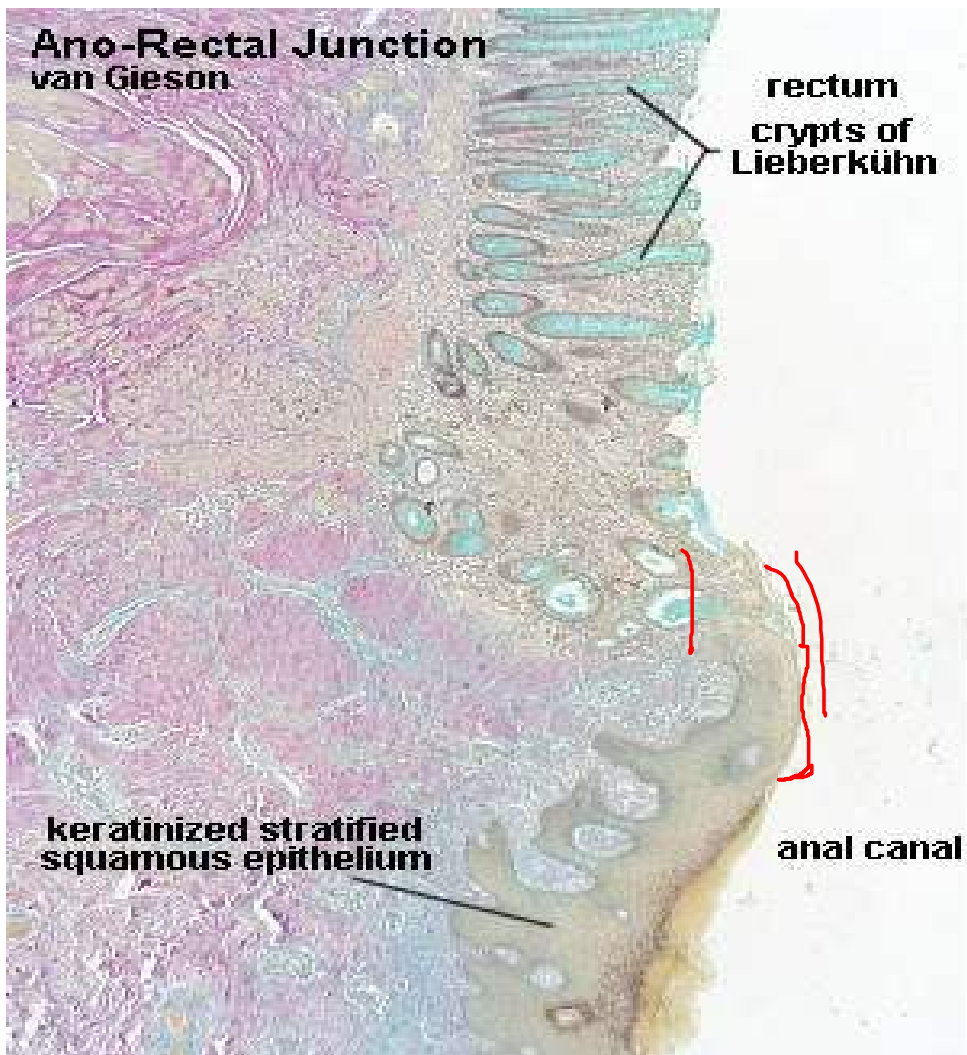
Anal Canal:

- (1) Opens to exterior via anus.
- (2) Has 2 anal sphincters:
 - Internal Anal Sphincter (smooth m.) = involuntary
 - External Anal Sphincter (skeletal m.)= voluntary

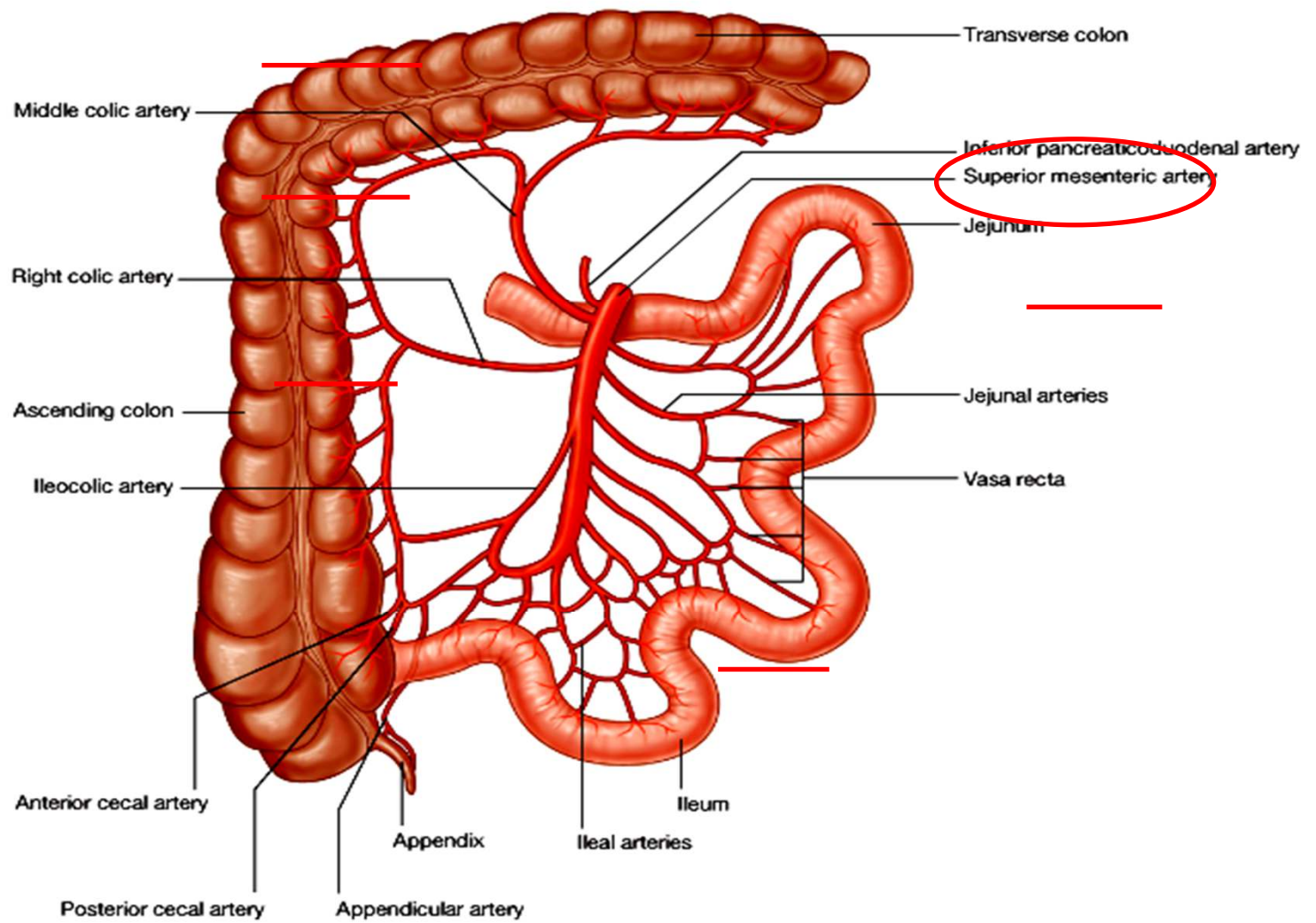
Shier/Butler/Lewis, *Hole's Human Anatomy and Physiology*, 8th edition, Copyright © 1999, The McGraw-Hill Companies, Inc. All rights reserved.

Rectum and Anal Canal

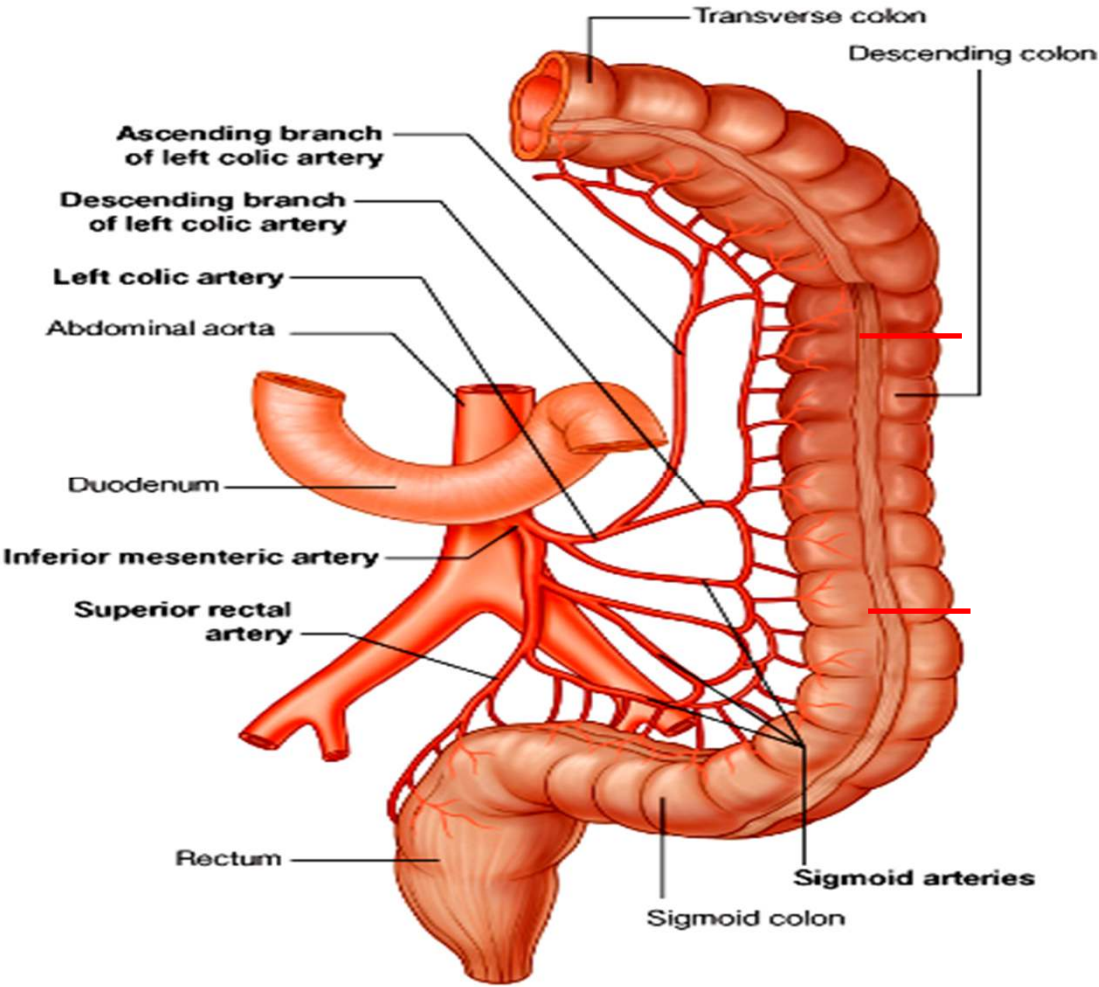




**Superior
mesenteric A.**



Inferior mesentric A.



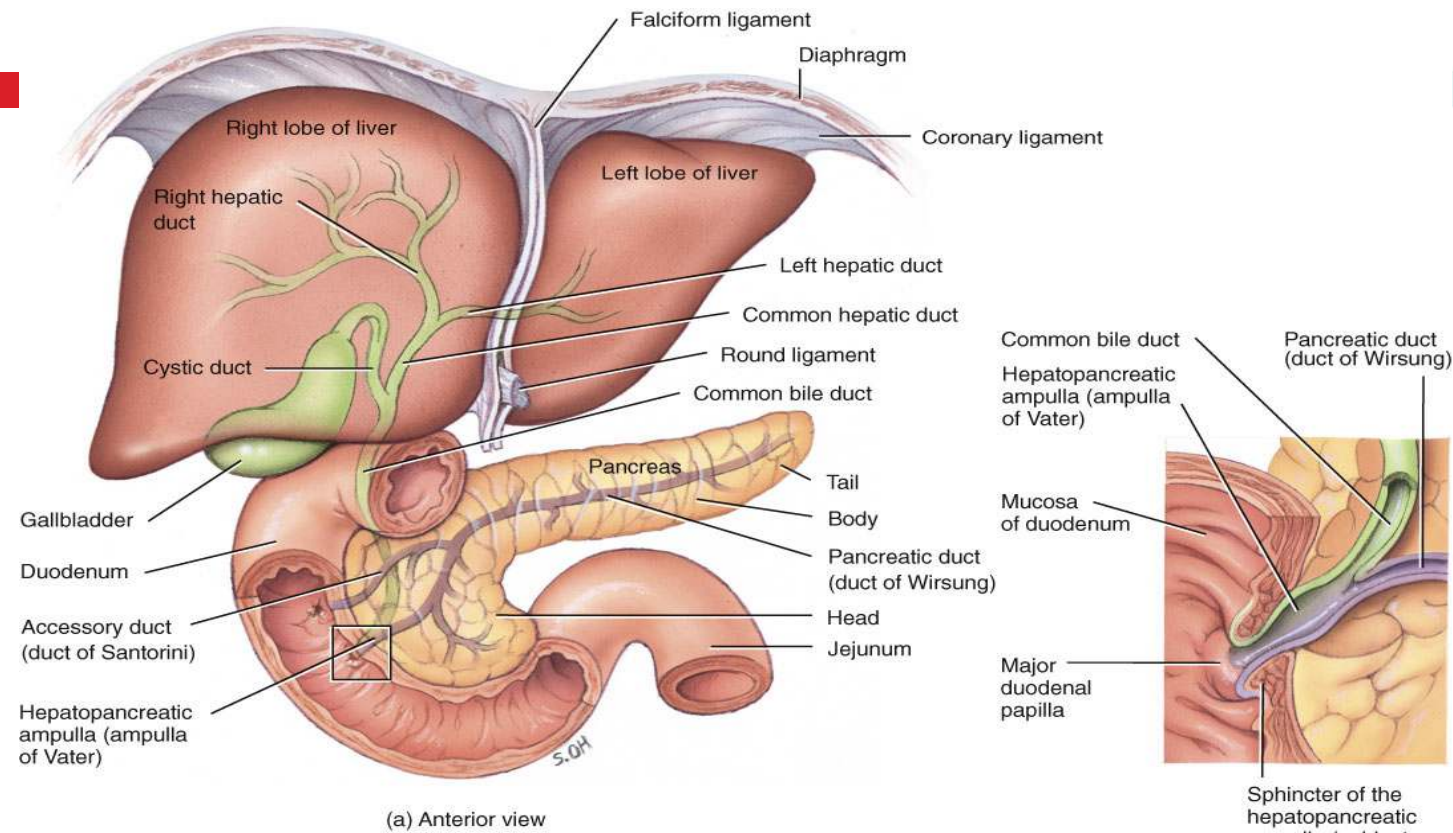
Differences

Large & small intestines

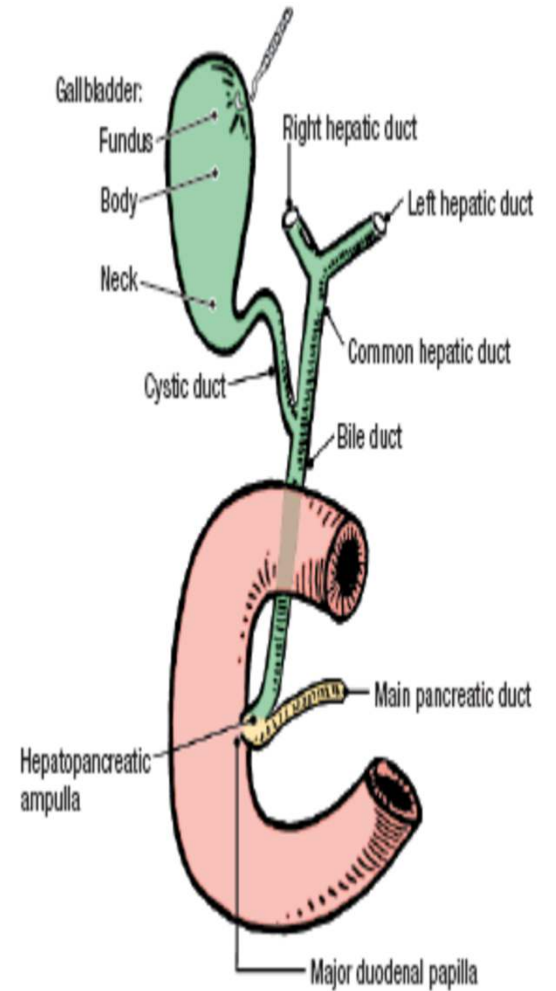
- Teniae coli
 - Haustra
 - Omental appendices /
Appendices epiploica
 - Semicircular folds
 - Large diameter
- No teniae coli
 - No Haustra
 - No Omental appendices /
Appendices epiploica
 - Circular folds
 - Small diameter

Duodenum

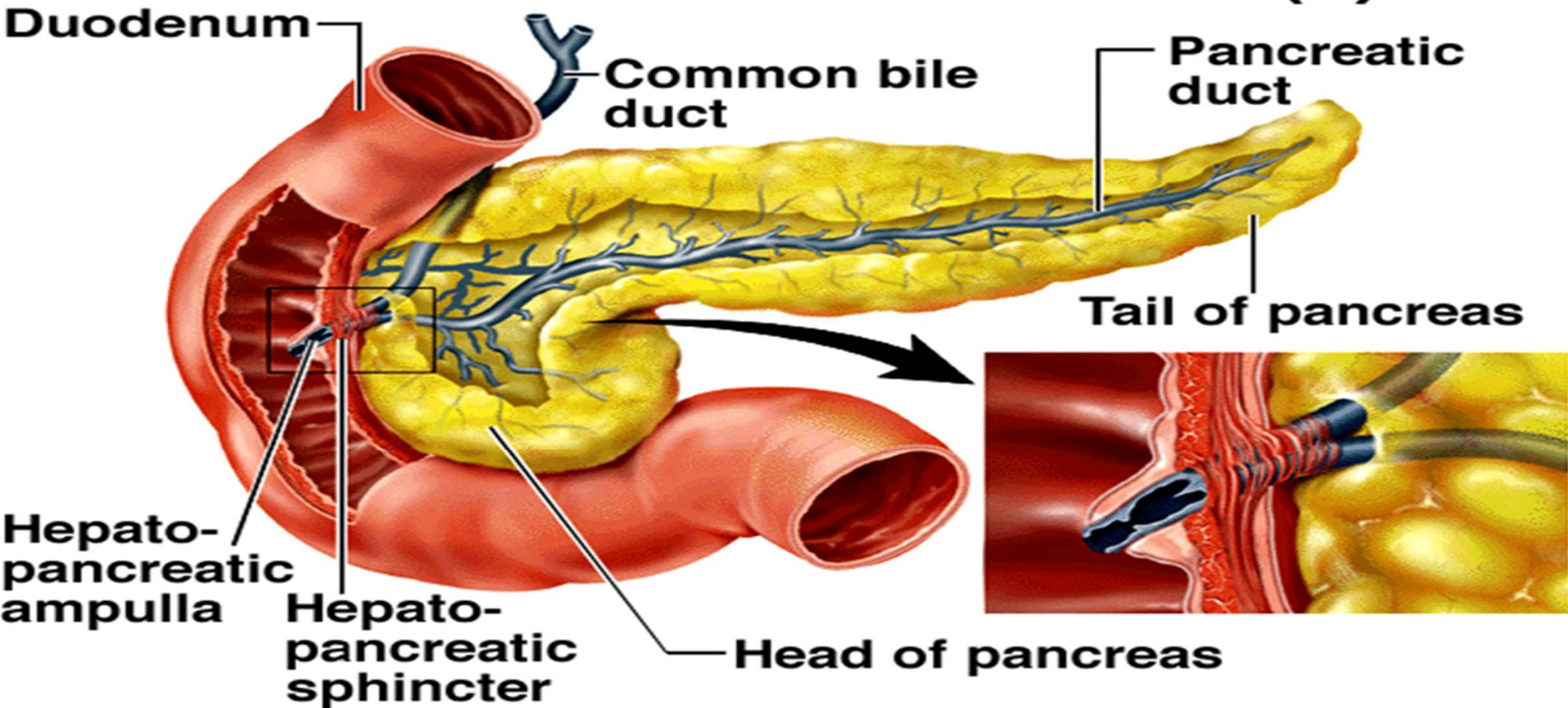
Fig. 24.17a



24.17a



Pancreas and Duodenum (1)



4 Lobes & segments

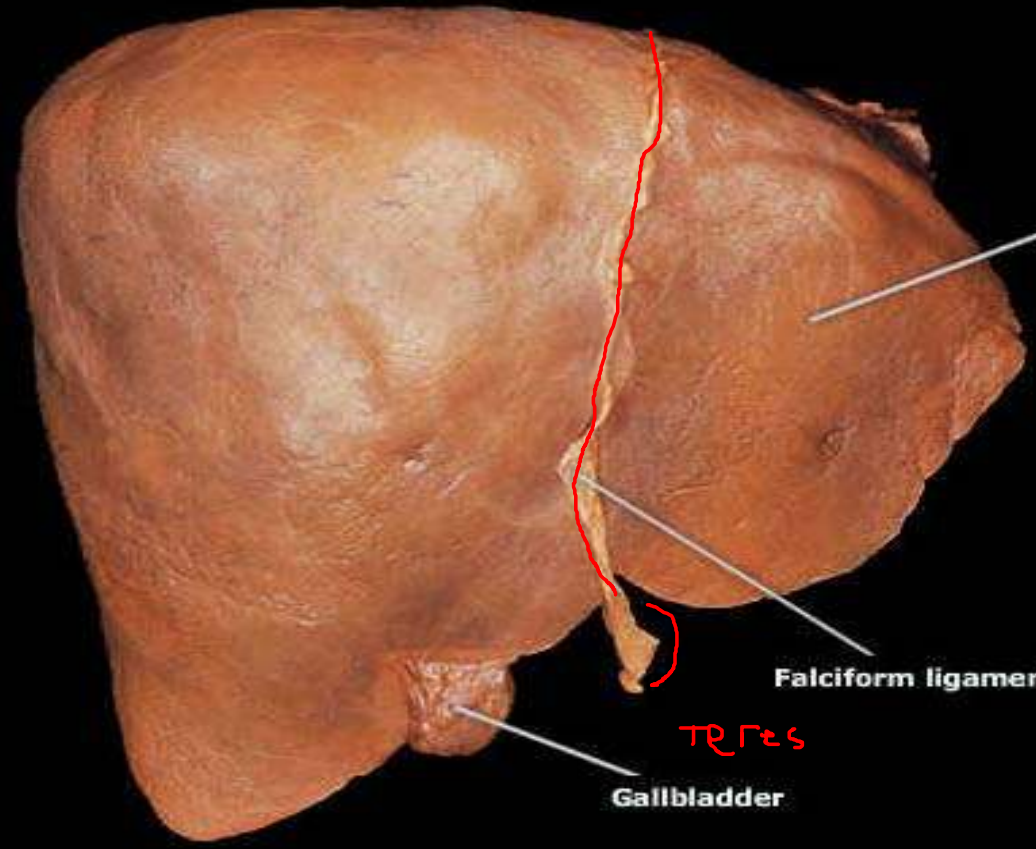
Largest organ in the body

Three basic functions

- Metabolic
- Secretory
- Vascular

Major function

- Excretion of waste products from bloodstream by excretion into bile



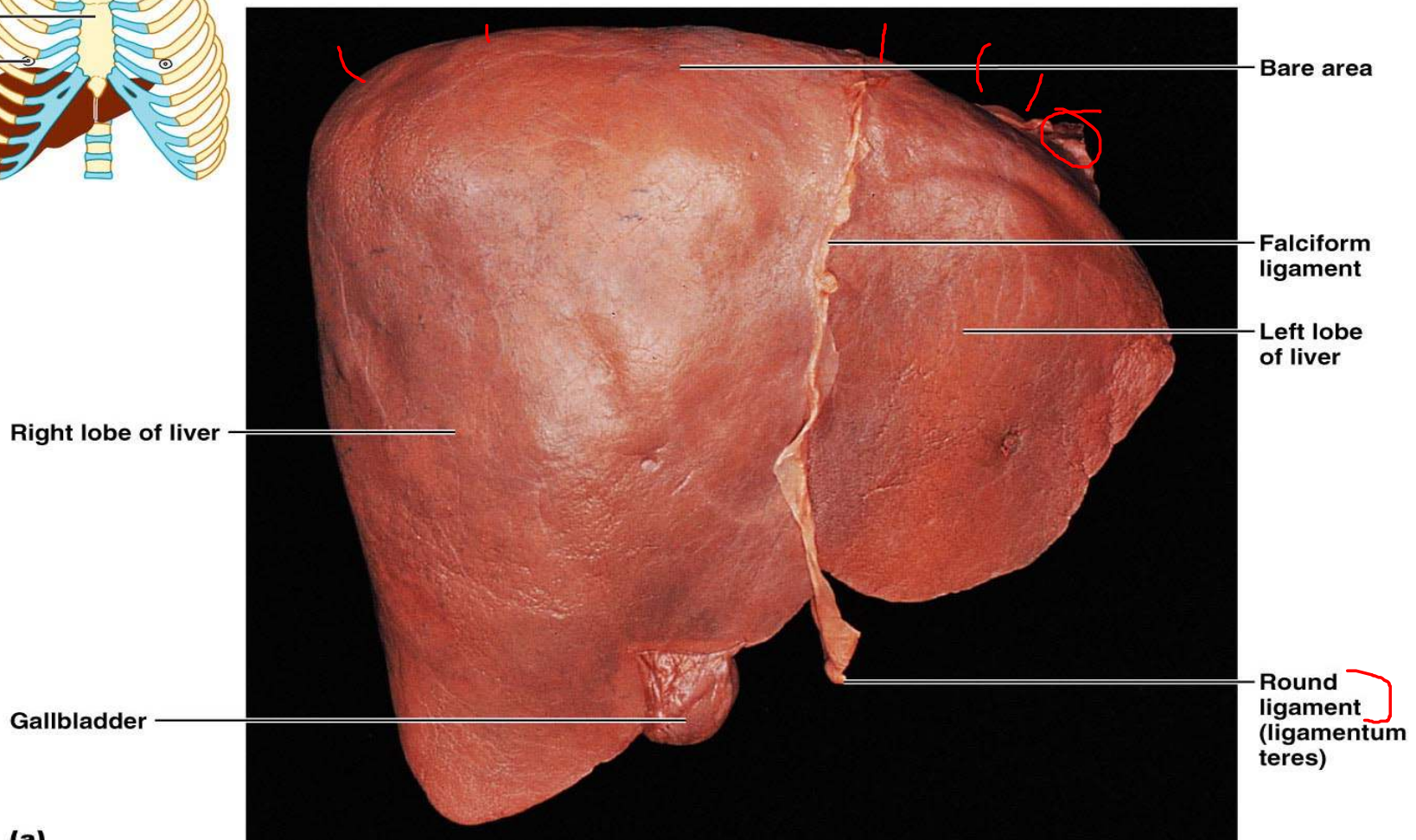
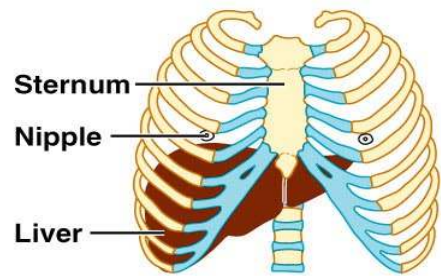
TRETS
ligament
GF
LEI

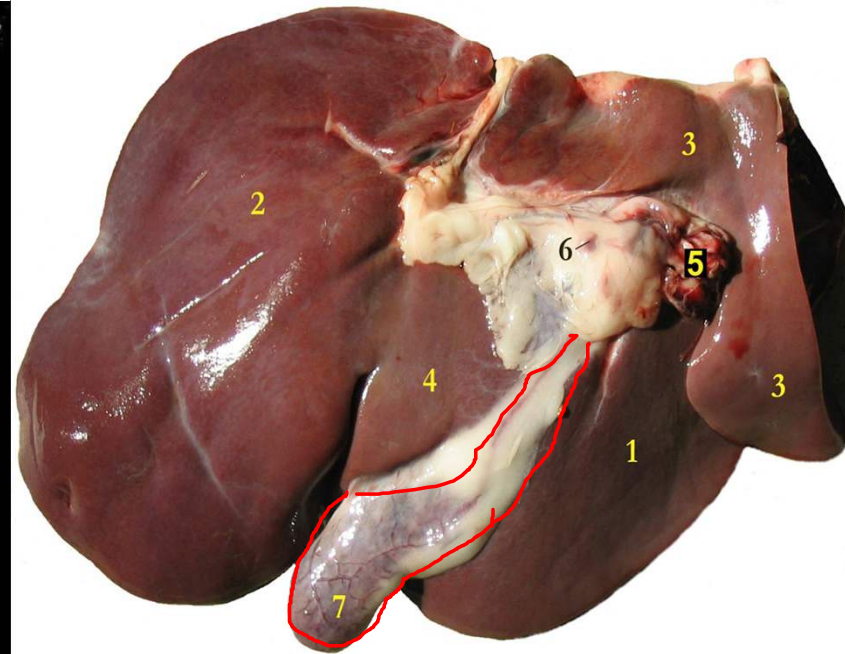
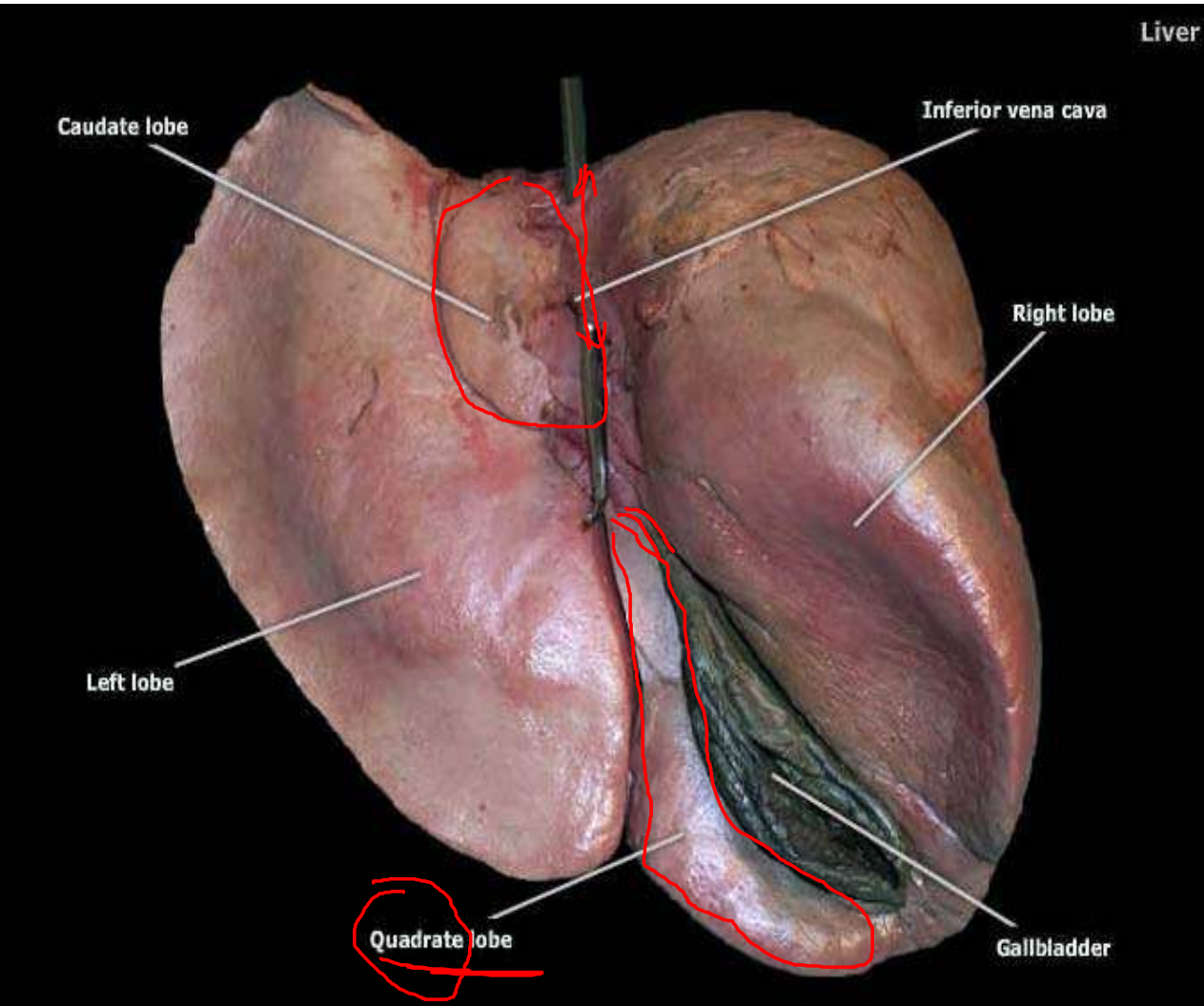
TRETS

Gallbladder

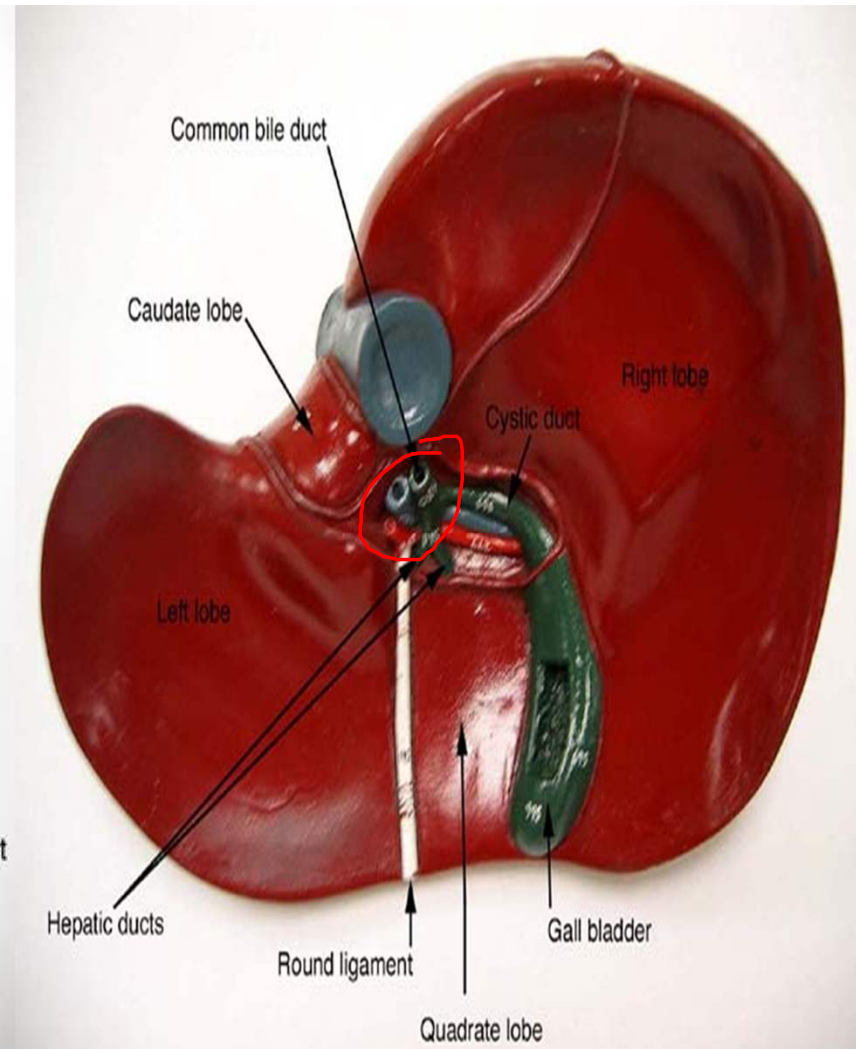
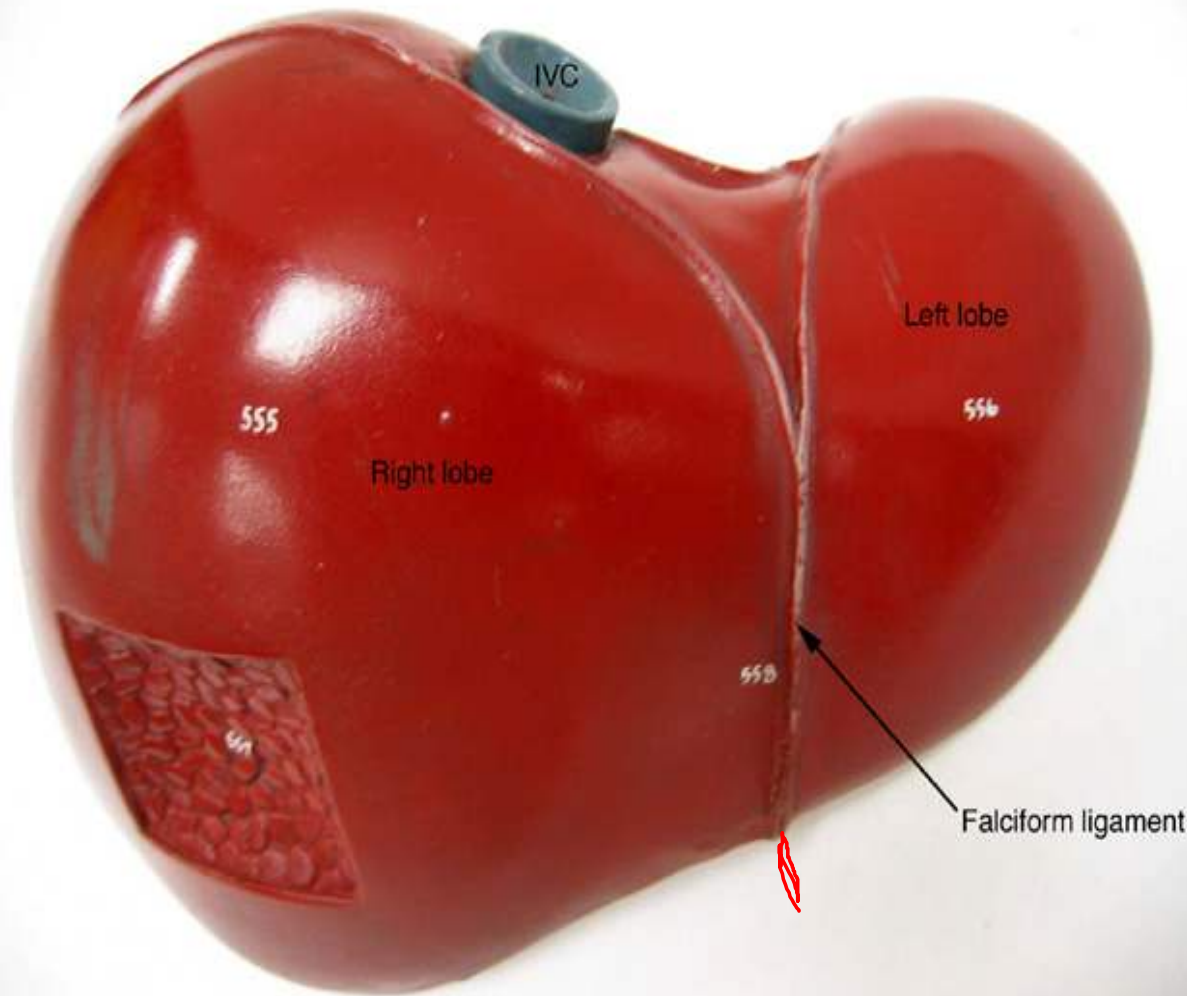
Falciform ligament

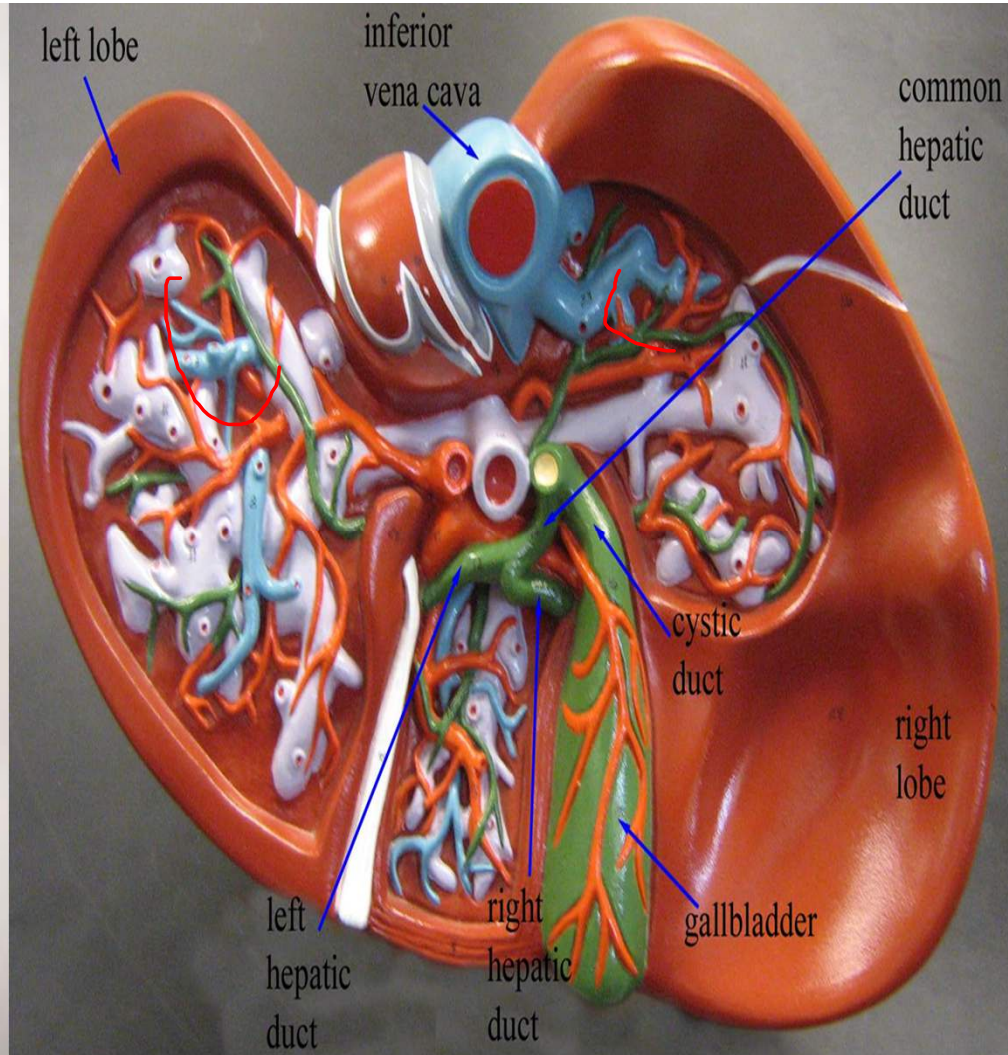
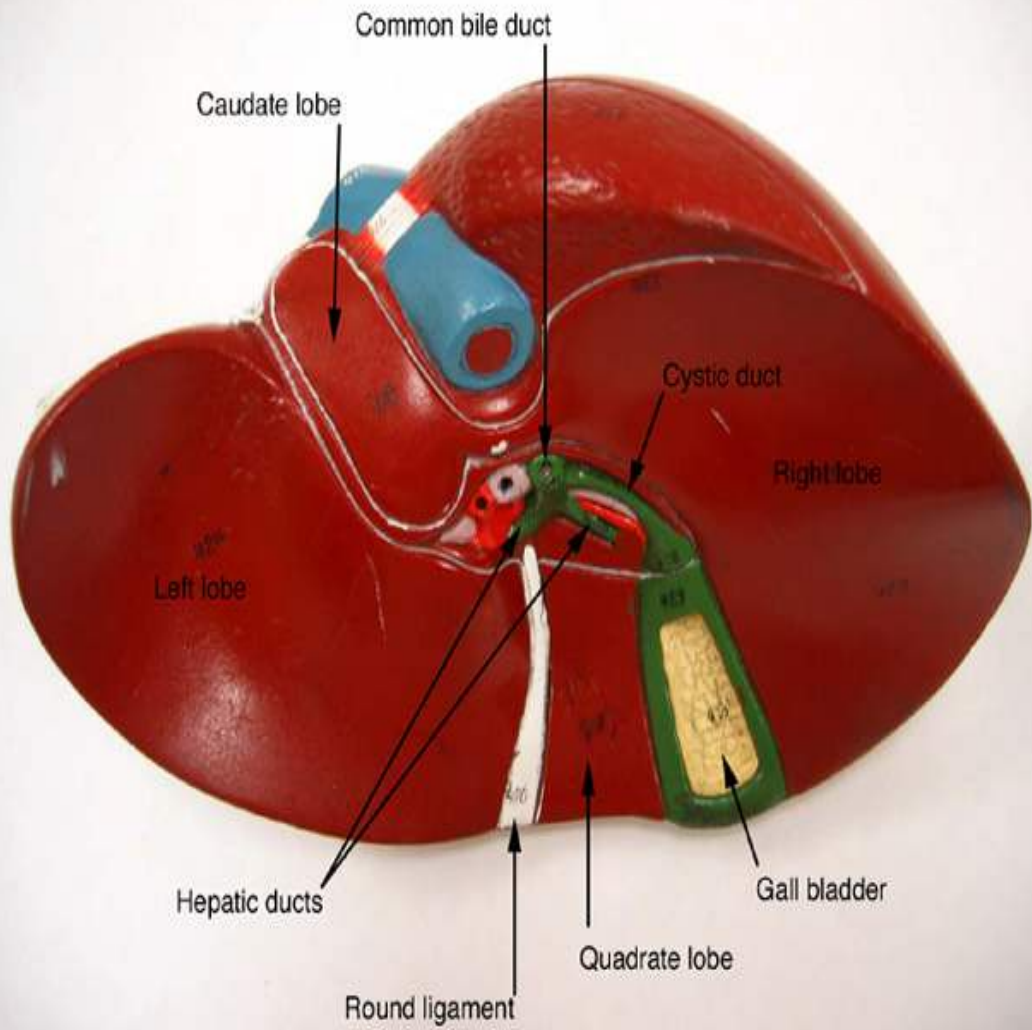
Left lobe of liver

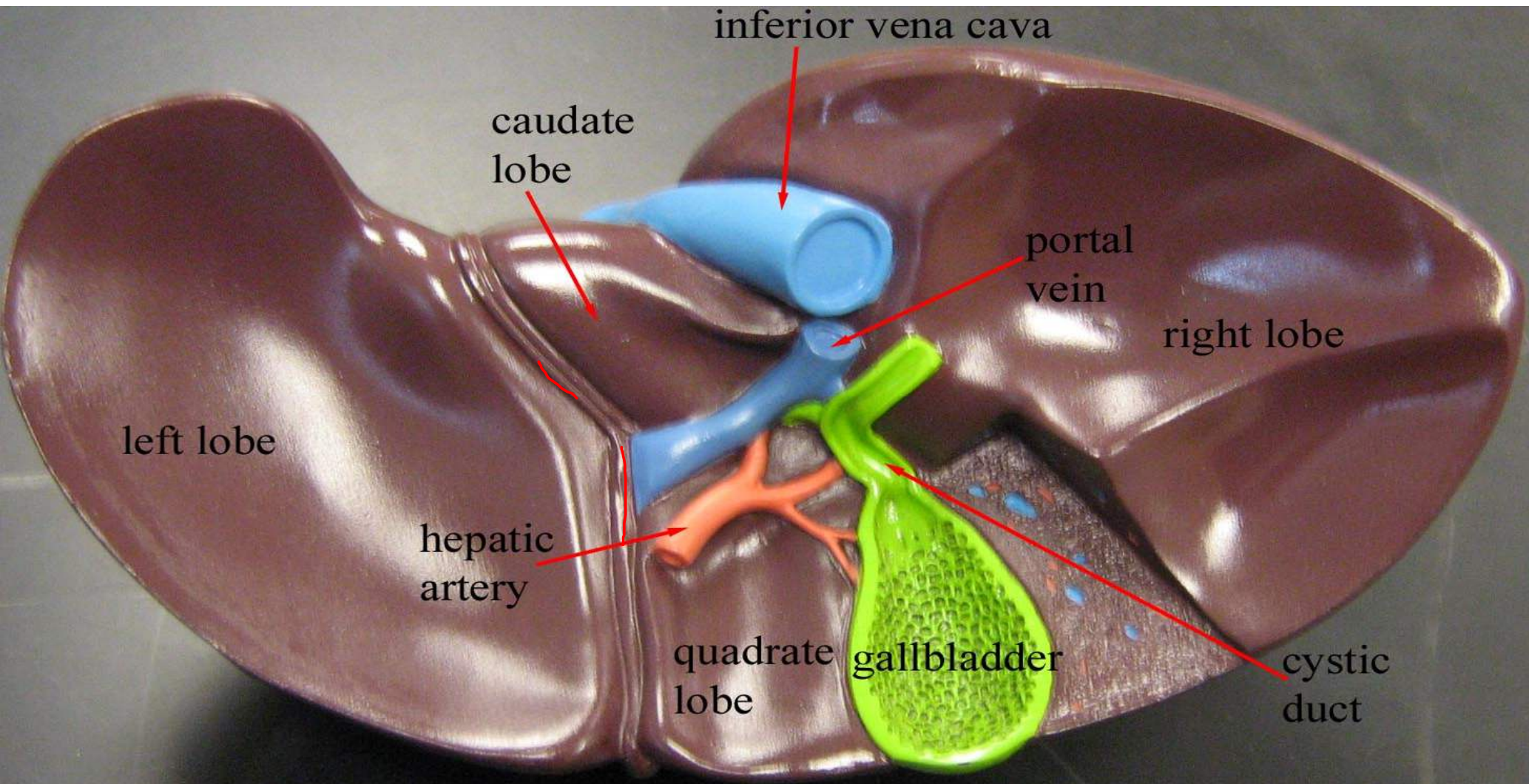


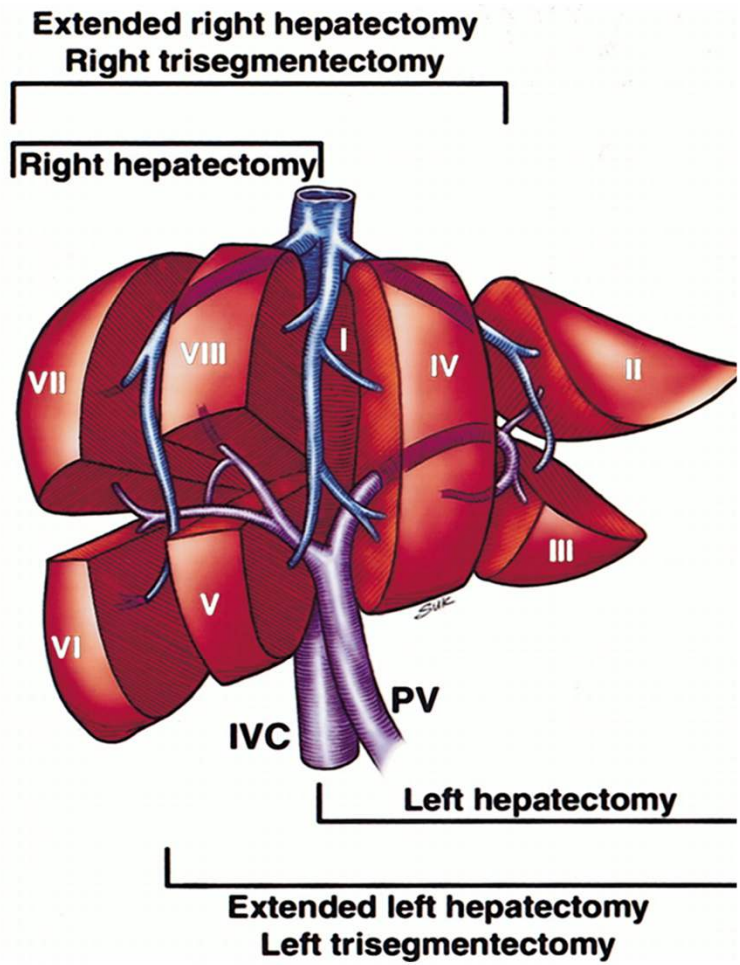


Liver of a sheep, visceral aspect
1 left lobe, 2 right lobe, 3 caudate lobe, 4 quadrate lobe, 5 hepatic artery and portal vein, 6 hepatic lymph nodes, 7 gall bladder

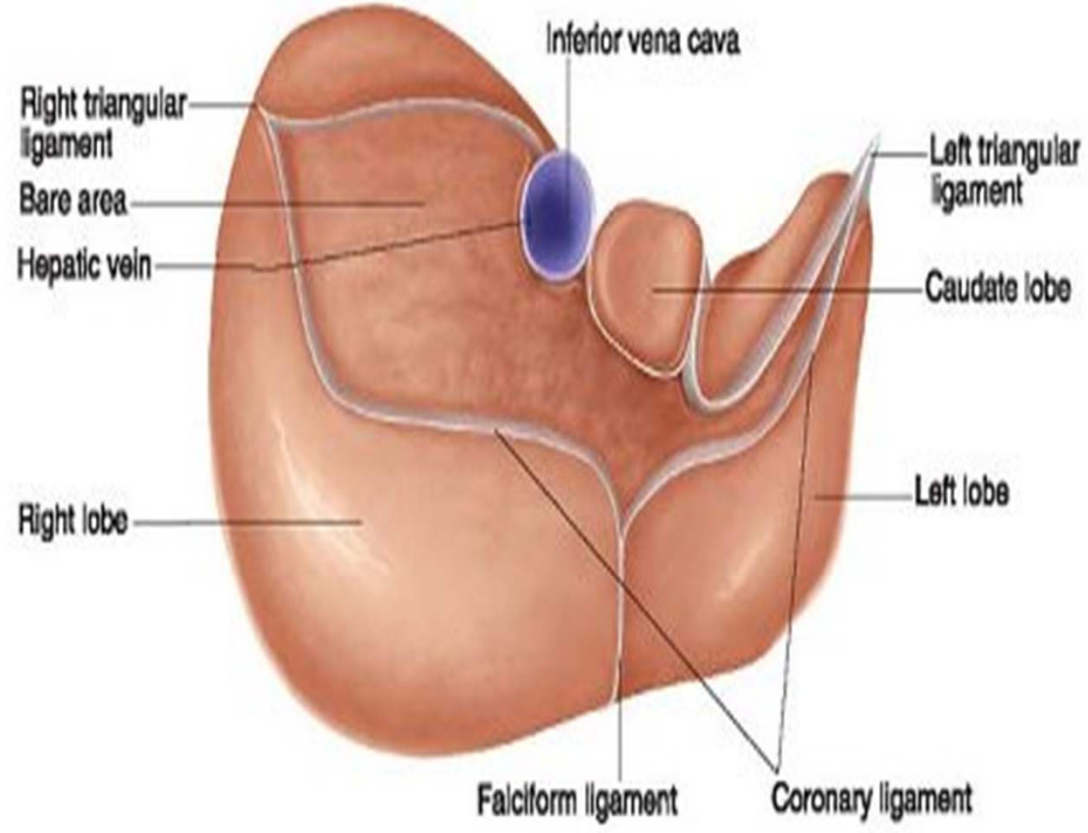




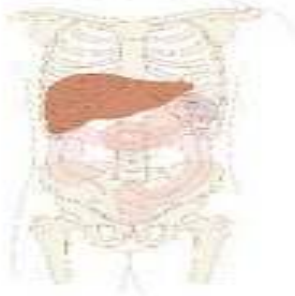




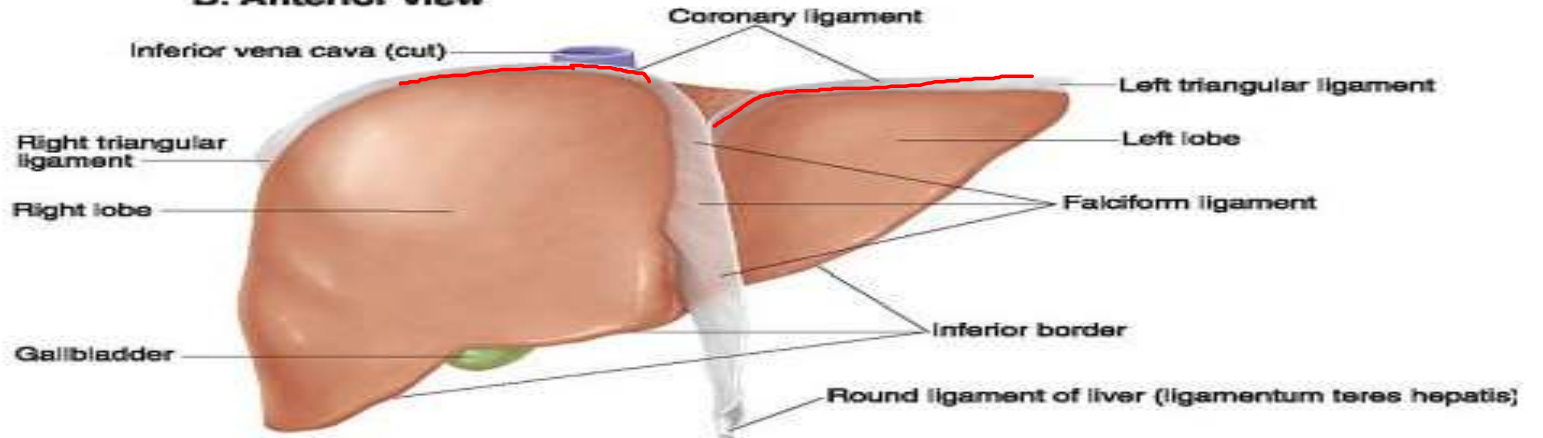
D. Superior view



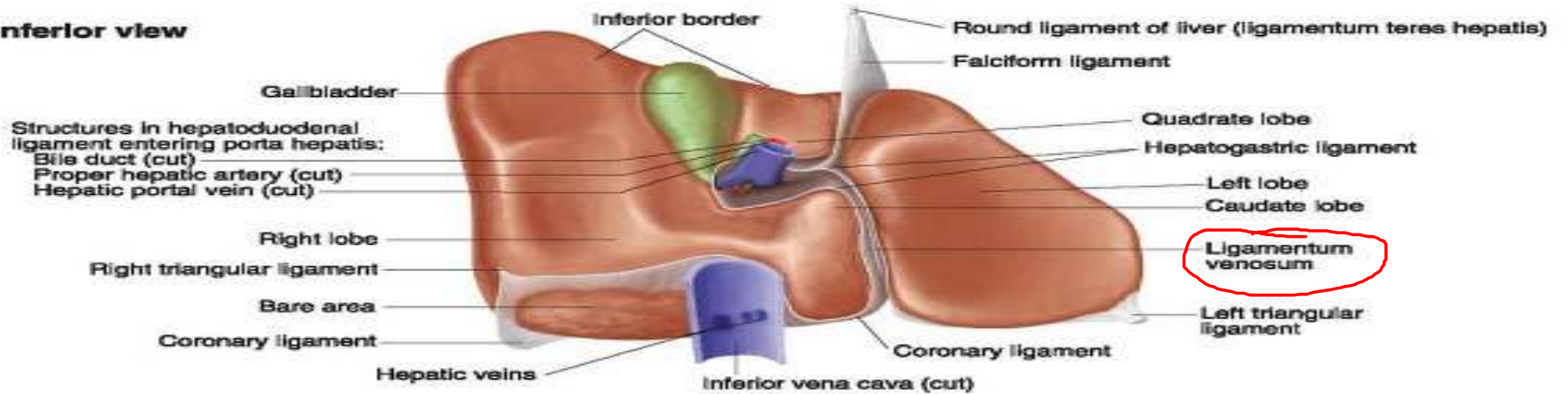
A. Orientation

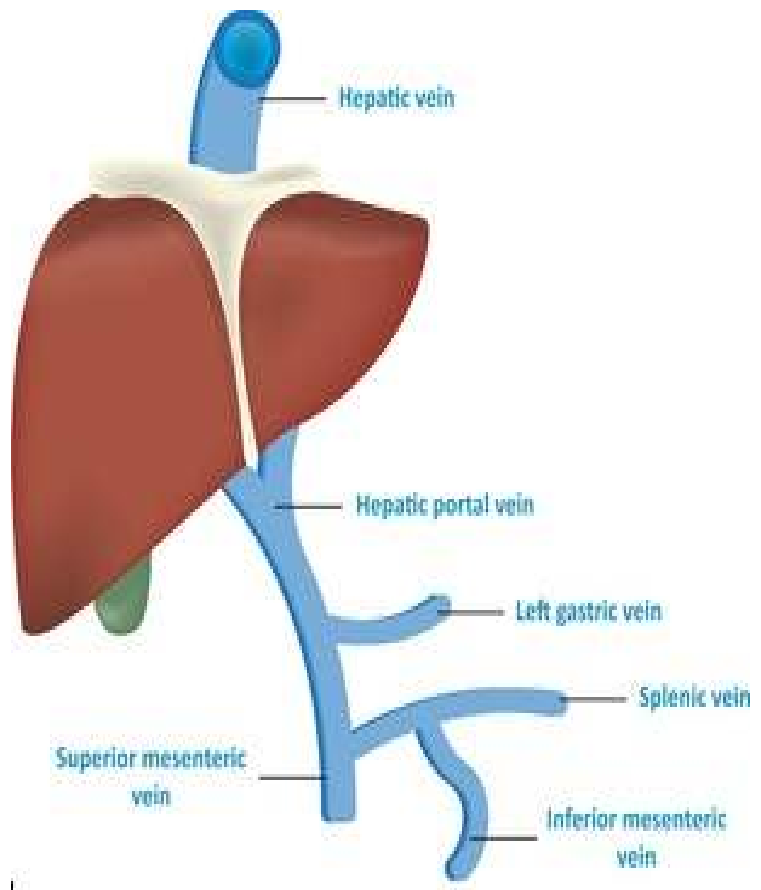


B. Anterior view

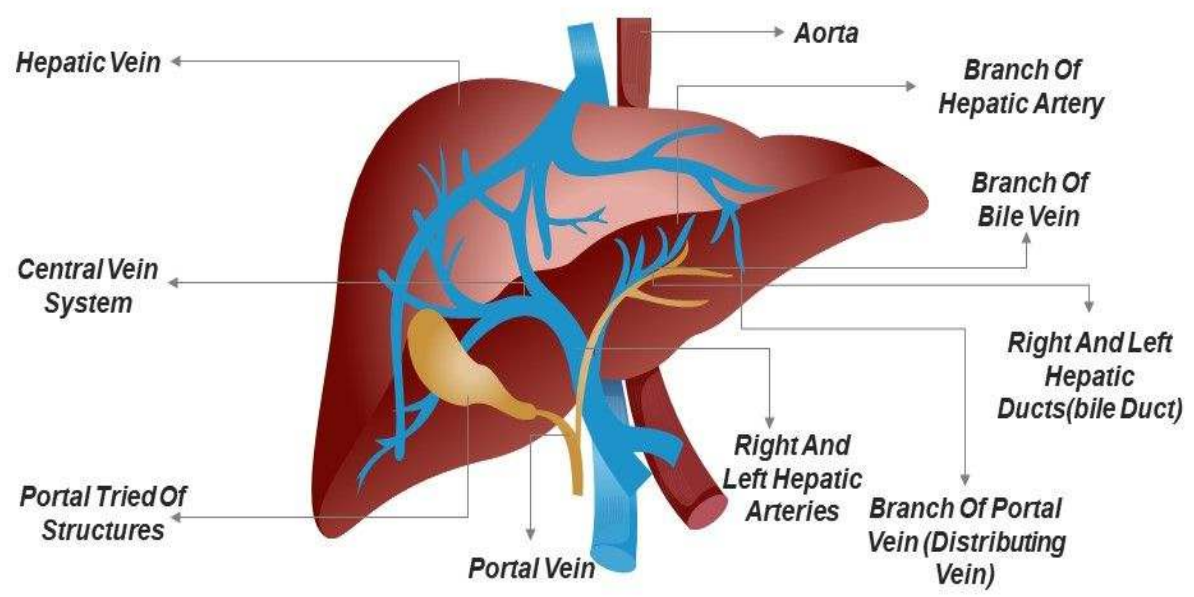


C. Inferior view

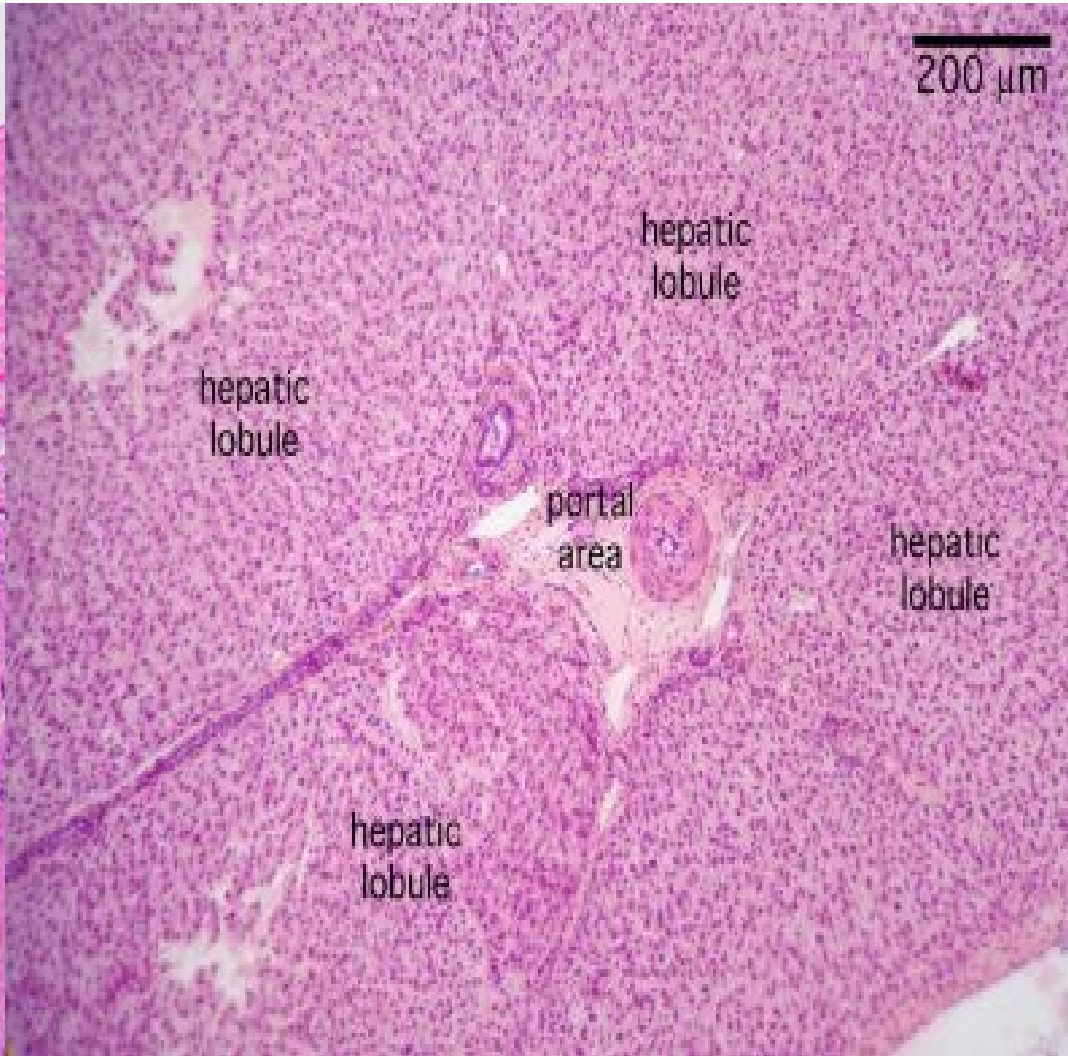
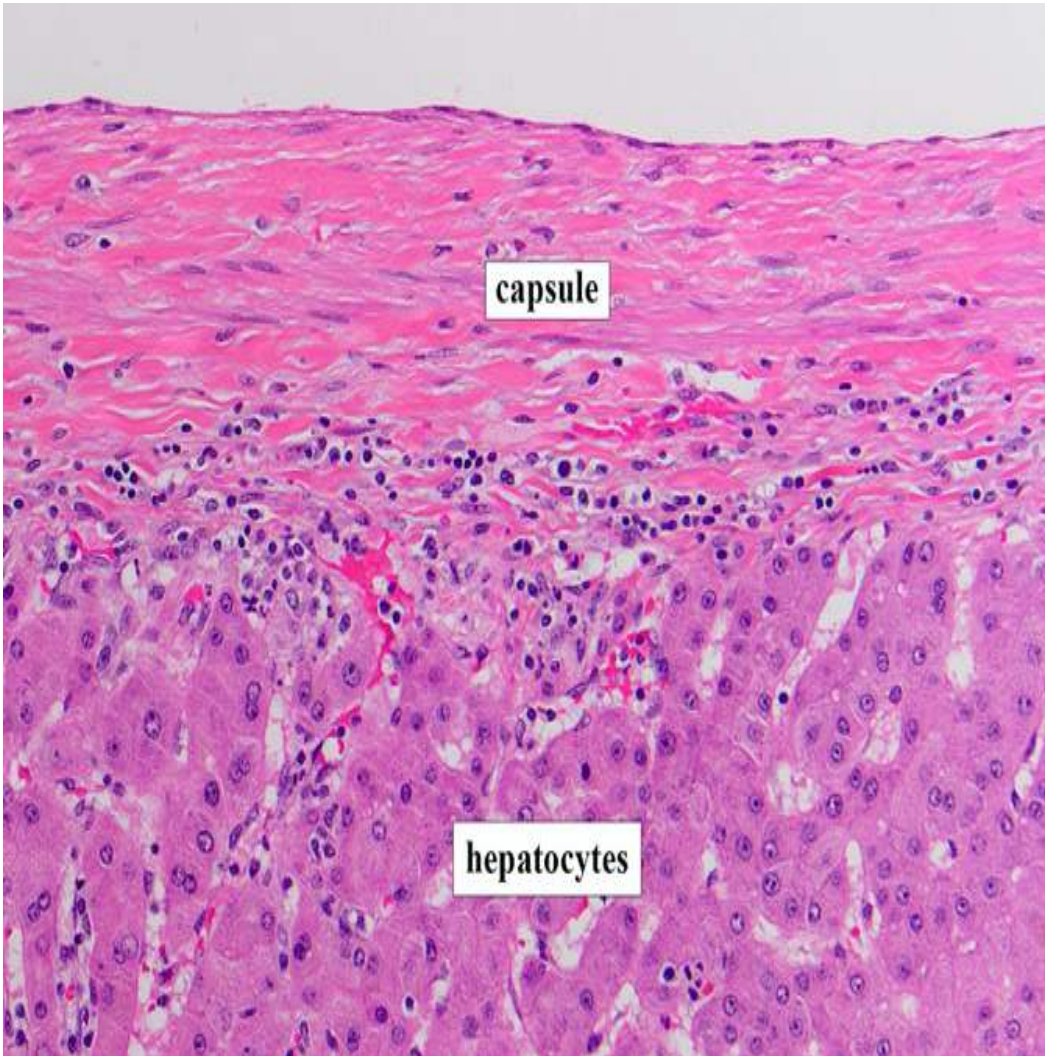


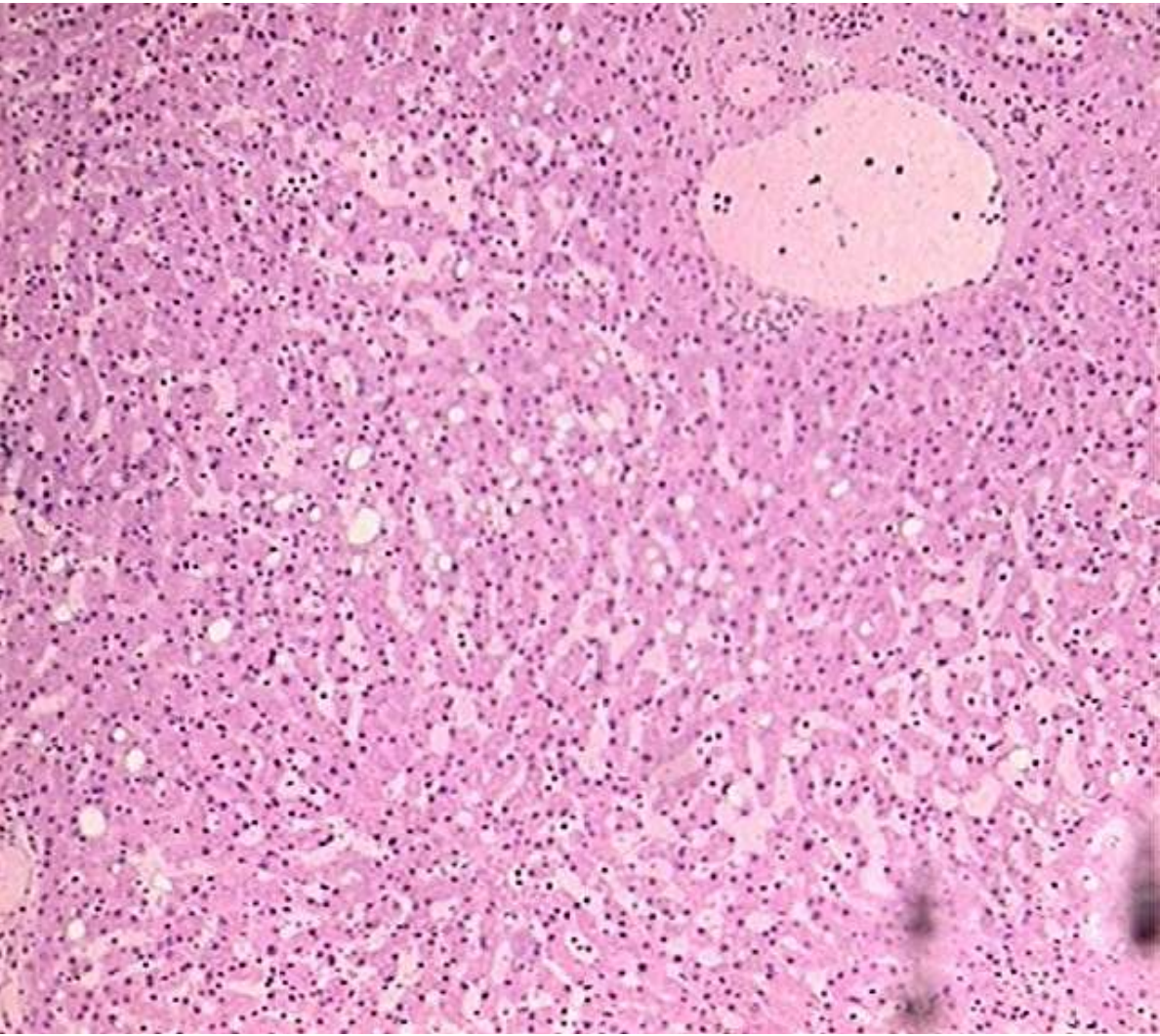
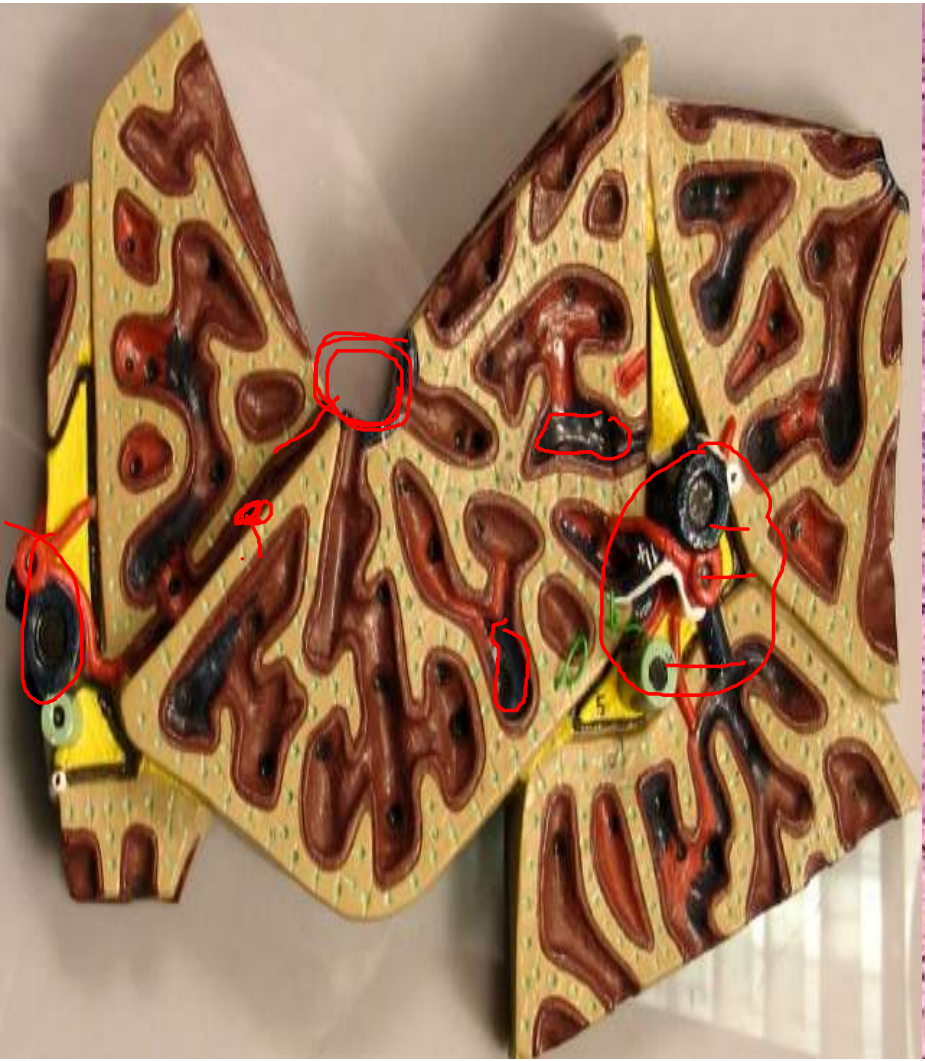


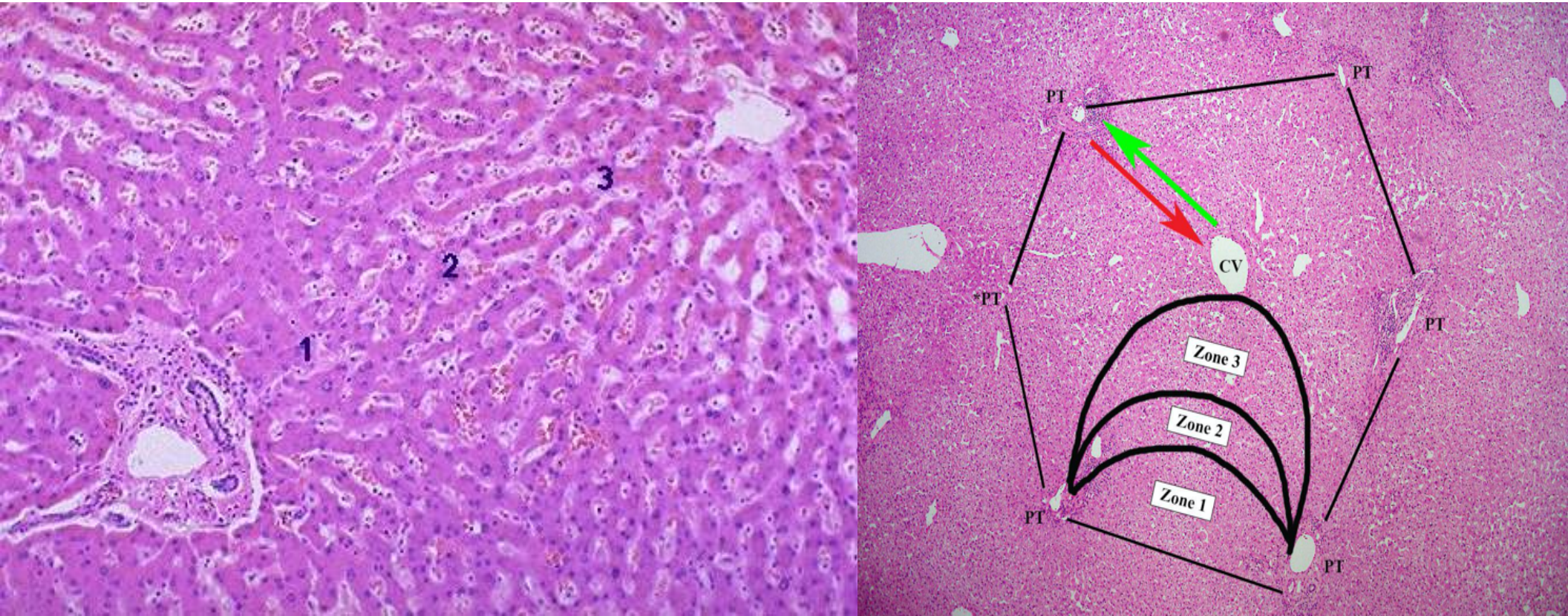
Internal Anatomy Of Liver With Branch Of Portal...



This slide is 100% editable. Adapt it to your needs and capture your audience's attention.

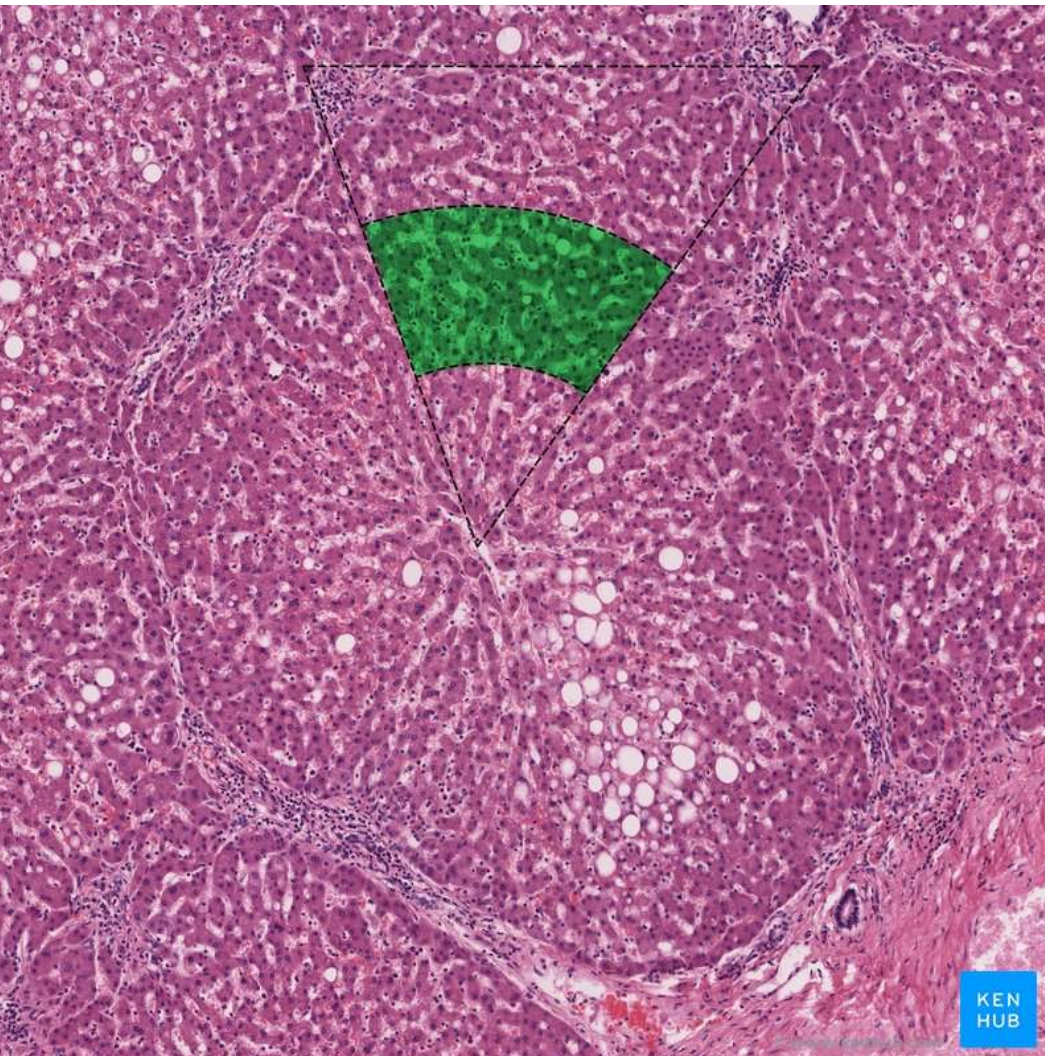




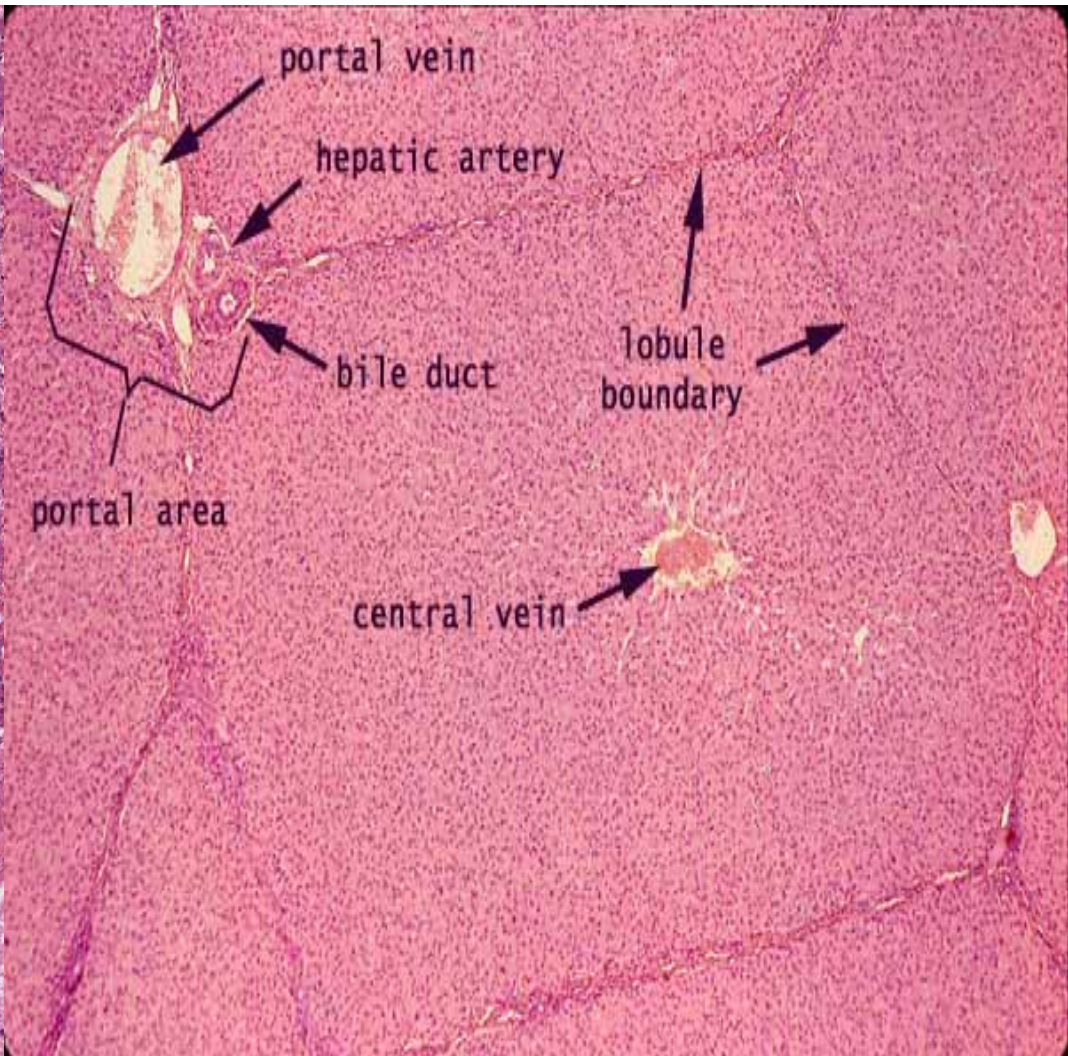


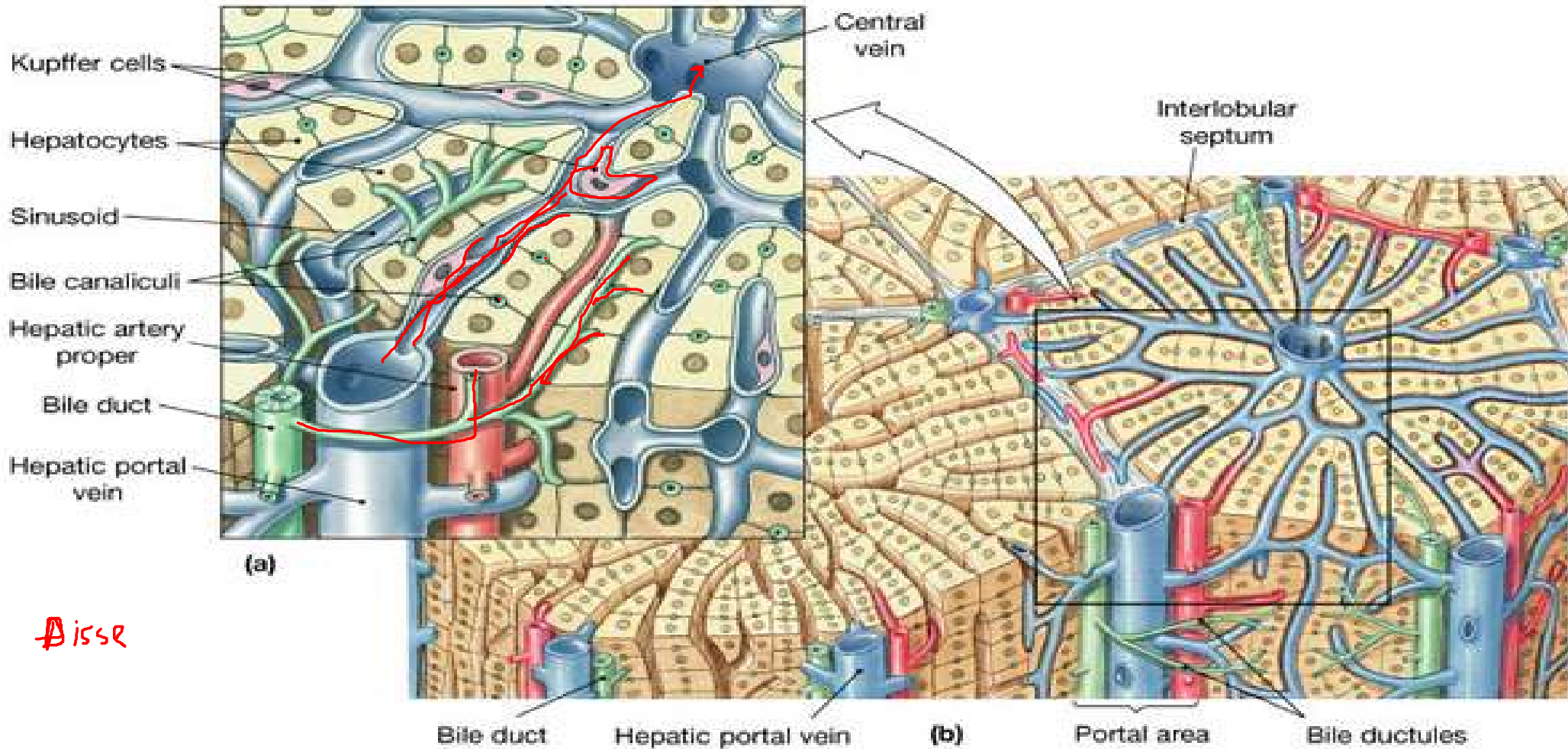
This is normal liver at medium power with zone 1 in periportal region, zone 2 in the middle of the lobule, and zone 3 in centrilobular region.

A **central vein** and a **portal triad** define the lobule.

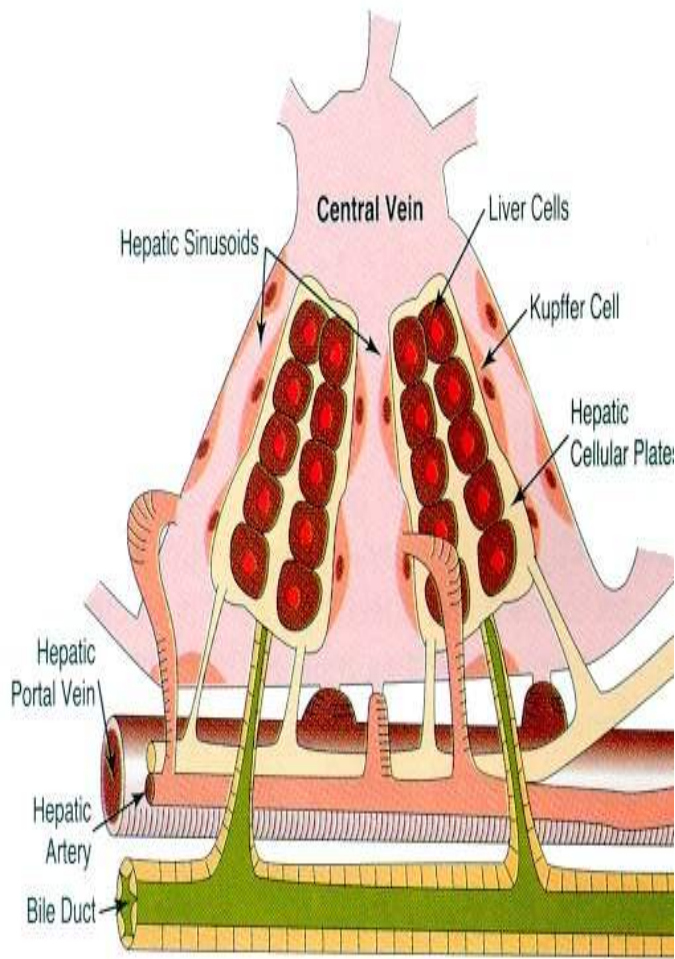


KEN
HUB

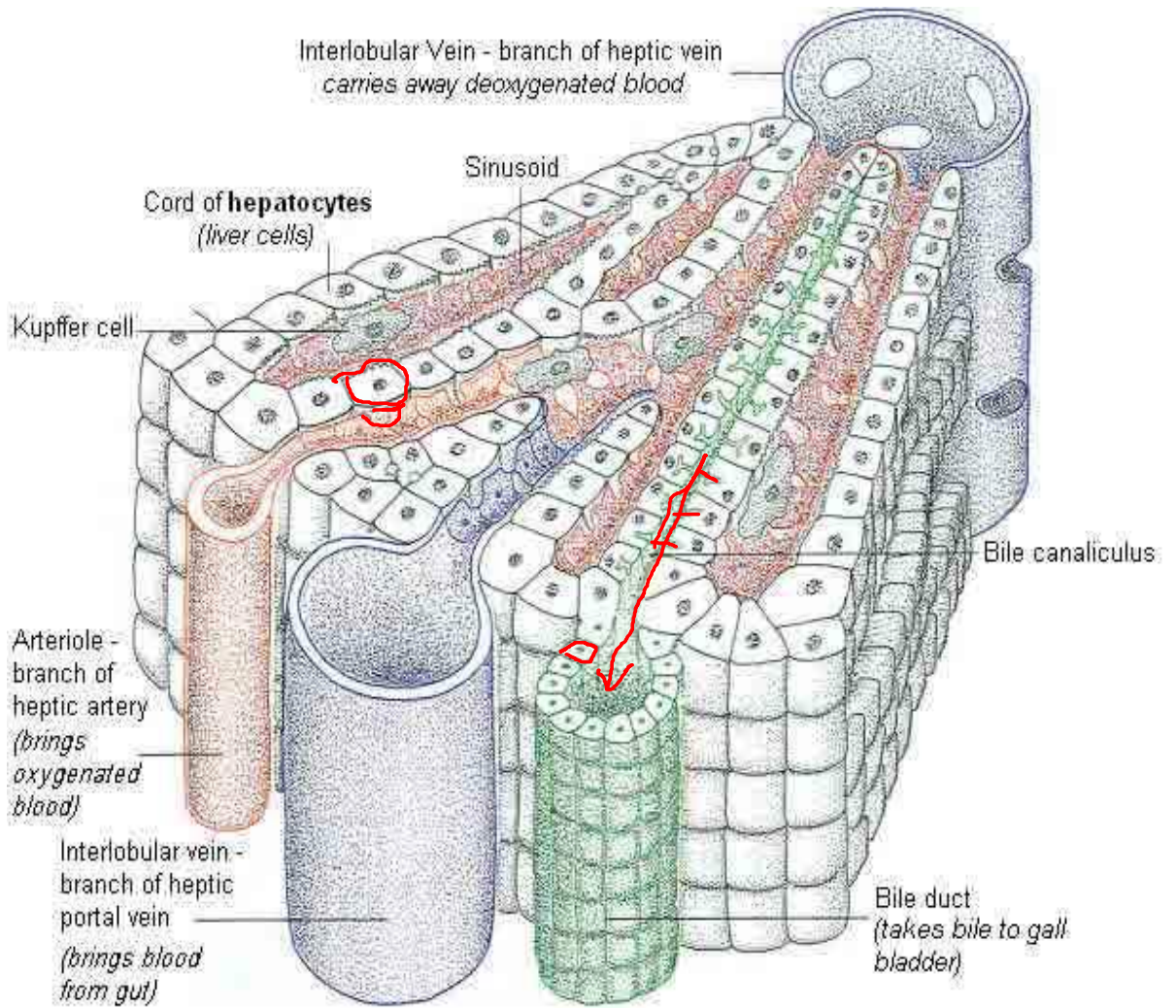


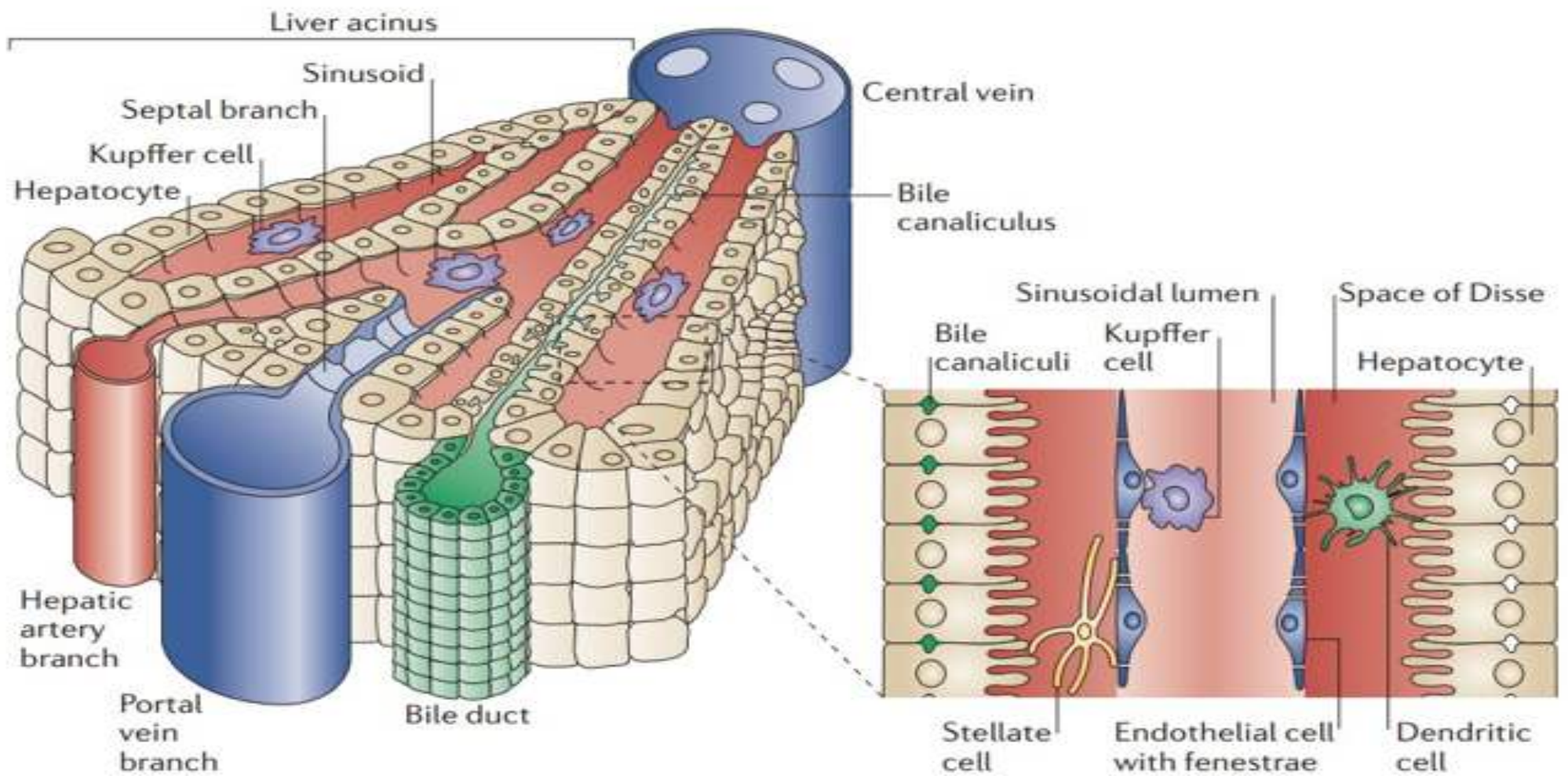


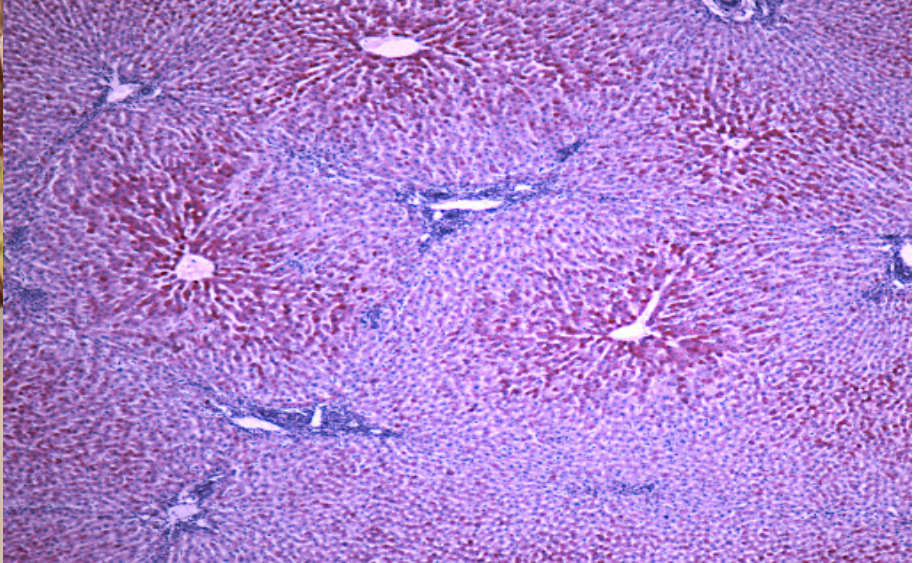
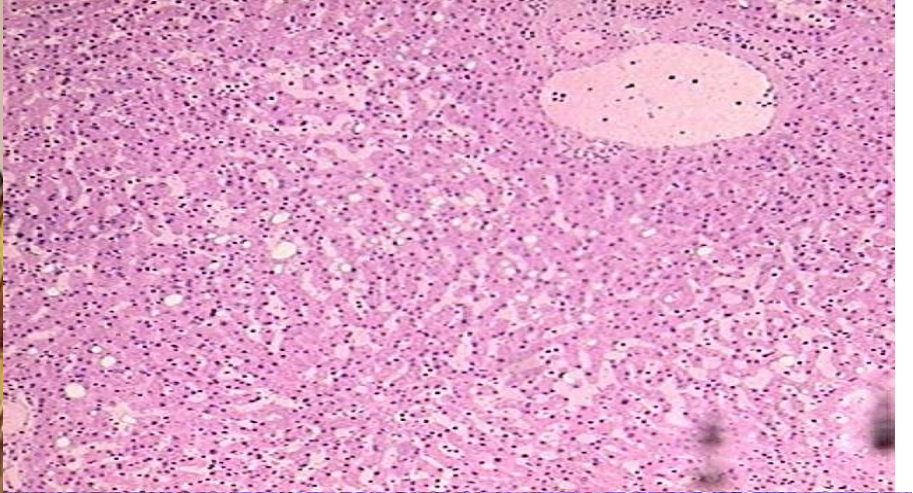
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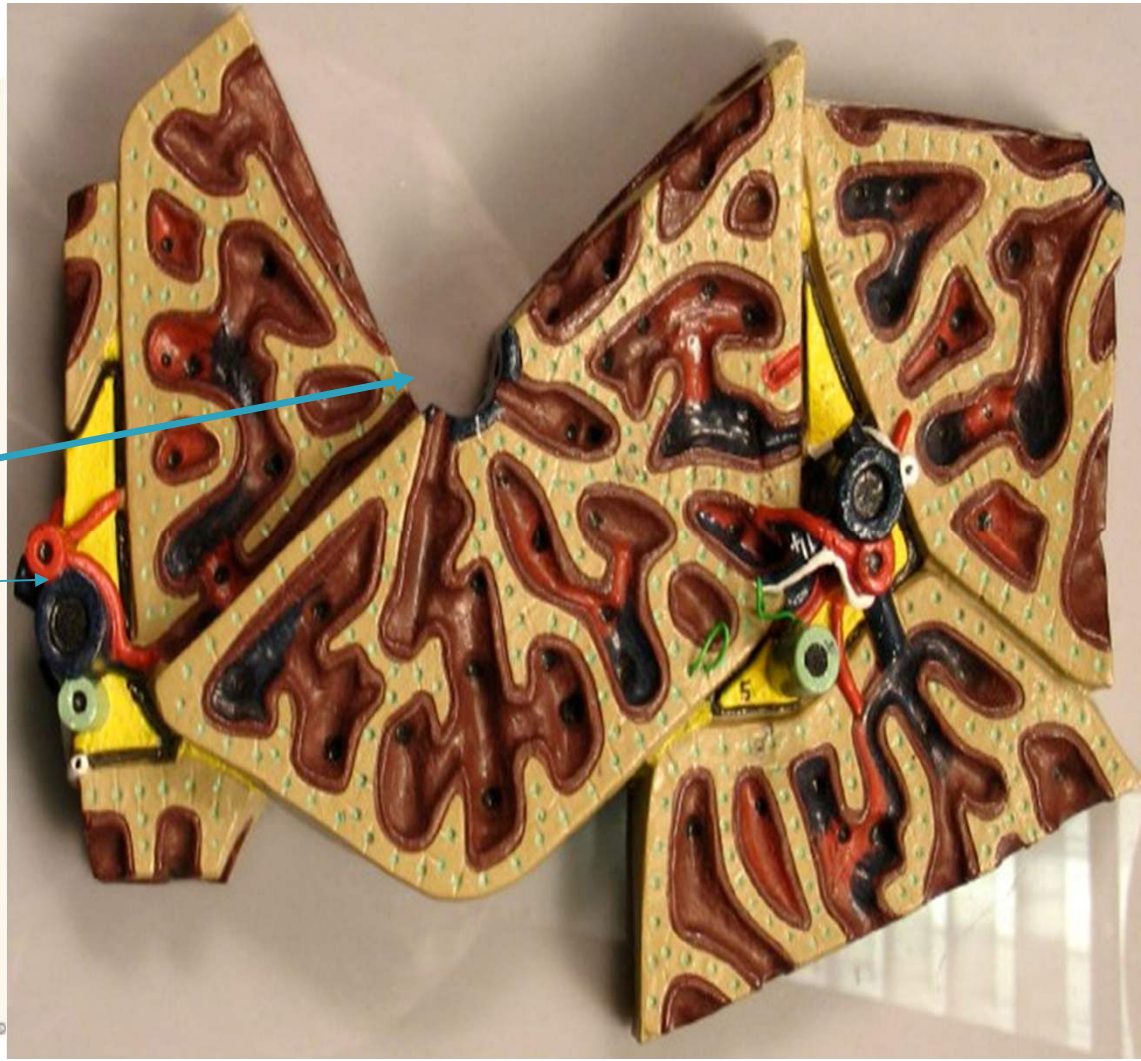
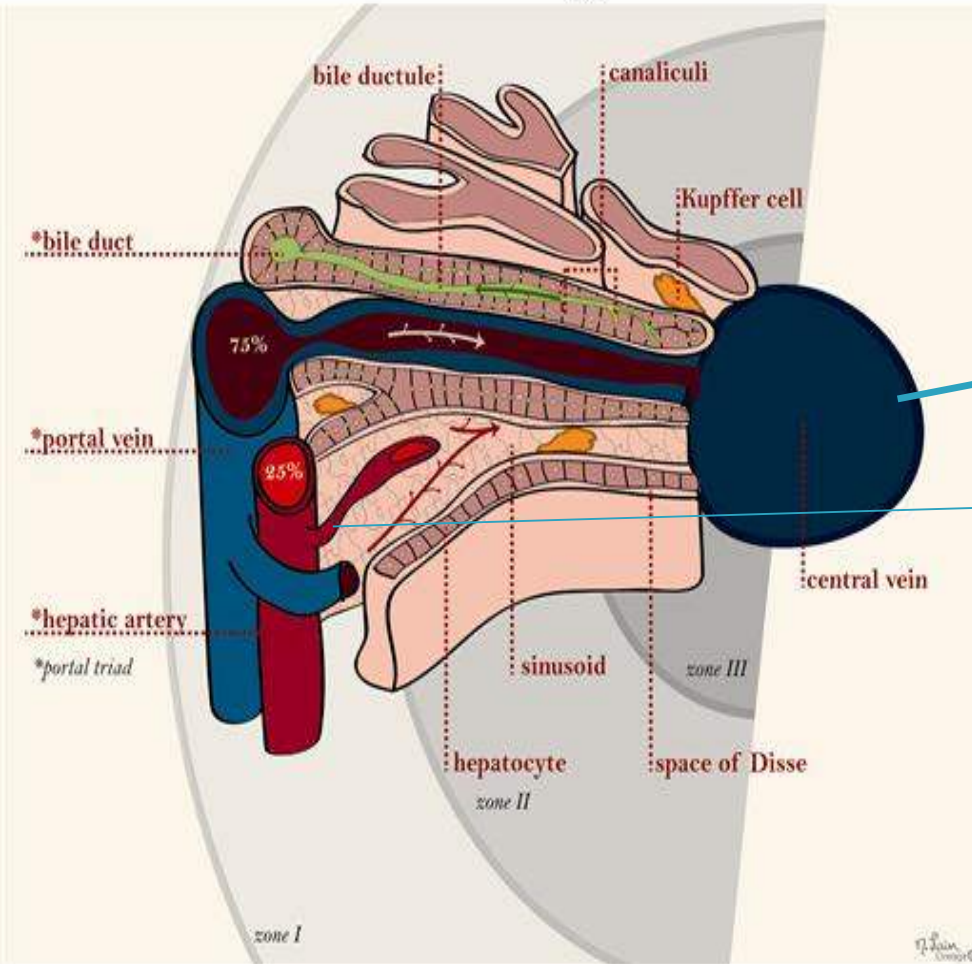
A LIVER LOBULE





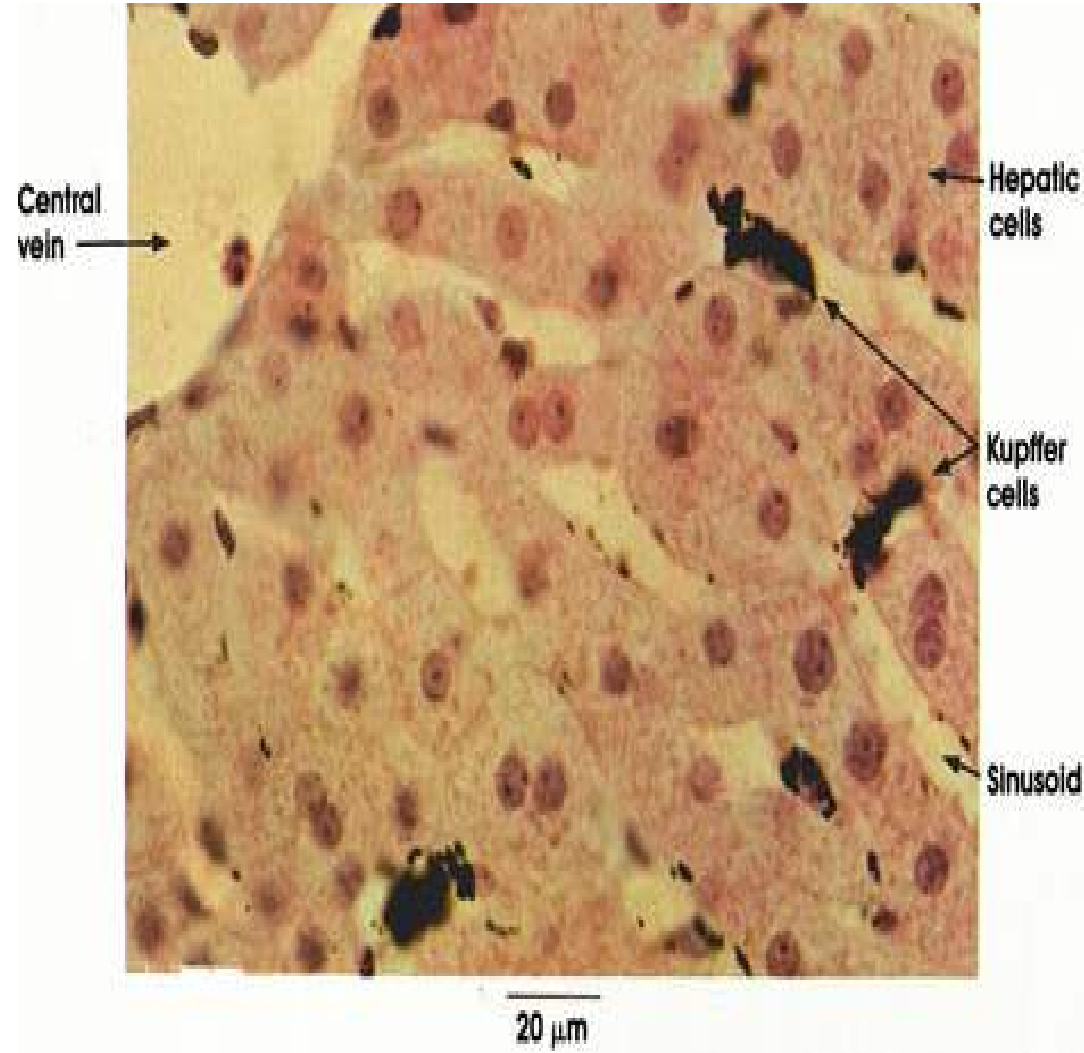
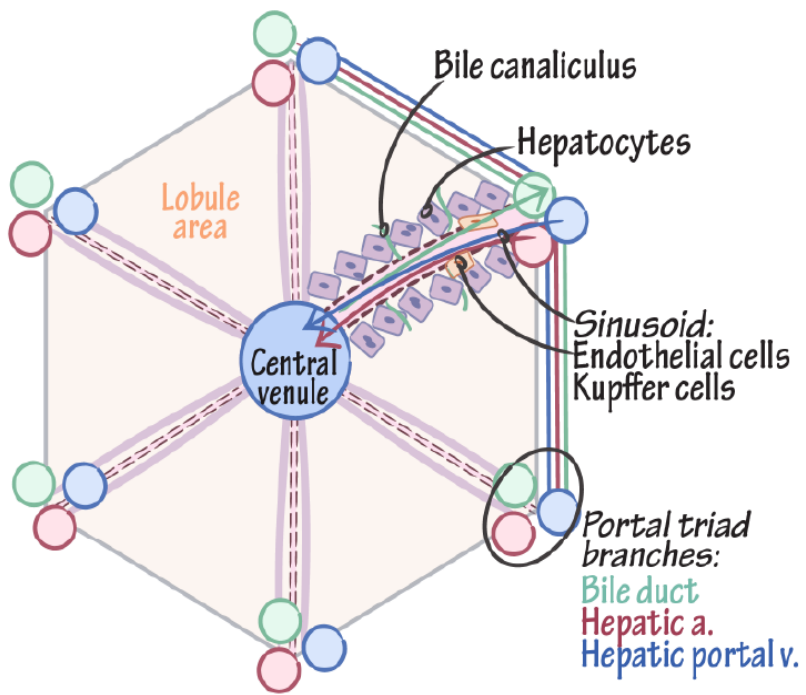


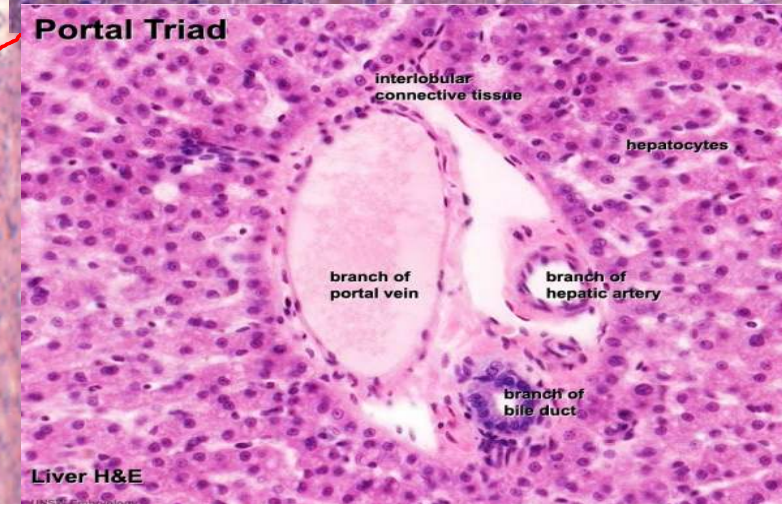
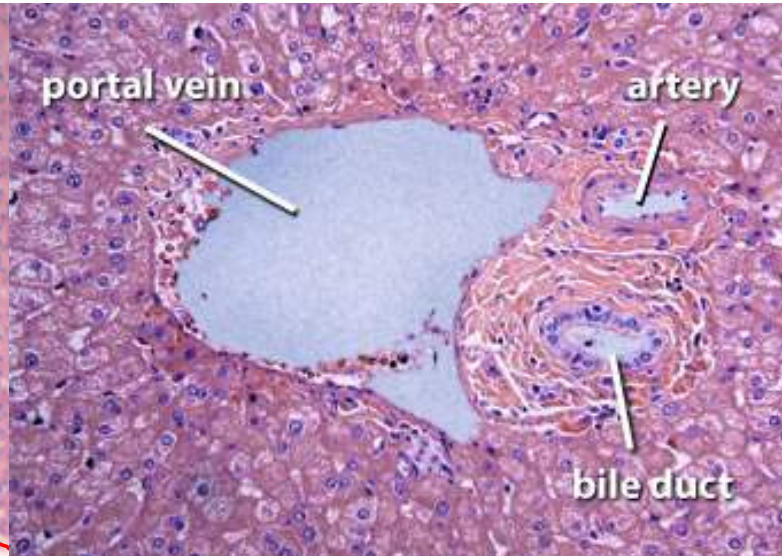
Liver Histology

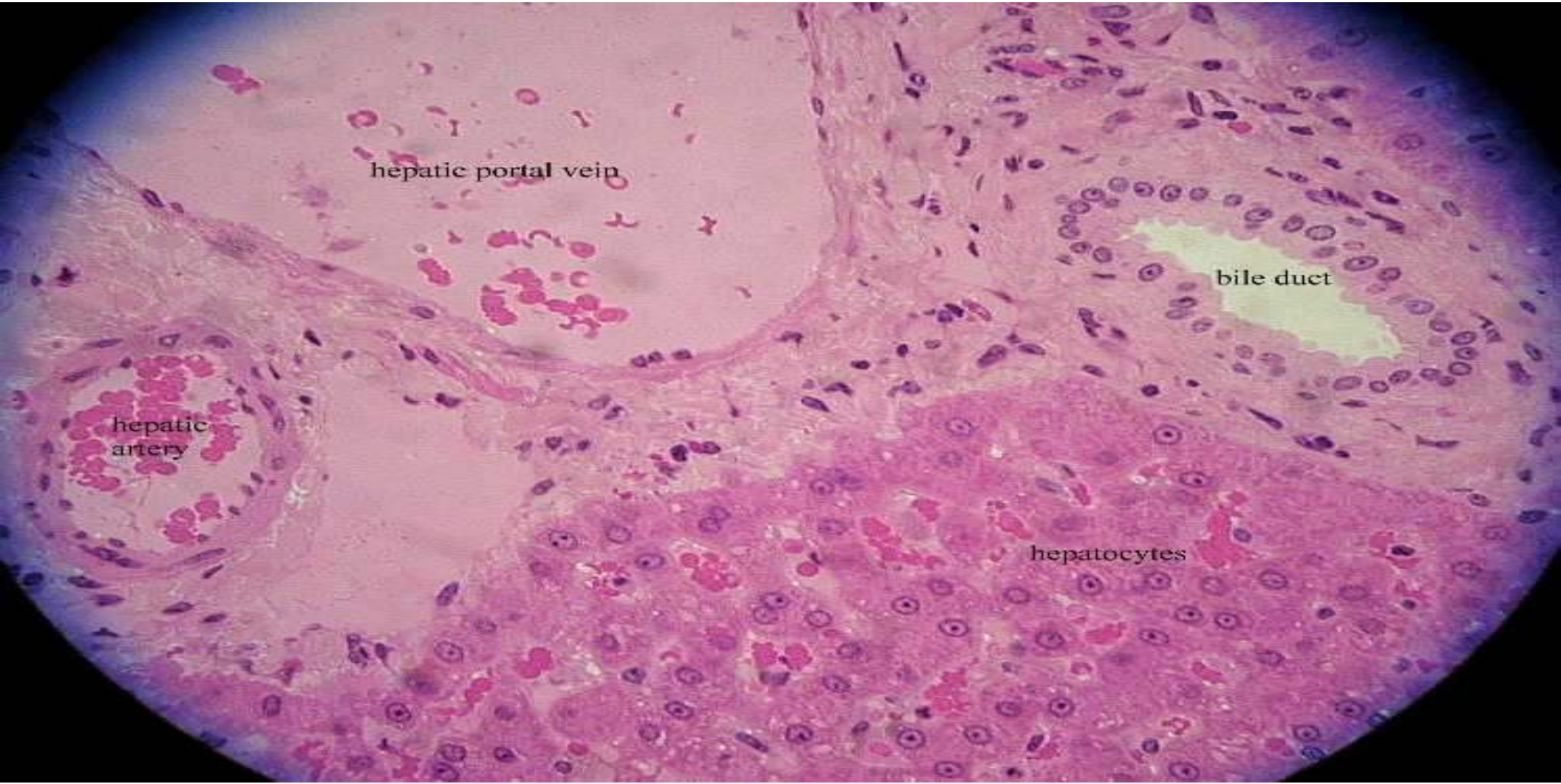


Classic Lobule Model

✓ Central Venule







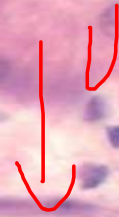
hepatic portal vein

bile duct

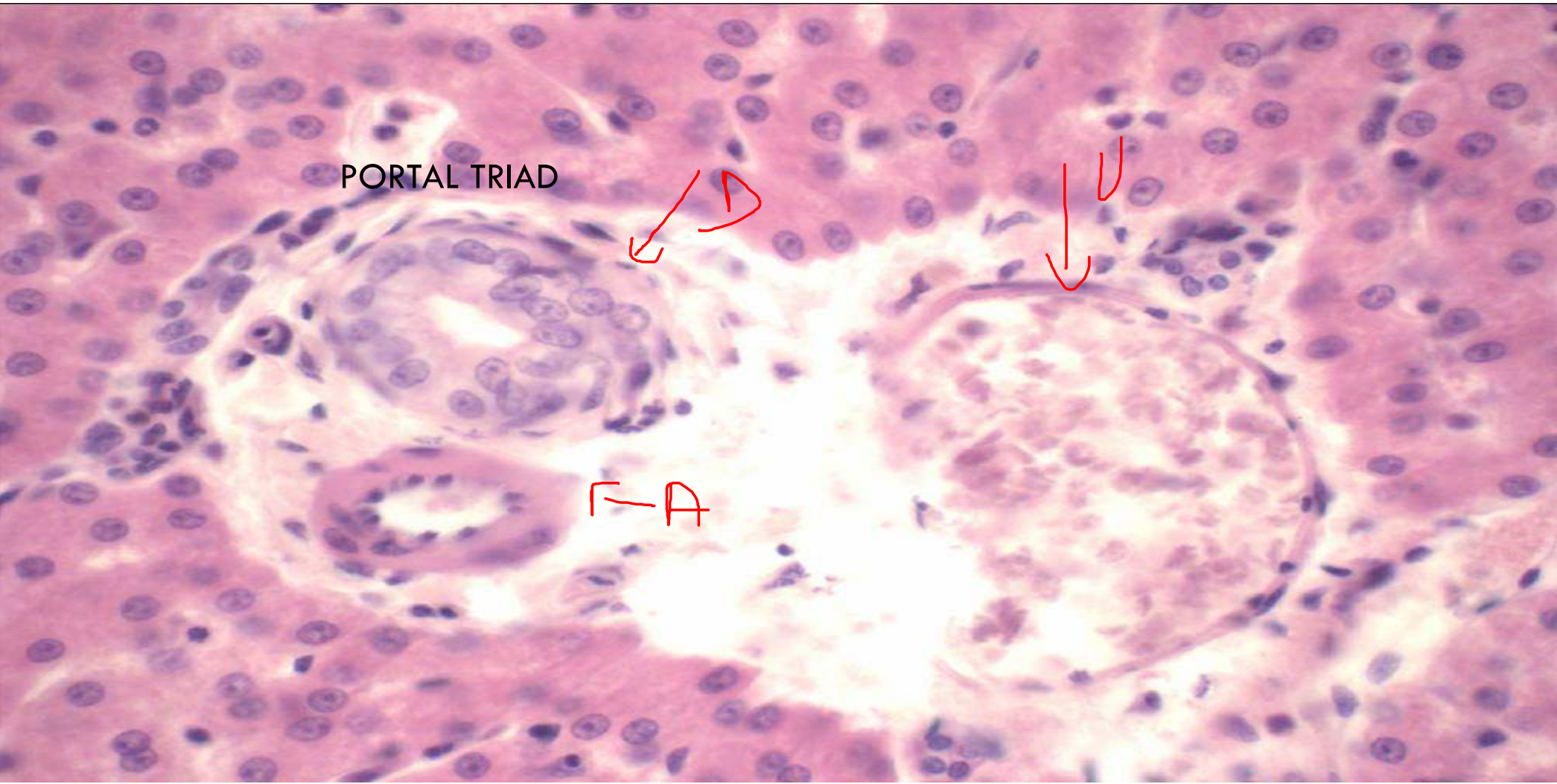
hepatic artery

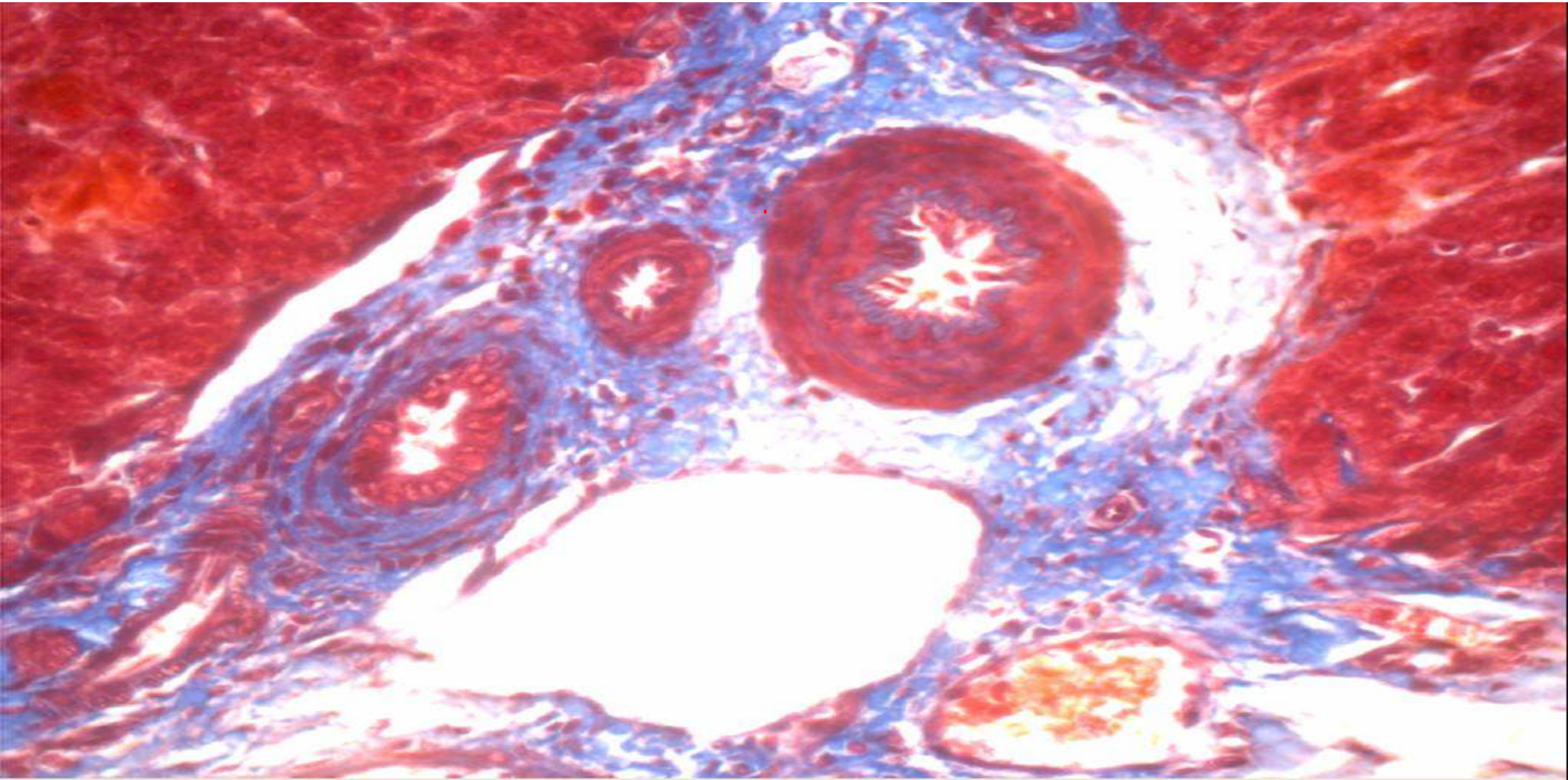
hepatocytes

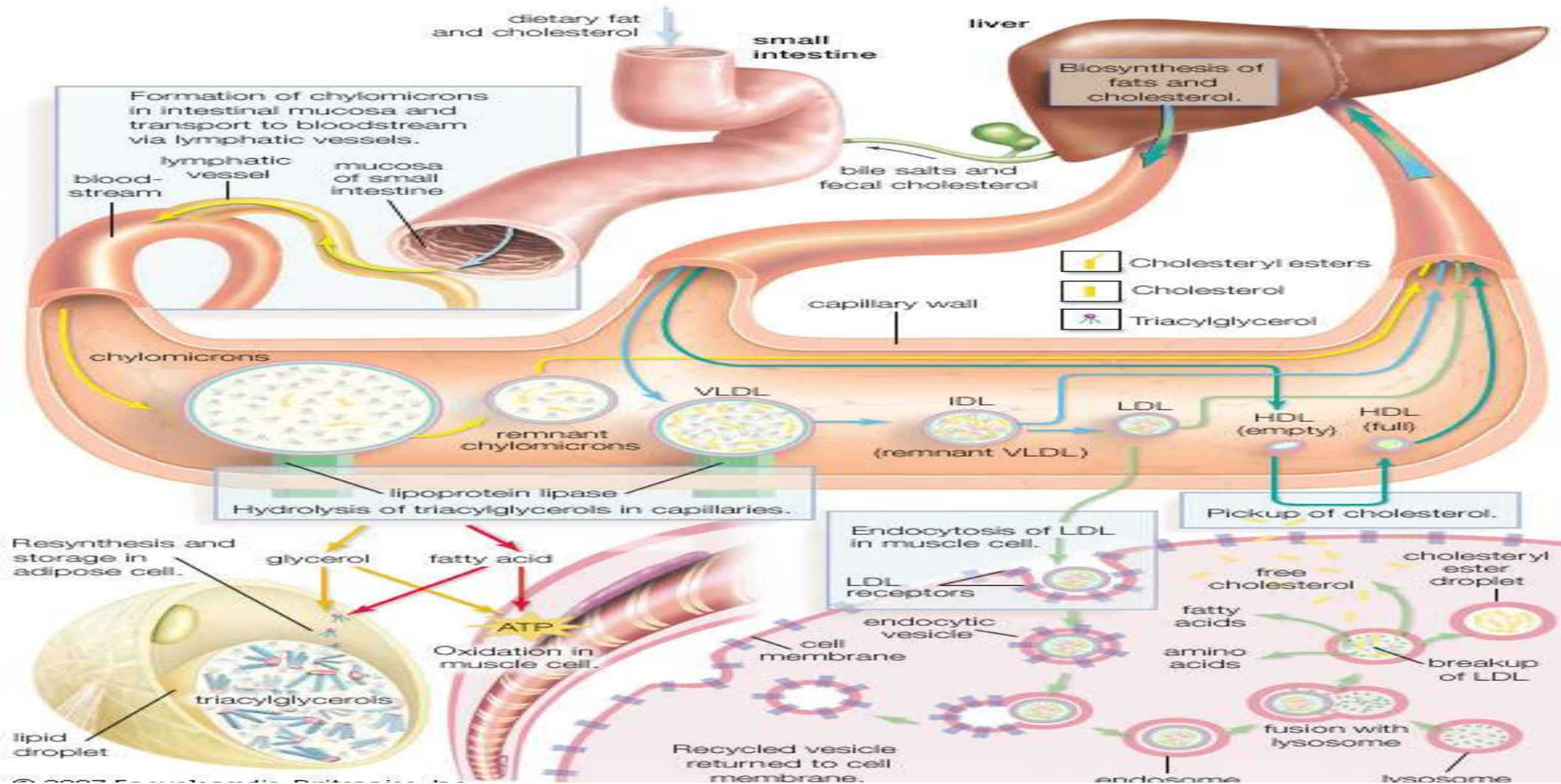
PORTAL TRIAD

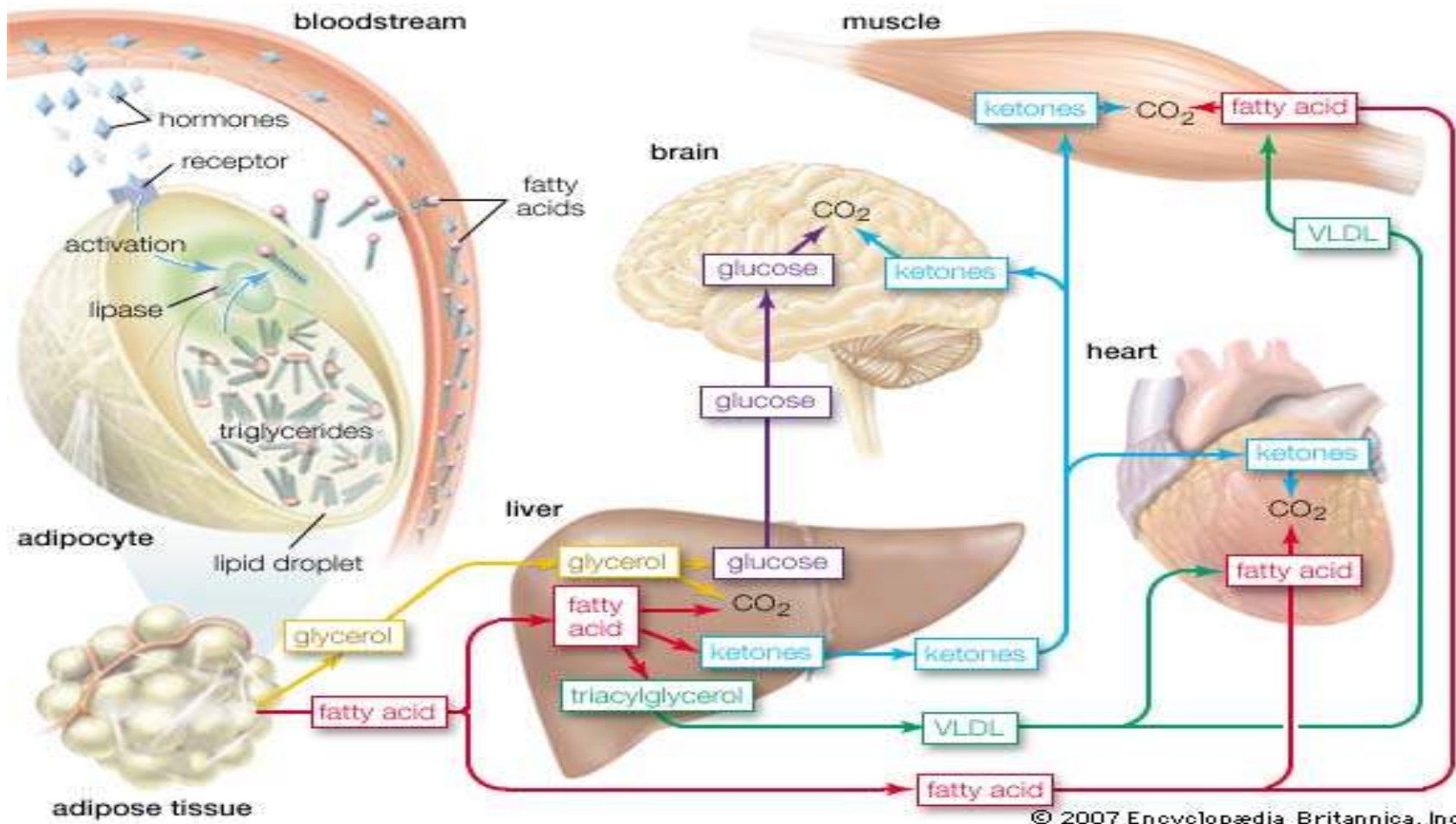


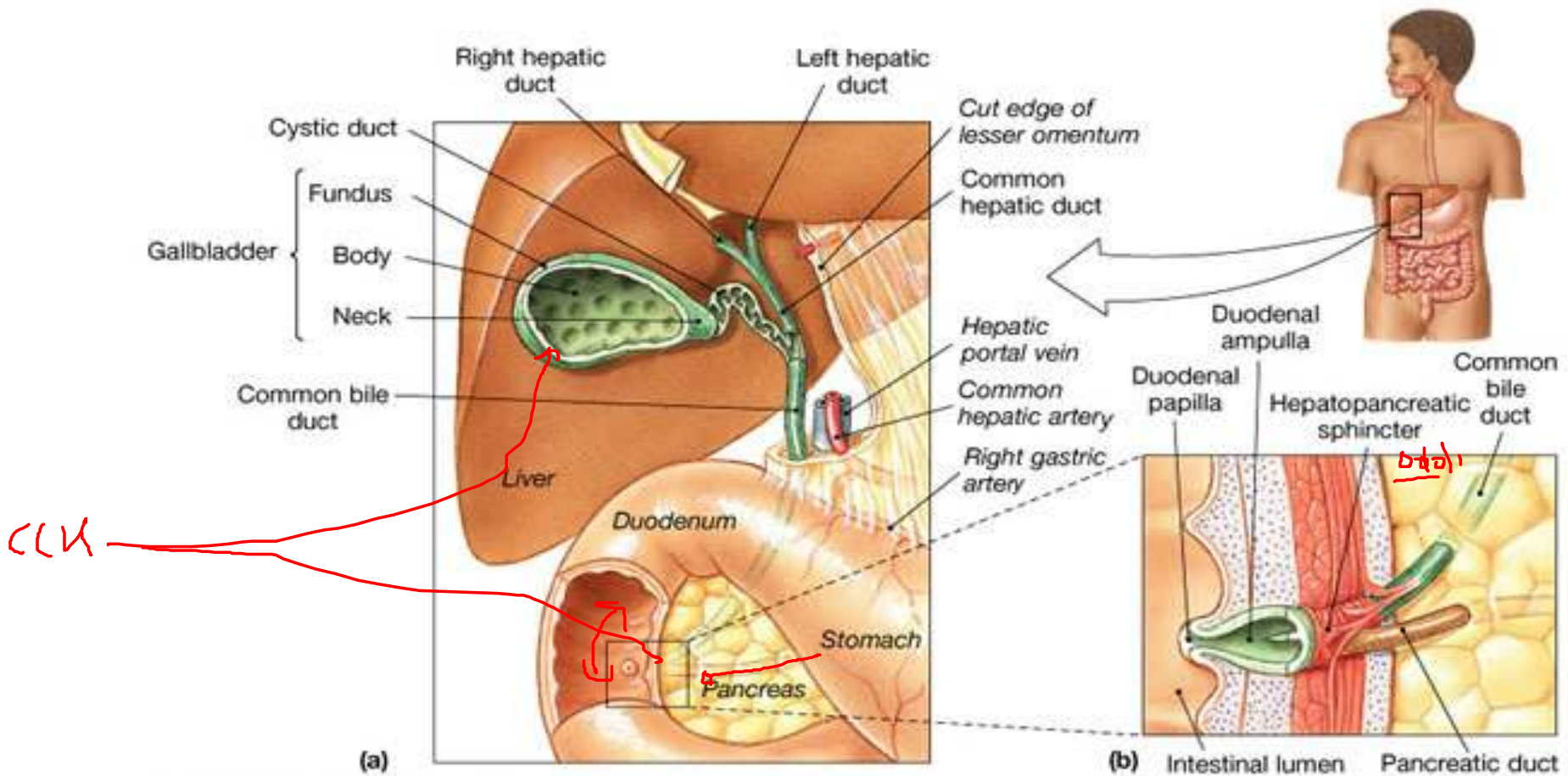
F-A

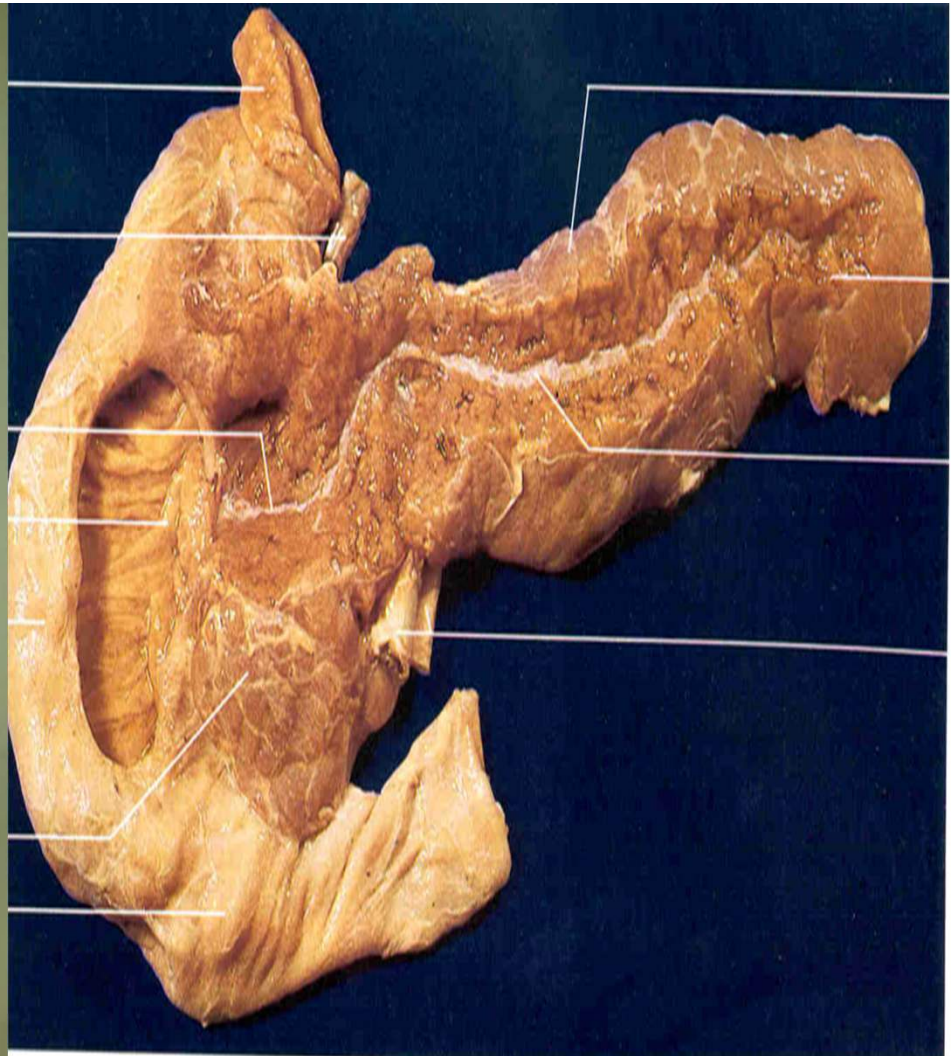
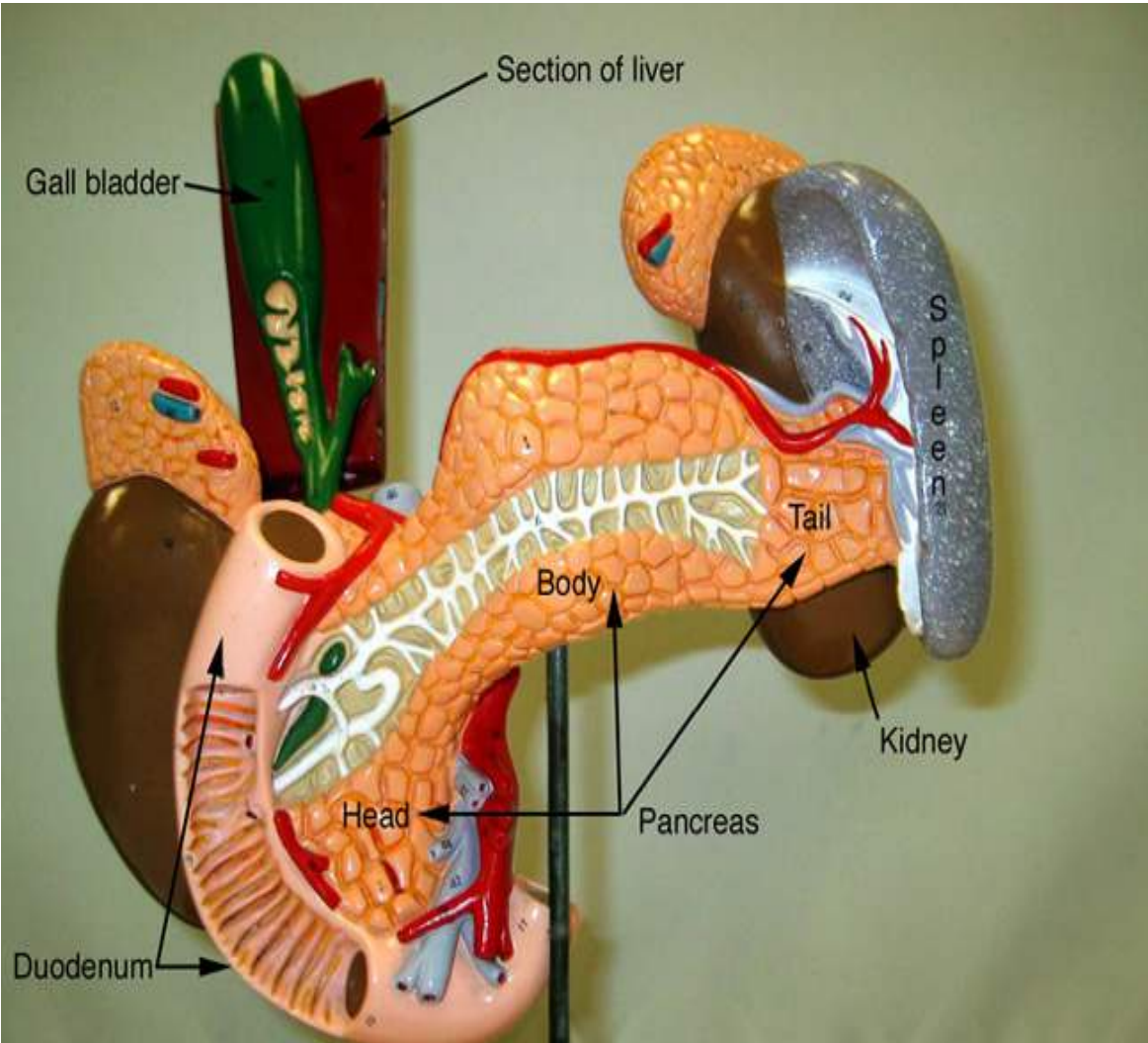


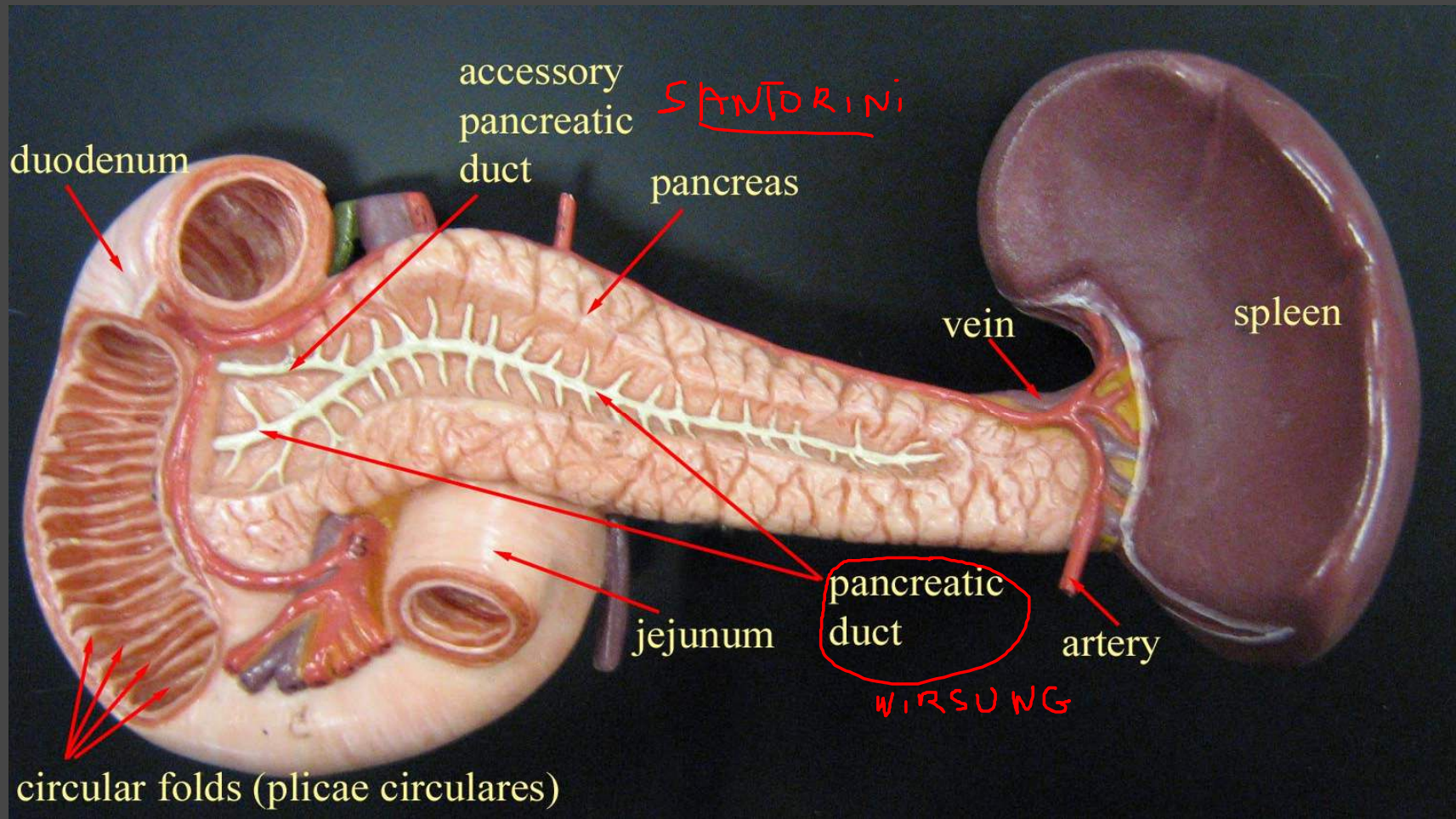


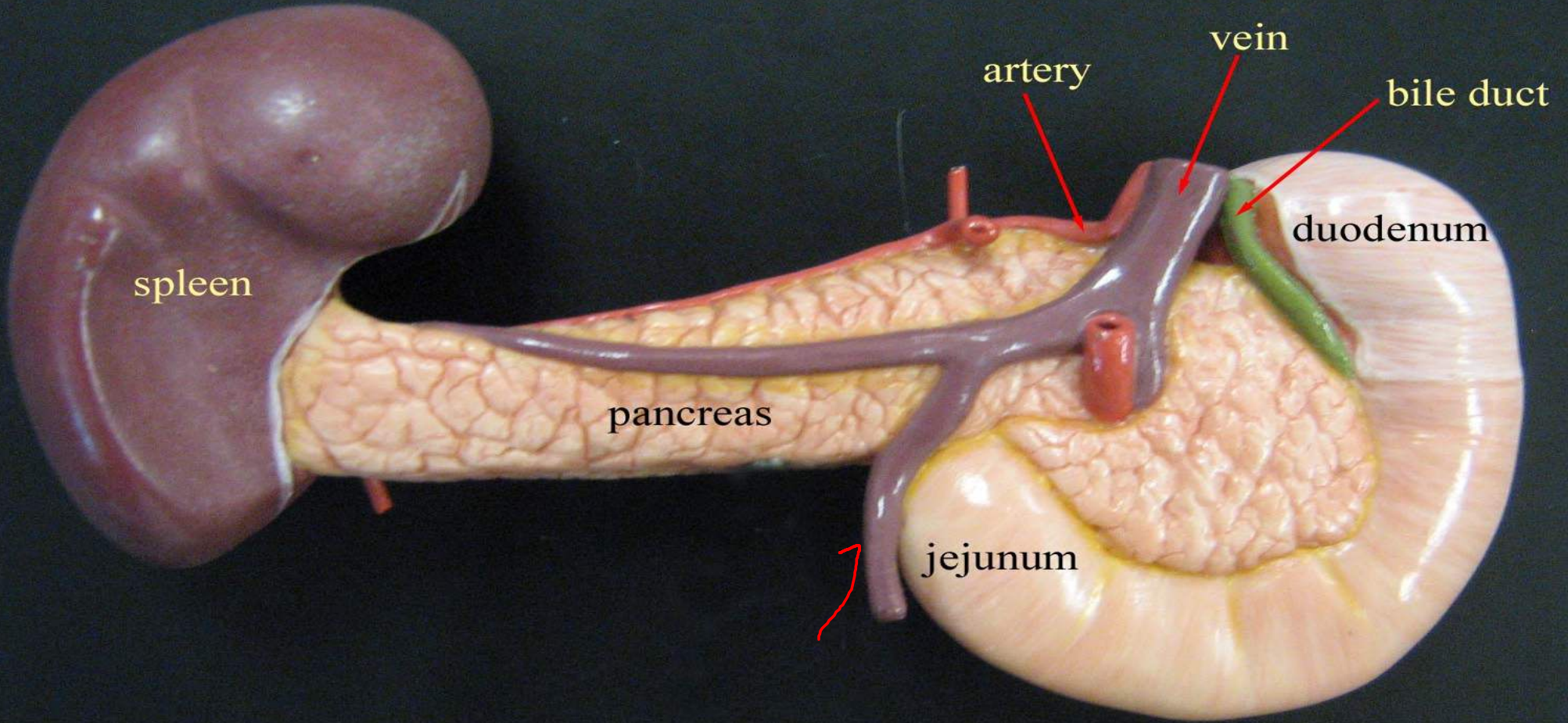


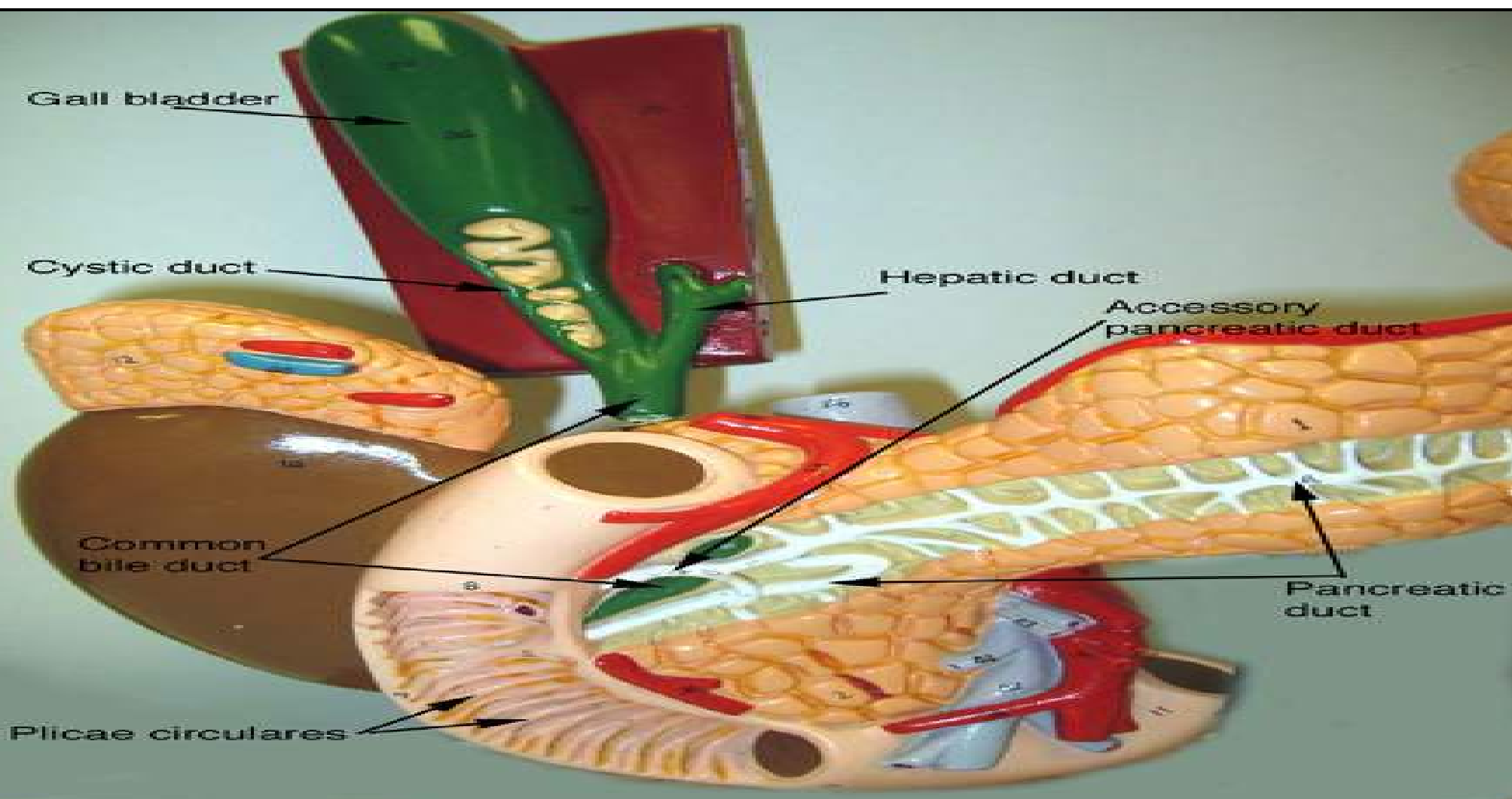












Gall bladder

Cystic duct

Hepatic duct

Accessory pancreatic duct

Common bile duct

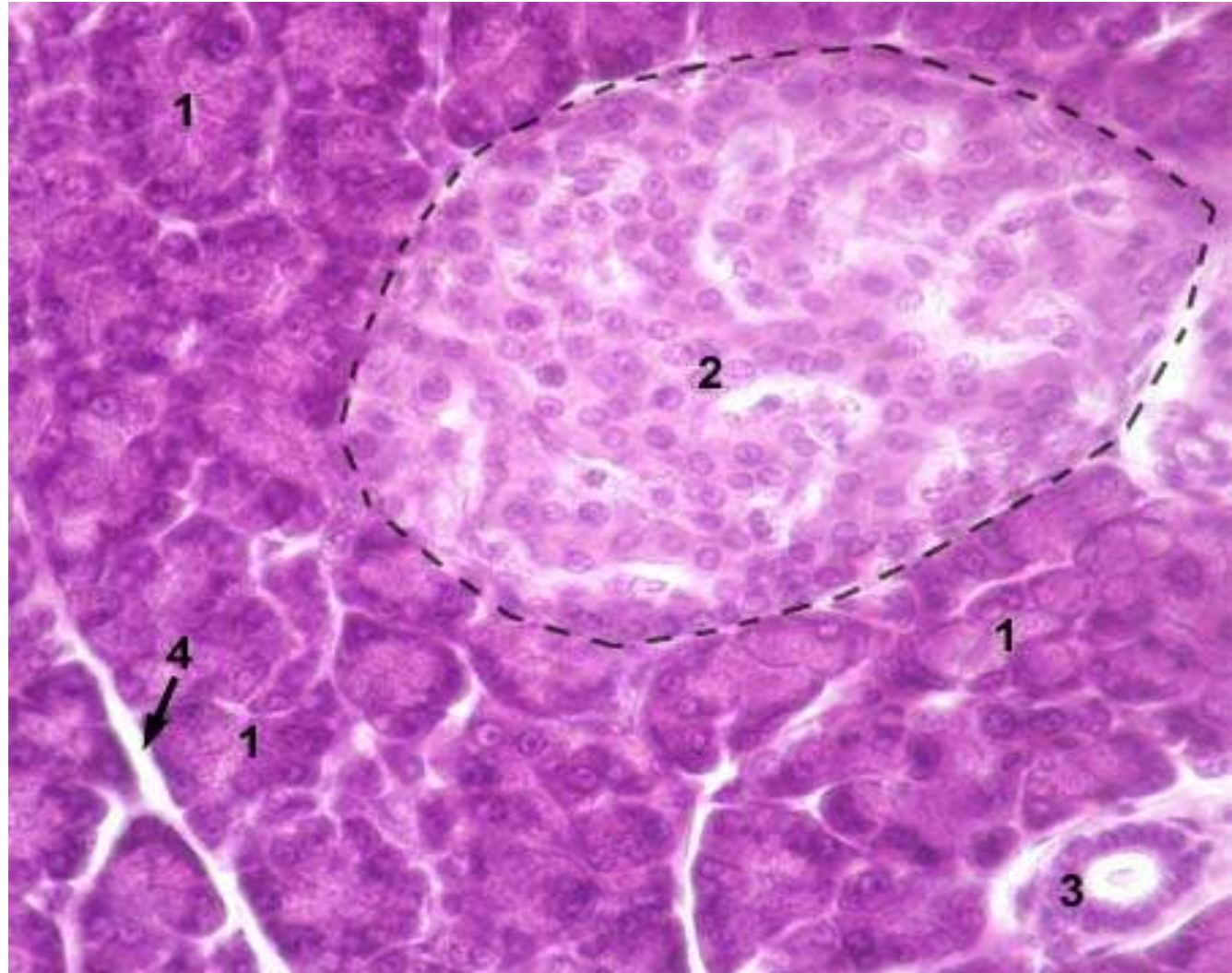
Pancreatic duct

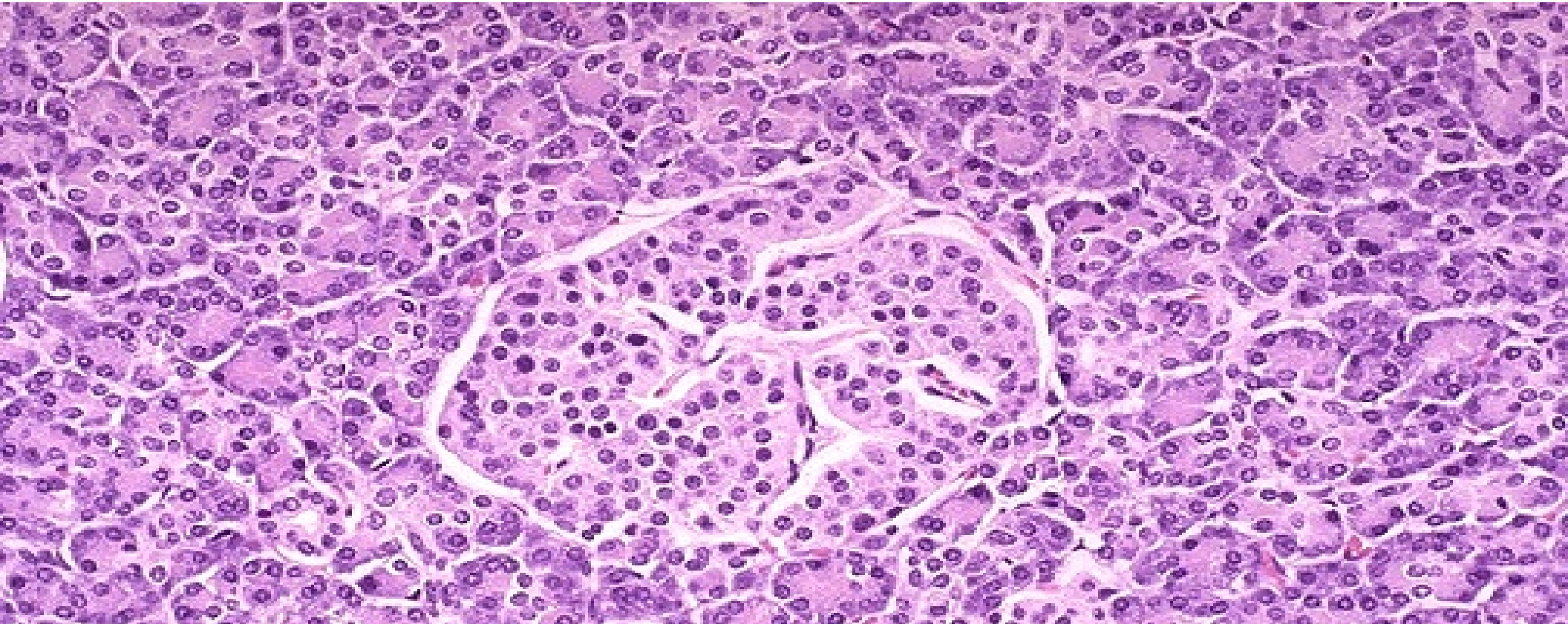
Plicae circulares

PANCREAS

Stained with haematoxylin and eosin

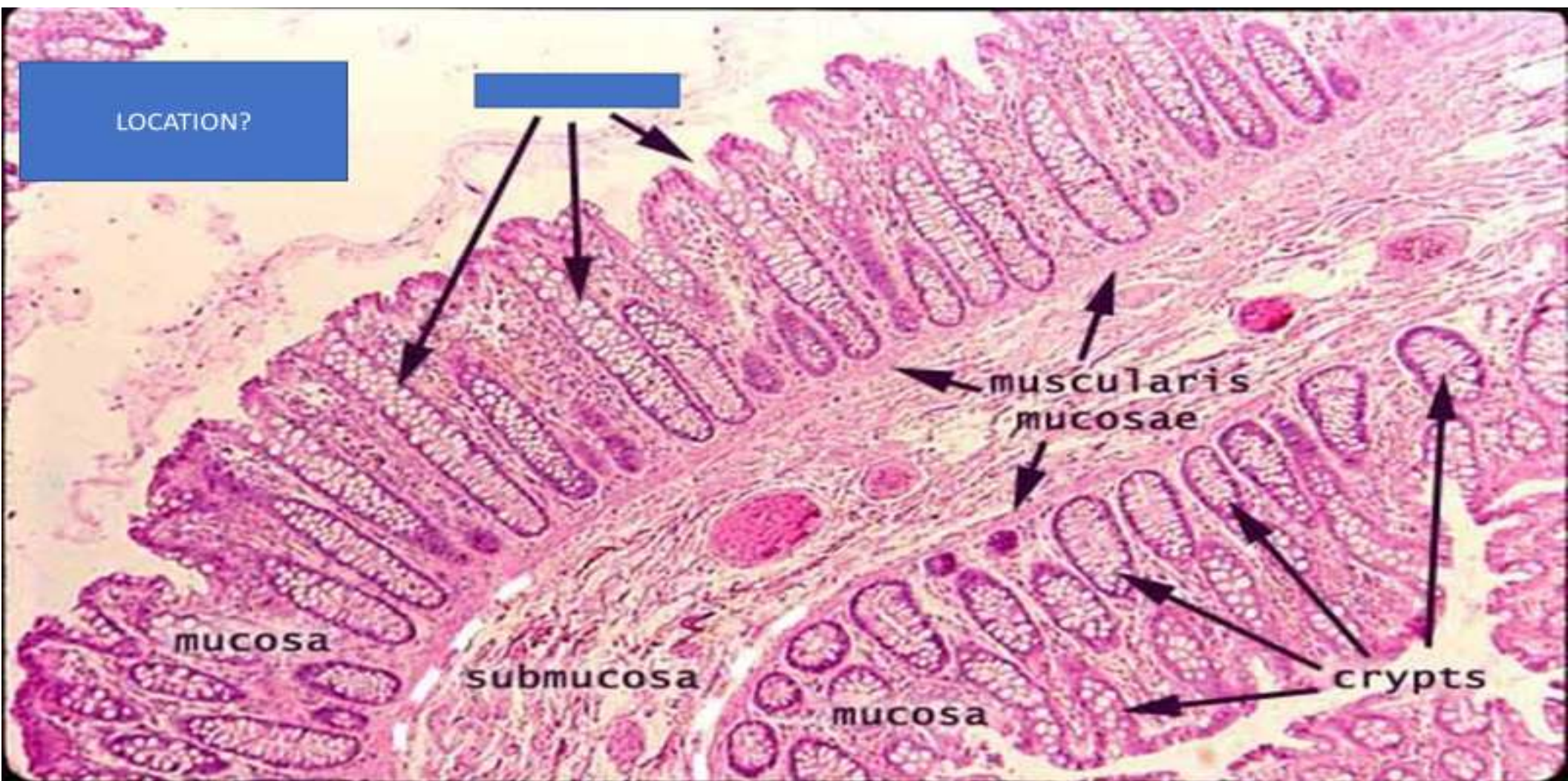
- 1 - acinus
- 2 - islet of Langerhans
- 3 - intralobular duct
- 4 - interlobular connective tissue septa

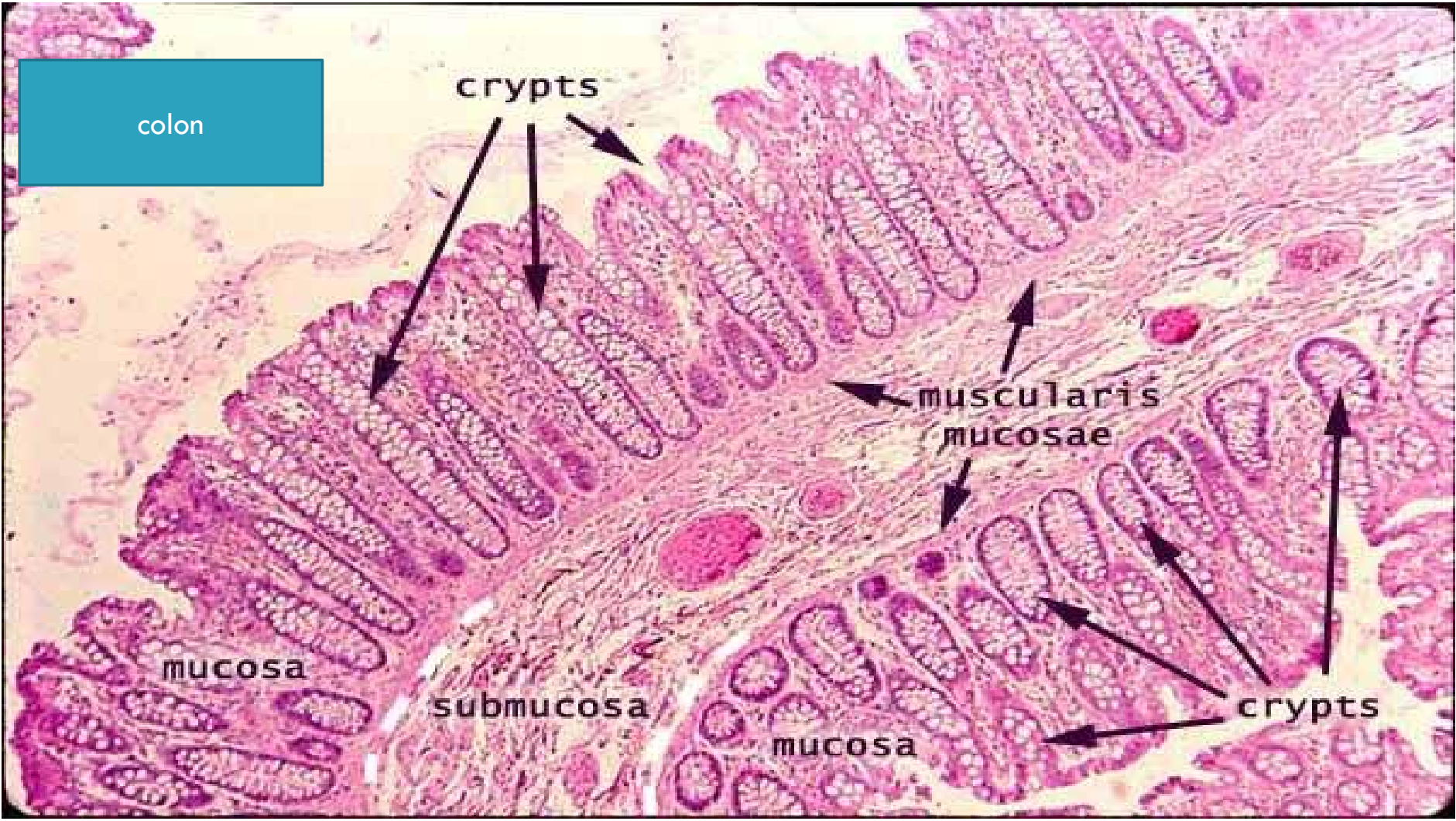




This is a normal **islet of Langerhans** seen at high power, surrounded by acinar pancreas. The endocrine cells of the islet have a similar appearance with H&E staining. Immunohistochemical staining can reveal which are alpha cells (secreting glucagon), beta cells (insulin), and delta cells (somatostatin).

LOCATION?





colon

crypts

muscularis mucosae

mucosa

submucosa

mucosa

crypts