



**DIGESTIVE TRACT cont.
AND ASSOCIATED ORGANS**

SMALL INTESTINE

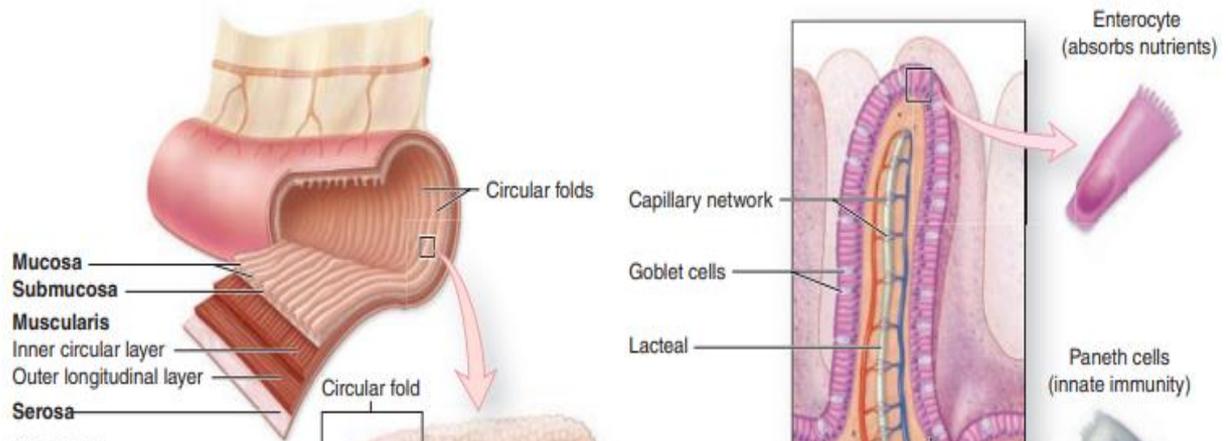
The site where the digestive processes are completed and where the nutrients are absorbed by cells of the epithelial lining.

consists of three segments: the duodenum, jejunum, and ileum

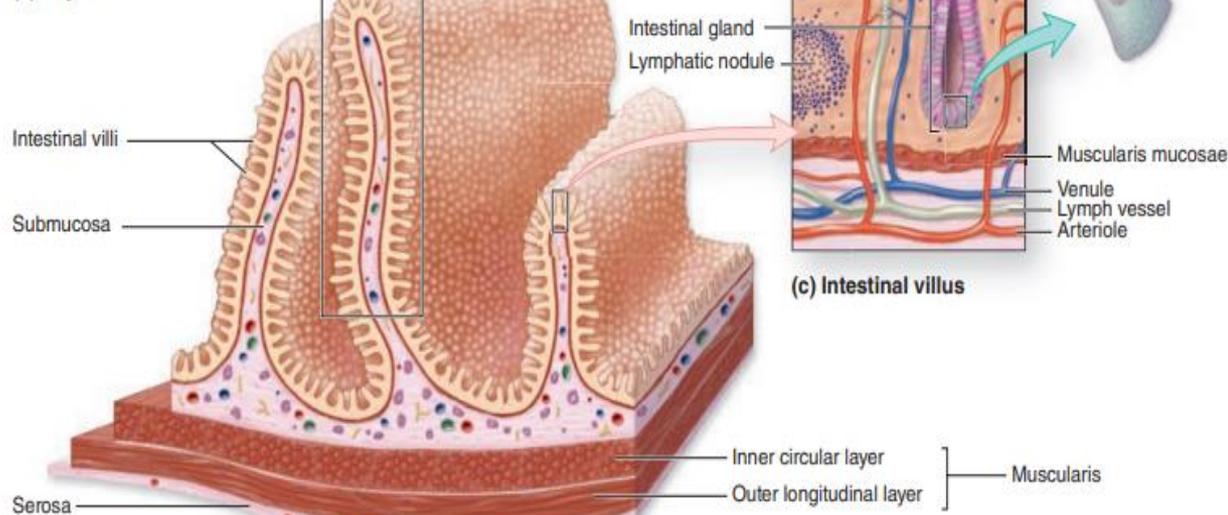
SMALL INTESTINE

Mucosa and submucosa form circular folds, which increase the absorptive area.

- **Mucosa** : contain fingerlike projections called villi projecting into the lumen densely cover the entire mucosa and consist of simple columnar epithelium of absorptive cells called (**enterocytes with microvilli**) , goblet cells.
- Lamina propria: loose connective tissue containing extensive blood and lymph vessels, diffuse lymphoid tissue and smooth muscle cells (muscularis mucosae),

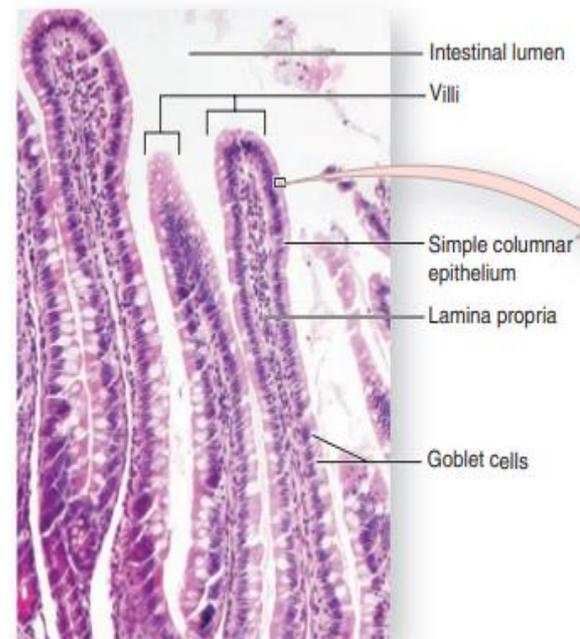


(a) Layers



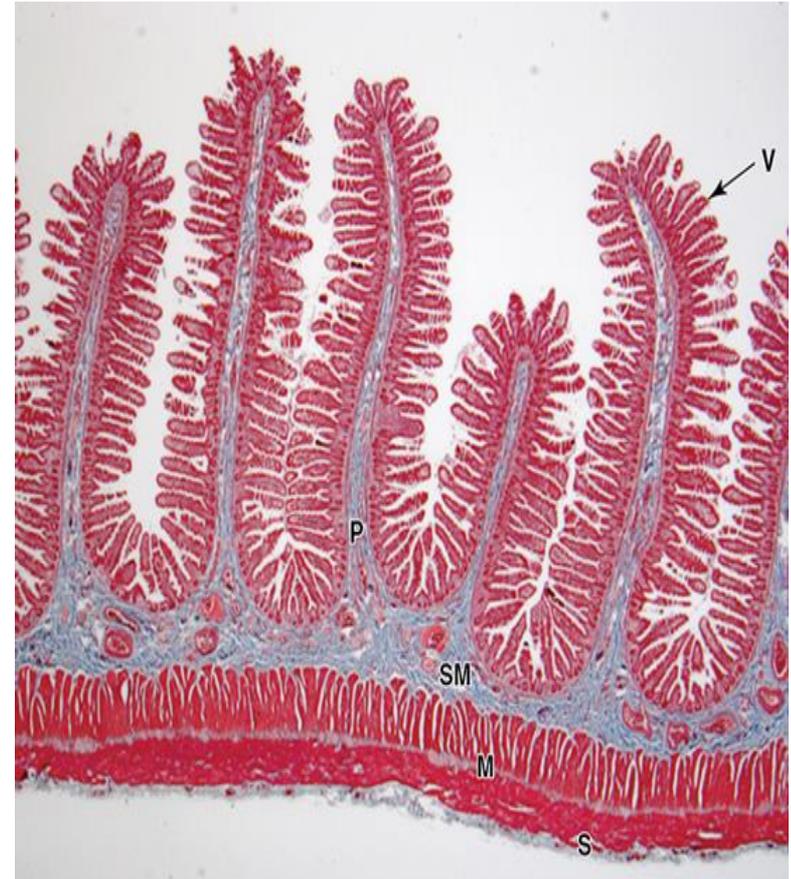
(b) Section of small intestine

(c) Intestinal villus



(d) Intestinal villi

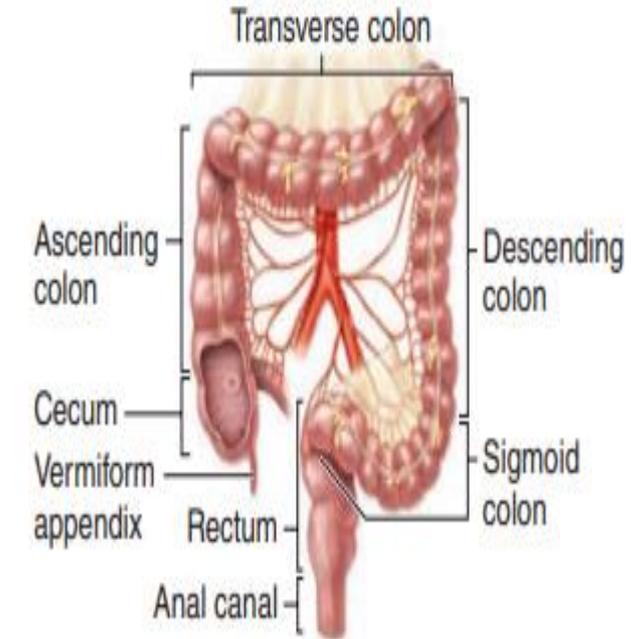
- **Submucosa** has larger blood and lymph vessels , mucous glands, and autonomic nerves
- **Muscularis** composed of an inner circular layer, outer longitudinal layer, and between them is the autonomic nerves producing their contractions for peristalsis.
- **Serosa**



LARGE INTESTINE

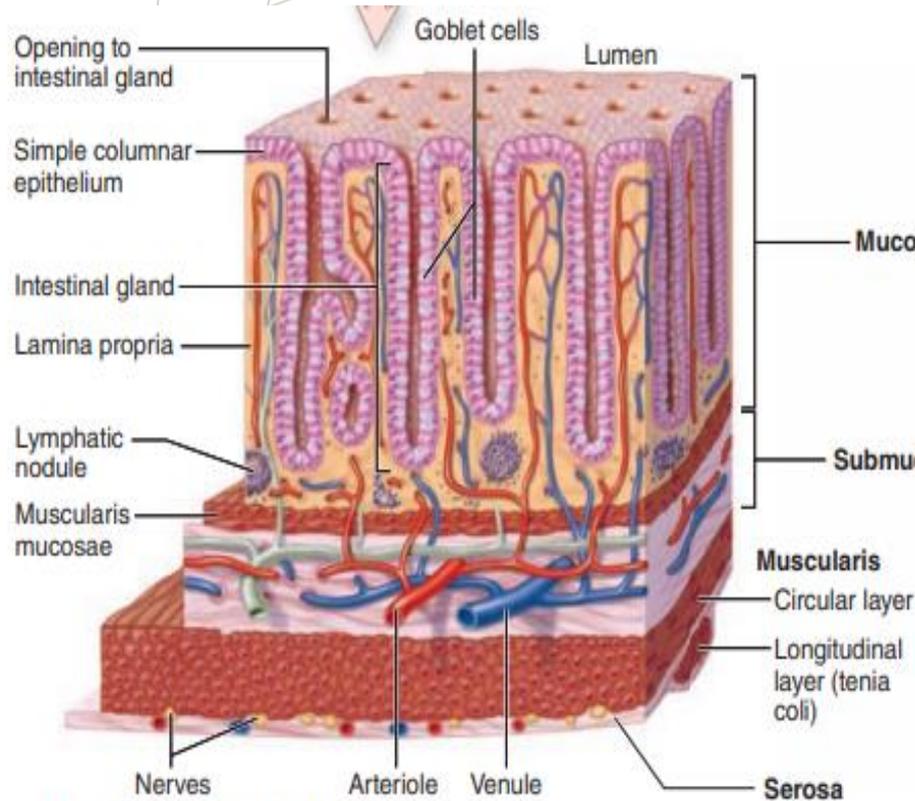
Function : absorbs water and electrolytes and forms indigestible material into feces.

Has the following regions: cecum, ileocecal valve , appendix; the ascending, transverse, descending, and sigmoid colon; and rectum.

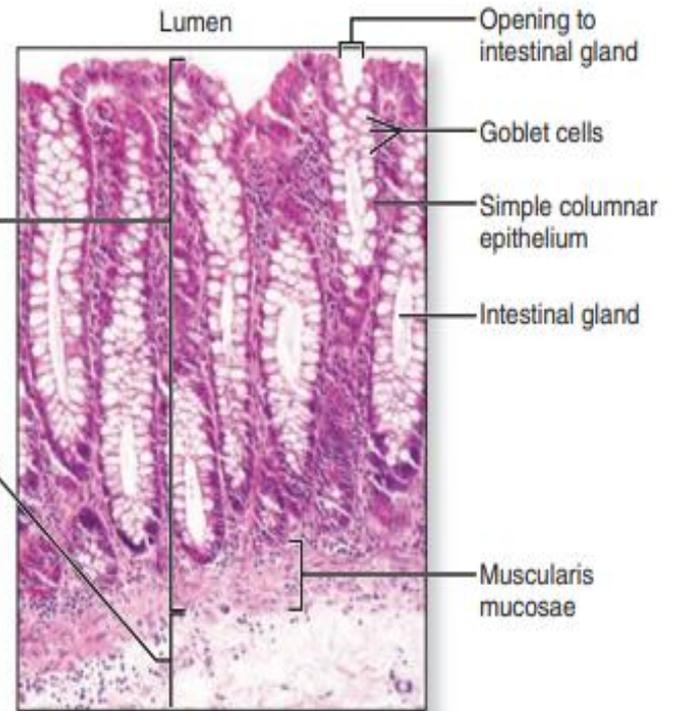




- Mucosa has glands lined by columnar absorptive cells (**colonocytes**) and goblet cells , **No villi** .
- Lamina propria is rich in lymphoid cells.
- Submucosa is well vascularized.
- Muscularis has a inner circular layer, but the outer longitudinal muscle is present in three equally spaced bands.
- Serosa.



(a) Large intestine tunics



(b) Large intestine mucosa and submucosa

ANAL CANAL

- Distal end , 3-4 cm long.
- At the rectoanal junction the simple columnar lining of the rectum is replaced by **stratified squamous epithelium** of anal canal.
- lamina propria and submucosa contain venous sinuses.
- Muscularis : Circular layer forms the internal anal sphincter.
- External anal sphincter: striated muscle.
- Adventitia



Organs associated with digestive tract

These organs include:

A- Salivary glands: function of them are:

- 1- To wet and lubricate ingested food and oral mucosa.
- 2- initiate the digestion of carbohydrates and lipids with amylase and lipase.
- 3- to secrete innate immune components such as lysozyme and lactoferrin.

B- Pancreas:

Secretes digestive enzymes that act in the small intestine and hormones important for the metabolism of the absorbed nutrients

C- The Liver:

- 1- Produces bile for digestion and absorption of fats.
- 2- Plays a major role in carbohydrate and protein metabolism
- 3- Inactivates many toxic substances and drugs
- 4- Synthesizes most of blood plasma proteins

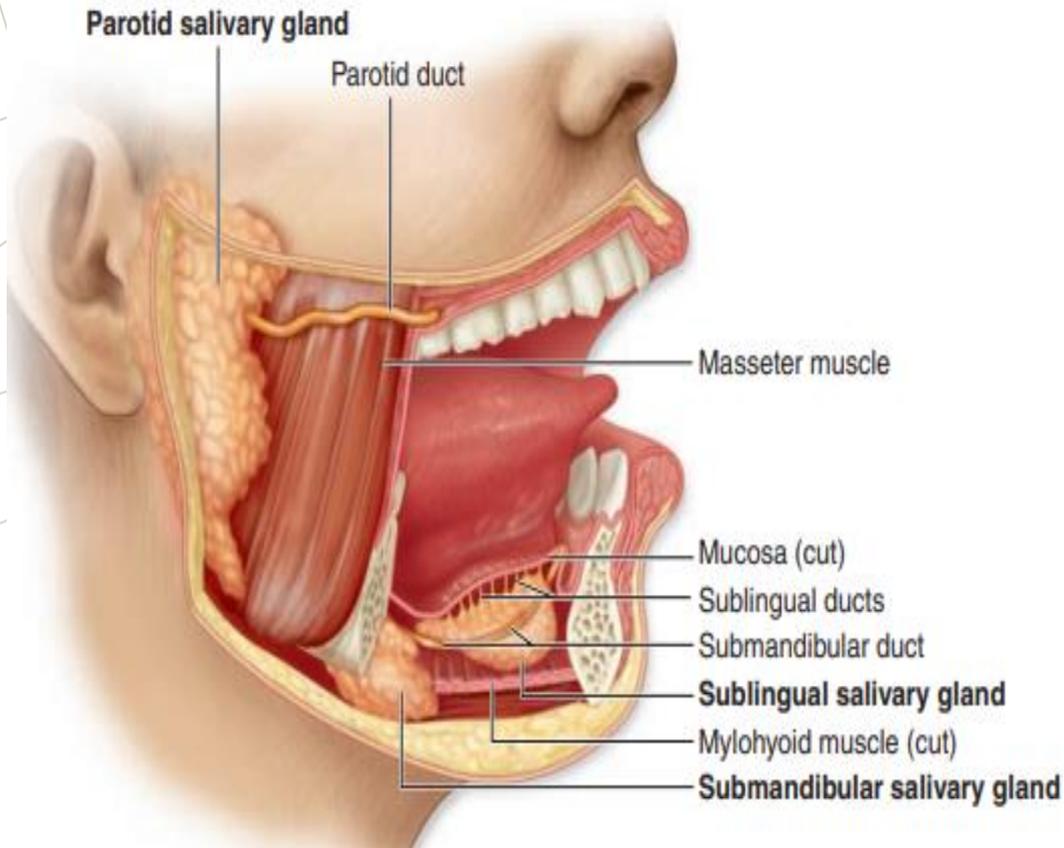
SALIVARY GLANDS

Exocrine glands in the mouth produce saliva, which has digestive, lubricating, and protective functions.

With a normal pH of 6.5-6.9.

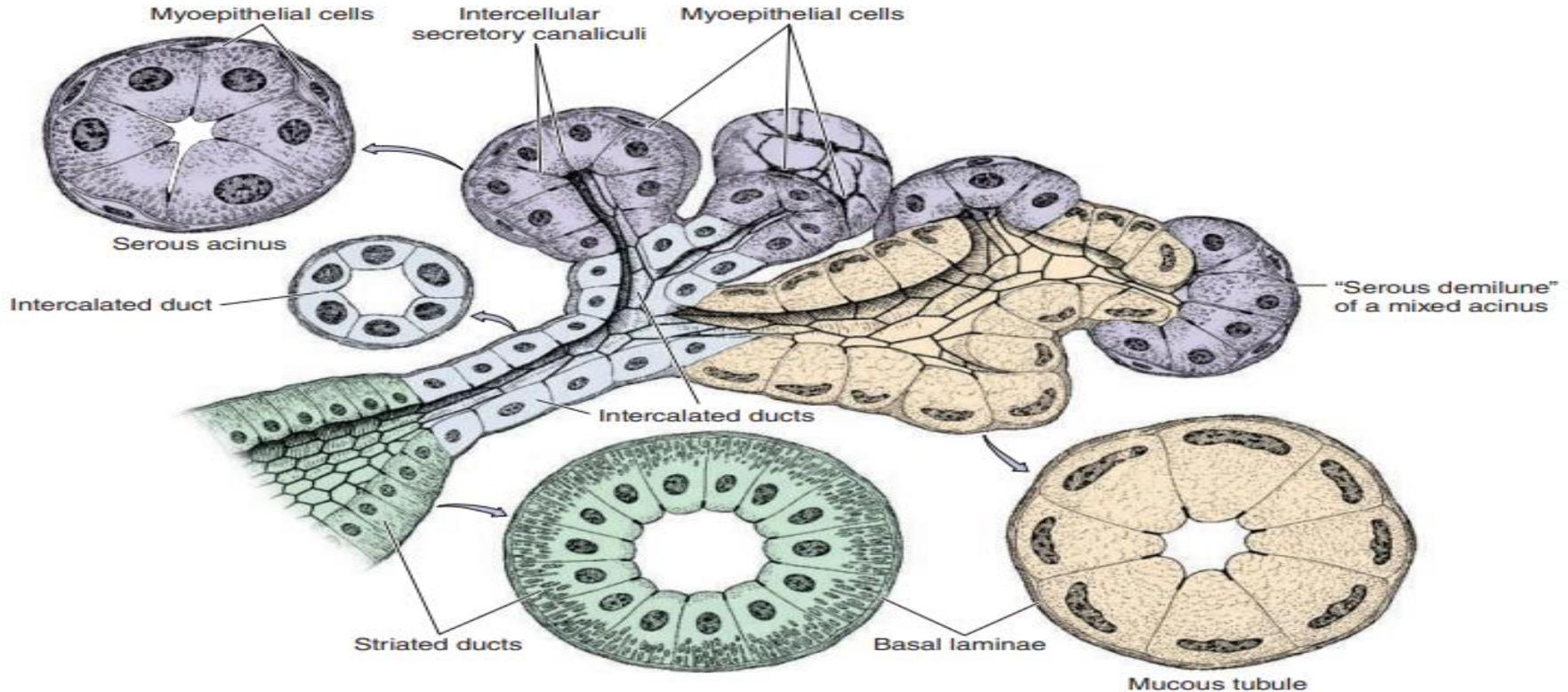
There are three pairs of large salivary glands:

- The parotid
- Submandibular
- Sublingual glands



There are three bilateral pairs of major salivary glands, the **parotid, submandibular, and sublingual glands**, which together produce about 90% of saliva. Their locations, relative sizes, and excretory ducts are shown here. These glands plus microscopic minor salivary glands located throughout the oral mucosa produce 0.75-1.50 L of saliva daily.

Histology - A capsule of connective tissue surrounds each major salivary gland. - The parenchyma of each consists of secretory units and branching duct separated by connective tissue.



Parotid glands, located in each cheek near the ear, are branched acinar glands with secretory part composed of serous cells secrete α -amylase that initiates hydrolysis of carbohydrates and proline (antimicrobial protein)

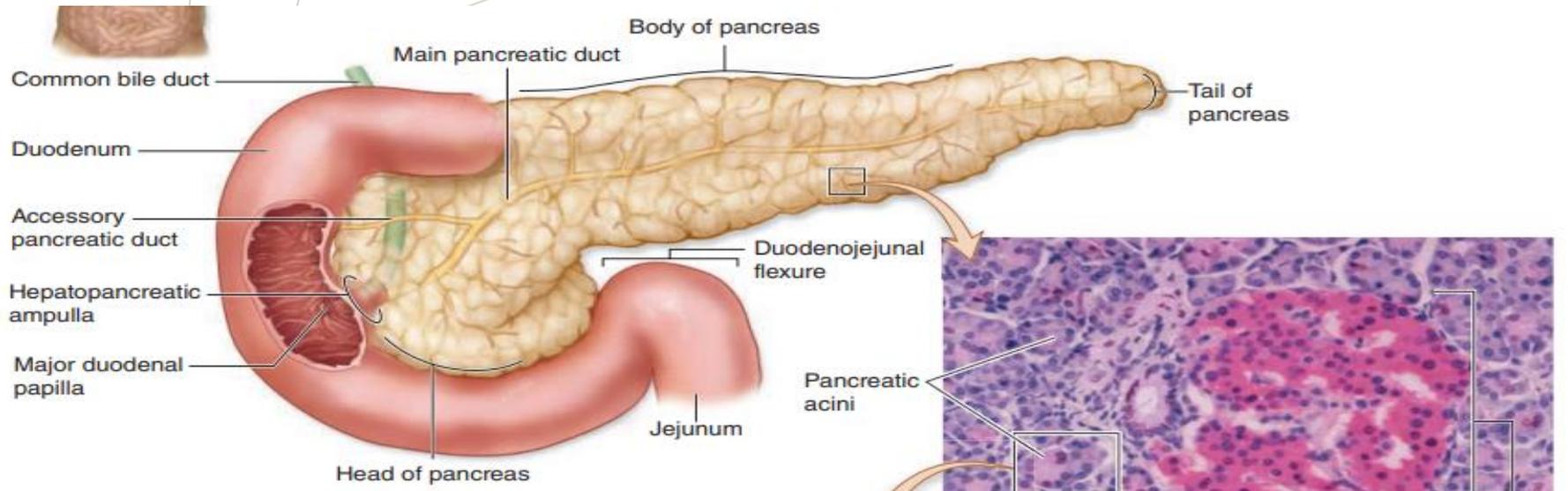
Submandibular glands, which produce two-thirds of all saliva, are branched tubuloacinar glands, serous and mucus cells. In addition to α -amylase and proline rich proteins, serous cells of the submandibular gland secrete lysozyme for hydrolysis of bacterial walls.

Sublingual glands, the smallest of the major glands, are branched tubuloacinar glands. The main product of the gland is mucus. Formed of serous and mucus cells.

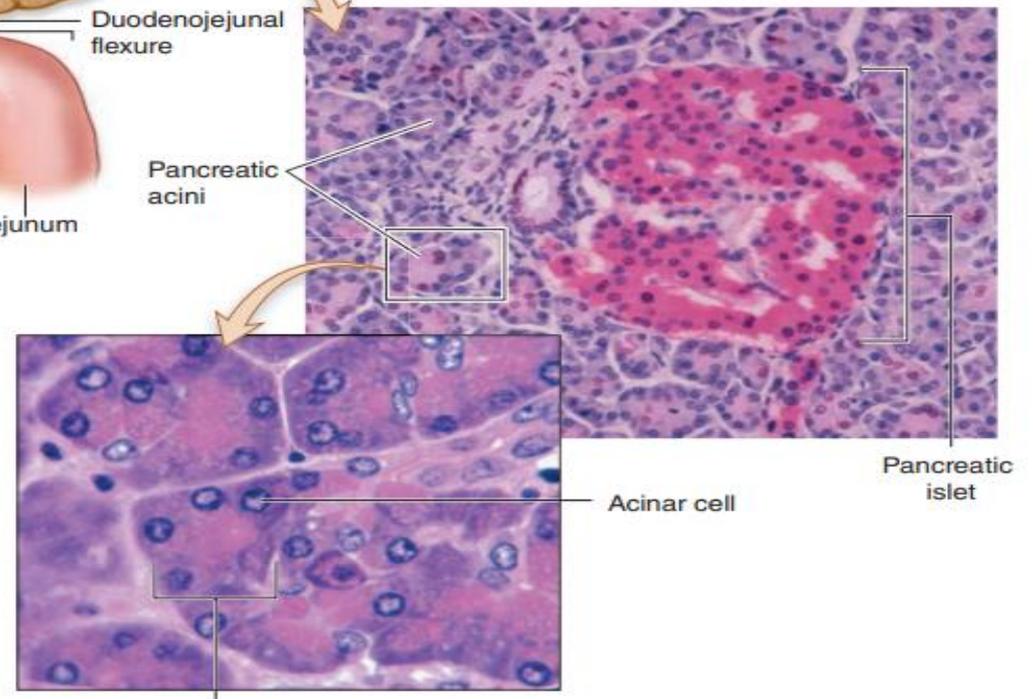
Pancreas

- The pancreas is a mixed exocrine-endocrine gland that produces both digestive enzymes and hormones.
- A thin capsule of connective tissue cover the pancreas
- The secretory acini are surrounded by a basal lamina that is supported only by a delicate sheath of reticular fibers with a rich capillary network.

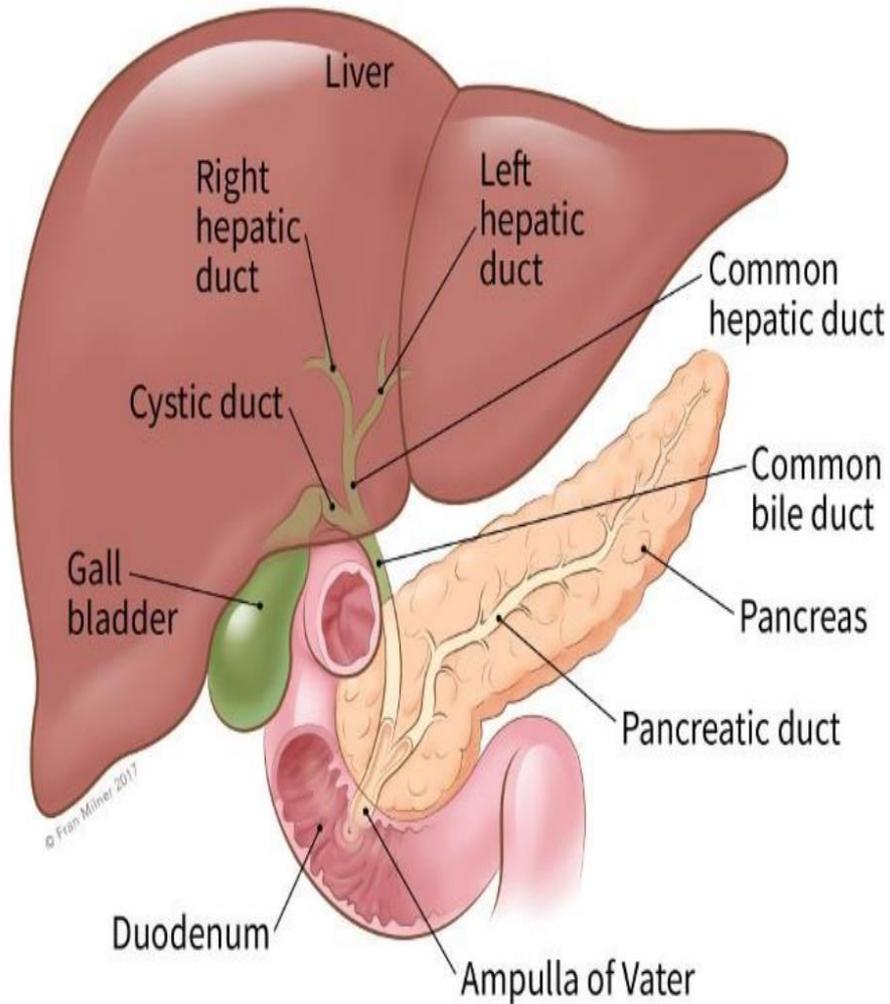
- The digestive enzymes are produced by cells of exocrine portion of the pancreas.
- Hormones are synthesized in endocrine epithelial cells known as pancreatic islets (islets of Langerhans)
- Exocrine pancreas secretes 1.5-2 L of fluid per day, rich in bicarbonate ions and digestive enzymes.



(a) Duodenum and pancreas, anterior view

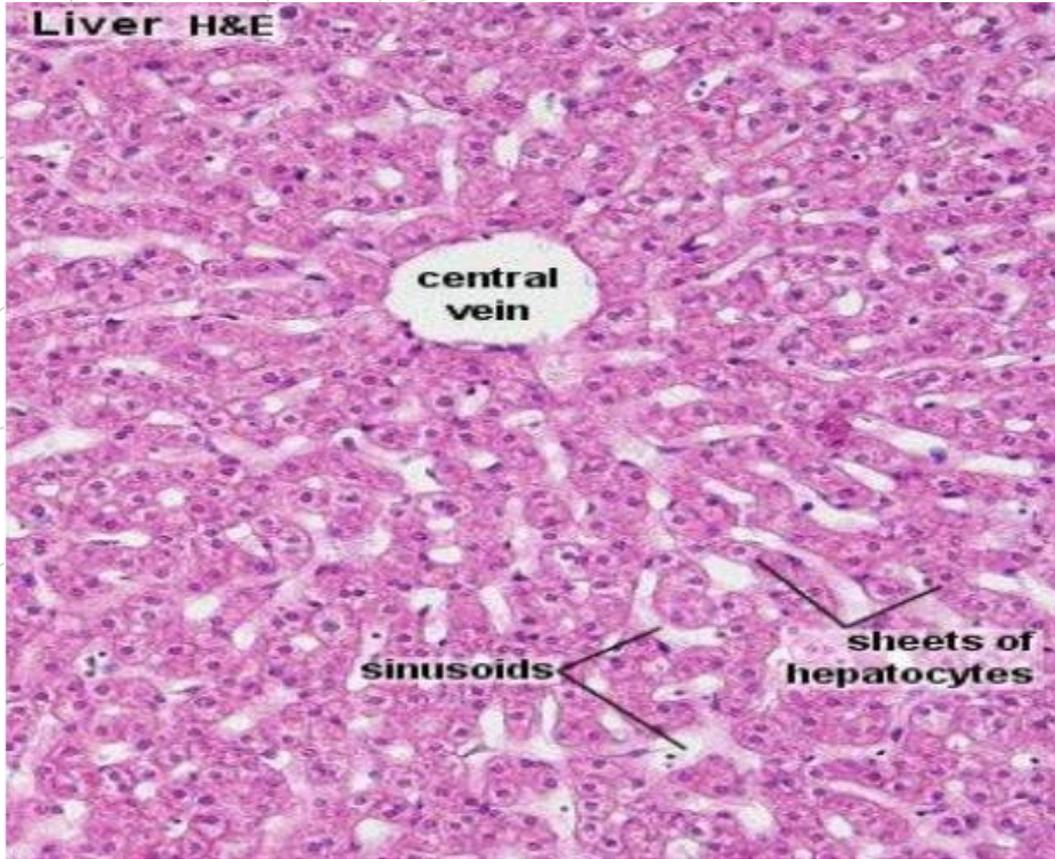


(b)



Liver

- The liver is the second biggest organ in the body, in adults averaging about 1.5 kg.
- Located in the right upper quadrant of the abdomen just below the diaphragm.
- Liver is an interface between the digestive system and blood
- Most blood in liver 80% comes from the portal vein arising from intestine, stomach and spleen.

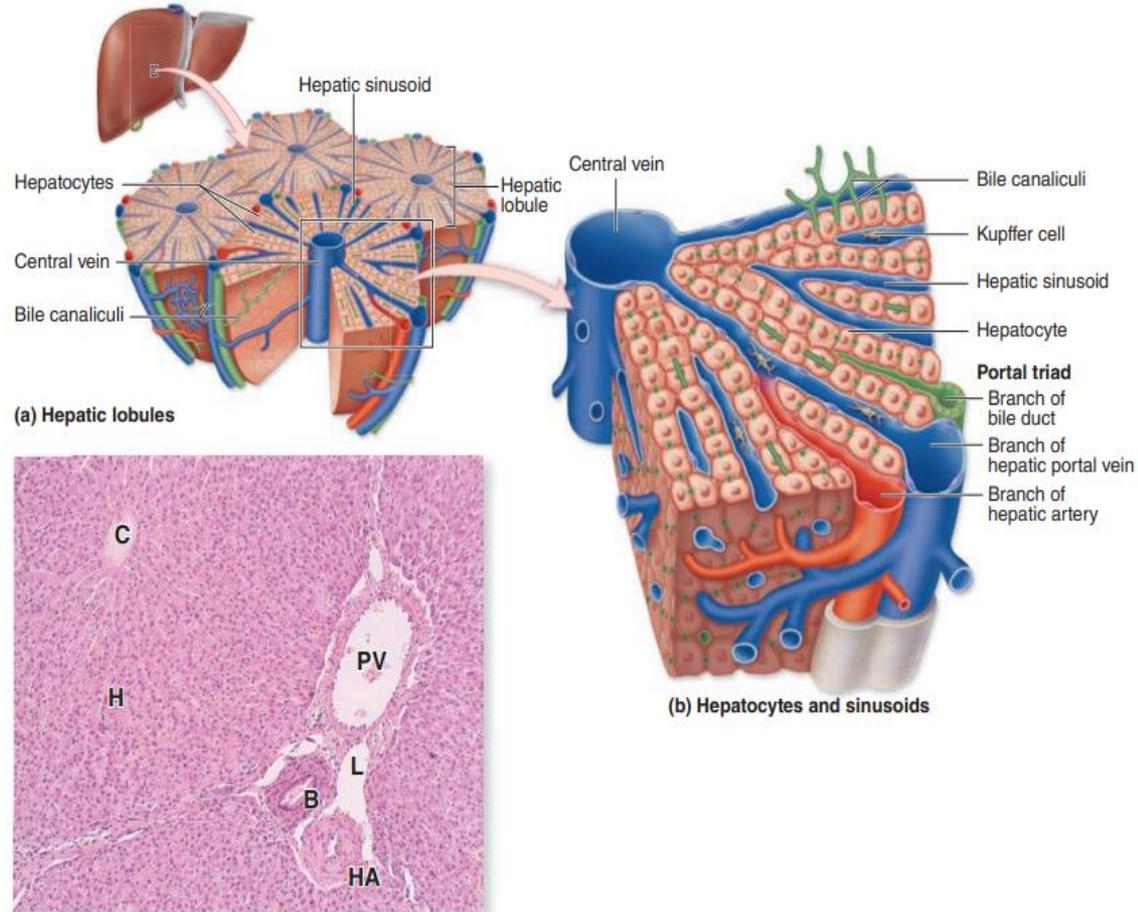


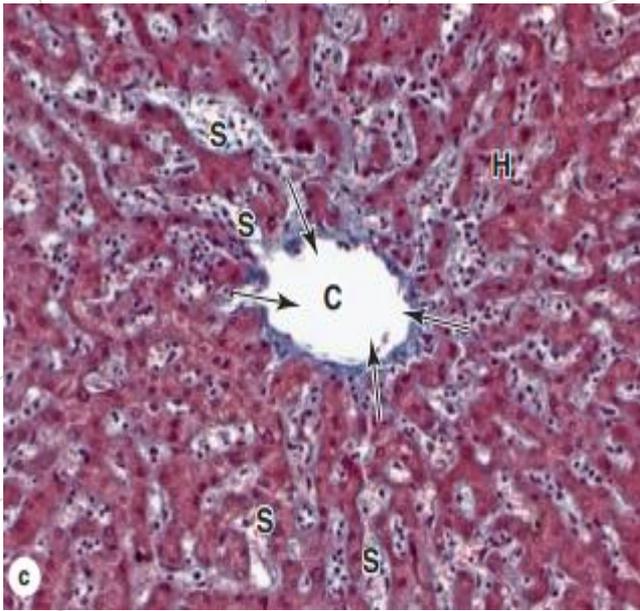
Histology

- The liver is covered by a thin fibrous capsule of connective tissue that becomes thicker at the hilum.
- The portal vein and the hepatic artery and the duct are surrounded by connective tissue all the way to their termination.

Hepatic lobules

- Liver cells (Hepatocytes) are epithelial cells grouped in an interconnected plate
- Liver cells arranged of thousands of small polygonal hepatic lobules.
- Hepatocytes like bricks of wall arranged radially around the central vein





- Hepatocytes branch and anastomose freely, forming spongy like structure
- Liver sinusoids are surrounded and supported by delicate sheath of reticular fibers and endothelial cells
- Two cell types are associated with
 - 1- Stellate macrophage (Kupffer cells) their role to breakdown aged RBC, free heme for re-use, remove bacteria and act as antigen- presenting cells.
 - 2- Stellate fat storing cells with small lipid droplets with vitamin A.

Hepatic lobule structure and function

- secretion of protein factors in blood (endocrine)
- secretion of bile components (Exocrine)
- removal of oxygen and small compounds of all kinds from blood
- liver has strong capacity for regeneration despite its slow rate of cell renewal.
- loss of hepatic tissue from the action of toxic substance triggers the remaining healthy hepatocytes begin to divide.
- the bile produced by hepatocytes flow through the bile ducts and hepatic duct.
- the bile duct and hepatic duct are lined by mucous membrane having a simple columnar epithelium.

THANK YOU

