



+

THE



SYSTEM

Histology

Sheet

Slide

Handout

Number: 2

Subject: Histology of the esophagus , the stomach and the s. intestines

Done By: Lina I. Mansour

Corrected By: Jawad Masarweh

Doctor: H. Mohtaseb

Date: 0/0/2016

Price:

THIS SHEET IS NOT LONG; IT IS JUST FULL WITH PICTURES.

[Record](#) , [Slides](#)

Histology of the Esophagus

The esophagus is a 25-cm-muscular tube. It starts at the lower border of the cricoid cartilage (lower of the larynx at level of C6) ends at the cardia of the stomach.

Unlike the pharynx it's completely muscular, but still composed of :

(Mucosa, Submucosa, Muscularis externa (proper) , serosa / adventita)

the mucosa itself is composed of (lining epithelium , lamina propria , Muscularis mucosea)

indicated in Figure 1

- *Lining epithelium is stratified squamous non keratinized (for protection).*
- Lamina propria is a loose connective tissue contains glands → esophageal glands and the lower third they are called Cardiac glands.
- Muscularis mucosa its very thin(2-3 layers only)
- Submucosa which is a connective tissue, that has lymphatic and blood vessels . contains a gland called esophageal glands proper .
note that :the only organs that have glands in the submucosa are the duodenum and the esophagus
- Muscularis externa a muscles with inner circular , outer longitudinal layers . **figure3** in between there is an autonomic nervous plexus the myenteric nerve plexus that contains parasympathetic ganglia (in the wall of the organ) which implies that the parasympathetic nerve enters the plexus as preganglionic ,while the sympathetic nerves reach it as post ganglionic.
Sympathetic for the sphincter and the blood vessels
parasympathetic for the glands → secretomotor, and excitatory for the peristaltic movement.
They divide the esophagus according to type of muscles present in muscularis externa into:

Upper: skeletal only (so it's voluntary).
middle : skeletal+ smooth
Lower: Smooth only

The outer most layer

most of the esophagus present in the neck and thorax and is covered by thick connective tissue → adventitia , just a small portion (1.3 cm) presented by the area below the diaphragm in the abdominal cavity and is covered by peritoneum thus its outer layer is → serosa .

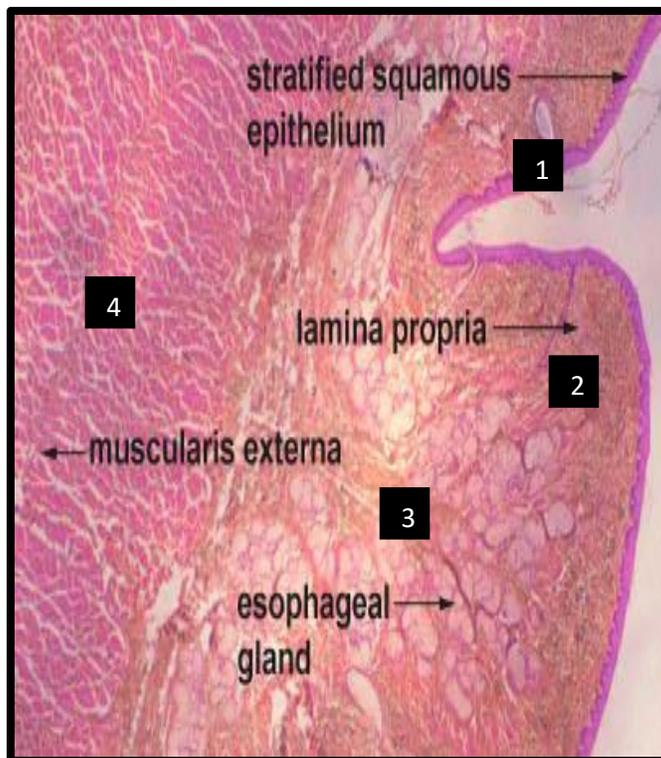


Figure 1

- 1:lining epithelium (stratified squamous non keratinized)
- 2: lamina propria contain cardiac glands
- 3:submucosa contains esophageal glands proper
- 4: muscularis externa .

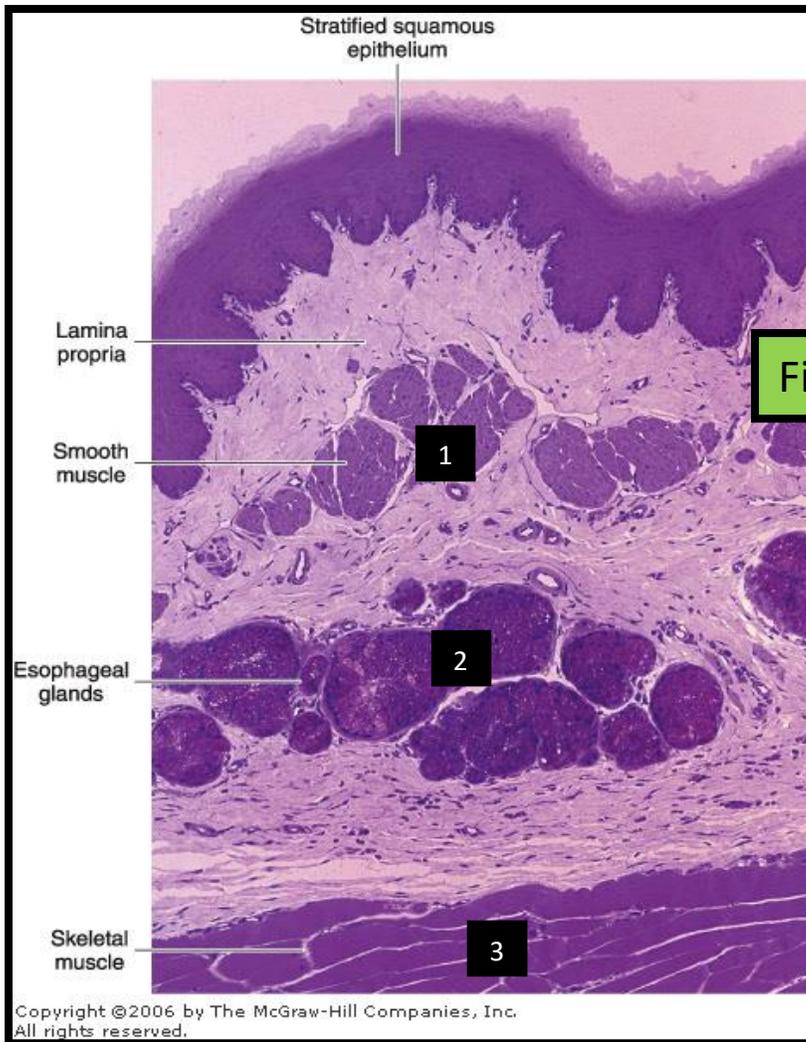


Figure 2

1: muscularis mucosa contains smooth muscles
 2: Submucosa contains esophageal glands
 3: Muscularis Externa contains skeletal muscles then most likely it's from the upper or middle esophagus.

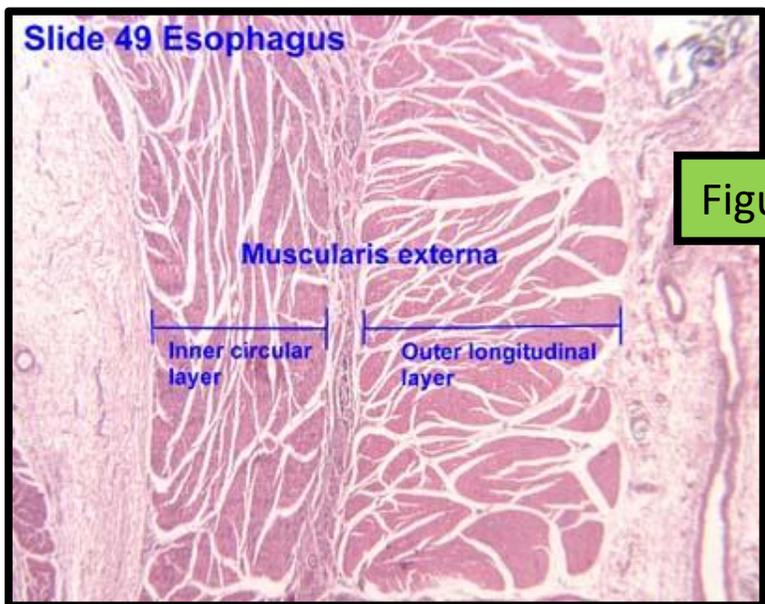


Figure 3

Long. Vs Circular Fibers of the muscularis externa .

*the function of the esophagus, is the propulsion of the bolus to the stomach and preventing food from going backwards.

Notes: its 45 cm from the incisors.(this helps in gastroscopy).

Histology of the Stomach

Parts of the stomach figure 4:

- Cardia, is a small area around the cardiac orifice .
cardiac orifice: it is a physiological sphincter but not an anatomical /histological sphincter .
because anatomist only consider the orifice as a sphincter if it has thickness of smooth muscles around it , otherwise its is not a sphincter it's just an orifice .
function : is to prevent food from the stomach from moving back to the esophagus . by creating an angle between the esophagus and the fundus .
- Fundus usually it contains gases
- Body it has lesser curvature which ends by incisura angularis opposite to it on the greater curvature is a bulge .(the imaginary line between incisura and the bulge saperates the body from the pylorus)
- Pylorus is_ divided into antrum , pyloric canal and pyloric sphincter .
the pyloric sphincter is an Actual anatomical sphincter as the inner smooth muscle thickened.
its function is to empty the stomach content under the control of sympathetic system .

They called it cardia as it is near the heart .



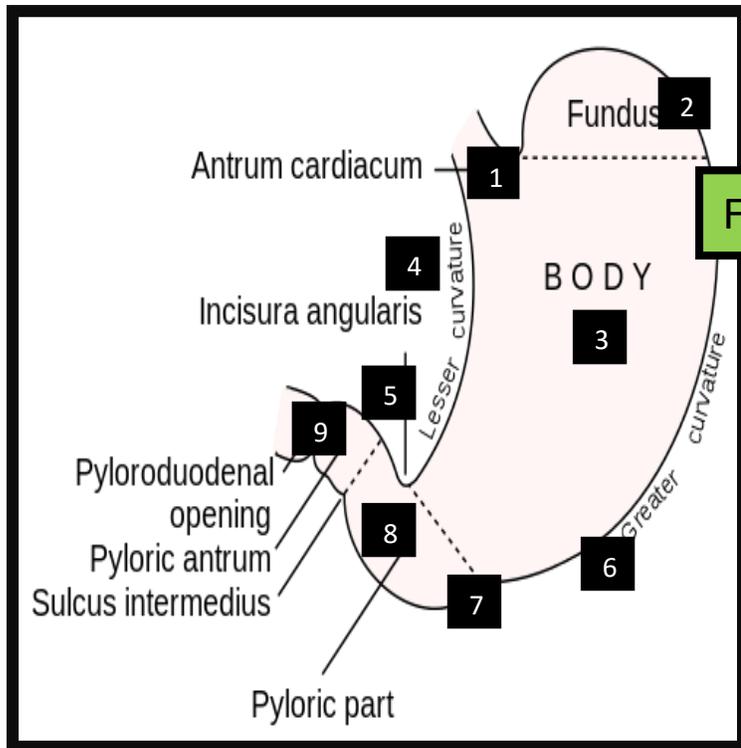


Figure 4

- 1: cardia orifice
- 2: fundus
- 3: body that has 4: lesser curvature ends at 5: incisura angularis ,and 6:the greater curvature that bulge at 7 . notice the line between 5 and 7
- 8: pylorus
- 9: pyloric sphincter

when we study the histology of the stomach we have three different sections:

- From the cardia
- From the Body /Fundus (the same)
- From the pylorus

Grossly, the inlet of the stomach is full with foldings called **rugae** (represented by the invaginations of the submucosa through the mucosa) they are circular except at the lesser curvature it's longitudinal, in order to ease and fasten the passage of the fluids through the stomach to reach the intestine, that's why just a small amount of them are mixed with the food.

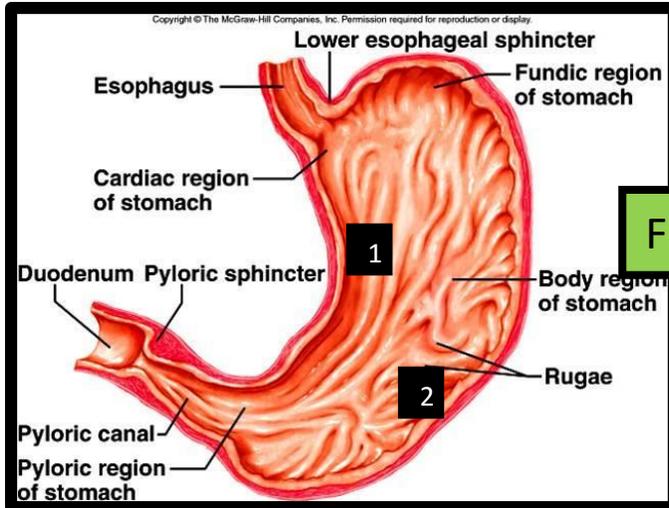


Figure 5

1: long. Rugae
2: circular Rugae

Mucosa of the stomach

- **Lining epithelium:** simple columnar without goblet cells.

*goblets appear in the intestines and increase in number as we move distally.

- **Lamina propria:** contains gastric glands.

the lining of the glands is also simple columnar epithelium , and they open into the surface of the mucosa (into the Lumen of the stomach) by transfer their contents by PITs

(so Glands and Pits)

Note that what you see on the slide is determined by how cut was made , and also notice the ratio between the size of the pit and the thickness of the gland helps to determine whether the section was taken from the cardia , body , or pylorus.

the pit of the cardia is short , of the body is also shorter , while the pit of the pylorus is long .

a short pit >>fast secretion .

note that the thickness of the gland reach its max. in the body.

so in the body of the stomach , where the digestion mainly occur , I need both fast and rich digestion mediated by the thick glands with short pits.

indicated in figures 6a 6b 6c

- **Muscularis mucosa** that separate the mucosa from submucosa.

the function of the stomach is to Digest the bolus turning it into acidic chyme , then passes it into the duodenum. This takes 2-4 hours , which means that the pyloric sphincter opens every 2-4 hours to pass the chyme.

Clinical application: Peptic ulcer (most common site) the first inch of the duodenum can be easily ulcer-ed as it the first part that deal with the Acidity of incoming chyme.

The three sections in more details (I will try to indicate everything mentioned here on figures 6-9 so look at them while reading : -)

before starting let us state some facts:

- Every gastric gland is composed of three parts the isthmus , the neck and the body and at the end of the body there is the base. indicated well in figure 6b
- The Gland is composed of several types of cells :

1. **mucous cells** : numerous ,present at the isthmus and the neck .
mode of secretion is alkaline mucous [to prevent the stomach from digestion its mucosa]
2. **parietal (Oxyntic) cells** : presented in the neck .secrete HCL. The base of these cells are acidophilic the nuclus is central. (they Appear fade)
canalculae of parietal cells :
as mentioned above parietal cells secrete HCL . when the partial cells are active they form canalculea (complicated +prominent).when the parietal cells are not active >>no canalculea>> just vesicles.
3. **chief cells** :present at the base .they secrete pepsinogen (endonuclease) . their nucleus are basal so their bases are basophilic (appear dark) while there apex contain Zymogenic granules .(they secrete lipase enzyme)
4. **enteroendocrine cells**: scattered , present from the isthmus downward to the base .secrete Gastrin (hormone) , serotonin (these are important in stmulation of the digestion) .
5. **Stem cells**: present in the neck (or the isthmus).regeneration of damaged cells whether upward or downward. Turnover is 4-7 days.

note that : every part of the stomach has its own distribution of these cells .

- Cardia :

- short glands with short pits

- the pit contains secretory cells that produce lysozymes (anti-bacterial role)

- the glands type is simple coiled .

- mucous cells present .

-parietal (Oxyntic) cells there (but fewer than body)

-no chief cells .

-enteroendocrine cells there

-Stem cells present .

- Fundus /Body:

-thick glands with short, wide pits , gland type is simple or branched tubular

- parietal cells ; present at the neck and the isthmus (numerous).

-chief cells present .

-enteroendocrine cells present.

-stem cells present

- Pylorus

-the pit is long , narrow.

-the gland is simple coiled , small (relatively)

-presence of lymphatic nodules in lamina propria . (those act as filters at the end of the stomach).

Lymphatic nodules : collection of lymphocytes . increase in number as u descends distally in the GI tract.

-no chief cells

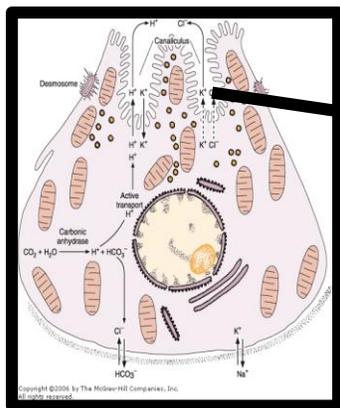
-numerous mucous cells

-the enteroendocrine cells secrete somatostatin (as the slides say) that inhibit the digestive activity ,

also secrete Cholecystikin CCK that stimulates the duodenum and gallbladder . (physiology)

-stem and enteroendocrine cells

*we cannot see the enteroendocrine cells/stem cells by the LM.



Canalculae of active parietal cells

the stomach is the only organ of the GI that has 3 layers of muscles:

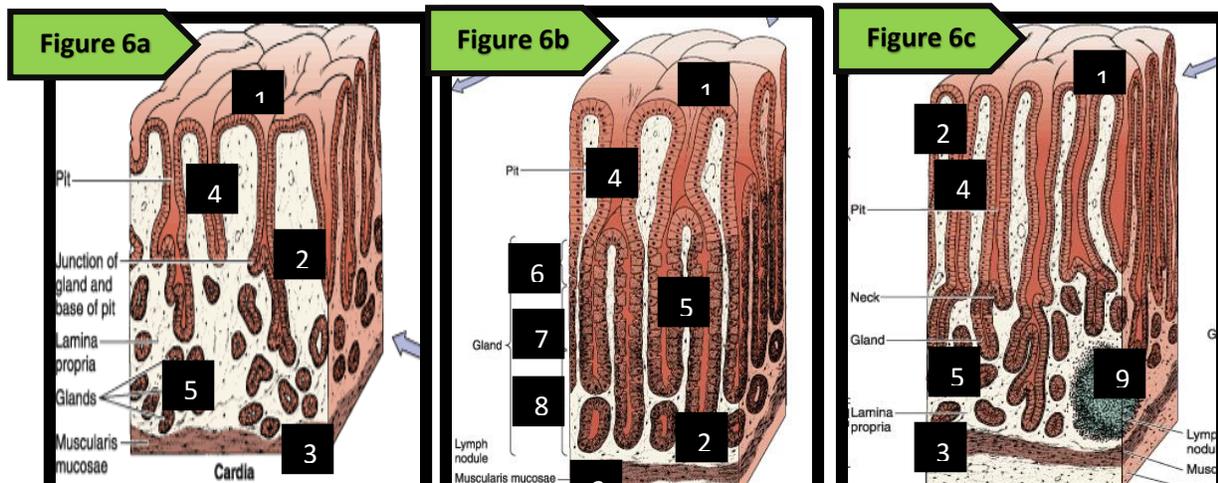
1. Outer ; longitudinal
2. Inner; circular. Thicken at the pyloric sphincter .
3. Inner most; oblique.(just present in the stomach)

one plexus present :

Myenteric plexus ; between the Outer and the inner layers .

the doctor considers it as a parasympathetic plexus (because of the presence of its ganglia at the wall of the organ)receives preganglionic parasympathetic fibers from the vagus nerve . in fact all the GI tract takes its parasympathetic fibers from the vagus nerve . except from the lateral third of the transverse colon and distally to the end of the GI , they receive their parasympathetic fibers from S2, S3, S4. The parasympathetic >>secretomotor for the glands and for the GI

movement.



The mucous layer among different parts of the stomach:

6a :the cardia , 6b :the body ,6c: the pylorus.

General layers

1: lining epithelium , 2: lamina propria (white color) , 3: Muscularis mucosa , 4: gastric pit , 5: gastric gland .

the gland is further divided into (indicated in 6b) :

6:isthum , 7:neck , 8: body

in the pylorus notice the presence of the lymphatic nodule (9)

in the cardia the gland is equal to the thickness of the duct.

in the body it's thicker with a short duct . in the pylorus the duct is so long while the duct is small .

the sympathetic fibers reach the plexus as Postganglionic, have role in controlling the Vessels and the sphincters.

however, some books consider this plexus as enteric system , that is independent from the central control recall:physio/ the Brain of GI but Dr. Mohtasib is not convinced by that .

the outer most layer of the stomach is **Serosa** as it completely covered by the peritoneum .

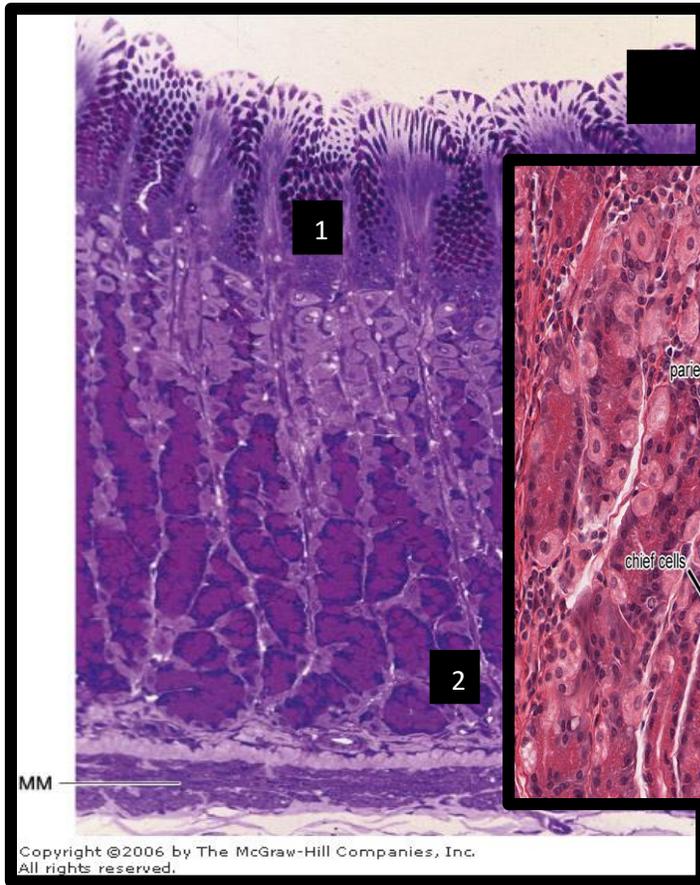


Figure 7

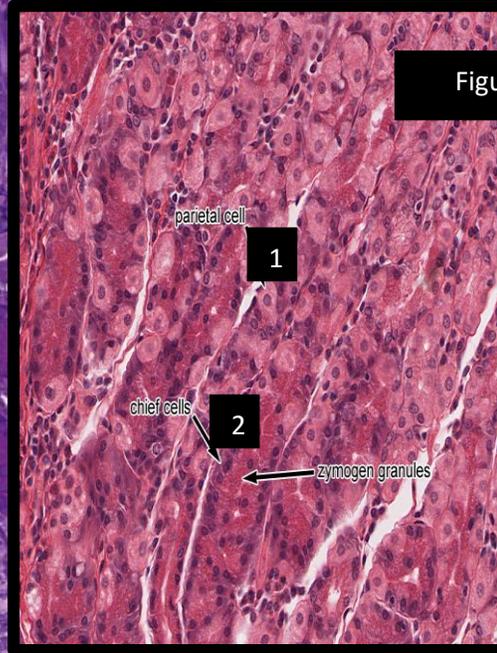


Figure 8

1: parietal cells situated at the neck of the gland , appears faint with rounded nucleus in figure 8.
 2: chief cells , situated at the body of the gland , appear dark with basal nuclei in figure 8.



Figure 9

1 : the lining epithelium (simple columnar) the nuclei are basal .
 2:glands
 the indicated arrow is where the pit empty its content in the lumen

Histology of the small Intestine

the small intestine is 6 m in length , composed of the duodenum , the jejunum , the ileum.

the duodenum is retroperitoneal organ which means that the peritoneum covers just its anterior wall . while, the jejunum and the ileum are completely covered by the peritoneum by the mesentery .
function of the small intestines →complete the digestion and absorption . that's why the duodenum receives two ducts : the common bile duct (from the liver and the gallbladder) & pancreatic duct from the pancreas (Digestion of fat)

while the jejunum and the ileum aids in absorption .

The Villi meats the absorption function. (high surface area)

note the villi is only present in the SMALL intestines .

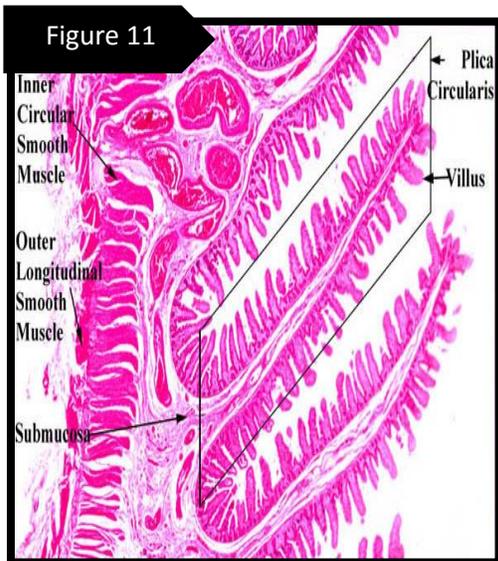
and like the rugae of the stomach , the intestines also have invasions of the submucosa through the mucosa , here called plicae circulares (AKA Kerckring's valves) very common in the jejunum(one of its features) .

at the edges of the peyer's patches , u can see the villi 0.5-1.5 mm in length, Shape : finger like (in the jejunum and ileum) , Leaf like in the duodenum. Figure11

at the lamina propria of the small intestine the glands of Lieberkühn (crypts)

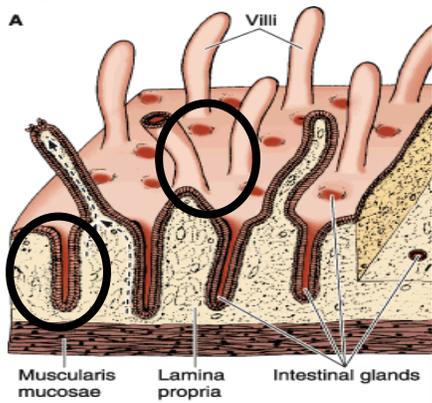
mucous :

- Lining epithelium ,simple columnar epithelium with goblet cells . also the lining of the glands is Simple Columnar
- Lamina propria followed by muscularis mucosa

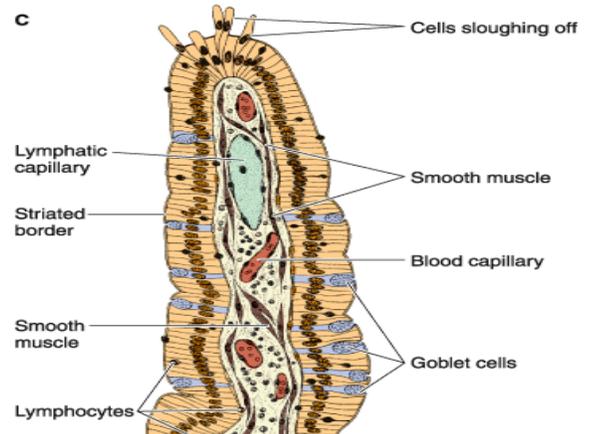
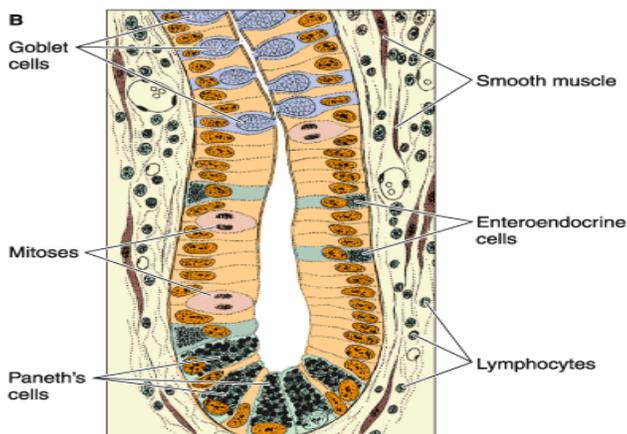


Notice the Plica circularis , also notice the villi on its edge .

- **Figure 12 , shows the difference between the villi and the gland.**



In **A** notice the left circled part is the gland (notice how it opens in the lumen) right the villi . the whitish part is the lamina propria .
C the structure of the villi (lining epithelium with goblets) the lamina contains smooth muscles and Lymphatic capillary (called lacteal :the dead end of the lymphatic vessel important for fat absorption) , also there are plasma cells , lymphocytes..



In **B** , u can see the Gland .. enteroendocrine cells are there , also the stem cells –but now they are basal- . and **Paneth's cells** (basal cells that secrete lysozymes) –discussed later .

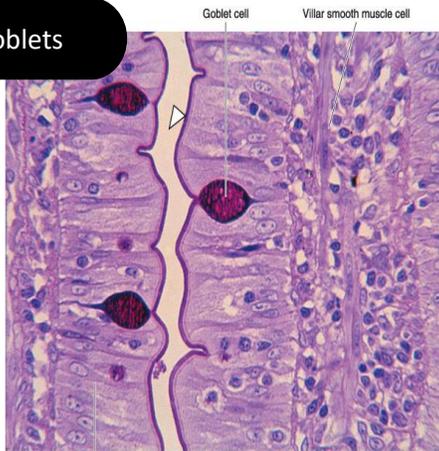
on the surface of the villi there are microvilli (3000miV/cell) known as brush surface (AKA straighted surface).
each microvilli is around 0.1 m in diameter .

Total surface area of the small intestines =200 m²
because of the presence of the microvilli

more details :

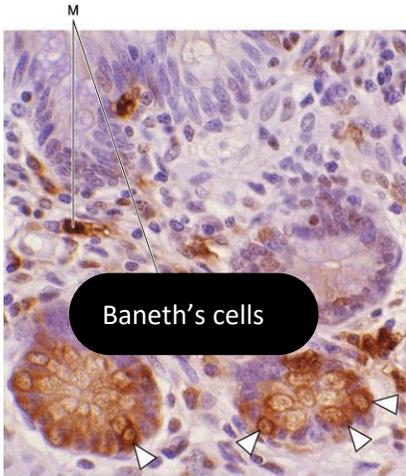
*goblet cells are present in the intestines and as u move distally they increase in number . because it secrete mucous which aids in lubrication of the intestines .

Goblets



A Absorptive columnar epithelium
Copyright ©2006 by The McGraw-Hill Companies, Inc.
All rights reserved.

*Paneth's cells, on the base , have zymogen granules , secrete lysosomes (so it's anti-bacterial) their bases are acidophilic . and they control the flora that makes vitamins.



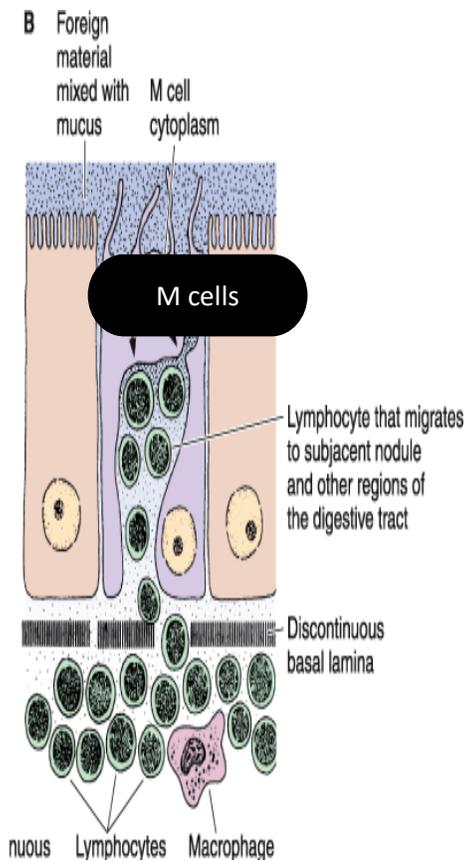
Copyright ©2006 by The McGraw-Hill Companies, Inc.
All rights reserved.

Microflods cells (m cells):

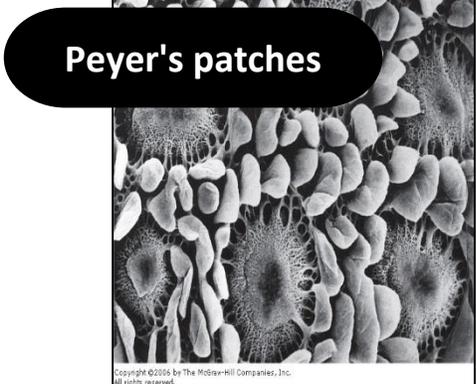
they contain lymphocytes and macrophages cells , it aids in making a communication between the surface and the lamina propria ..

also in making antibodies when the pathogen is on the surface.

(immunity role) → basement membrane under it is discontinuous to form a connection between the surface and lamina propria.



there are something we call GALT(gut associated lymphatic tissue). located in both the mucosa and the submucosa. Remember as we move distally the lymphoid tissues increase . one of them is Peyer's patches in the ileum only located on the anti-mesenteric surface (10-200)

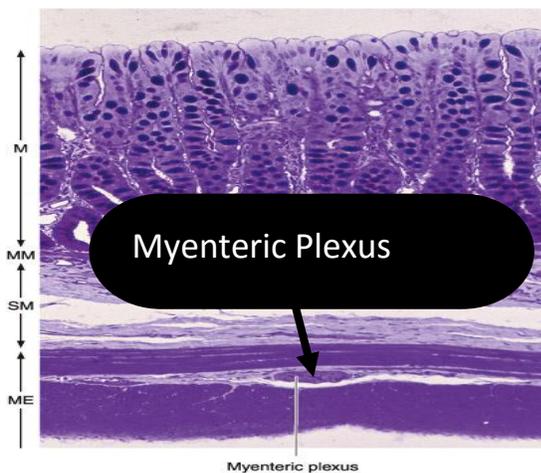


*an important characteristic for the duodenum is the presence of glands in the submucosa , called Brunner's glands they produce alkaline secretion to neutralize the acidic chyme of the stomach .

Nerve supply :

- **Myenteric plexus** ; between the longitudinal outer muscle layer and the circular inner layer. (for all the small intestines)
- **Meissner's plexus** ; submucosal plexus .

The mesentery delivers everything to the intestines (blood vessels , nerves..) contains a lot of fat , blood vessels (from the superior mesenteric artery) and lymphatic capillaries [lacteal] that absorb tiny fats.



Myenteric plexus
Copyright ©2006 by The McGraw-Hill Companies, Inc.
All rights reserved.

-END OF TEXT

- :3