SMALL & LARGE INTESTINE

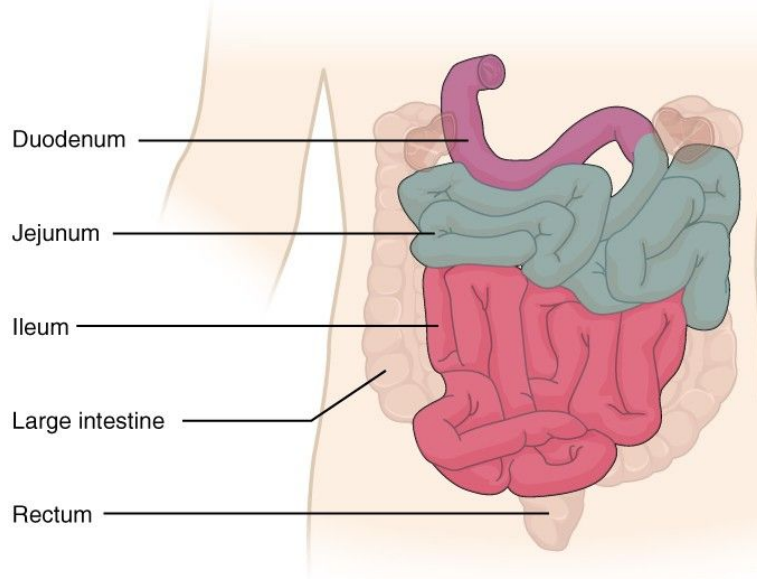
Objectives:
Describe the microscopic structure of the of the small intestine , large intestine & Vermiform Appendix

- **Editing file**
- **Important**
- **Doctor notes / Extra**

Small Intestine

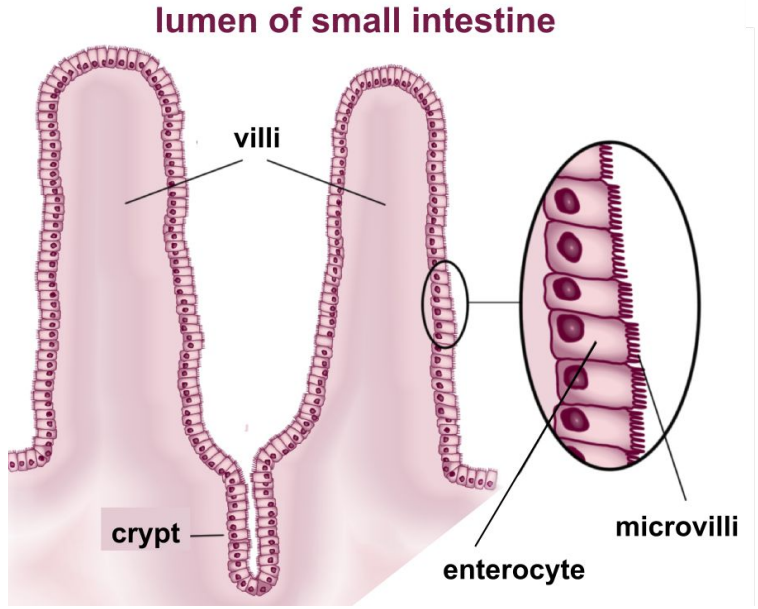
It is divided into the duodenum, the jejunum, and the ileum.

the main functions of the small intestine are digestion, absorption of food and production of gastrointestinal hormones. The small intestine is 4-6 metres long in humans.



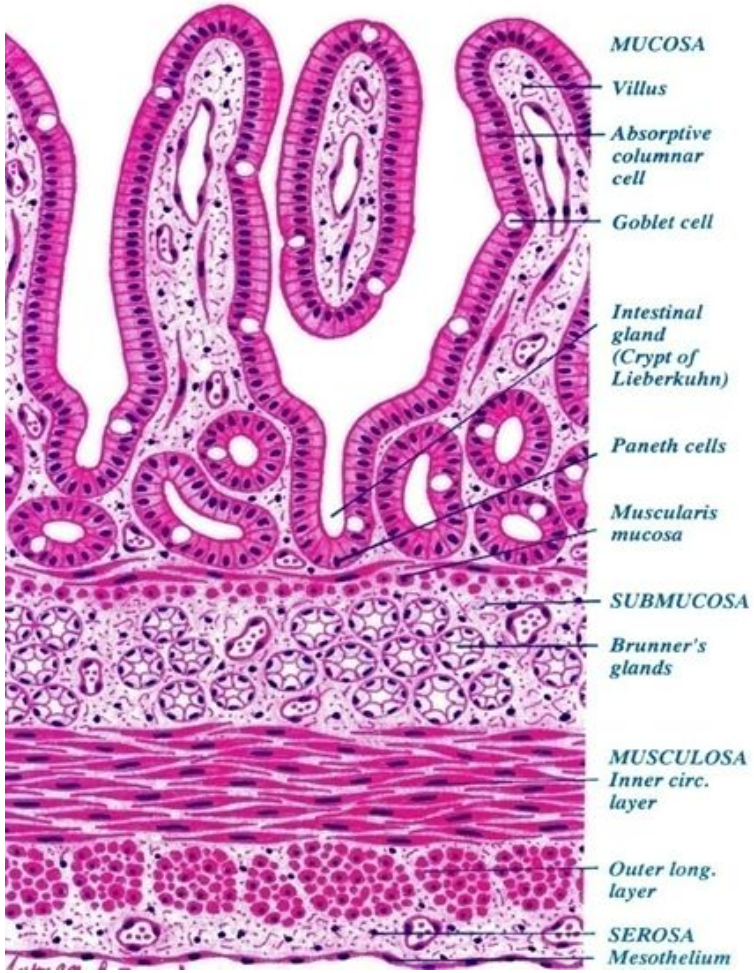
To increase surface area (To aid in digestion and absorption) the mucosa has:

- Plicae circulares (circular folds): Permanent folds of the mucosa and submucosa.
- Villi. only found in the small intestine
- Intestinal crypts (crypts of Lieberkühn).
- Microvilli (Brush border).



Duodenum

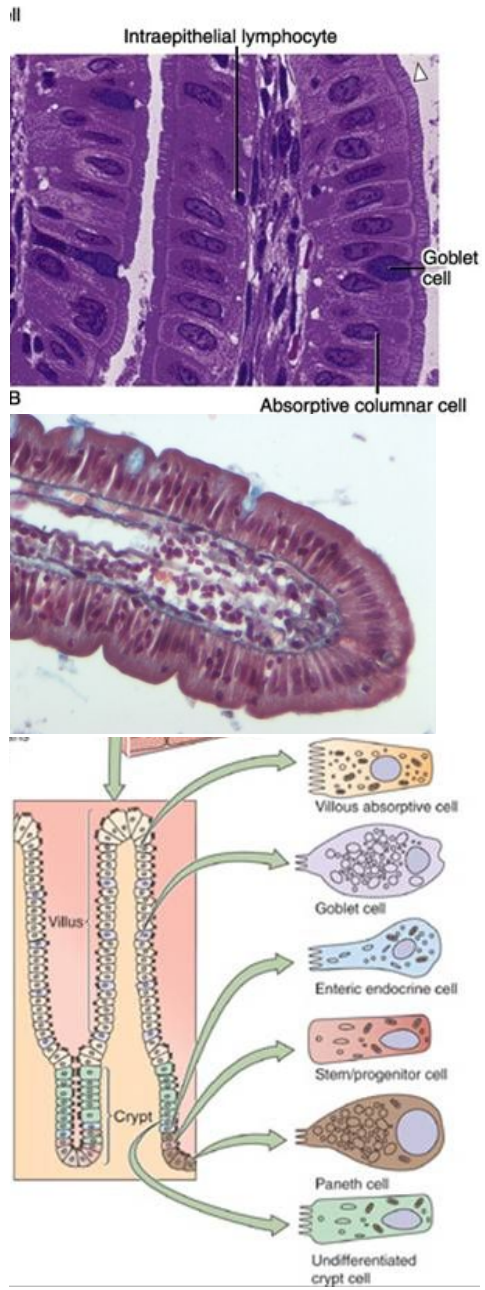
Mucosa	Shows villi and crypts. A- Epithelium: simple columnar epithelium with goblet cells (with brush border). B- Lamina propria: Loose areolar C.T. C- Muscularis mucosae: 2 layers of smooth muscle cells.
Submucosa	• Connective tissue containing blood vessels & nerves. • Contains **Brunner's glands** (secrete mucus).
Muscularis Externa	2 smooth muscle layers: • Inner circular layer • Outer longitudinal layer
Serosa or Adventitia	Duodenum is invested by a serosa or adventitia. 1st & 4th part = serosa , 2nd & 3rd part =adventitia



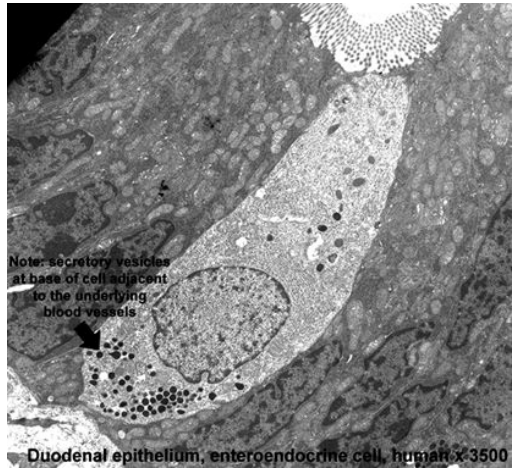
Exposed to peritoneum → Serosa
NOT Exposed to peritoneum → adventia

Mucosa of Duodenum

Cells Covering the Villi	1- Surface columnar absorptive cells: They have brush border (microvilli). They are covered with thick glycocalx that has digestive enzymes. They have Junction complex (tight, adhering and desmosome junctions). 2- Goblet cells: Increase toward the ileum. 3- Enteroendocrine (EE) cells (DNES cells).
Intestinal villi	• Each Villus is a **finger-like projection of small intestinal mucosa** and it is formed of: 1- Central core of loose areolar C.T. containing: • Lymphocytes. • Plasma cells. • Fibroblasts. • Smooth muscle cells. • Capillary loops. • Lacteal (blindly ending lymphatic channels)(characteristic feature of the small intestine). 2- Villus-covering epithelium.
Intestinal Glands (Crypts)	• Simple tubular glands that open between villi. • Composed of 5 cell types: 1. Columnar absorptive cells. 2. Goblet cells: secrete mucus. 3. Enteroendocrine (EE) (DNES) cells: secrete hormones. **4. Paneth cells: secrete Lysozyme (antibacterial)** (make the small intestine sterile) are found in the base of the crypts. 5. Stem cells: are regenerative cells. are found in the base of the crypts.



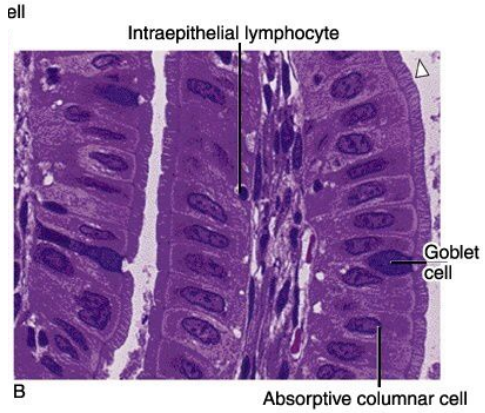
EE (DNES) cells:



- **EC cells**: secrete endorphin and serotonin.
- **S cells**: secrete secretin.
- **D cells**: secrete somatostatin.
- **A cells**: secrete glucagon.
- **Mo cells**: secrete motilin.
- **CCK-PZ cells**: secrete cholecystokinin (pancreozymin)

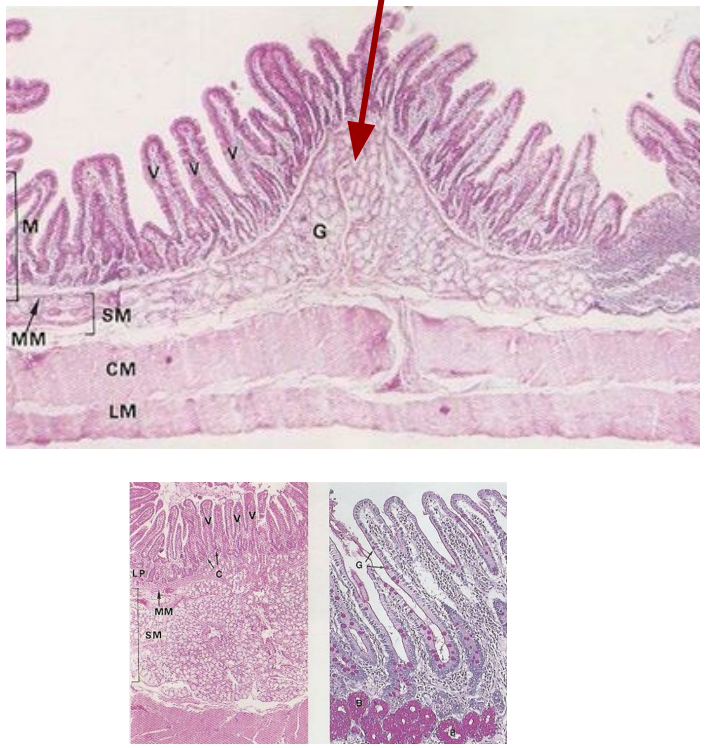
M Cells (Microfold cells) (immune cells) antigen presenting cell

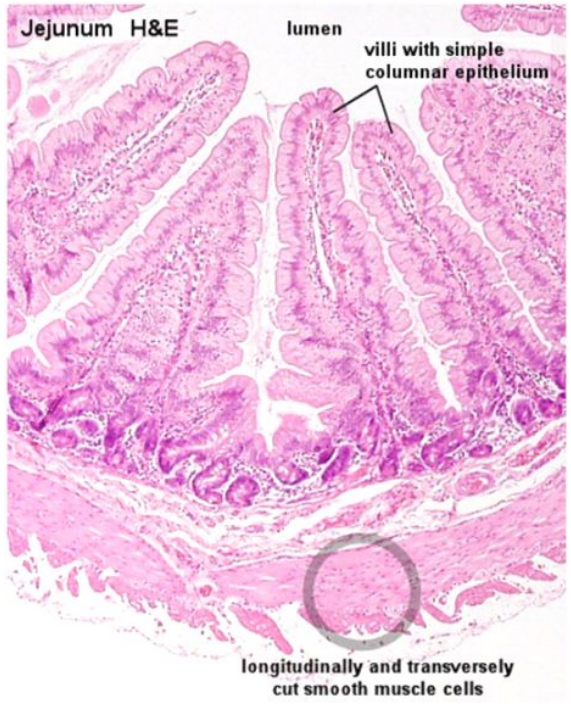
They are mainly found within the intestinal epithelium overlying lymphatic nodules of lamina propria. Each is a dome-shaped cell (or specialized squamous cell) with a basal concavity that contains intraepithelial lymphocytes and macrophages. They **phagocytose and transport antigens** present in the intestinal lumen to the underlying lymphoid tissue cells to initiate the immune response to these antigens leading to the **secretion of IgA**.

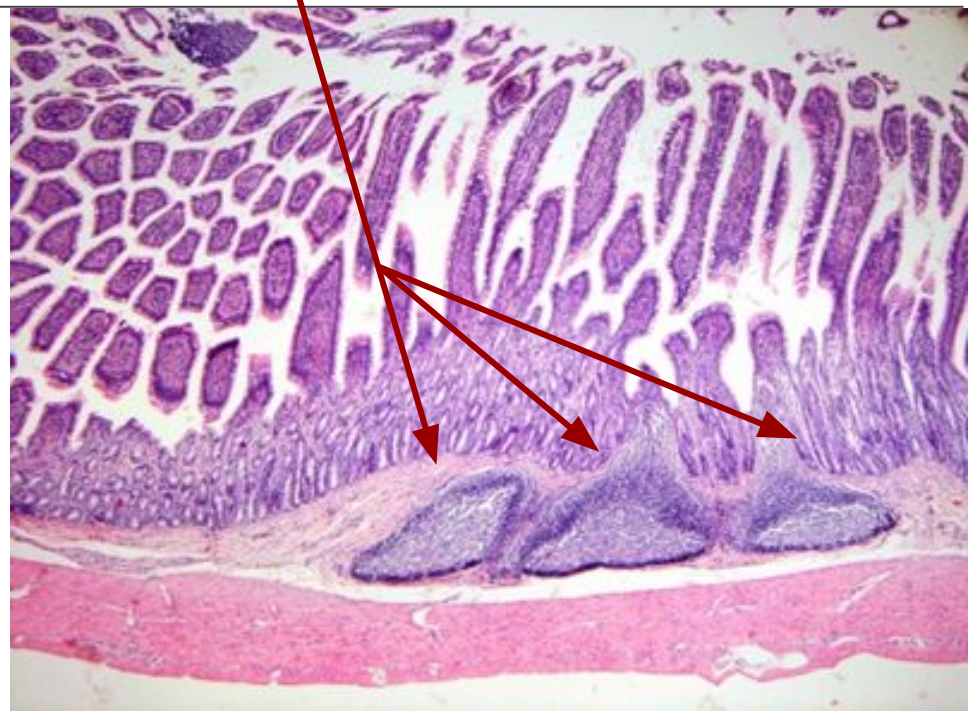


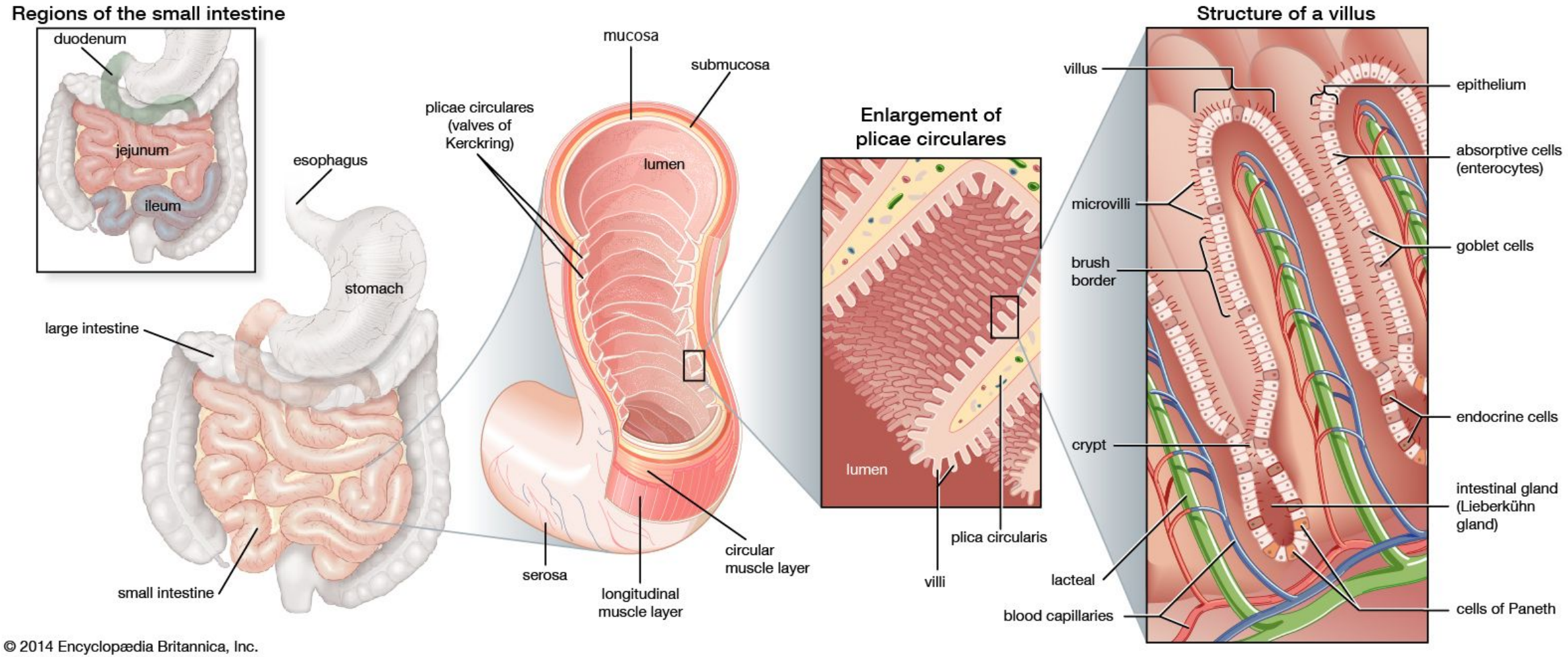
Regional differences of small intestine

Duodenum	Jejunum	Ileum
Its submucosa has **Brunner's glands**. It is invested by serosa or adventitia.	has neither Brunner's glands nor Peyer's patches. Jejunum is invested by serosa.	Its lamina propria, opposite the attachment of the mesentery, lymphoid nodules (**Peyer's patches**) that extend to the submucosa. Ileum is invested by serosa. the peyer's patches are found in half of the circumference








Regions of the small intestine
duodenum
jejunum
ileum
esophagus
stomach
large intestine
small intestine
mucosa
submucosa
plicae circulares
(valves of
Kerckring)
lumen
serosa
longitudinal
muscle layer
circular
muscle layer
Enlargement of
plicae circulares
lumen
plica circularis
villi
Structure of a villus
villus
epithelium
absorptive cells
(enterocytes)
microvilli
goblet cells
brush
border
endocrine cells
crypt
intestinal gland
(Lieberkühn
gland)
lacteal
blood capillaries
cells of Paneth
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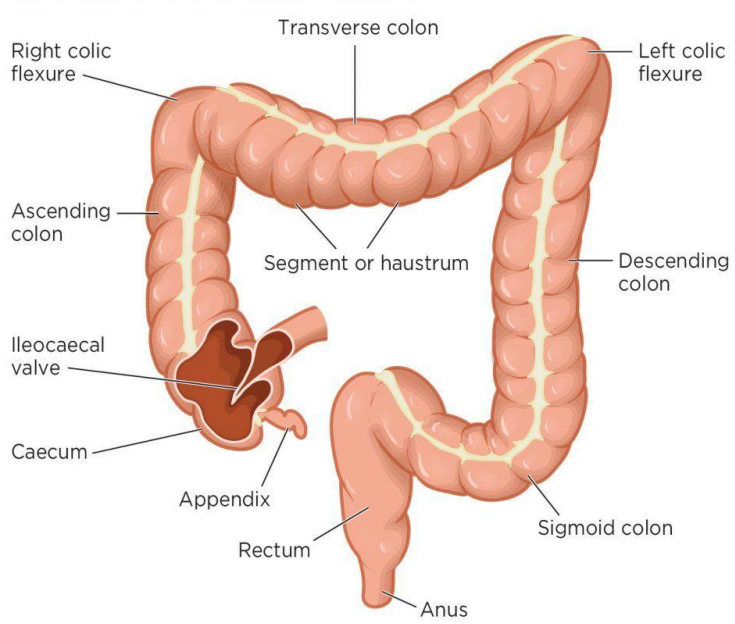
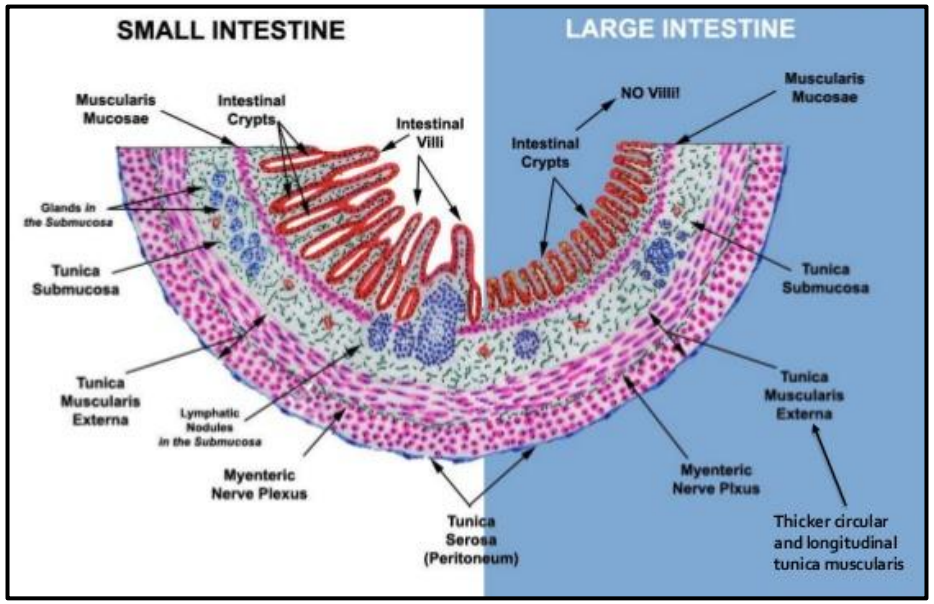
Large intestine

It is divided anatomically into:

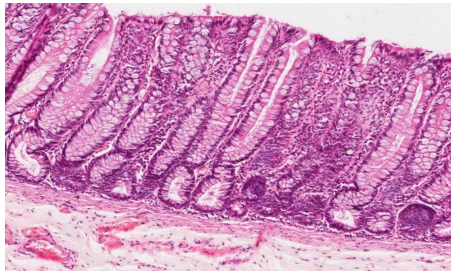
- Appendix
- Cecum
- Colon (ascending, transverse, descending & sigmoid)
- Rectum
- Anal canal.





Colon

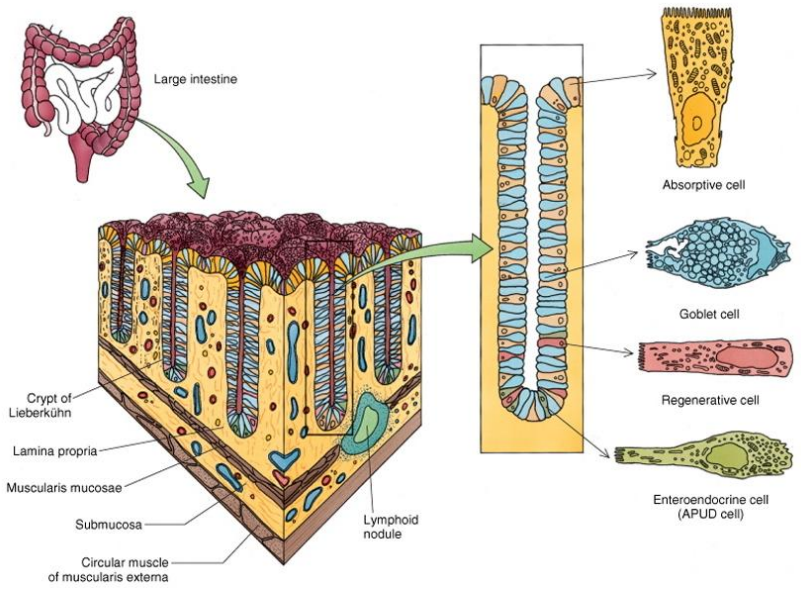
Mucosa	• Shows ***only crypts*** (**NO villi**) • **Epithelium:** simple columnar epithelium **with numerous goblet cells.** • **Lamina propria:** Connective tissue containing numerous **crypts**. Cells of the crypts are the same as in small intestine but **NO Paneth cells**. **Lymphatic nodules (solitary)**: frequent. • **Muscularis mucosae:** 2 layers of smooth muscle.
Submucosa	• **NO glands**. (Submuosal glands are only in esophagus and duodenum) • Meissner's nerve plexus.
Muscularis Externa	• Inner circular & outer longitudinal smooth muscle layers. • The longitudinal layer is not continuous but in the form of 3 longitudinal ribbons or bands (**teniae coli**). • Auerbach's nerve plexus.
Serosa	• C.T. covered by mesothelium. • Has fat-filled pouches (pendulous masses) called appendices epiploicae.



Intestinal Crypts of Colon

Cells lining the crypts are:

1. Surface columnar absorptive cells. most prominent
2. Goblet cells.
3. Enteroendocrine cells.
4. Stem cells.
5. M-cells.



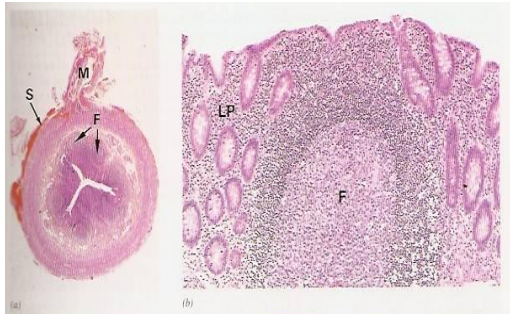
Vermiform Appendix

Similar to the colon, but with much smaller diameter, shallow crypts, more lymphoid nodules (aggregated lymphoid nodules, all around, in lamina propria and extending into submucosa), **Cells lining the crypt are same as Intestinal Crypts of Colon with Few goblet cells and many EE cells.**

Muscularis mucosae: Not continuous.

Muscularis externa:

- No teniae coli. continuous.
- It is invested by serosa.



Quiz

1- Duodenum is covered by?

A. serosa
B. adventia
C. A & B
D. None

2- Which of the following is true about duodenum ?

A. Goblet cells decrease toward the ileum
B. No goblet cell
C. Goblet cells increase toward the ileum
D. Brunner’s glands in mucosa

3- submucosal glands are found in :

A. colon
B. ileum
C. esophagus
D. stomach

4- Paneth cells are found in :

A. submucosa of the duodenum
B. mucosa of the duodenum
C. mucosa of the Jejunum
D. Ileum

5- Peyer's patches are found in:

A. Duodenum
B. Jejunum
C. Ileum
D. ALL

6- help sterile the small intestine:

A. Paneth cells
B. Brunner’s glands
C. Goblet cells
D. Stem cells

1.C 2.C 3.C 4.B 5.C 6.A

Quiz

1- What is the lining epithelium of the colon ?

A. Simple columnar with goblet cell
B. Simple columnar
C. Simple squamous
D. Transitional epithelium

2- Which one of the following is true about Vermiform Appendix?

A. has teniae coli
B. has many goblet cells
C. is covered by serosa
D. continuous Muscularis mucosae

3- Which of the following is true about colon?

A. is covered by adventitia
B. composed of squamous epithelium
C. The longitudinal muscle layer is not continuous
D. has submucosal glands

4- Which one of the following has mucosal villi?

A. small intestine
B. colon
C. stomach
D. Vermiform Appendix

5- appendices epiploicae of the colon are found in :

A. serosa
B. adventitia
C. mucosa
D. Muscularis Externa

6- the Lymphatic nodules are found in which layer of the colon?

A. serosa
B. lamina propria
C. submucosa
D. Muscularis mucosae

1.A 2.C 3.C 4.A 5.A 6.B

Team Leaders

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Good luck