

# SMALL INTESTINE

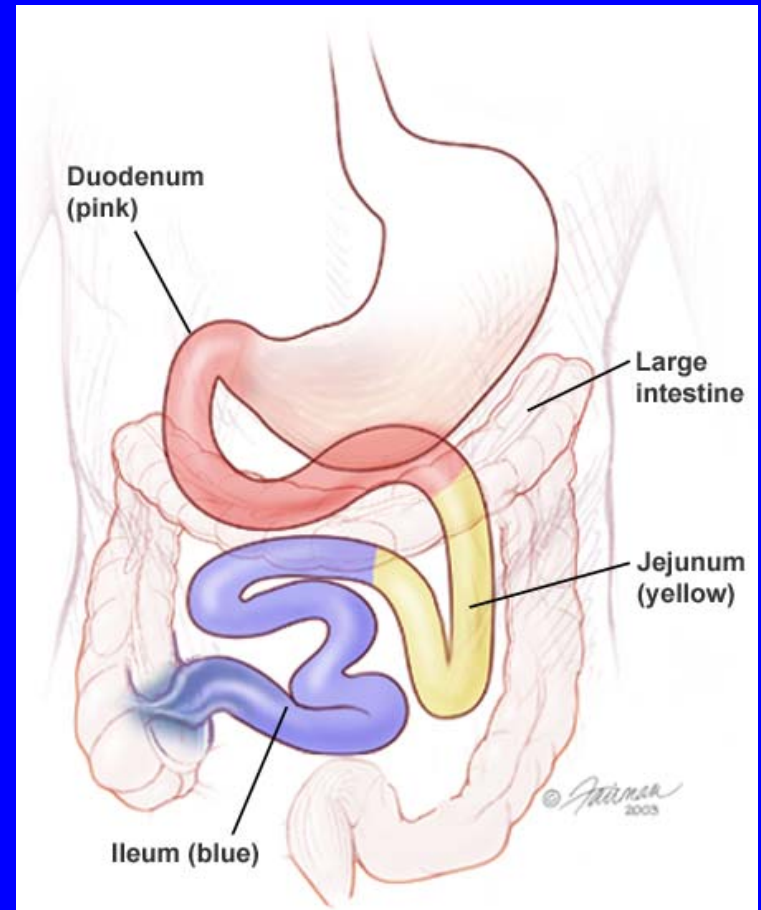
## ■ Objectives:

By the end of this lecture,  
The student should  
describe the microscopic  
structure of the three  
regions of the small  
intestine:

1- *Duodenum.*

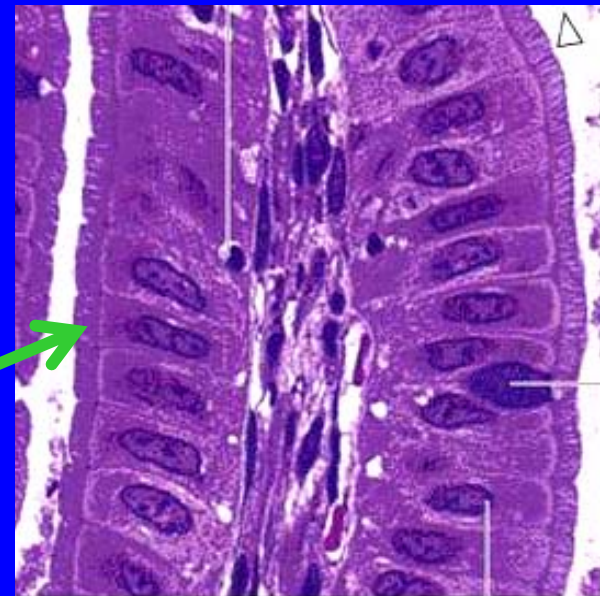
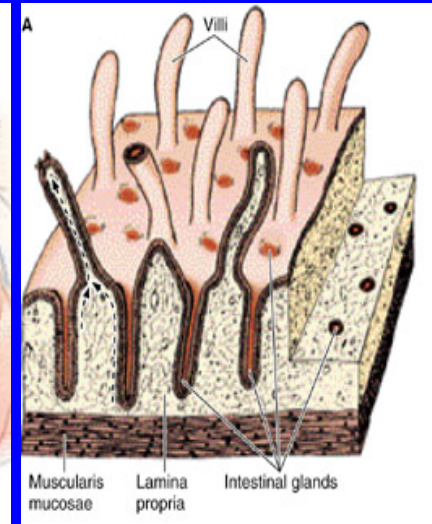
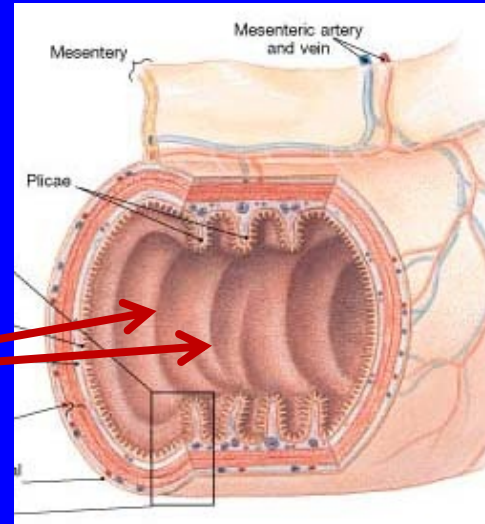
2- *Jejunum.*

3- *Ileum.*



# SMALL INTESTINE

- To increase surface area the mucosa has:
  - Plicae circulares (circular folds):  
Permanent folds of the mucosa and submucosa.
  - Villi.
  - Intestinal crypts (crypts of **Lieberkühn**).
  - Microvilli (Brush border).



# Duodenum

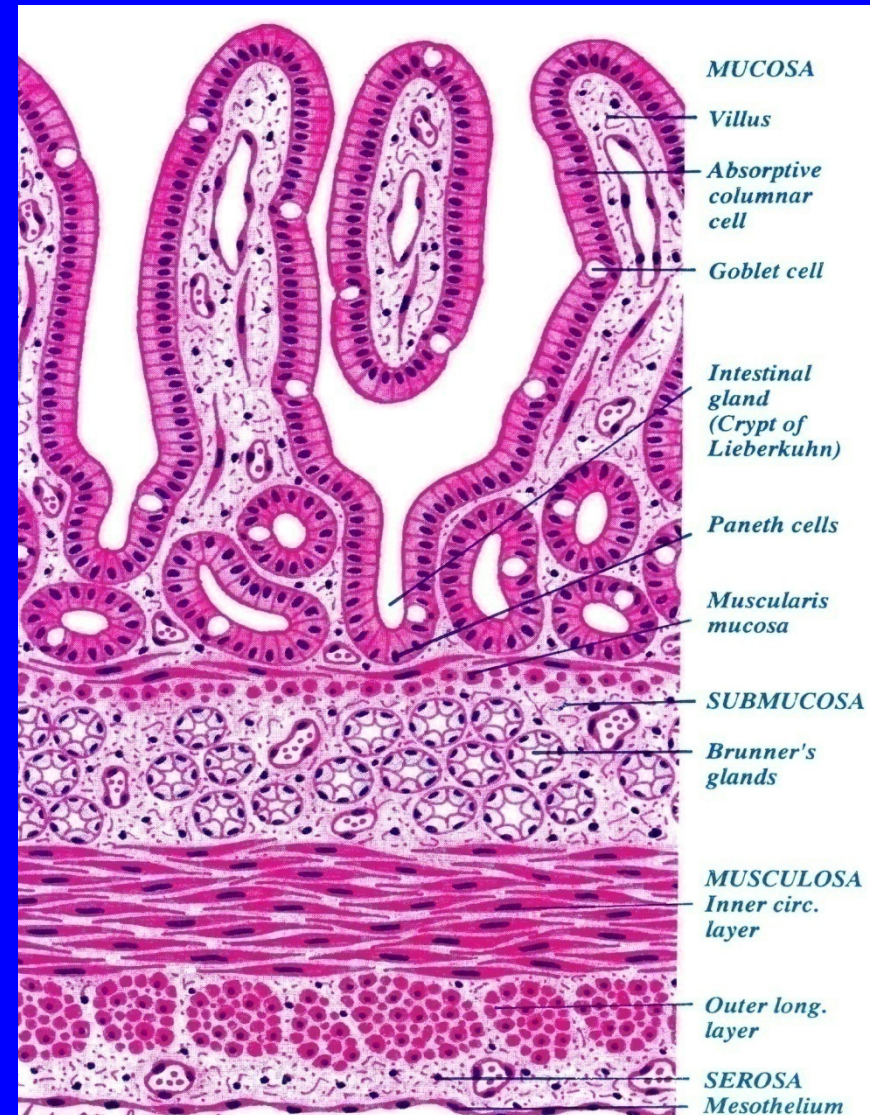
## 1. Mucosa:

Shows *villi* and *crypts*.

**A- Epithelium:** simple columnar epithelium with goblet cells.

**B- Lamina propria:** Loose areolar C.T.

**C- Muscularis mucosae:** 2 layers of smooth muscle cells.



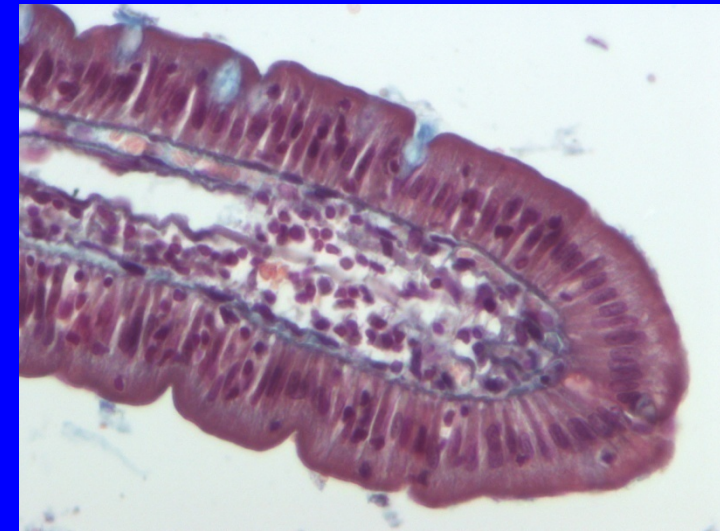
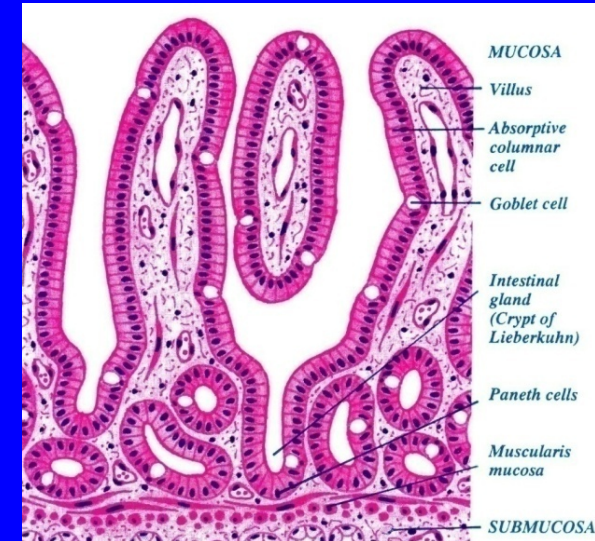
# Intestinal villi

- Each Villus is a finger-like projection of small intestinal **mucosa** and it is formed of:

I- Central core of loose areolar C.T. containing:

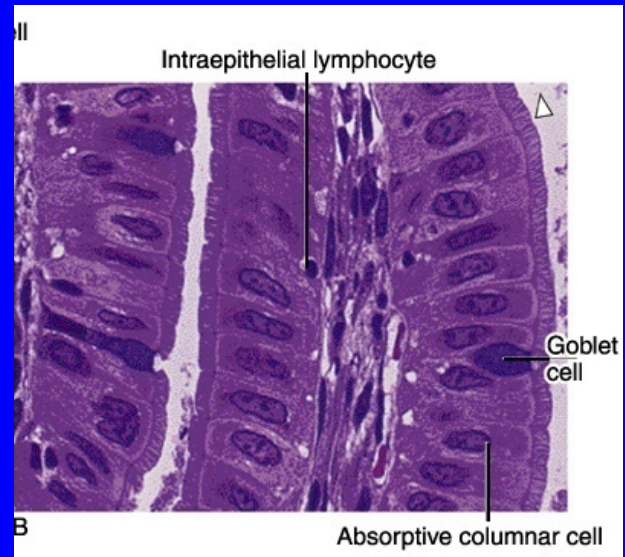
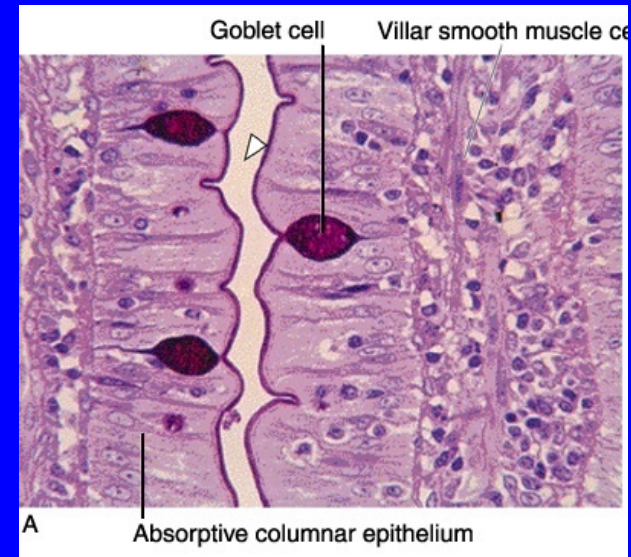
- » Lymphocytes.
- » Plasma cells.
- » Fibroblasts.
- » Smooth muscle cells.
- » Capillary loops.
- » Lacteal (blindly ending lymphatic channels).

II- Villus-covering epithelium.



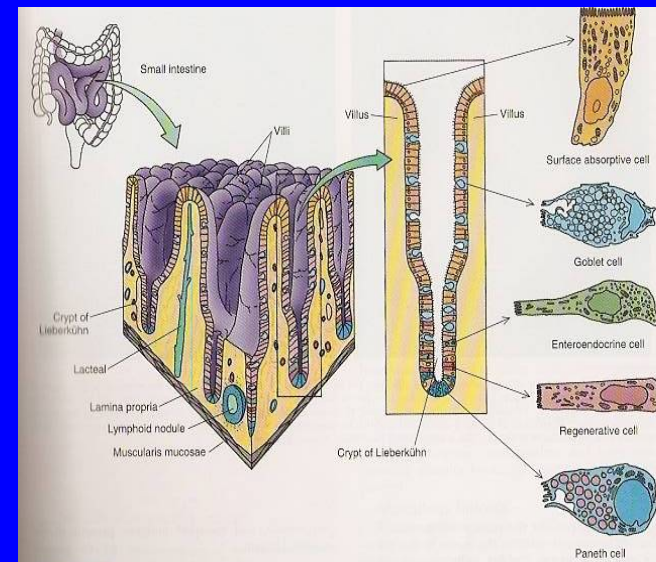
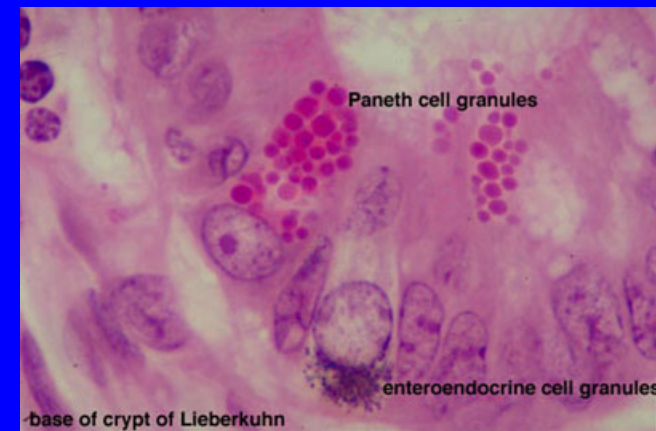
# Cells Covering the Villi

- 1- Surface columnar absorptive cells:** They have brush border (microvilli). They are covered with thick glycocalyx 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 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).  
are found in the base of the crypts.
  5. **Stem cells:**  
are **regenerative** cells.  
are found in the base of the crypts.



## Columnar Absorptive cells



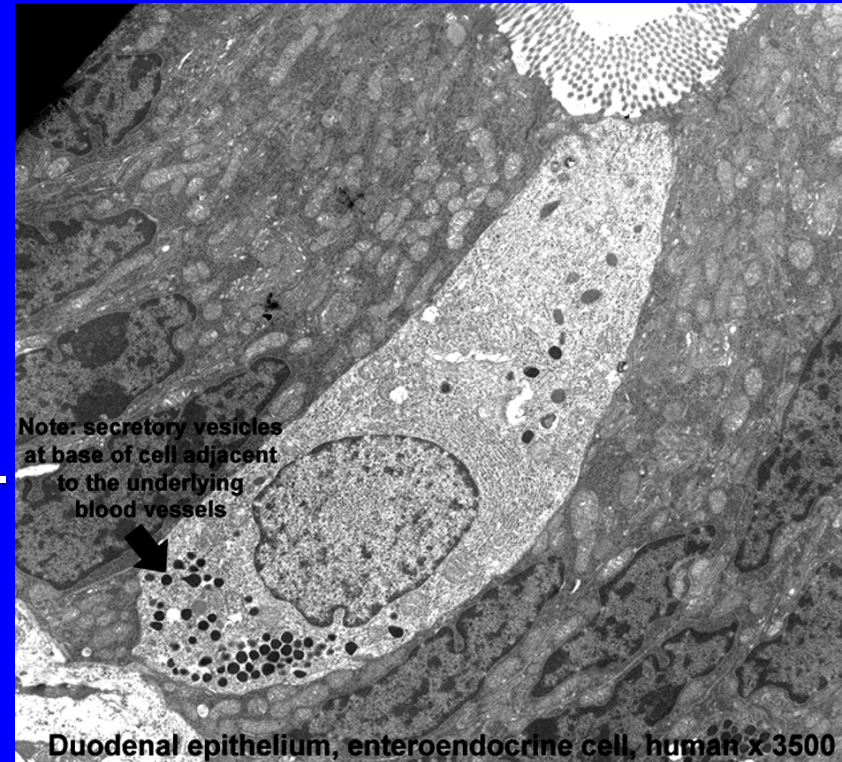
## Paneth cell



# EE (DNES) cells

## EE 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 cholecystikinin (pancreozymin)



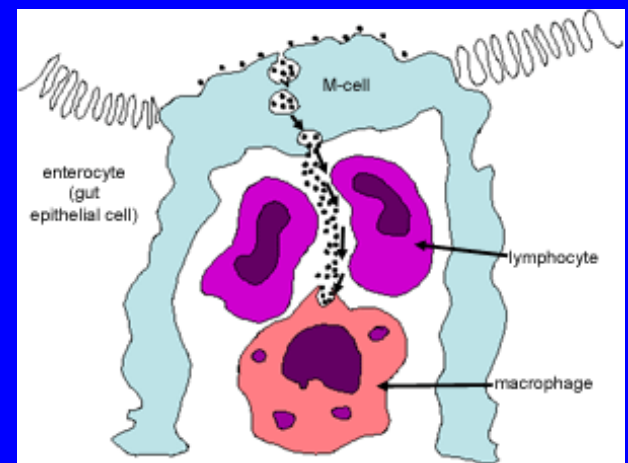
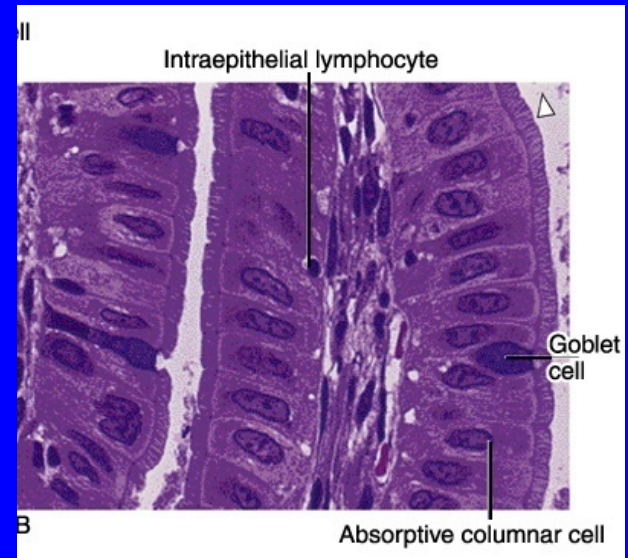


# M Cells (Microfold cells)

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.



# Duodenum

## 2. Submucosa:

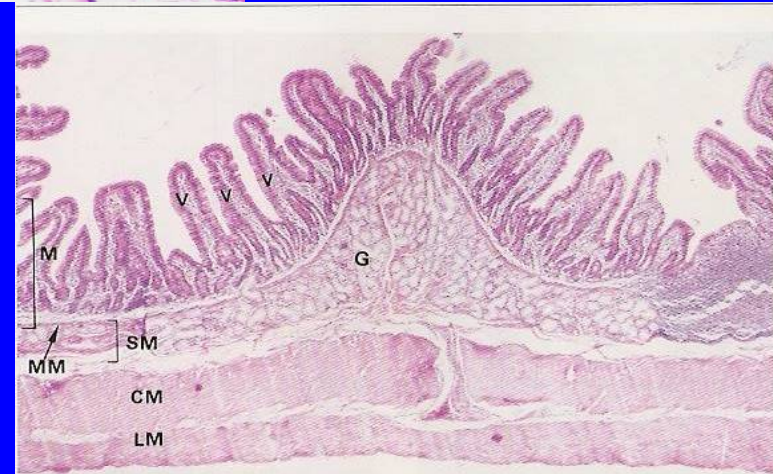
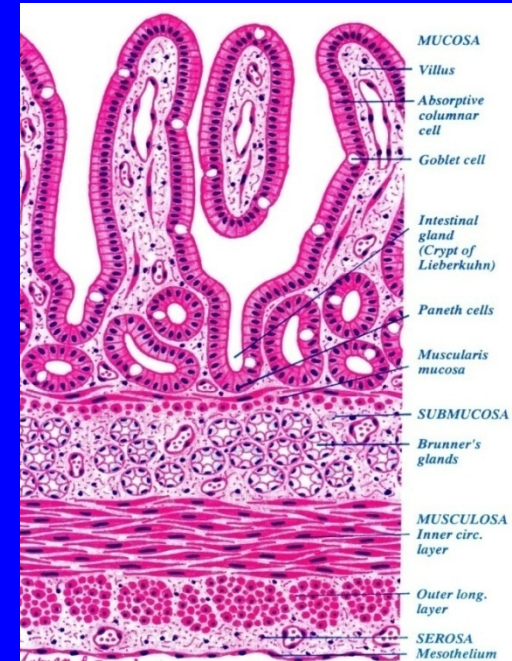
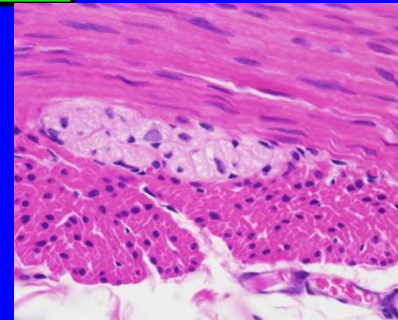
- Connective tissue containing blood vessels & nerves.
- Contains **Brunner's glands** (secrete mucus).

## 3. Muscularis Externa:

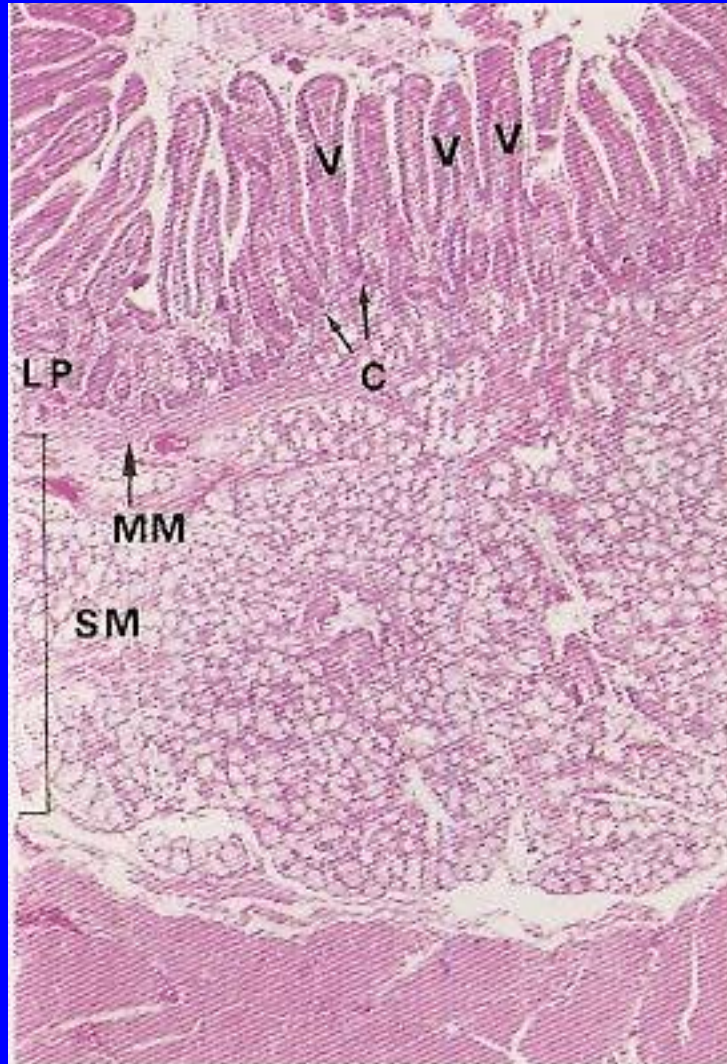
- 2 smooth muscle layers:
  - » Inner circular layer.
  - » Outer longitudinal layer.

## 4. Serosa or Adventitia:

Duodenum is invested by a serosa or adventitia.



# Duodenum



# Regional differences of small intestine

- **Duodenum:** Its submucosa has **Brunner's glands**.

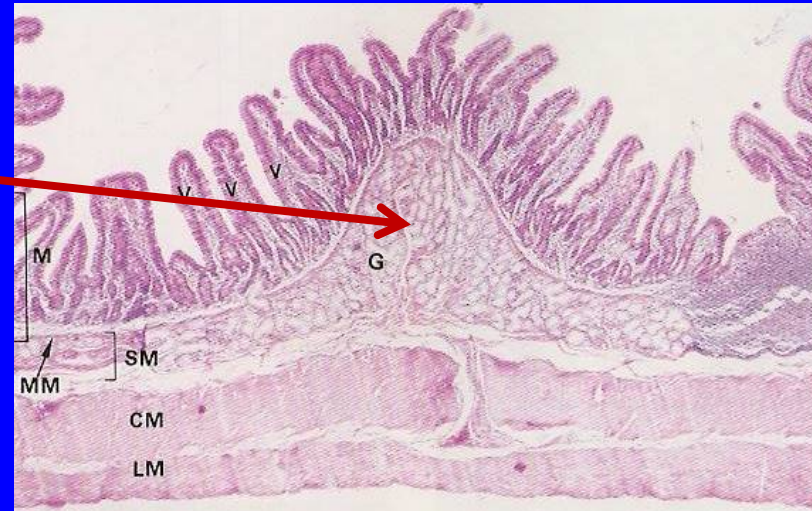
It is invested by serosa or adventitia

- **Jejunum:** has neither Brunner's glands nor Peyer's patches.

Jejunum is invested by serosa.

- **Ileum:** Its lamina propria, opposite the attachment of the mesentery, has lymphoid nodules (**Peyer's patches**) that extend to the submucosa.

Ileum is invested by serosa.



# Jejunum

