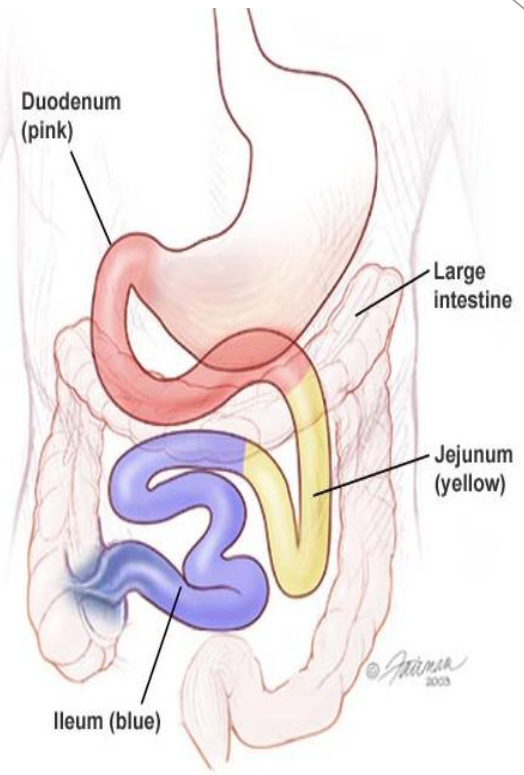
LECTURE 3:
SMALL INTESTINE

- **Objectives:**

At the end of this lecture, you should describe the microscopic structure of the three regions of the small intestine

1. **Duodenum**
2. **Jejunum**
3. **Ileum**



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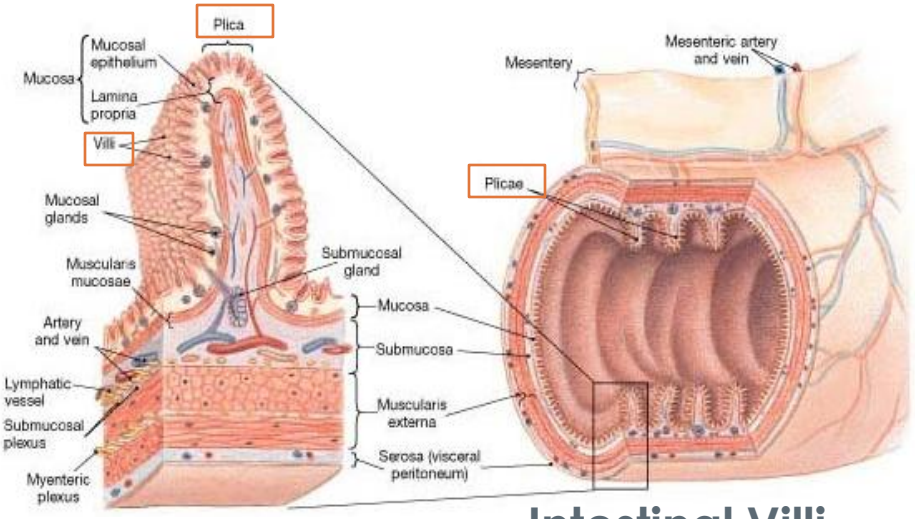
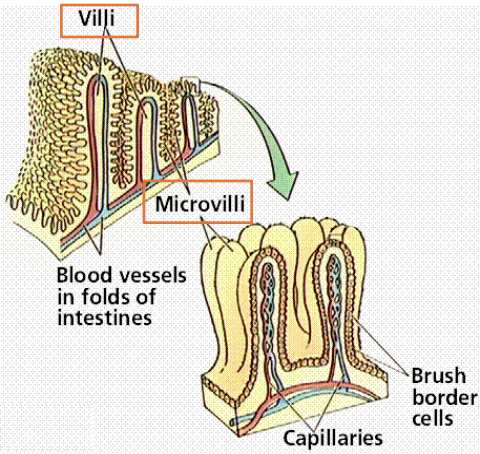
SMALL INTESTINE

- To increase surface area, the mucosa has:
  - **Plicae circulares**
  - **Villi**
  - **Intestinal crypts (crypts of Lieberkühn)**
  - **Microvilli (Brush border)**

Notes:
• Plicae circularis are the large ridges, they have villi on them. In between the villi we have crypts. Microvilli [brush border] are very small and cover villi





Intestinal Villi

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

I. Central core of loose C.T. containing:
   - **Lymphocytes**
   - **Fibroblasts**
   - **Smooth muscle cells**
   - **Capillary loops**
   - **Lacteal** (blindly ending lymphatic channels)

II. Villus-covering epithelium.

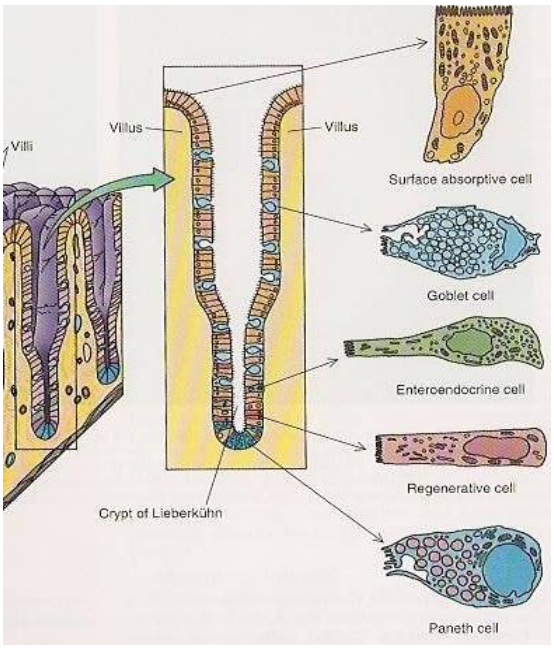
Cont. SMALL INTESTINE

Cells Covering the Villi

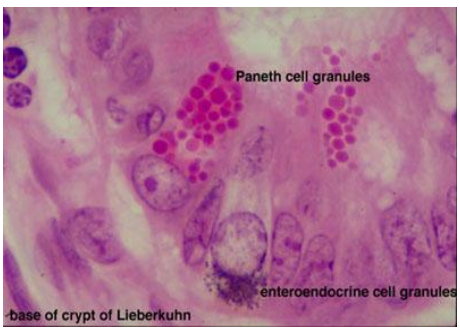
I. **Surface columnar absorptive cells**: They have brush border (microvilli). They are covered with *thick glycocalyx* that has digestive enzymes. They have Junction complex (tight, adhering and desmosome junctions).

II. **Goblet cells**: Increase toward the ileum.

III. **Enteroendocrine cells (DNES cells)**



Note: **M cells (microfold cells)**: They phagocytose and transport antigens present in the intestinal lumen. They are mainly found within epithelium overlying lymphatic nodules of lamina propria.



Columnar Absorptive cells

Intestinal Glands (Crypts)

- Simple tubular glands that *open between villi*.
- Composed of **5** cell types:

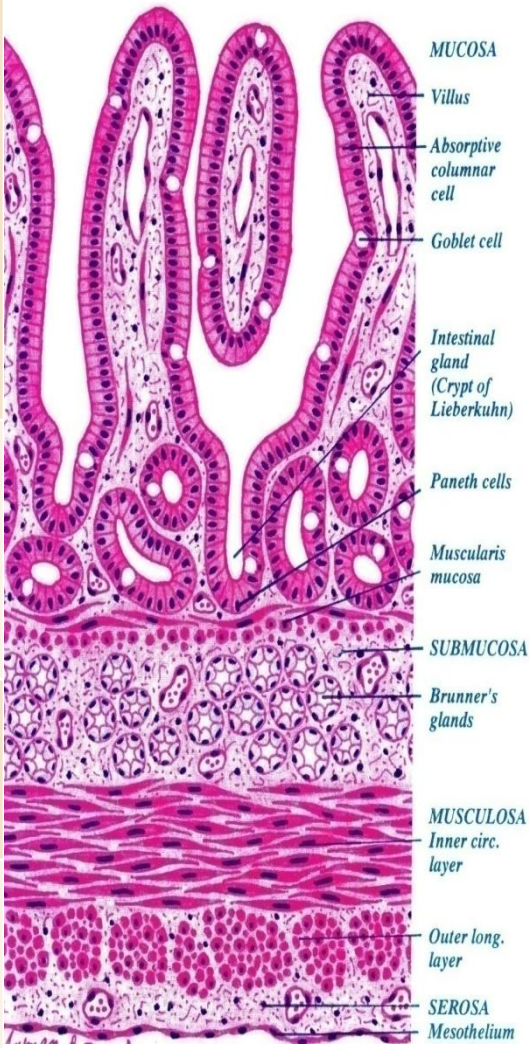
1) **Columnar absorptive cells**
2) **Goblet cells**: secrete mucus
3) **Paneth cells**: secrete Lysozymes (antibacterial)
4) **Enteroendocrine cells**: secrete hormones
5) **Stem cells**: regenerative cells

Notes:
- There are only 2 places which have glands in the submucosa: Esophagus & Duodenum
- There are no goblet cells in the stomach
- There are no Villi or Paneth Cells in large intestine (this note is important for large intestine lecture)*

DUODENUM

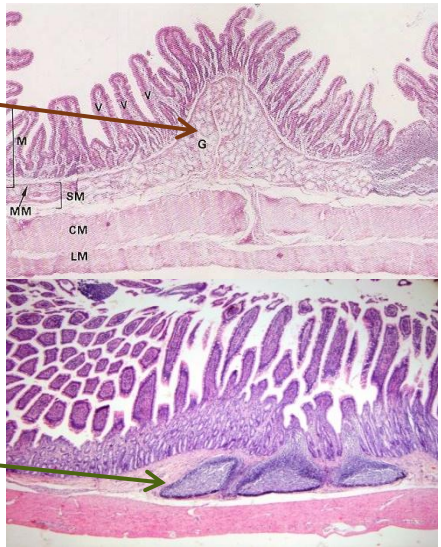
Notes:
• This table applies to all the parts of the small intestine except for what is stated otherwise (regional differences)

Mucosa	Shows *villi* and *crypts*. I. **Epithelium**: simple columnar epithelium with goblet cells. II. **Lamina propria**: C.T. III. **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	**Serosa** covers all the duodenum EXCEPT for the 2nd & 3rd parts, which have adventitia



Regional Differences Of Small Intestine

- **Duodenum:** Its submucosa has Brunner's glands.
- **Jejunum:** **has neither Brunner's glands nor Peyer's patches.**
- **Ileum:** Its lamina propria, opposite the attachment of the mesentery, has lymphoid nodules (Peyer's patches) that extend to the submucosa.



Summary

Where does submucosa GLANDS exists in GIT?

- ONLY in esophagus and duodenum

What is the type of epithelium of mucosa of duodenum?

- Simple columnar epithelium with goblet cells

Mention two features about Paneth cells?

- Exists only in duodenum
- Secretes antibacterial agents (Lysozymes)

What does submucosa of duodenum contain?

- Brunner's glands, and It secretes mucus

Mention a feature about jejunum?

- Has neither brunner's glands nor peyer's patches

Where are Peyer's patches located?

- In anti-mesentery of ileum (origin in lamina properia and extend to submucosa)

MCQs

1. Which One of these structures is not involved in increasing surface area of the mucosa

A- Plicae circulares

B- Lymphoid nodules

C- Villi

D- Microvilli

2- Which one of these layers is does not participate in mucosa of duodenum

A- Serosa

B- Epithelium

C- Lamina propria

D- Muscularis mucosae

3- Only part that contain submucosal glands in the GIT?

A- Esophagus

B- Stomach

C- Duodenum

D- A and C

4- One of these glands is present in the crypts and the villi

A- Paneth cells

B- Stem cells

C- Goblet cells

D- Brunner's gland

5. Where can we find the Brunner's gland

A- Submucosa of duodenum

B- Jejunum

C- Ileum

D- Mucosa of esophagus

6. Which of the following structures is not found in colon?

a) Mucosa

b) Submucosa

c) peyer's patches

d) Muscularies externa

1-b 2-a 3-d 4-c
5-a 6-c