



DIGESTIVE SYSTEM

SMALL INTESTINE

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LECTURE OBJECTIVE

- describe the histological structure of the small intestine .
- Distinguish the structural modifications in their histological structure .
- Distinguish the histological differences between the three parts of small intestine .

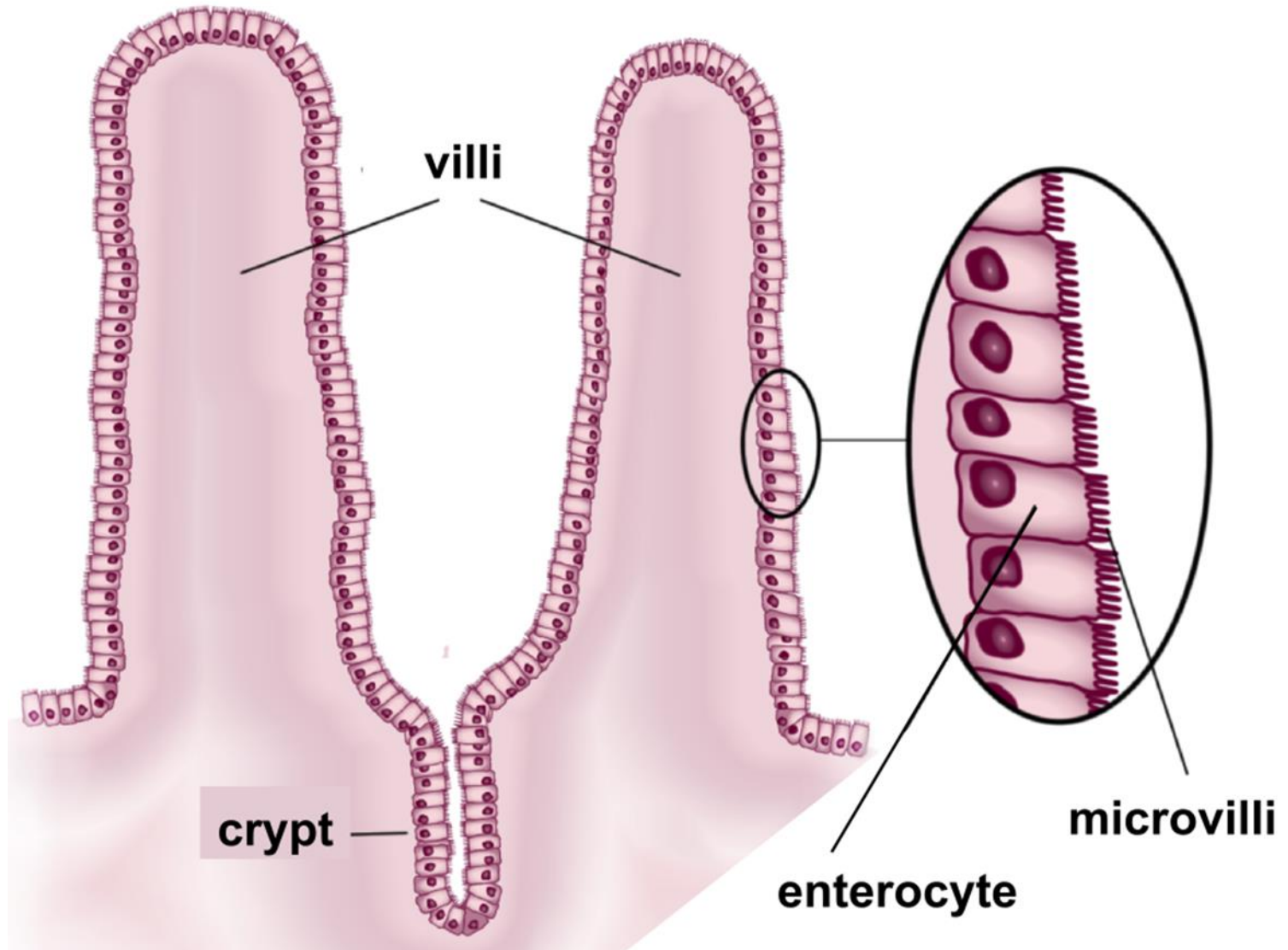
SMALL INTESTINE

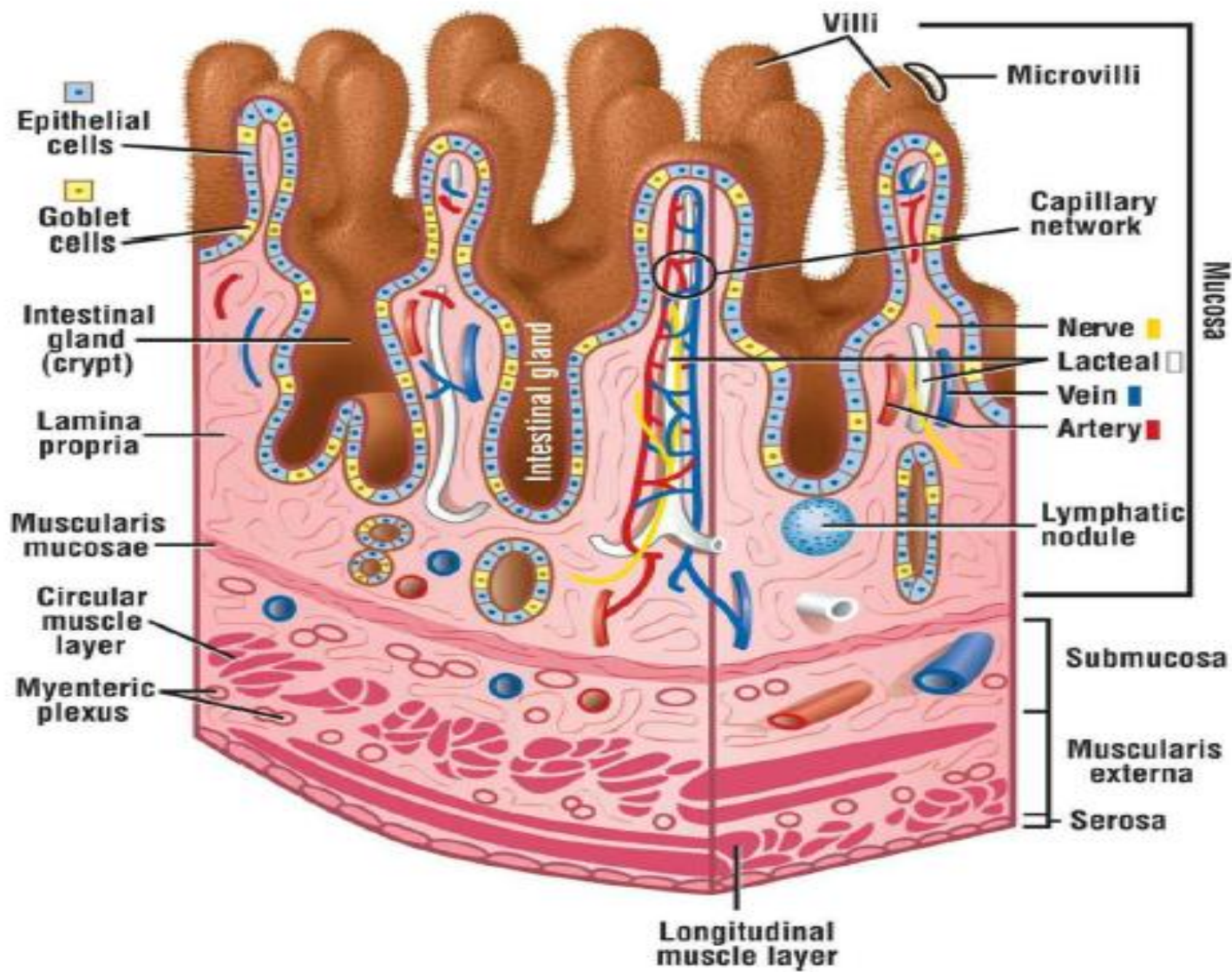
- ❖ The small intestine is consists of three segments: the **duodenum, jejunum, and ileum.**
- ❖ The **mucosa** of the small intestine exhibits structural modifications that increase the cellular surface areas for the absorption of nutrients and fluids.
- ❖ These modifications include three structures: **plicae circulares, villi, and microvilli.**

- ❖ The **plicae circulares** are permanent spiral folds or elevations of the mucosa (with a submucosal core) that extend into the intestinal lumen.
- ❖ These structures are best developed in the jejunum., where most absorption takes place and they decrease in prominence toward the ileum.
- ❖ The entire mucosa of the small intestine covering by **villi** are short mucosal outgrowths that project into the lumen.

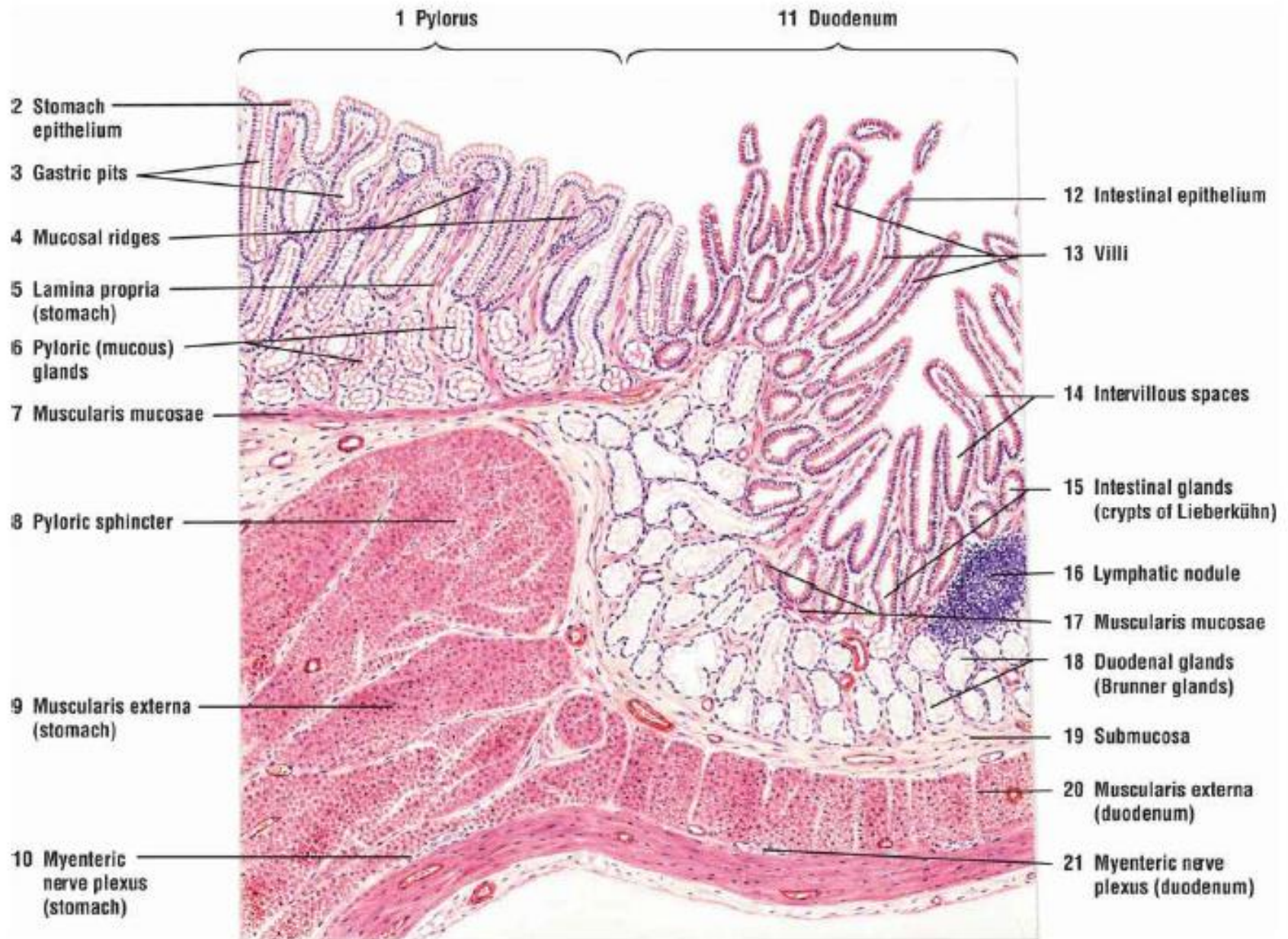
- ❖ **Villi** are finger or leaflike projections that covered by a **simple columnar** epithelium of absorptive cells called **enterocytes**, with many interspersed **goblet cells**.
- ❖ **Microvilli** are cytoplasmic extensions that cover the apices of the intestinal absorptive cells.
- ❖ The epithelium of each villus is continuous with that of the intervening glands (short tubular glands called **intestinal glands (crypts of Lieberkühn)** , which contain differentiating **absorptive, goblet, Paneth, enteroendocrine** and **stem** cells that give rise to all these cells types.

lumen of small intestine

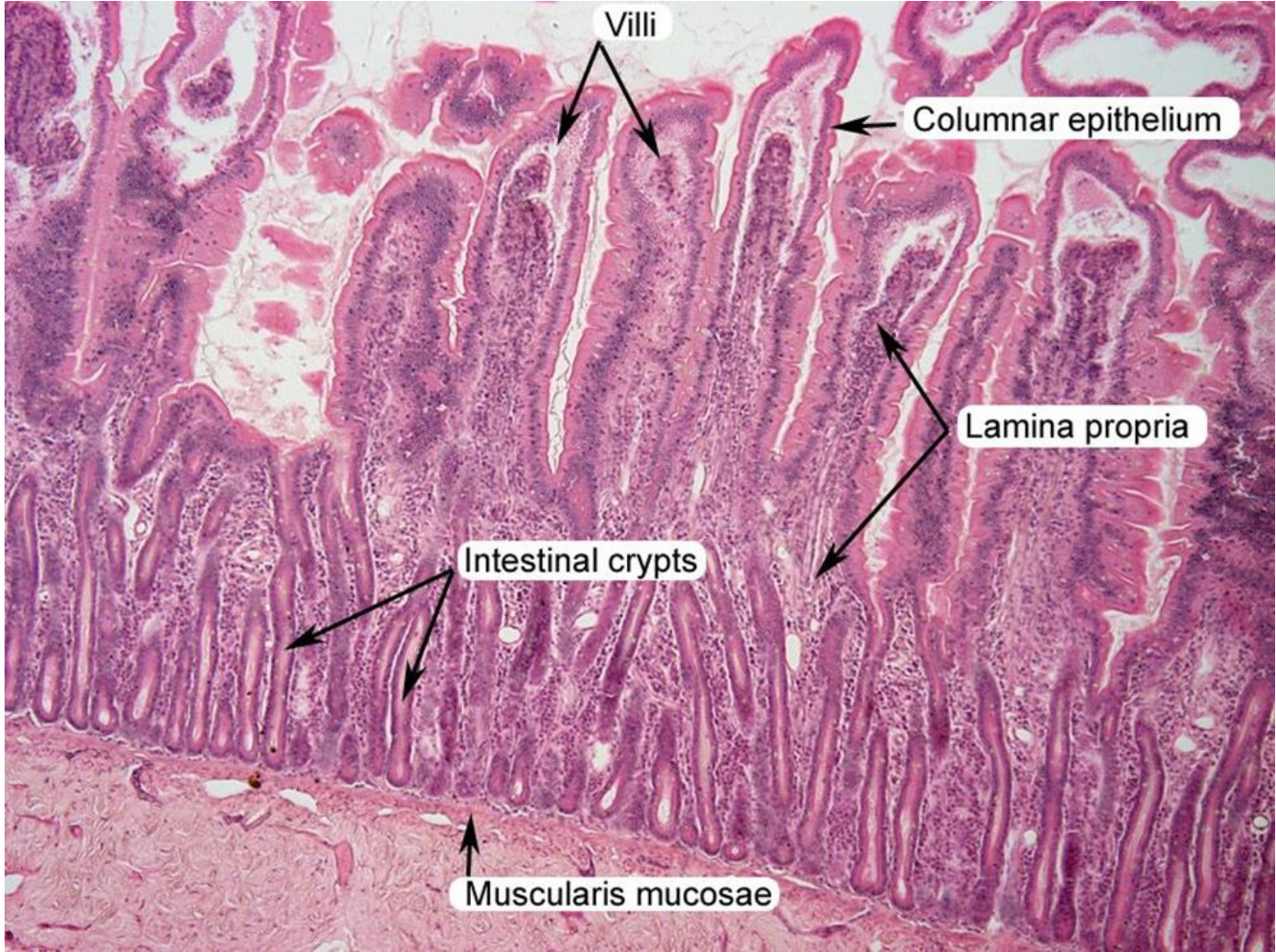




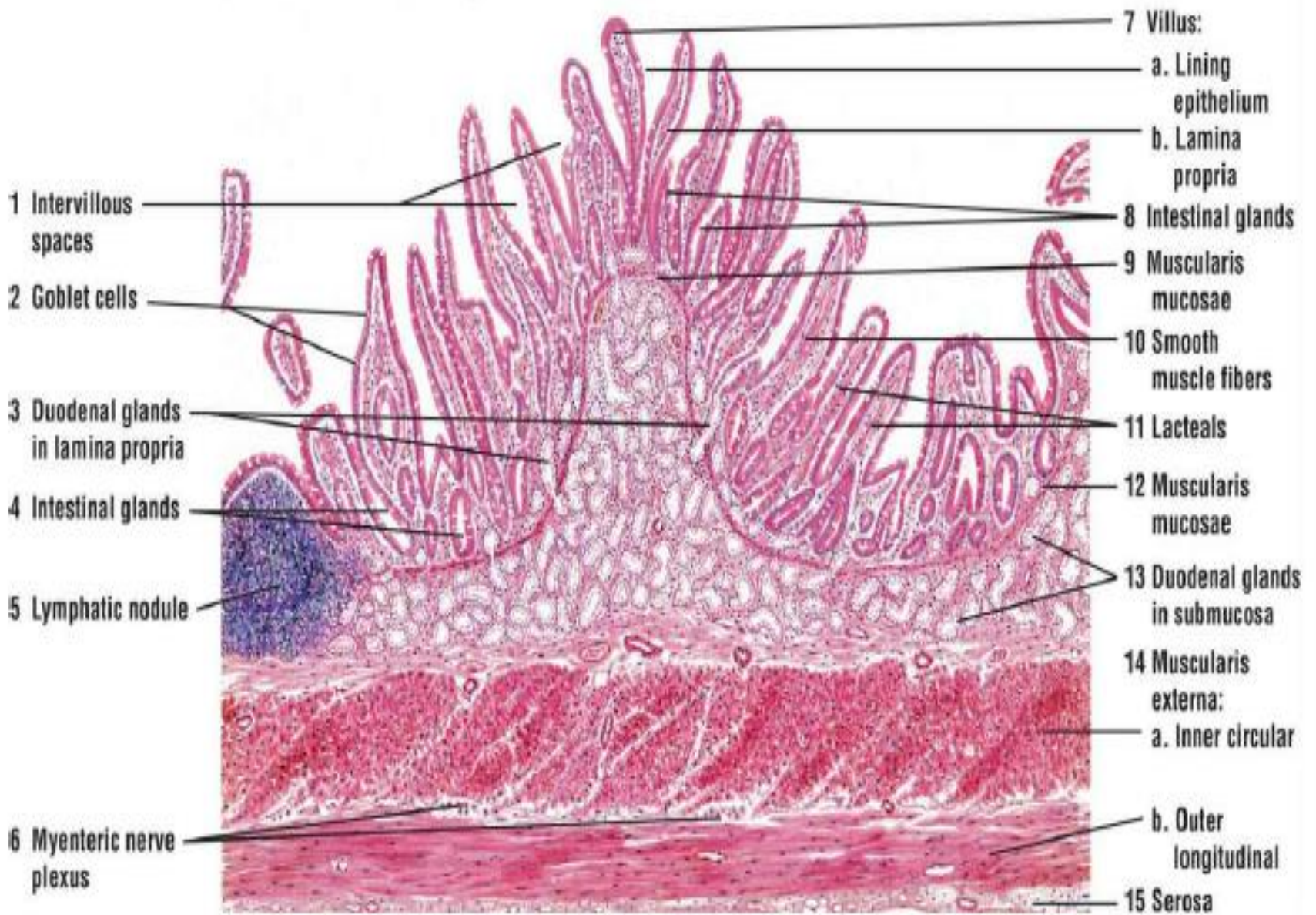
Different cell types and layers in the wall of the small intestine.



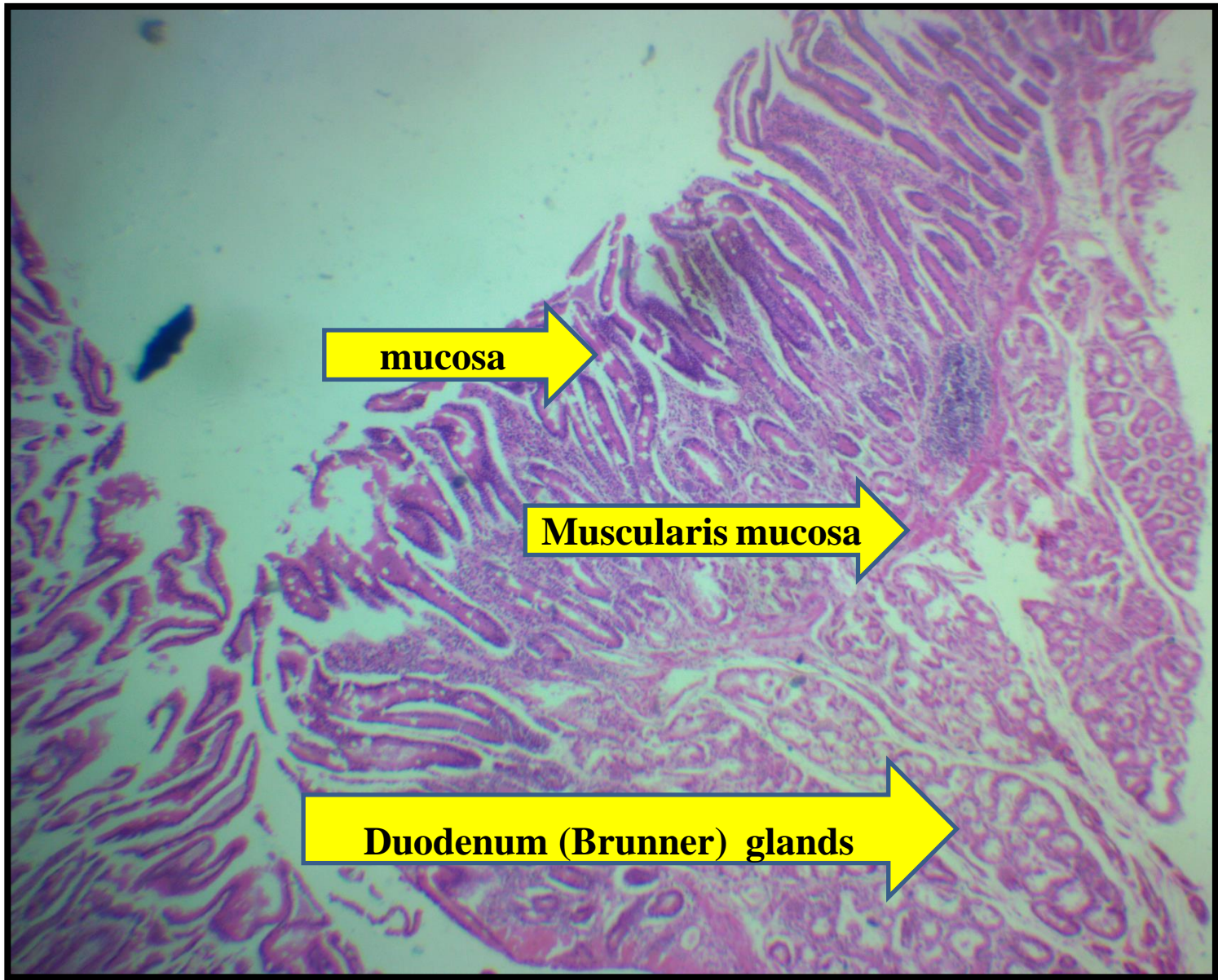
Pyloric-duodenal junction (longitudinal section).



- The **duodenum** is the shortest segment of the small intestine.
- The wall of the duodenum consists of four layers:
- The mucosa, submucosa , muscularis externa and serosa.
- Here, the villi are broad, tall, and numerous, with fewer goblet cells in the epithelium.
- **Branched tubuloacinar duodenal (Brunner) glands** with mucus-secreting cells in the **submucosa** **characterize** this region. These glands diminish in number toward the end of the duodenum.



Small intestine: duodenum (longitudinal section).

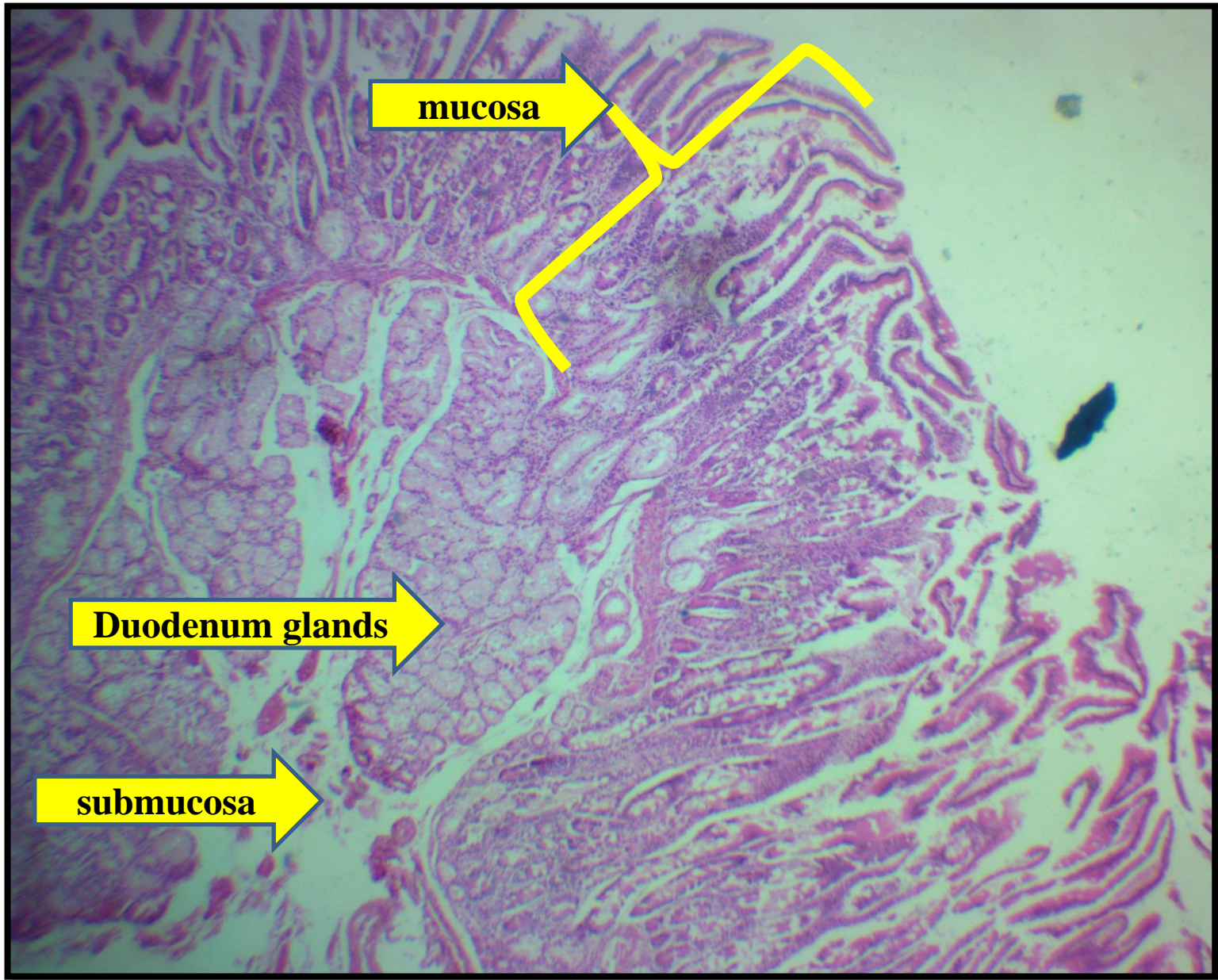


mucosa

Muscularis mucosa

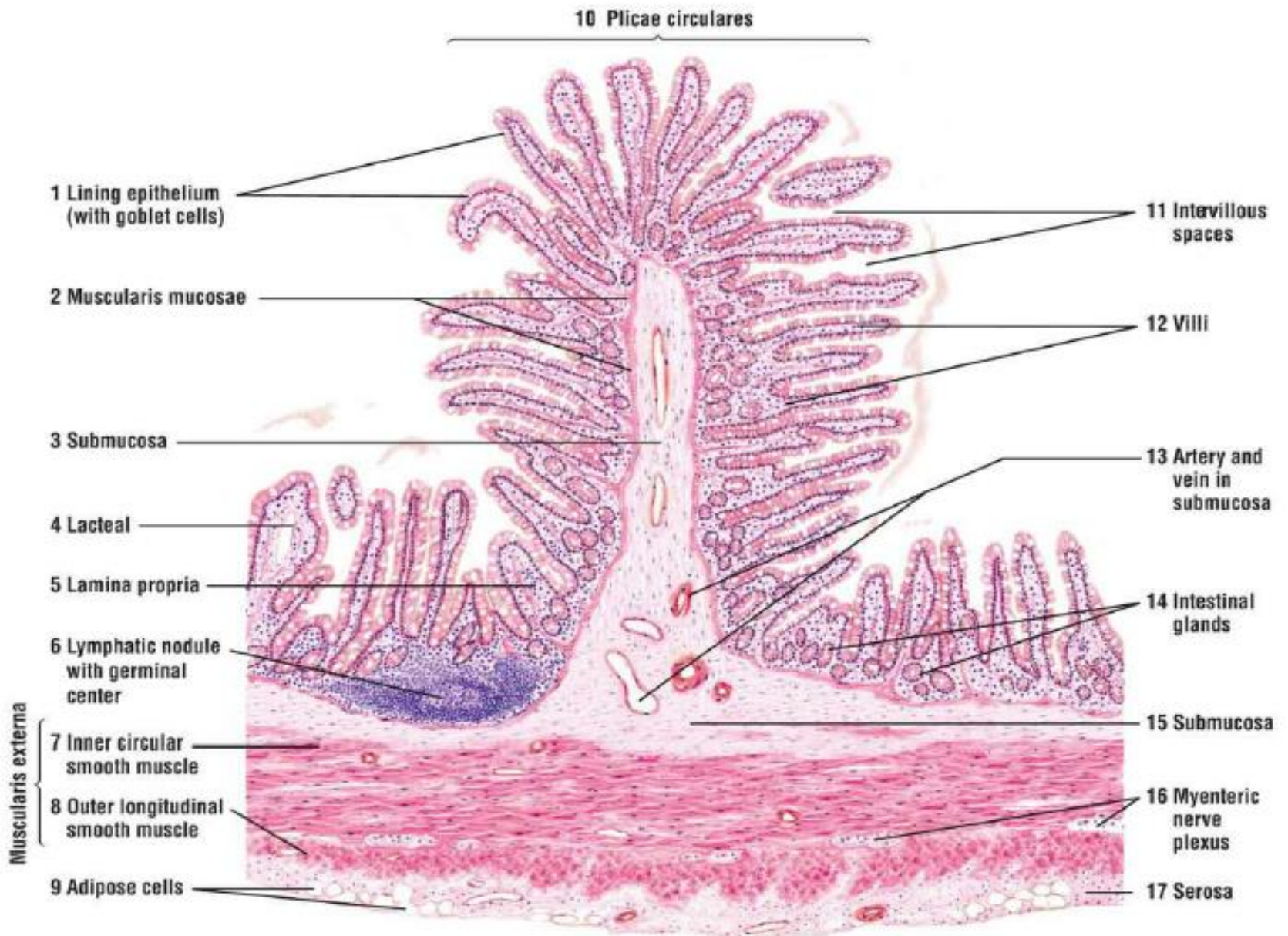
Duodenum (Brunner) glands

Duodenum

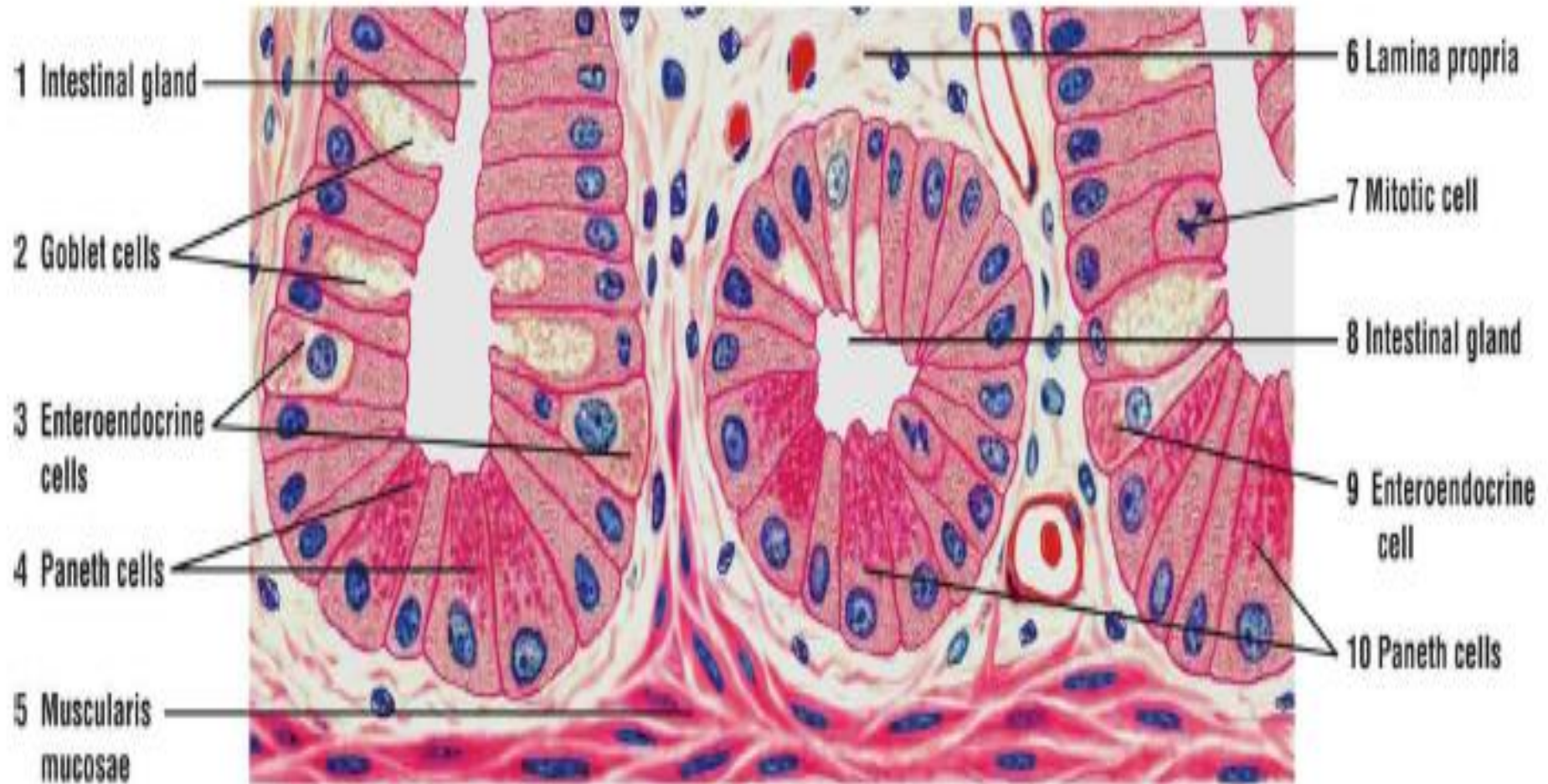


Duodenum

- The **jejunum** is longer than the duodenum and contains the largest surface area for the absorption of the digested material.
- The villi are tall and lined with simple columnar epithelium composed of absorptive cells and more goblet cells than in the duodenum.
- The jejunum **does not contain** any duodenal (Brunner) glands or lymphatic nodule aggregations (Peyer patches).



Small intestine: jejunum (transverse section).



Intestinal glands with Paneth cells and enteroendocrine cells.



plicae circulares

Jejunum

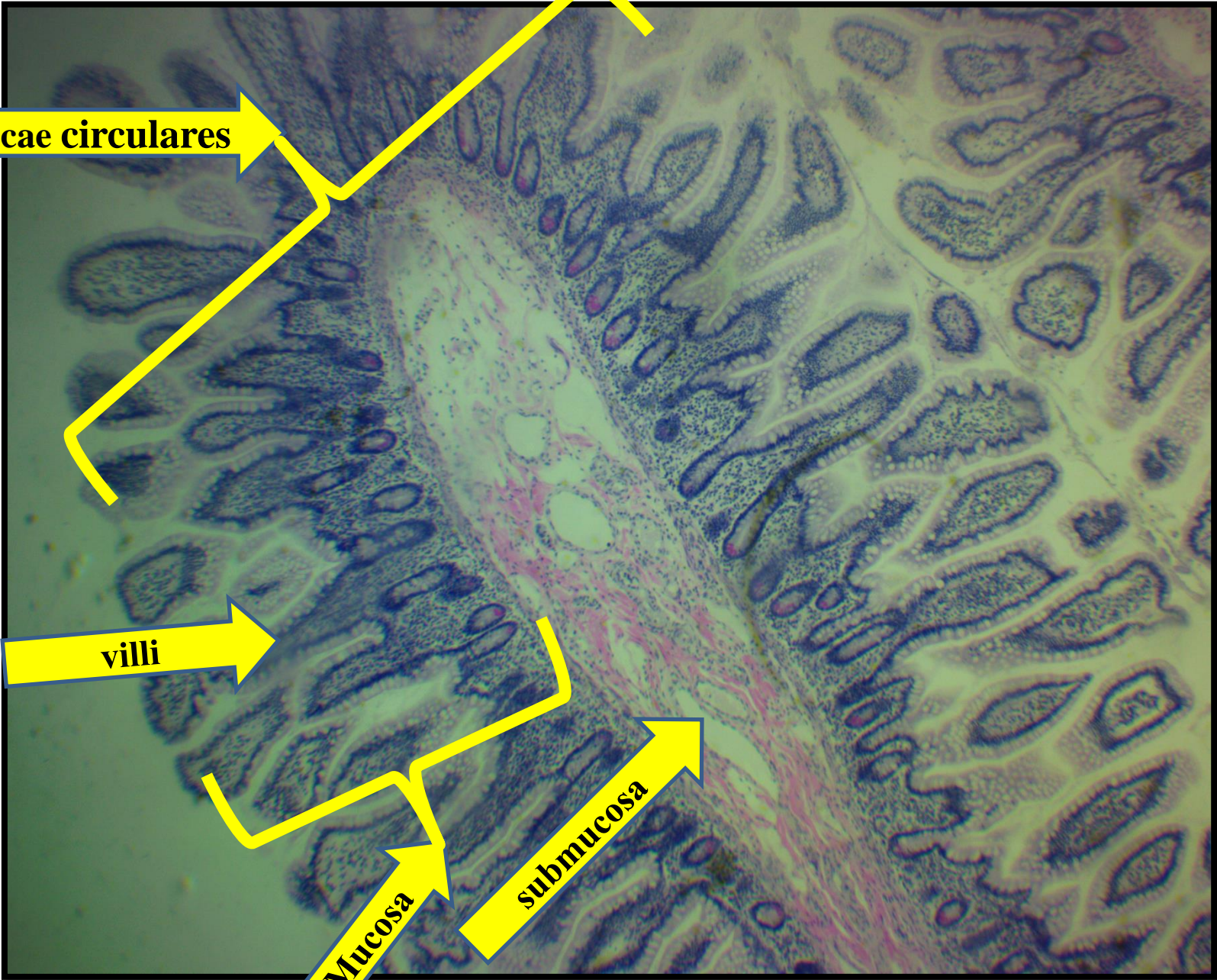
Plicae circulares

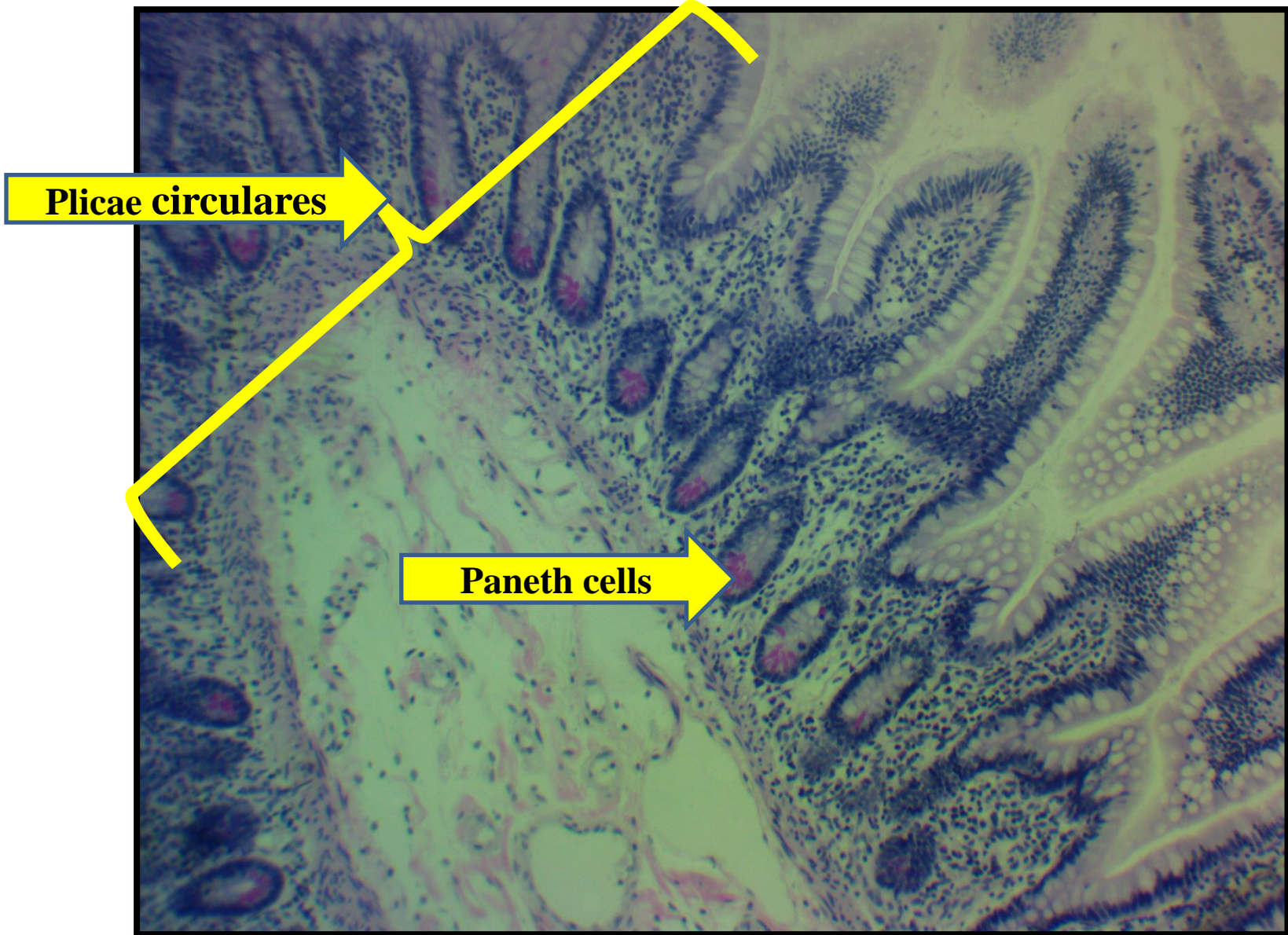
villi

Mucosa

submucosa

Jejunum

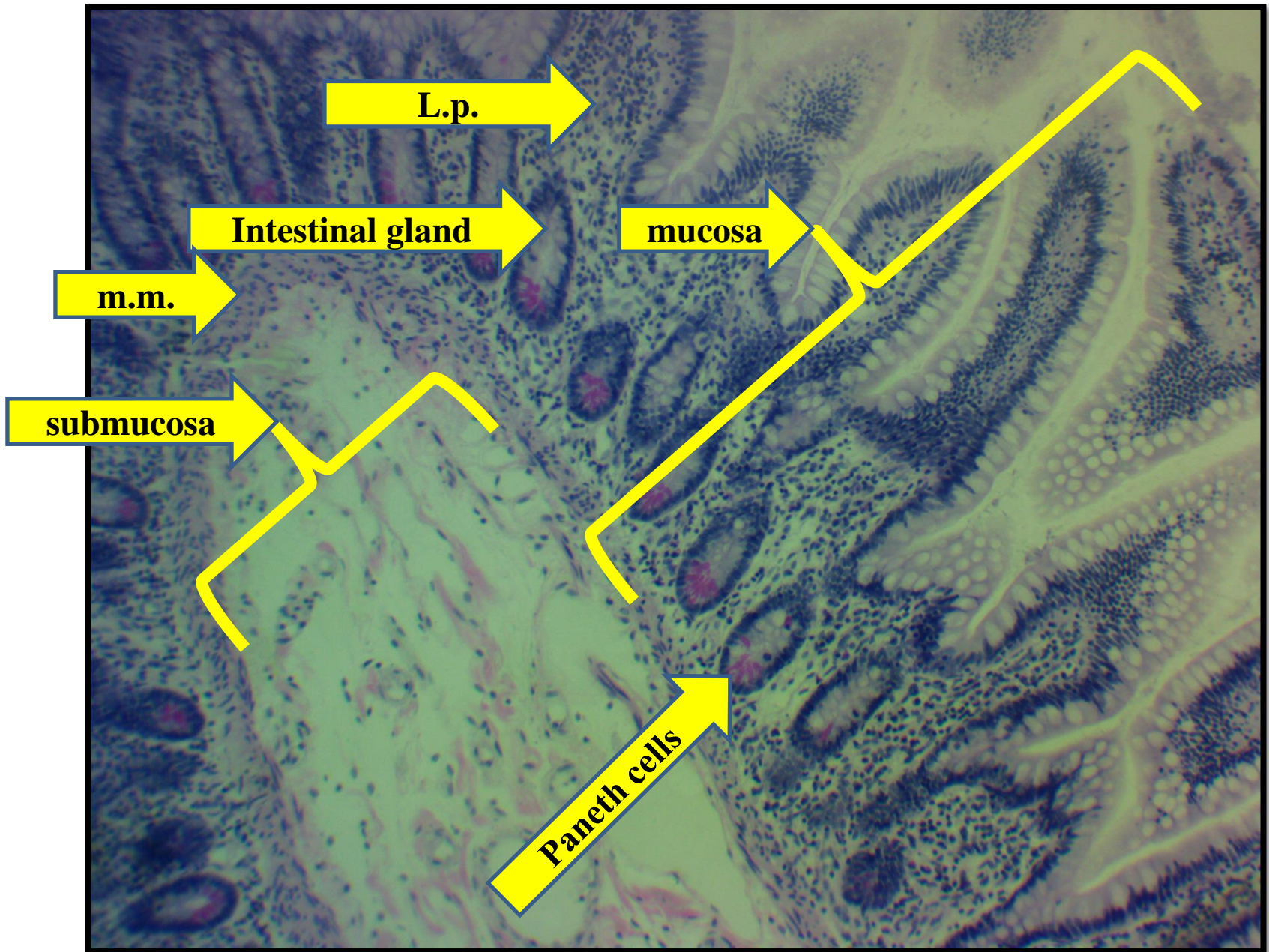




Plicae circulares

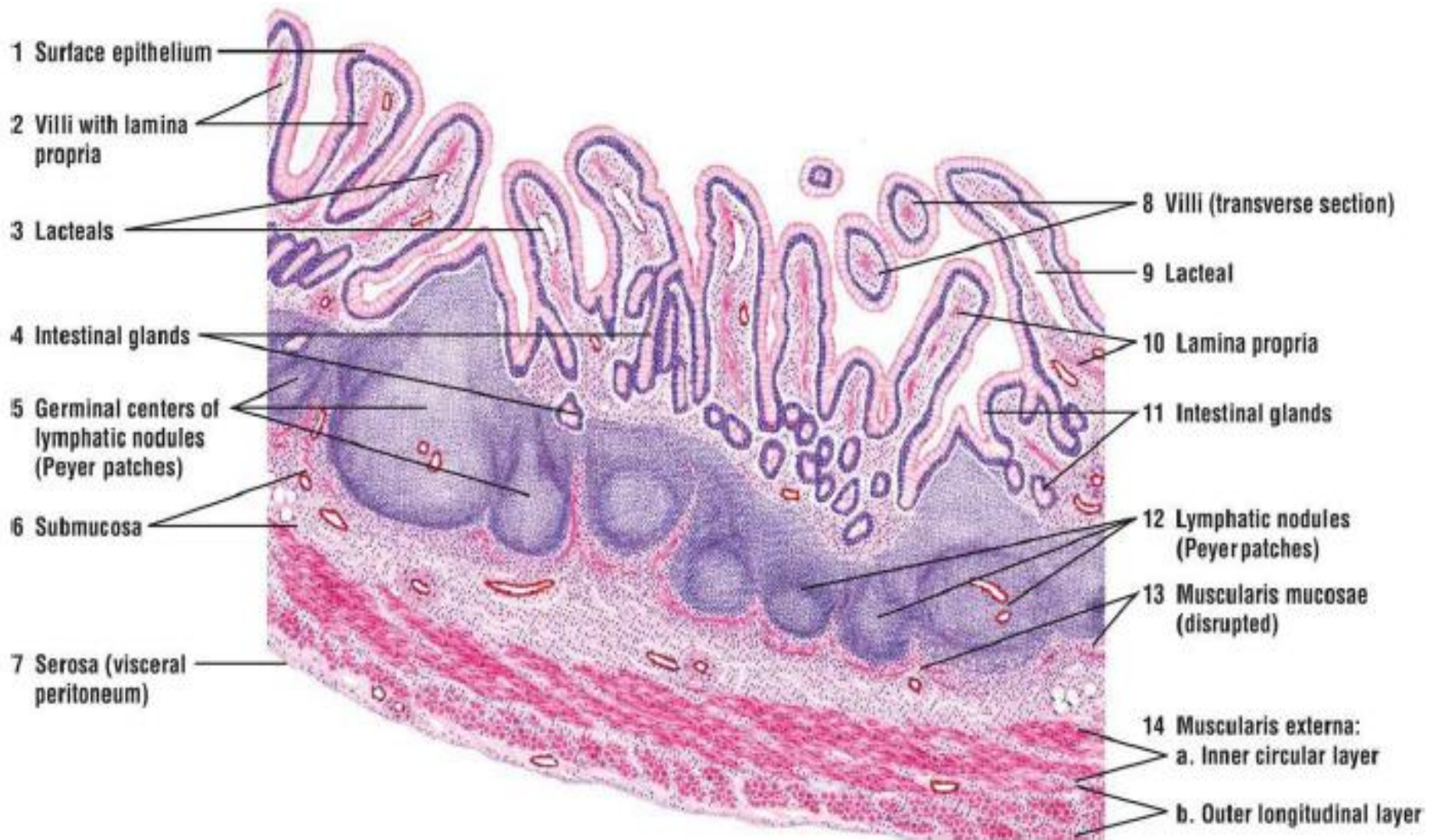
Paneth cells

Jejunum

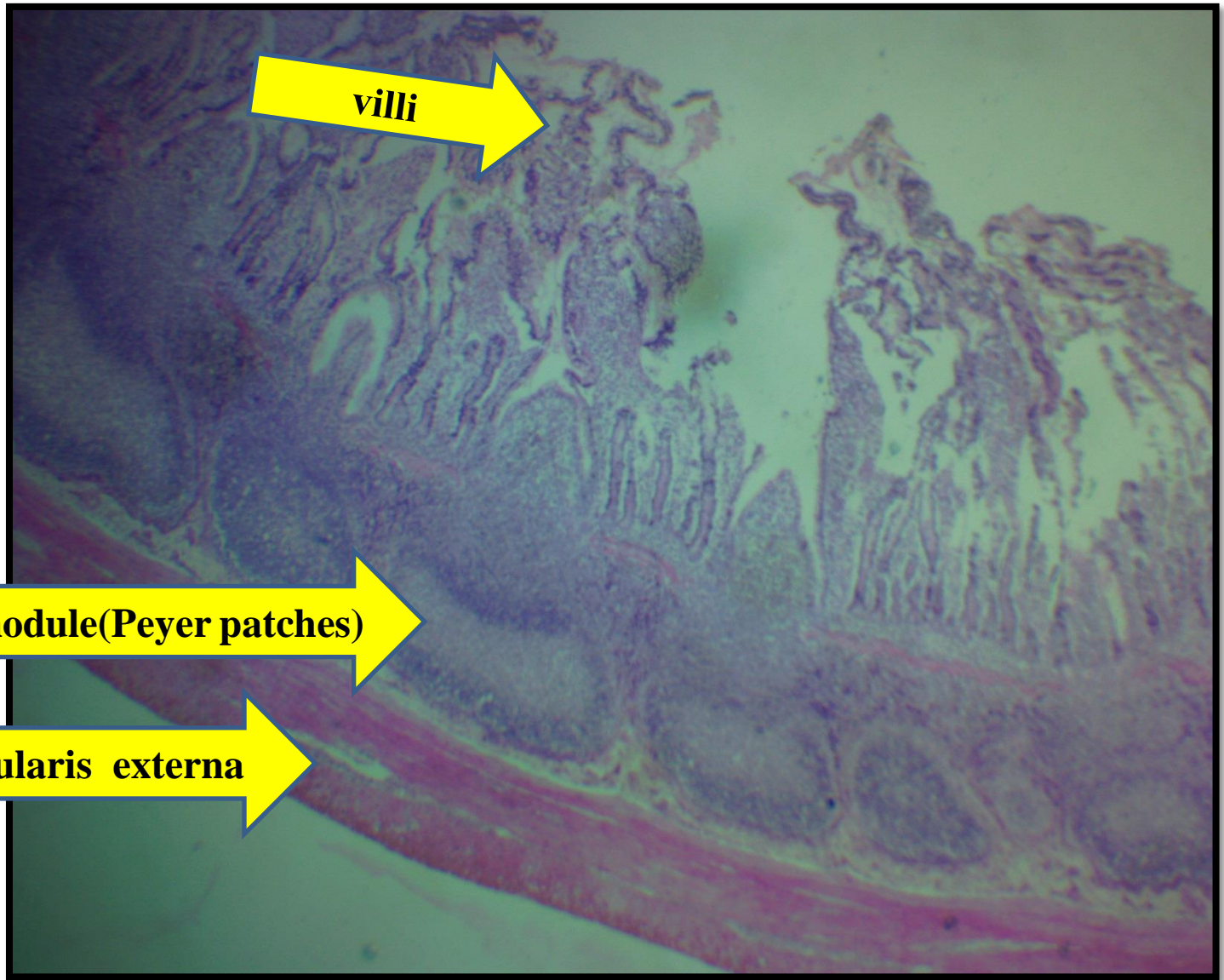


Jejunum

- **The ileum** contains villi that are narrow and short with the epithelium containing more goblet cells than the duodenum or the jejunum.
- In addition to increased numbers of lymphocytes in the lamina propria, the aggregated **lymphatic nodules (Peyer patches)** are large and most numerous in the distal ileum.
- Lymphatic nodules aggregate in the lamina propria and submucosa to form the prominent Peyer patches.



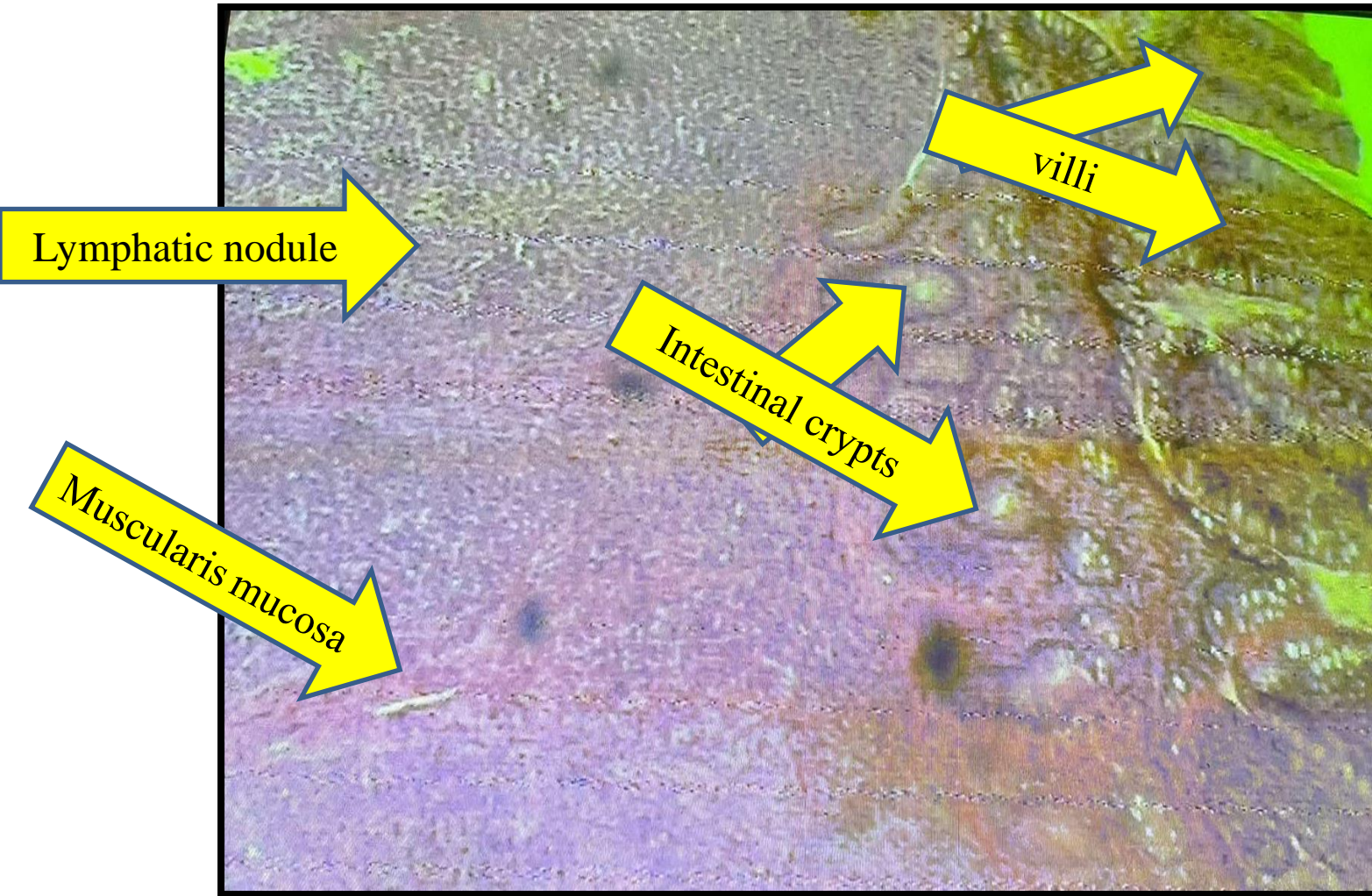
Small intestine: ileum with lymphatic nodules (Peyer patches)



Lymphatic nodule (Peyer patches)

Muscularis externa

Ileum



Ileum