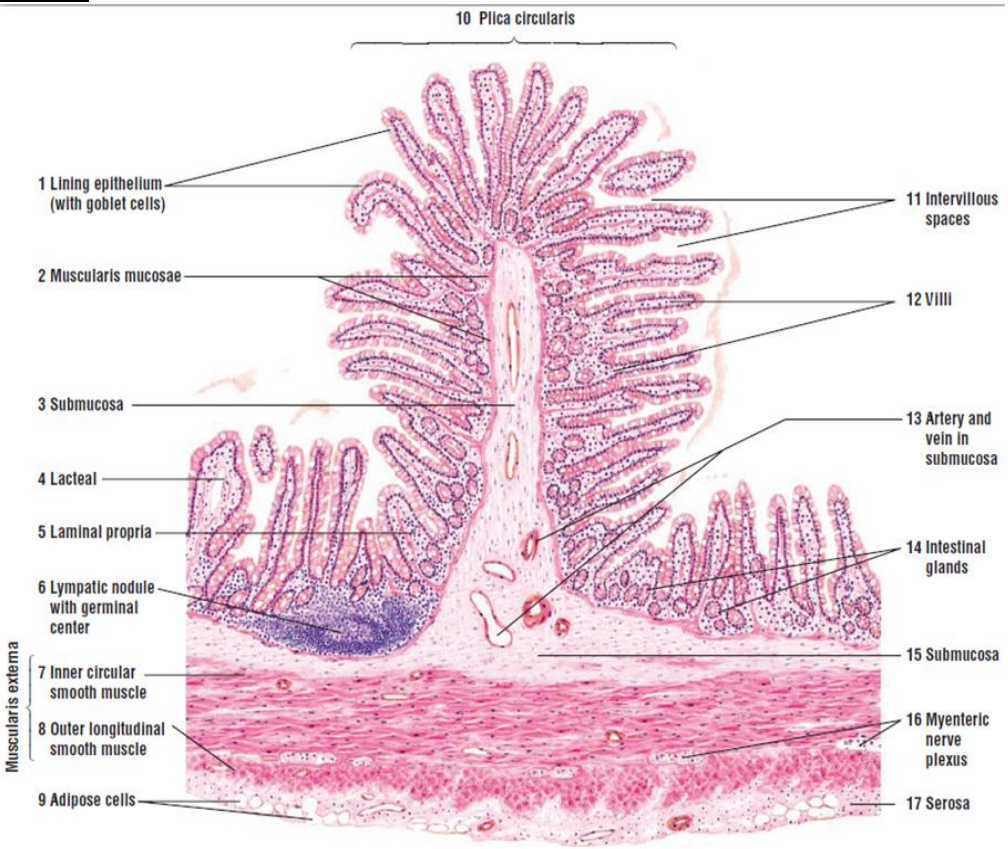
Unit V – Problem 5 – Histology: Small Intestine and Pancreas

- **Small intestine:**
  - **Jejunum** (Histology of duodenum was discussed in previous problem):
    - ✓ Mucosa: it is composed of villi. These villi are lined with simple columnar epithelium with brush border & goblet cells. In the core of the villi are central lacteals and blood vessels. In the lamina propria are found intestinal glands with different cell types:
      - ❖ **Paneth cells**: pyramidal cells in which the nucleus is pushed near the base of the cell and they contain acidophilic granules. These cells secrete lysozymes and have phagocytic activity.
      - ❖ **Goblet cells**: which secrete mucus to lubricate the lumen of the intestine.
      - ❖ **Mitotic cells**: which are stem-cells replacing damaged cells of the intestinal gland.
      - ❖ **Enteroendocrine cells**: which have fine granules toward the base of the cells. They secrete hormones which regulate secretions such as CCK & secretin.

      The muscularis mucosa separates the mucosa from the underlying submucosa.
    - ✓ Submucosa: containing blood vessels & submucosal plexuses.
    - ✓ Muscularis externa: containing inner circular & outer longitudinal smooth muscle fibers between them are found myenteric plexuses.
    - ✓ Serosa.



  - **Ileum:**
    - ✓ Mucosa: it is composed of villi. These villi are lined with simple columnar epithelium with brush border & goblet cells. In the core of the villi are central lacteals and blood vessels. In the lamina propria are found intestinal glands & aggregation of lymphatic nodules known as Peyer's patches (consisting of B-lymphocytes, plasma cells, T-lymphocytes & macrophages). The muscularis mucosa separates the mucosa from the underlying submucosa & it is disrupted by Peyer's patches.

- ✓ Submucosa: containing blood vessels & submucosal plexuses.
- ✓ Muscularis externa: containing inner circular & outer longitudinal smooth muscle fibers between them are found myenteric plexuses.
- ✓ Serosa.

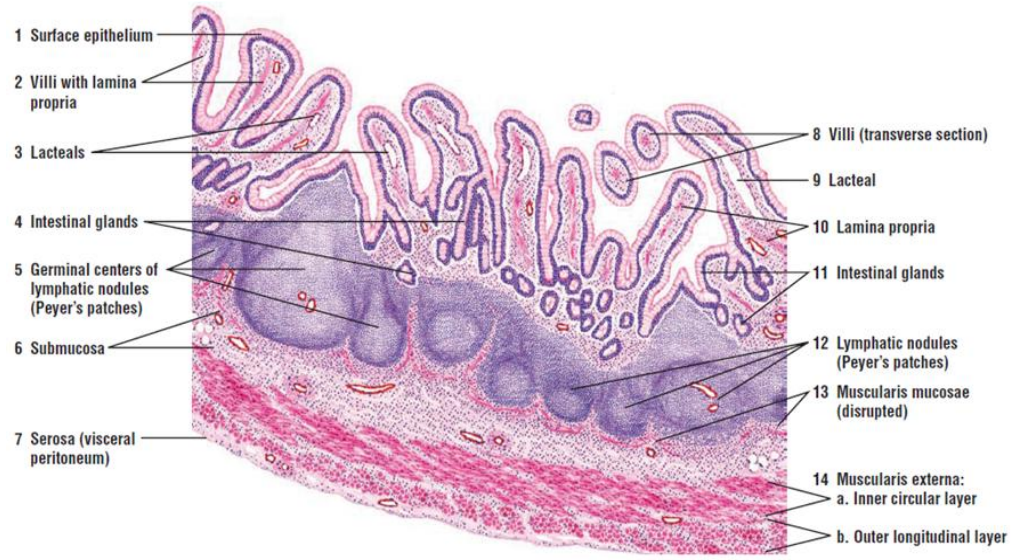


FIGURE 13.6 ■ Small intestine: ileum with lymphatic nodules (Peyer's patches) (transverse section). Stain: hematoxylin and eosin. Low magnification.

- **Pancreas:**
  - **Exocrine pancreas:**
    - ✓ Head of organ lies in the duodenal loop and tail extends to the spleen.
    - ✓ Exocrine component forms majority of the organ and is composed of serous acini.
    - ✓ Acinar cells filled with granules that contain digestive enzymes.
    - ✓ Acini contain pale-staining centroacinar cells in their lumina from which excretory ducts start.
    - ✓ Centroacinar cells continuous with cells of short intercalated ducts.
    - ✓ Excretory ducts do not have striations in their cells and no striated ducts.
    - ✓ Neural and hormones secretin and cholecystokinin (CCK) regulate exocrine secretions.
    - ✓ Intestinal enteroendocrine cells release hormones when acidic chyme is present.
    - ✓ Secretin stimulates sodium bicarbonate production by centroacinar cells and intercalated duct cells.
    - ✓ Alkaline sodium bicarbonate fluid neutralizes acidic chyme for pancreatic enzymes.
    - ✓ CCK released when fats and proteins are present in chyme.
    - ✓ CCK stimulates the production and release of numerous pancreatic digestive enzymes.
    - ✓ Enzymes produced and released in inactive form and activated first in duodenum.
    - ✓ Trypsinogen from pancreas converted to trypsin by intestinal mucosa hormone enterkinase.
    - ✓ Trypsin converts all pancreatic enzymes into active digestive enzymes.
  - **Endocrine pancreas:**
    - ✓ Endocrine portion in the form of isolated pancreatic islets among exocrine acini.
    - ✓ Each pancreatic islet is surrounded and separated by fine reticular fibers.
    - ✓ Four cell types present in pancreatic islets: alpha, beta, delta and pancreatic polypeptide cells.
    - ✓ Alpha cells produce glucagon in response to low sugar levels.

- ✓ Glucagon elevates blood glucose by accelerating conversion of glycogen in liver.
- ✓ Beta cells produce insulin during elevated glucose levels.
- ✓ Insulin lowers blood glucose by inducing glucose transport into liver, muscle and adipose cells.
- ✓ Delta cells produce somatostatin, which inhibits the activity of both alpha and beta cells.
- ✓ Pancreatic polypeptide cells inhibit enzymatic and alkaline pancreatic secretions.

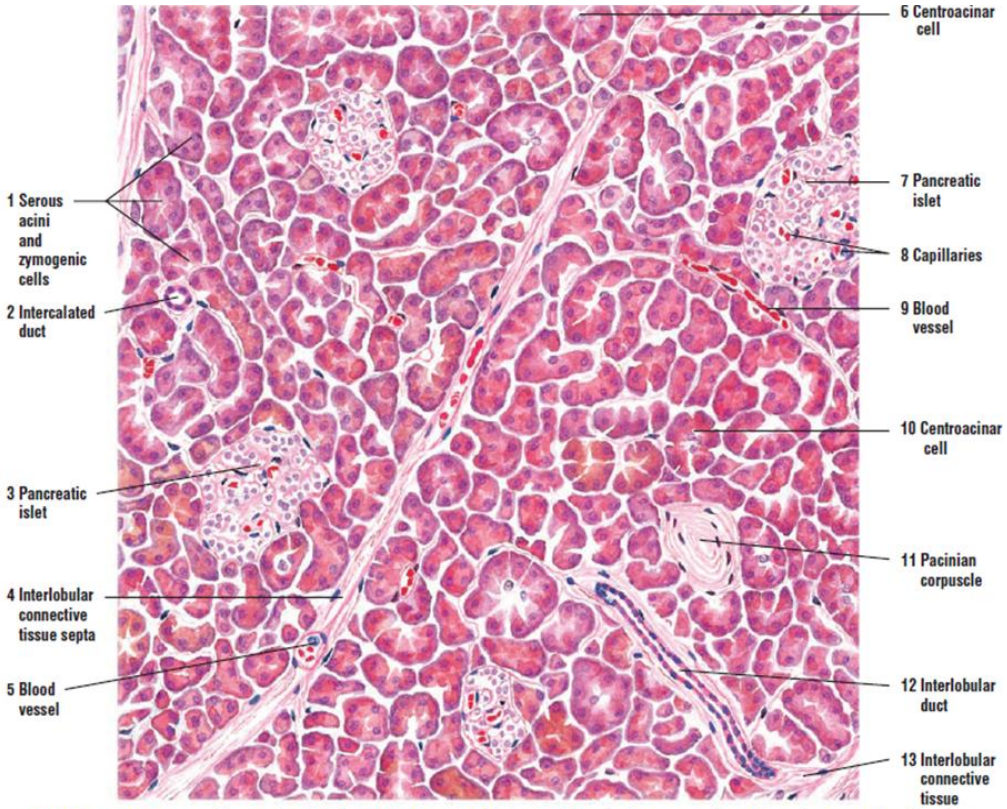


FIGURE 14.10 ■ Exocrine and endocrine pancreas (sectional view). Stain: hematoxylin and eosin. Low magnification.