LEARNING OUTCOMES:

- ❍ Identify the major layers and tissues of the digestive tract.
- ❍ Identify all digestive anatomy on laboratory models and figures.
- ❍ Describe the histological structure of the various digestive organs.
- ❍ Trace the secretion of bile from the liver to the duodenum.
- ❍ List the organs of the digestive tract and the accessory organs that empty into them.
- ❍ Identify the major digestive system organs in a dissected animal.

ACTIVITY 1: Digestive System—Gross Anatomy (Models)

In Lab:

1. On the torso model(s), you should be able to find: (Use Martini Figs. 24-6, 24-7, 24-12, 24-18, 24-19, and 24-24.)
   - ❍ hard palate
   - ❍ soft palate
   - ❍ tongue
   - ❍ sublingual and submaxillary salivary glands
   - ❍ esophagus
   - ❍ stomach
   - ❍ rugae
   - ❍ cardia, fundus, body, and pylorus of stomach
   - ❍ pyloric sphincter
   - ❍ liver
   - ❍ falciform ligament
   - ❍ hepatic ducts
   - ❍ gallbladder
   - ❍ cystic duct
   - ❍ common bile duct
   - ❍ pancreas
   - ❍ pancreatic duct
   - ❍ small intestine
   - ❍ appendix
   - ❍ haustra of large intestine
   - ❍ cecum
   - ❍ ascending, transverse, descending, and sigmoid colon
   - ❍ rectum
2. On the liver lobule model, you should be able to find: (Use Martini Fig. 24-20.)
   - ❍ lobules
   - ❍ portal area (triad)
   - ❍ central vein
   - ❍ hepatocytes
3. You can find a gallery of our digestive anatomy images online at http://bit.ly/10Kr6Kb. (Link also available in Canvas.) Photos of the torso heads can be found in the gallery of respiratory anatomy images (http://bit.ly/10aLjZ3).

ACTIVITY 2: Digestive System—Gross Anatomy (Cat Dissection)

Before beginning:

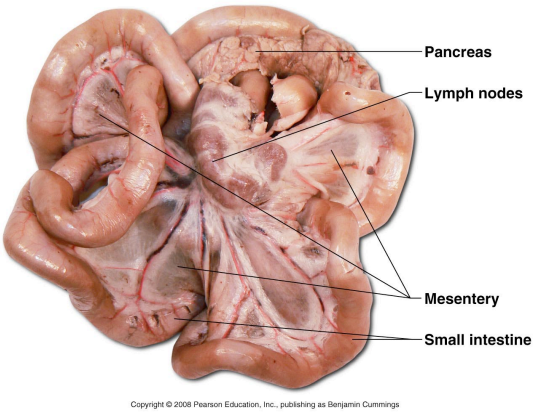
❍ Inform the instructor if you need to drain embalming fluid from your cat.

In Lab:

1. Identify the **esophagus** in the thoracic cavity. It is directly behind the trachea. Note that it connects to the stomach in the abdominopelvic cavity.

2. Push aside the **greater omentum**. It is a double membrane filled with fat and serves as a protective cover for the abdominal organs.

3. The **small intestine** is connected to the abdominal wall by a double-layered membrane, the **mesentery**. Identify fat and blood vessels in the mesentery. The connective tissue connecting the large intestine to the abdomen is the **mesocolon**.



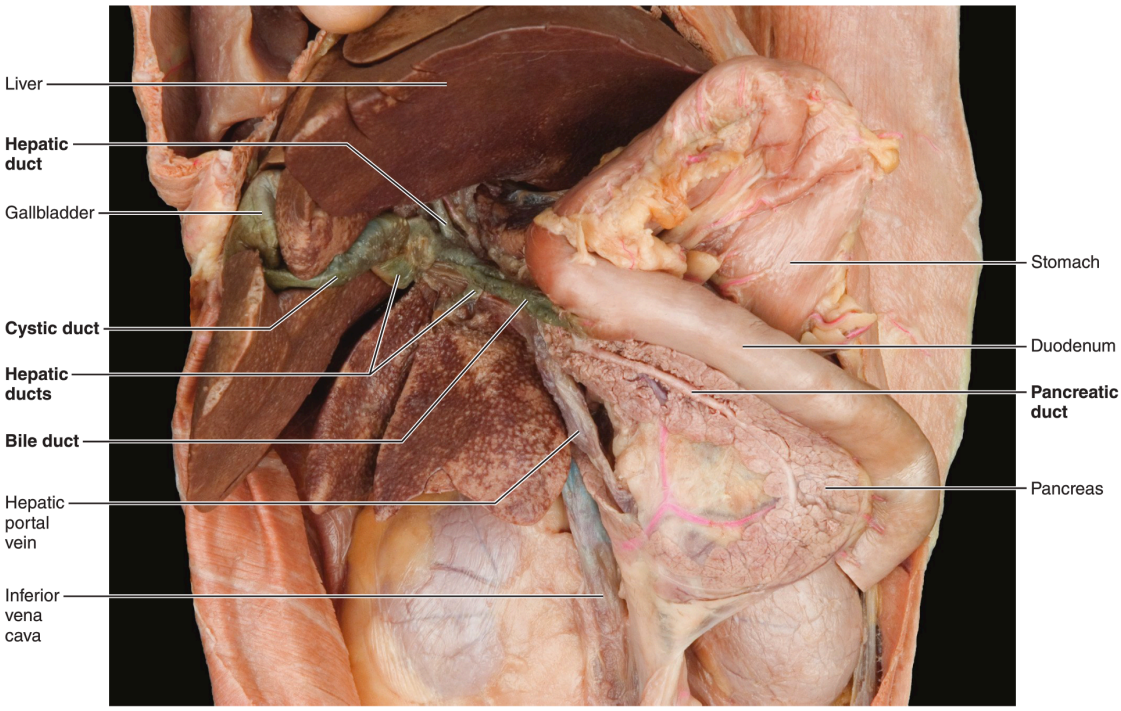
4. Locate the **stomach** on the left just under the diaphragm, and cut it open to observe the **rugae** in the stomach lining. If your cat does not have prominent rugae in its stomach, observe them on another cat. Identify the **duodenum** where it connects to the stomach. A longitudinal cut at the pyloric end of the stomach near the duodenum will reveal the **pyloric sphincter**.

5. Locate the **liver**. Unlike in humans, the cat liver is divided into five lobes (right and left medial, right and left lateral, and caudate). Note that it is attached superiorly to the diaphragm and anteriorly to the abdominal wall by the sheet like **falciform ligament**. This is a remnant of the umbilical vein and fetal mesentery. Using the blunt probe, locate the **gallbladder** among the liver lobes. It is often a greenish color. Trace the **cystic duct** from the gall bladder to where it joins the **bile duct**. Trace the bile duct to its entry into the duodenum at the **hepatopancreatic ampulla**. You can feel the ampulla as a small lump in the duodenum.

6. The **pancreas** is located in the mesentery of the duodenum. Using a blunt probe and starting at the hepatopancreatic ampulla, scrape the pancreatic tissue carefully to locate the **pancreatic duct**, which enters the duodenum with the bile duct.

7. Cut open a part of the duodenum and observe the villi using a magnifying glass.

8. Locate the **cecum**, the blind end of the large intestine. The ileum enters the large intestine just above the cecum. A longitudinal cut here will reveal the **ileocecal valve**. Open the ileum and observe the villi with a microscope. Compare the villi of the duodenum and the ileum. Do you see any difference in the size and/or number of villi?

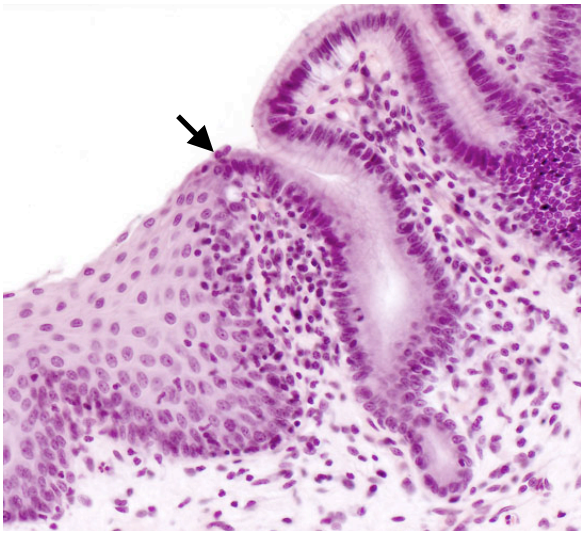


ACTIVITY 3: Examining Prepared Slides of the Digestive System

In Lab:

1. Obtain a compound microscope and a slide of the **gastroesophageal junction**, the location where the esophagus meets the stomach. Find the exact location by scanning along the epithelial layer until the stratified squamous epithelium (esophageal lining) meets the simple columnar epithelium (stomach lining).

2. You should be able to find the following:
   - ❍ esophageal lining
   - ❍ stomach lining
   - ❍ submucosa
   - ❍ muscularis externa
   - ❍ adventitia

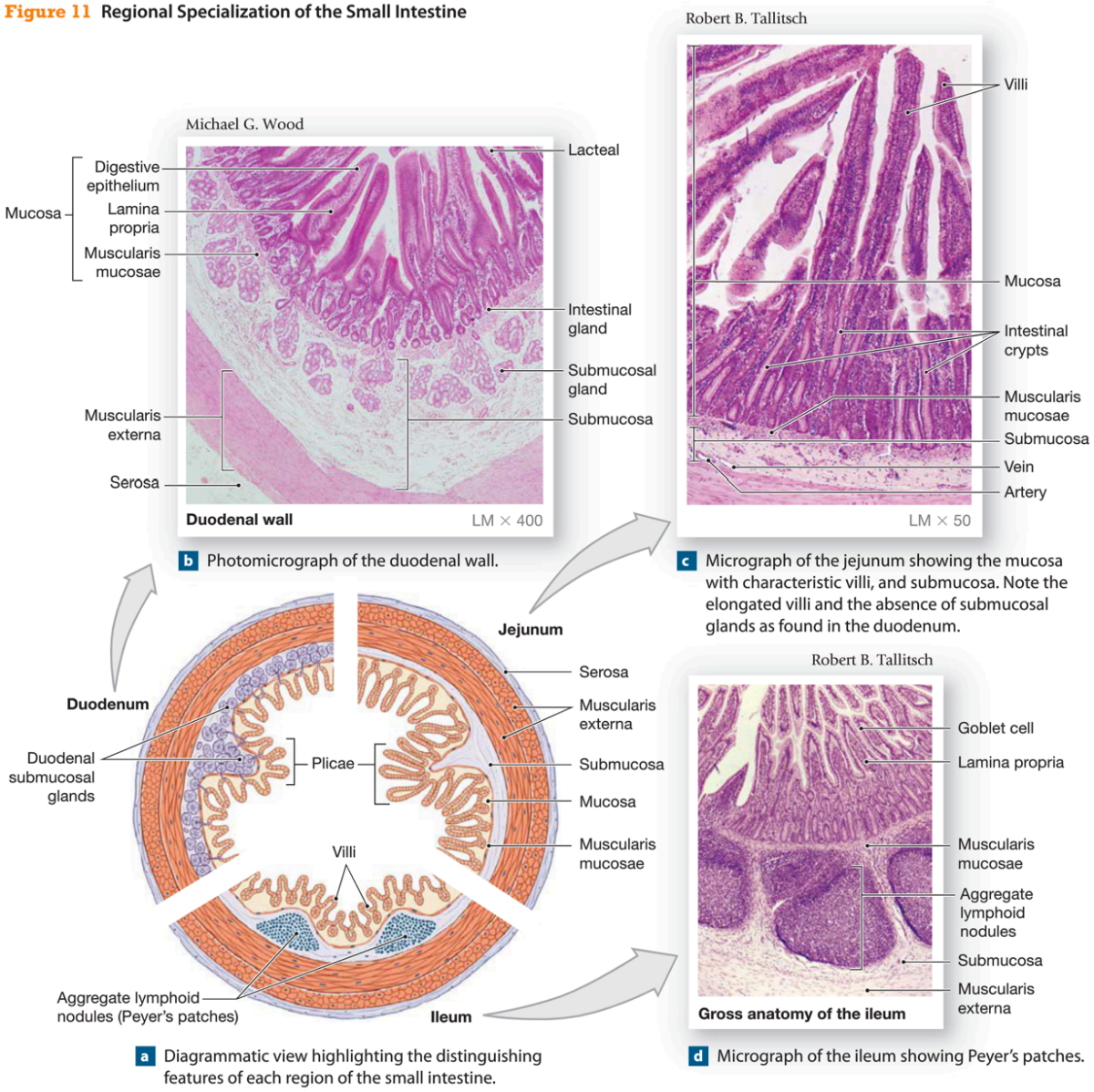


3. The key to understanding the histology of the small intestine lies in knowing that its major function is absorption. To that end, its absorptive surface area has been amplified greatly in the following ways:

    - The mucosa and submucosa are thrown into permanent circular folds (plicae circulares).
    - Fingerlike extensions of the lamina propria form villi (singular: villus) that protrude into the intestinal lumen.
    - The individual simple columnar epithelial cells (enterocytes) that cover the villi have microvilli (a brush border), tiny projections of apical plasma membrane to increase their absorptive surface area.

4. Obtain slides of duodenum, jejunum, and ileum for comparison. Use the figure below and find the histological differences between the different parts of the small intestine. (Recommendation: set up three microscopes side-by-side with your lab group and practice going back and forth between the microscopes.)

Figure 11 Regional Specialization of the Small Intestine



5. On the ileum slide, you should be able to identify:
   - ❍ villi
   - ❍ mucosa
   - ❍ goblet (mucous) cells
   - ❍ submucosa
   - ❍ Peyer's patches
   - ❍ circular layer of muscularis externa
   - ❍ longitudinal layer of muscularis externa
   - ❍ serosa

6. The functional tissue of the liver is organized into hexagonally shaped cylindrical **lobules**, each delineated by connective tissue.

   Within the lobule, large rounded **hepatocytes** form linear cords that radiate peripherally from the center of the lobule at the central vein to the surrounding connective tissue. **Blood sinusoids** lined by simple squamous endothelial cells and darkly stained phagocytic **Kupffer cells** are interposed between cords of hepatocytes in the same radiating pattern.

   Located in the surrounding connective tissue, roughly at the points of the hexagon where three lobules meet, is the **portal area** (portal triad).

7. Obtain a slide of pig liver tissue for examination. Liver slides rarely look as nice in reality as they appear in photos, but pig liver tends to be better than human liver. On the slide, you should be able to identify:
   - ❍ lobules
   - ❍ hepatocytes (the major cell type of the liver)
   - ❍ central vein
   - ❍ portal area (triad)