

CHAPTER TWENTY - SIX

Content Review

1. The general structural plan of the digestive tract, from the esophagus through the large intestine, is a tube composed of four concentric layers, called tunics, that exhibit considerable consistency. The layers of the digestive tract (from deep to superficial) are the *mucosa*, a mucous membrane, with a superficial epithelium and an underlying lamina propria, and a thin layer of smooth muscle called the muscularis mucosa; the *submucosa*, a dense irregular connective tissue layer with few cells, but often containing accumulations of lymphatic structures; the *muscularis*, which typically contains two layers of muscle (fibers of the inner layer are oriented circumferentially and fibers of the outer layer are oriented lengthwise); and the *adventitia*, which is composed of areolar connective tissue, or a serosa, which is the adventitia covering plus a covering of visceral peritoneum. The esophagus has these tunics, with the following modifications: (1) a stratified squamous epithelium in the mucosa to resist abrasion during swallowing, (2) submucosal glands to lubricate the luminal surface of the esophagus, and (3) a mixture of skeletal and smooth muscle in the muscularis. The skeletal muscle ensures that the swallowed bolus moves through the esophagus quickly.
2. The pharyngeal constrictors are involuntary skeletal muscle groups that ensure that the swallowed bolus moves quickly through the pharynx and into the esophagus (about 1 second elapses during this phase).
3. Surface mucous cells line the stomach lumen and secrete mucin to protect the stomach wall. Mucous neck cells deep to the base of the gastric pit produce an acidic mucin to maintain the acidic conditions caused by the secretion of hydrochloric acid by parietal cells. Parietal cells secrete hydrochloric acid (to denature proteins) and intrinsic factor (to assist in vitamin B₁₂ absorption). Chief cells secrete enzymes to initiate the chemical digestion of proteins. Enteroendocrine cells produce peptide hormones that affect digestion activities.
4. Circular folds are composed of both mucosa and submucosa. They help increase the surface area of the small intestine, allowing more nutrients to be absorbed, and they slow down the movement of chyme to ensure that it remains within the small intestine for maximal nutrient absorption. Along these circular folds are smaller, fingerlike projections of mucosa only, called villi, that further increase the surface area for secretion and absorption. Microvilli are apical membrane surface folds that increase the absorptive and secretory surface of each cell.
5. The large intestine's tunica mucosa contains numerous goblet cells that produce large quantities of mucin to continue lubricating the undigested material as it passes through the GI tract.
6. The teniae coli in the wall of the large intestine help form sacs called haustra. Movement of digested materials through these sacs is called haustral churning. It occurs after a relaxed haustrum fills with fecal material to the point where its distension stimulates reflex contractions in the muscularis, causing churning and movement of the material to more distal haustra.
7. At the periphery of hepatic lobules are several portal triads, composed of a branch of

the hepatic portal vein, the hepatic artery, and the bile duct. The hepatic portal vein carries blood that is rich in nutrients and other absorbed substances but relatively poor in oxygen. The hepatic artery, a branch of the celiac trunk, carries well-oxygenated blood and supplies the remaining blood to the liver. Blood from branches of these two vessels mixes in passing to and through the liver lobules and drains into the central veins. Bile produced by hepatocytes is secreted into bile canaliculi; it flows through these tiny channels to the hepatic duct. Bile emulsifies fat arriving in the small intestine.

8. The gallbladder stores and concentrates excess bile produced by the liver. Bile is a yellow-green fluid produced by hepatocytes; its primary digestive function is to aid in the emulsification of fat.
9. The mouth is the site of initial mechanical digestion via mastication. The third layer of smooth muscle in the stomach assists in further mechanical digestion. Finally, the small intestine is involved with peristalsis and segmentation, which mixes and breaks down the digested materials.
10. The mucin-producing glands throughout the GI tract collectively produce a covering layer of viscous mucus. This mucus lubricates the lining and prevents desiccation of the lining cells. Additionally, the mucus protects the epithelial lining from abrasion or from damage by acid or enzymes in the contents of the tract.