

Digestive System

Bio 250 CSM

The Digestive System and Body Metabolism

- Digestion
 - Breakdown of ingested food
 - Absorption of nutrients into the blood
- Metabolism
 - Production of cellular energy (ATP)
 - Constructive and degradative cellular activities

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Organs of the Digestive System

- Two main groups
 - Alimentary canal – continuous coiled hollow tube
 - Accessory digestive organs

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Organs of the Digestive System

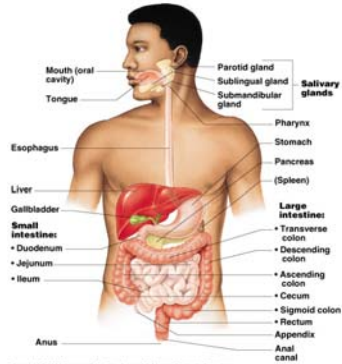


Figure 14.1

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Organs of the Alimentary Canal

- Mouth
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Anus

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Mouth (Oral Cavity) Anatomy

- Lips (labia) – protect the anterior opening
- Cheeks – form the lateral walls
- Hard palate – forms the anterior roof
- Soft palate – forms the posterior roof
- Uvula – fleshy projection of the soft palate

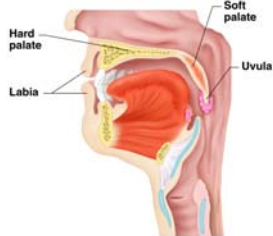


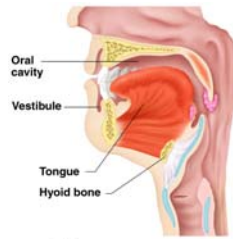
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Mouth (Oral Cavity) Anatomy

- Vestibule – space between lips externally and teeth and gums internally
- Oral cavity – area contained by the teeth
- Tongue – attached at hyoid and styloid processes of the skull, and by the lingual frenulum



(a)

Figure 14.2a

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Mouth (Oral Cavity) Anatomy

- Tonsils
 - Palatine tonsils
 - Lingual tonsil



(a)

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Processes of the Mouth

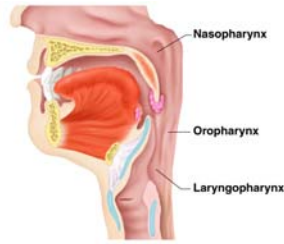
- Mastication (chewing) of food
- Mixing masticated food with saliva
- Initiation of swallowing by the tongue
- Allowing for the sense of taste

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Pharynx Anatomy

- Nasopharynx – not part of the digestive system
- Oropharynx – posterior to oral cavity
- Laryngopharynx – below the oropharynx and connected to the esophagus



(a)
Figure 14.2a

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Pharynx Function

- Serves as a passageway for air and food
- Food is propelled to the esophagus by two muscle layers
 - Longitudinal inner layer
 - Circular outer layer
- Food movement is by alternating contractions of the muscle layers (peristalsis)

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Esophagus

- Runs from pharynx to stomach through the diaphragm
- Conducts food by peristalsis (slow rhythmic squeezing)
- Passageway for food only (respiratory system branches off after the pharynx)

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Layers of Alimentary Canal Organs

- Mucosa
 - Innermost layer
 - Moist membrane
 - Surface epithelium
 - Small amount of connective tissue (lamina propria)
 - Small smooth muscle layer

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Layers of Alimentary Canal Organs

- Submucosa
 - Just beneath the mucosa
 - Soft connective tissue with blood vessels, nerve endings, and lymphatics

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Layers of Alimentary Canal Organs

- Muscularis externa – smooth muscle
 - Inner circular layer
 - Outer longitudinal layer
- Serosa
 - Outermost layer – visceral peritoneum
 - Layer of serous fluid-producing cells

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Layers of Alimentary Canal Organs

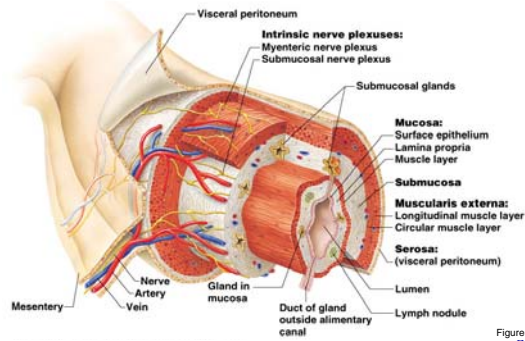


Figure 14.3
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Alimentary Canal Nerve Plexuses

- All are part of the autonomic nervous system
- Three separate networks of nerve fibers
 - Submucosal nerve plexus
 - Myenteric nerve plexus
 - Subserous plexus

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Stomach Anatomy

- Located on the left side of the abdominal cavity
- Food enters at the cardioesophageal sphincter

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Stomach Anatomy

- Regions of the stomach
 - Cardiac region – near the heart
 - Fundus
 - Body
 - Pylorus – funnel-shaped terminal end
- Food empties into the small intestine at the pyloric sphincter

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Stomach Anatomy

- Rugae – internal folds of the mucosa
- External regions
 - Lesser curvature
 - Greater curvature

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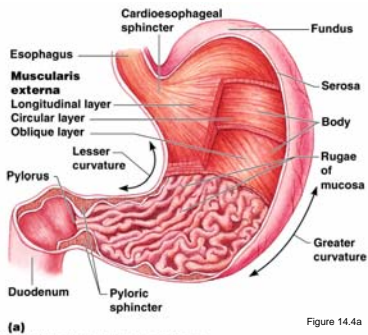
Stomach Anatomy

- Layers of peritoneum attached to the stomach
 - Lesser omentum – attaches the liver to the lesser curvature
 - Greater omentum – attaches the greater curvature to the posterior body wall
 - Contains fat to insulate, cushion, and protect abdominal organs

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Stomach Anatomy



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Stomach Functions

- Acts as a storage tank for food
- Site of food breakdown
- Chemical breakdown of protein begins
- Delivers chyme (processed food) to the small intestine

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Specialized Mucosa of the Stomach

- Simple columnar epithelium
 - Mucous neck cells – produce a sticky alkaline mucus
 - Gastric glands – secrete gastric juice
 - Chief cells – produce protein-digesting enzymes (pepsinogens)
 - Parietal cells – produce hydrochloric acid
 - Endocrine cells – produce gastrin

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Structure of the Stomach Mucosa

- Gastric pits formed by folded mucosa
- Glands and specialized cells are in the gastric gland region

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Structure of the Stomach Mucosa

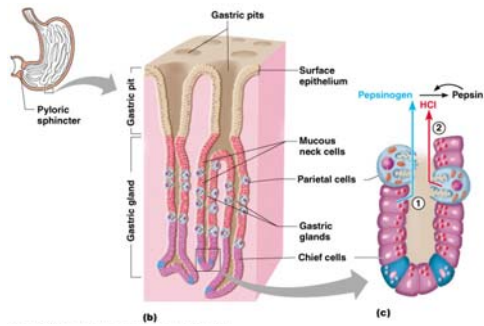


Figure 14.4b, c
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14.20b

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Small Intestine

- The body's major digestive organ
- Site of nutrient absorption into the blood
- Muscular tube extending from the pyloric sphincter to the ileocecal valve
- Suspended from the posterior abdominal wall by the mesentery

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Subdivisions of the Small Intestine

- Duodenum
 - Attached to the stomach
 - Curves around the head of the pancreas
- Jejunum
 - Attaches anteriorly to the duodenum
- Ileum
 - Extends from jejunum to large intestine

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Chemical Digestion in the Small Intestine

- Source of enzymes that are mixed with chyme
 - Intestinal cells
 - Pancreas
- Bile enters from the gall bladder

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Chemical Digestion in the Small Intestine

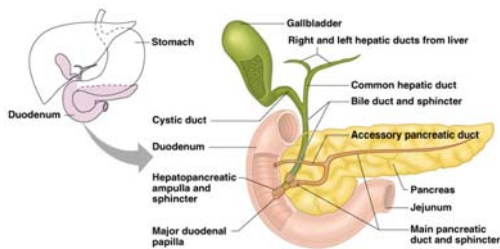


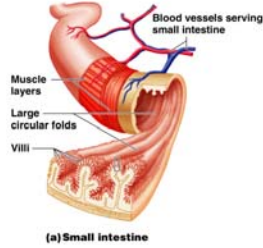
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Villi of the Small Intestine

- Fingerlike structures formed by the mucosa
- Give the small intestine more surface area



(a) Small intestine

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Microvilli of the Small Intestine

- Small projections of the plasma membrane
- Found on absorptive cells



(c) Absorptive cells

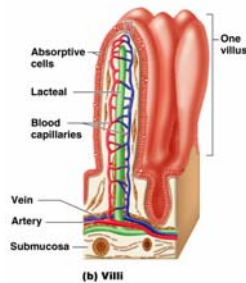
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Structures Involved in Absorption of Nutrients

- Absorptive cells
- Blood capillaries
- Lacteals (specialized lymphatic capillaries)



(b) Villi

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Folds of the Small Intestine

- Called circular folds or plicae circulares
- Deep folds of the mucosa and submucosa
- Do not disappear when filled with food
- The submucosa has Peyer's patches (collections of lymphatic tissue)

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Large Intestine

- Larger in diameter, but shorter than the small intestine
- Frames the internal abdomen

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Large Intestine

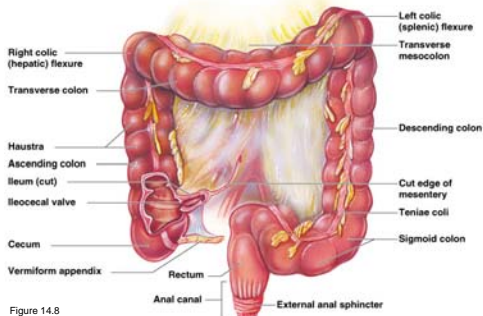


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Functions of the Large Intestine

- Absorption of water
- Eliminates indigestible food from the body as feces
- Does not participate in digestion of food
- Goblet cells produce mucus to act as a lubricant

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Structures of the Large Intestine

- Cecum – saclike first part of the large intestine
- Appendix
 - Accumulation of lymphatic tissue that sometimes becomes inflamed (appendicitis)
 - Hangs from the cecum

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Structures of the Large Intestine

- Colon
 - Ascending
 - Transverse
 - Descending
 - S-shaped sigmoidal
- Rectum
- Anus – external body opening

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Modifications to the Muscularis Externa in the Large Intestine

- Smooth muscle is reduced to three bands (teniae coli)
- Muscle bands have some degree of tone
- Walls are formed into pocketlike sacs called haustra

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Accessory Digestive Organs

- Salivary glands
- Teeth
- Pancreas
- Liver
- Gall bladder

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