The Human Body in Health and Illness

Barbara Herlihy

Chapter 23: Digestive System

Lesson 23.1 Objectives

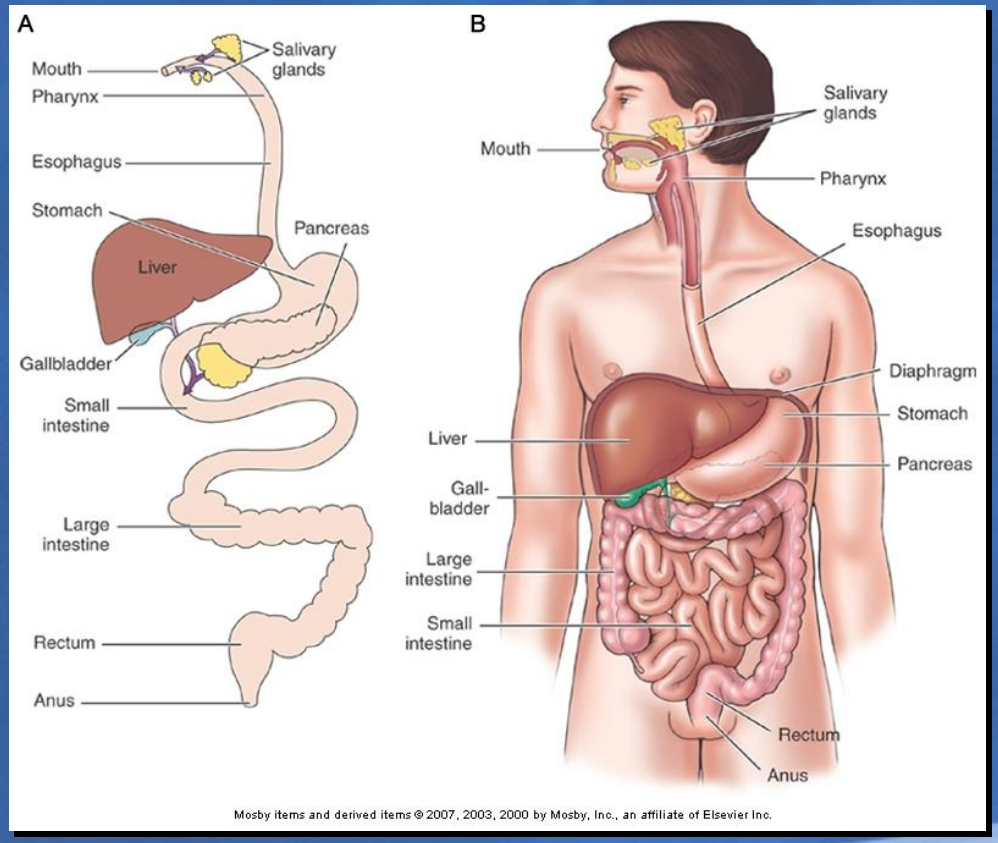
- List four functions of the digestive system.
- Describe the four layers of the digestive tract.
- Describe the structure and functions of the organs of the digestive tract.
- Describe the structure and functions of the accessory organs of the digestive tract.

Overview of the Digestive System

- Digestive system:
  - Digestive tract: hollow tube extending from the mouth to the anus; structures include the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anus
  - Accessory organs of digestion: salivary glands, liver, gallbladder, and pancreas

Overview of the Digestive System (cont'd.)

The digestive system.



Overview of the Digestive System (cont'd.)

- Four functions:
  - Ingestion: food enters the body
  - Digestion: process by which food is broken down into smaller particles suitable for absorption
    - Mechanical digestion: breakdown is due to physical actions
    - Chemical digestion: breakdown is due to chemical alteration of food

Overview of the Digestive System (cont'd.)

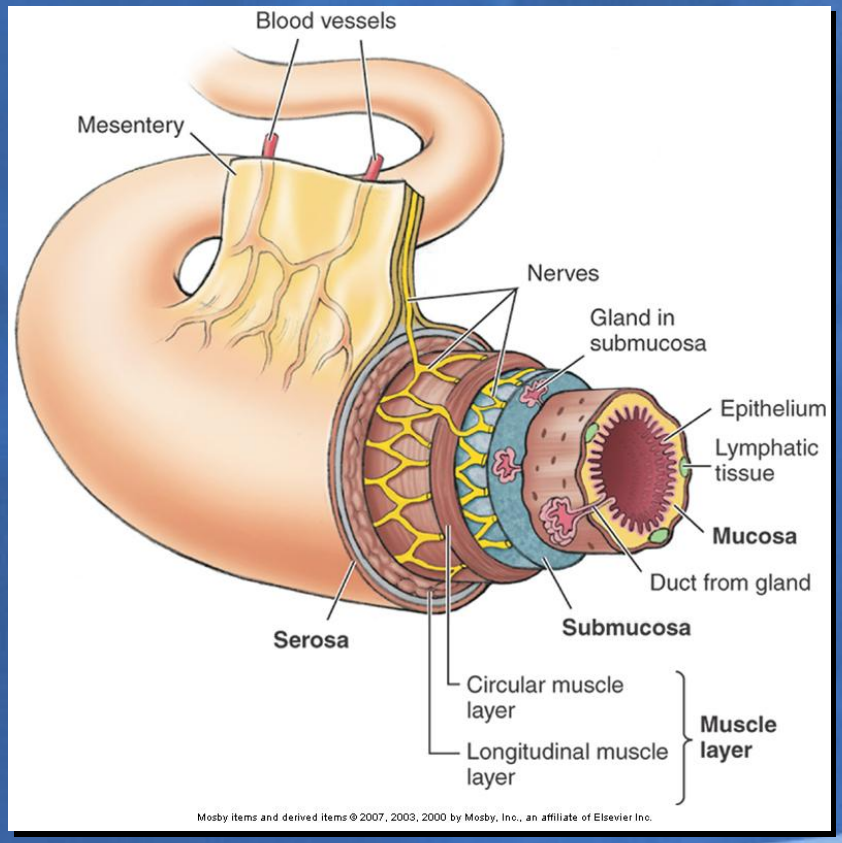
- Four functions (cont'd.):
  - Absorption: process by which the end-products of digestion move across the walls of the digestive tract into the blood for distribution throughout the body
  - Elimination: waste exits the body as feces

Overview of the Digestive System (cont'd.)

- Layers of the digestive tract:
  - Mucosa: innermost layer of the digestive tract; composed of mucous membrane
  - Submucosa: lies next to the mucosa; thick layer of loose connective tissue
  - Muscle layer: third layer; two layers of smooth muscles; autonomic nerve fibers lie between the two layers of muscles
  - Serosa: outermost lining; extends as peritoneal membranes

Overview of the Digestive System (cont'd.)

Wall of the digestive tract: four layers.

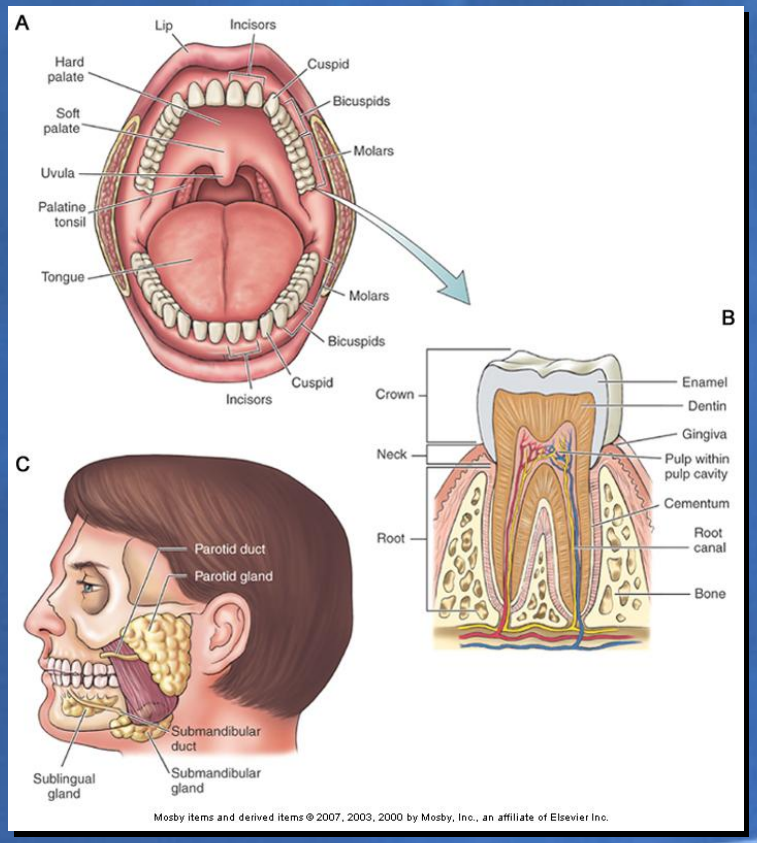


Structures and Organs

- Mouth: beginning of digestive tract
  - Teeth: mastication; begin mechanical digestion
  - Tongue: facilitates chewing and swallowing
  - Salivary glands: secrete saliva
    - Parotid glands: lie below and anterior to the ears
    - Submandibular glands: located on floor of mouth
    - Sublingual glands: located under the tongue
  - Other structures:
    - Hard and soft palates: form roof of mouth

Structures and Organs (cont'd.)

Oral cavity.

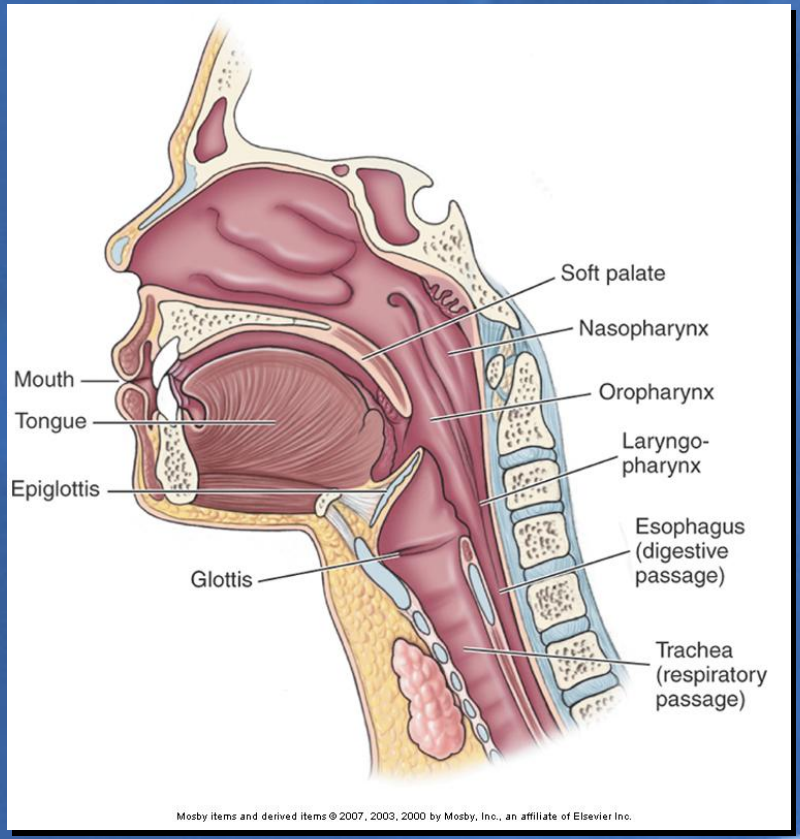


Structures and Organs (cont'd.)

- Pharynx: involved in deglutition
  - Nasopharynx
  - Oropharynx
  - Laryngopharynx

Structures and Organs (cont'd.)

Eating and swallowing.

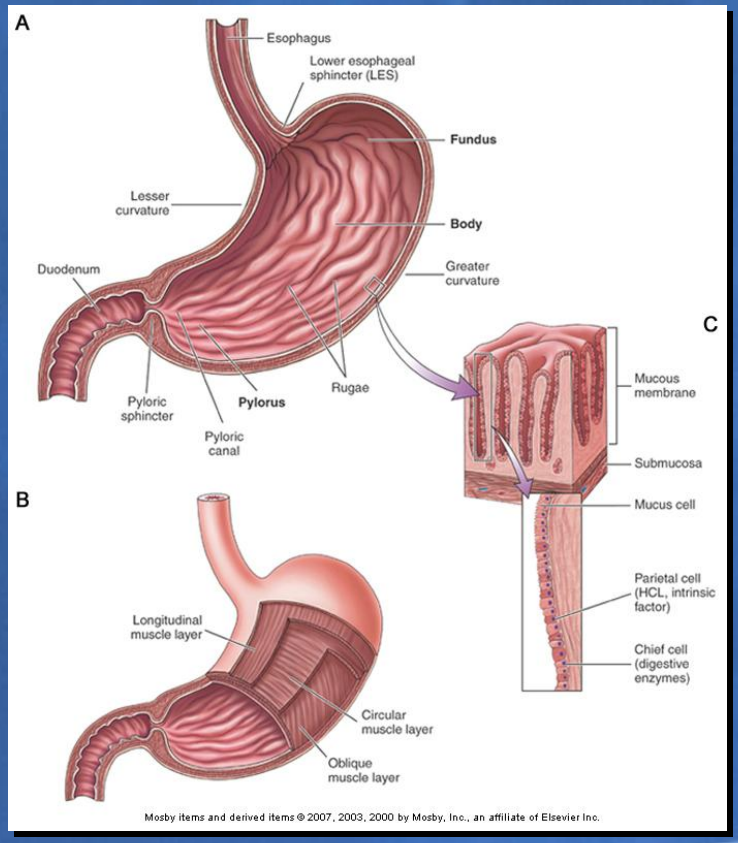


Structures and Organs (cont'd.)

- Esophagus: carries food from the pharynx to the stomach
- Two sphincters:
  - Pharyngoesophageal sphincter: located at the top of the esophagus
  - Gastroesophageal sphincter or lower esophageal sphincter (LES): a thickening at the base of the esophagus

Structures and Organs (cont'd.)

Stomach.



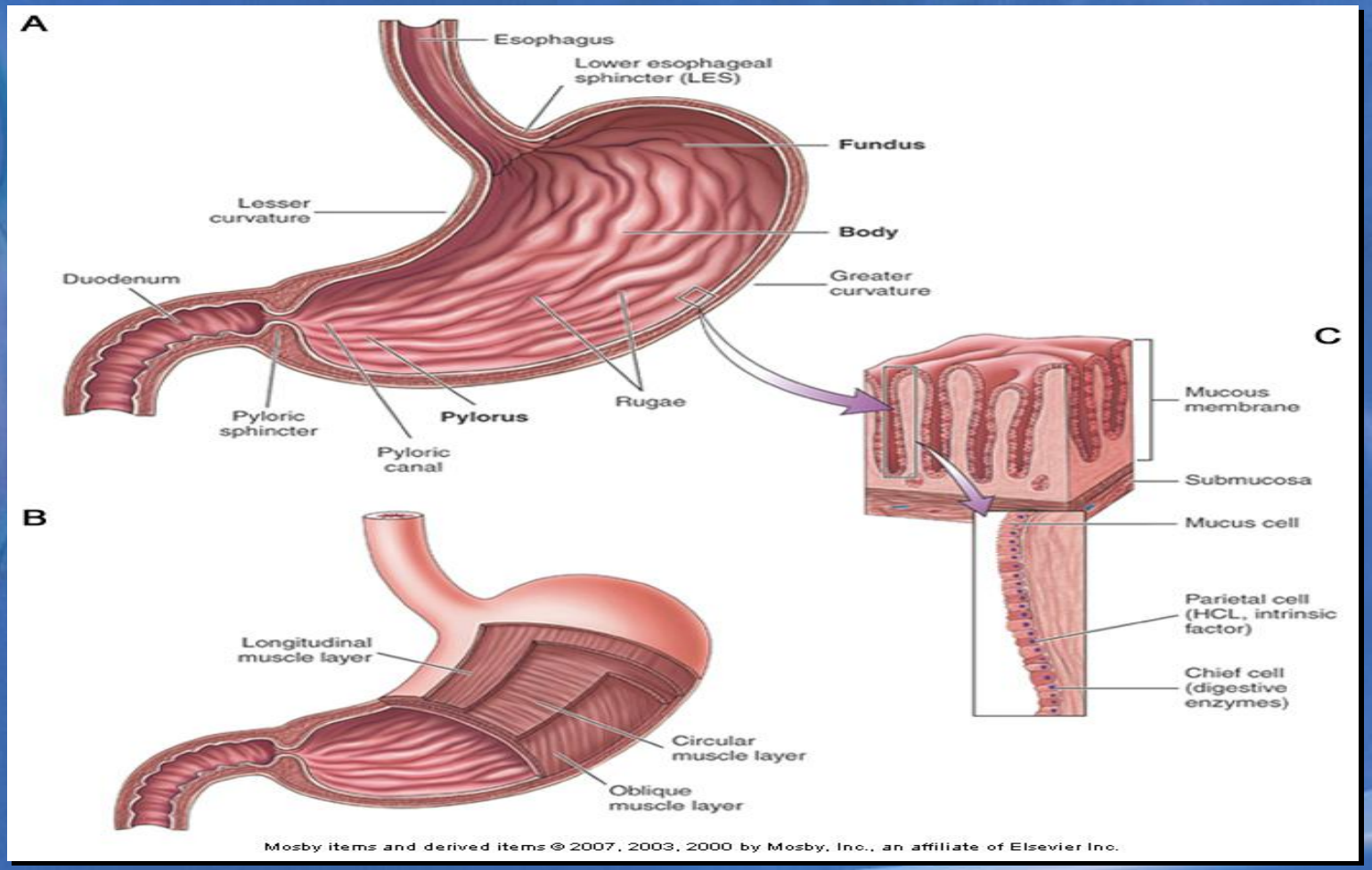
Structures and Organs (cont'd.)

- Stomach: pouchlike organ in the upper part of the abdominal cavity under the diaphragm
- Five functions:
  - Secretion of gastric juice
  - Secretion of gastric hormones and intrinsic factor
  - Regulation of the delivery of partially digested food to the small intestine
  - Digestion of food
  - Absorption of small quantities of water and dissolved substances

Structures and Organs (cont'd.)

- Regions of the stomach:
  - Fundus
  - Body
  - Pylorus
- Muscles of the stomach: three layers that lie in three directions
  - Longitudinal
  - Oblique
  - Circular

Structures and Organs (cont'd.)



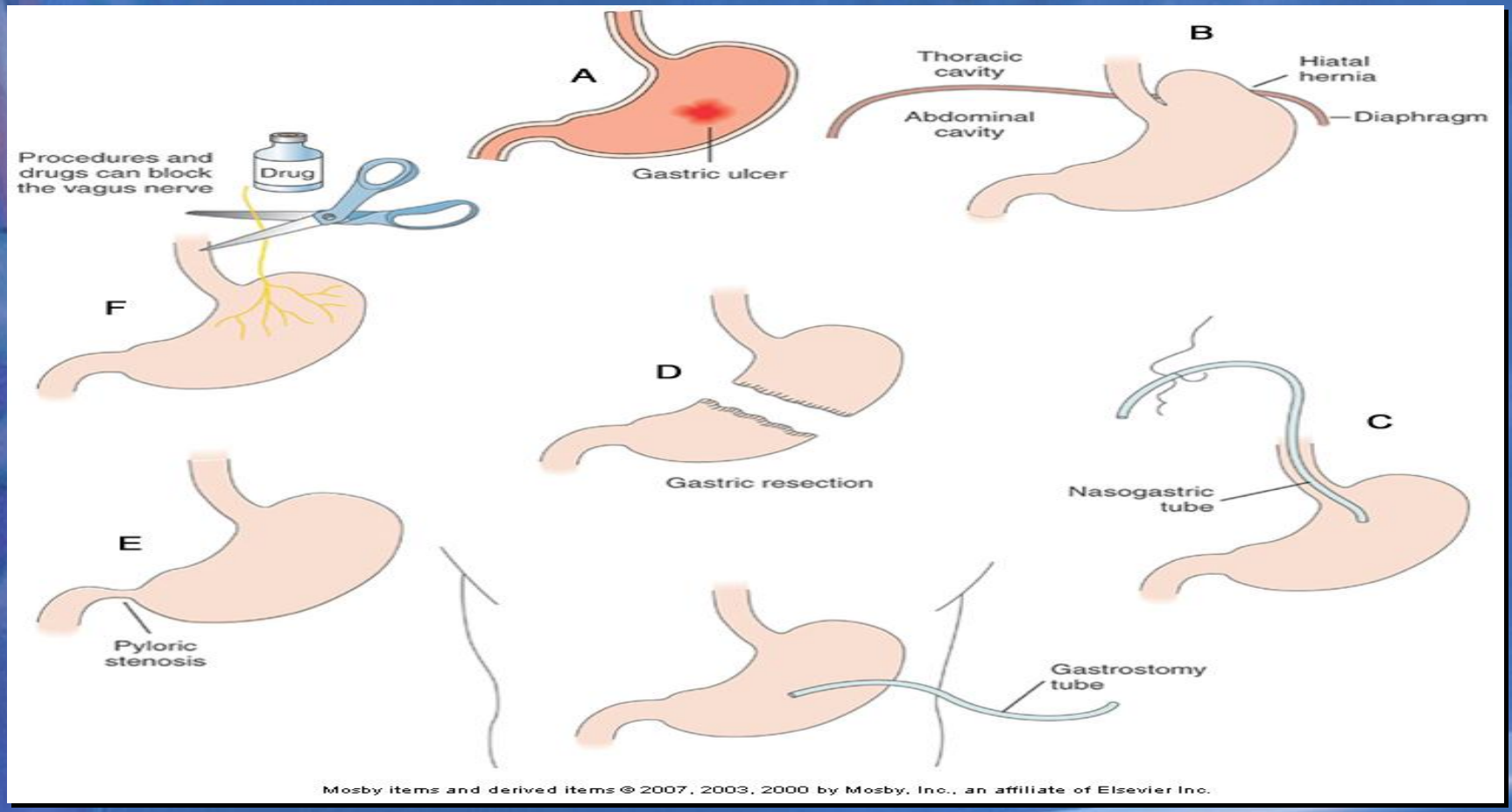
Structures and Organs (cont'd.)

- Glands of the stomach: contain three types of secretory cells
  - Mucus cells: secrete mucus
  - Chief cells: secrete digestive enzymes
  - Parietal cells: secrete hydrochloric acid (HCl) and intrinsic factor

Structures and Organs (cont'd.)

- Clinical conditions that involve the stomach:
  - Ulcer: lesion caused by an eroded stomach lining; sometimes caused by *Helicobacter pylori*
  - Hiatal hernia: protrusion of the stomach through a weakened or enlarged opening in the diaphragm into the thoracic cavity
  - Nasogastric tube: inserted through the nasal passages into the stomach
  - Gastric resection: surgical procedure to remove part or all of the stomach

Structures and Organs (cont'd.)



Structures and Organs (cont'd.)

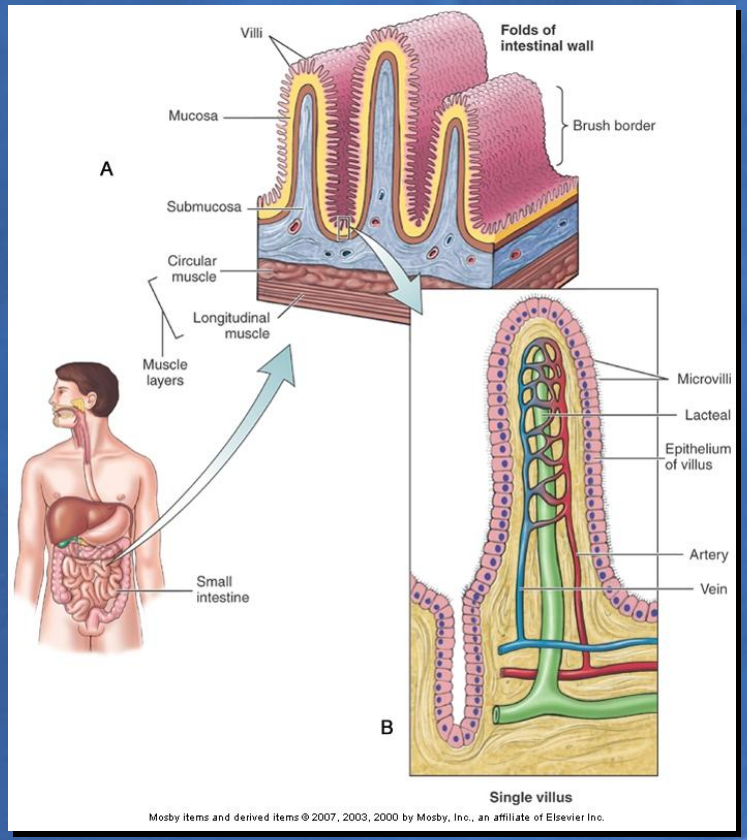
- Small intestine: located in the central and lower abdominal cavity and held in place by the mesentery; smaller in diameter, but longer than the large intestine
  - Duodenum: receives chyme from the stomach and secretions from the liver, gallbladder, and pancreas; where most digestion and absorption occurs
  - Jejunum: some digestion and absorption of food occurs in the first part of the jejunum
  - Ileum: extends from the jejunum to the ileocecal valve

Structures and Organs (cont'd.)

- Functions of the small intestine:
  - Absorption
  - Site of most digestion of food
  - Secretion of several digestive enzymes
  - Secretion of two important hormones
    - Secretin
    - Cholecystokinin (CCK)

Structures and Organs (cont'd.)

Small intestine.



Structures and Organs (cont'd.)

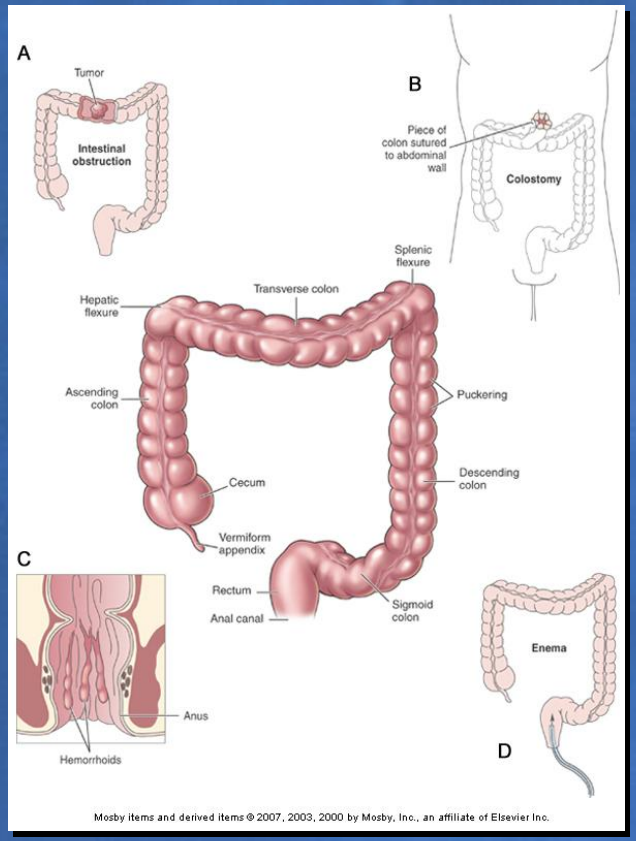
- Large intestine: extends from the ileocecal valve to the anus
  - Cecum: located in the lower right quadrant
  - Colon: ascends on right (i.e., ascending colon), bends near liver at hepatic fixture, crosses upper abdomen (i.e., transverse colon), bends near spleen at splenic fixture, descends on left side (i.e., descending colon), and makes another S-bend (i.e., S-shaped sigmoid colon)
  - Rectum: located distal to the sigmoid colon
  - Anal canal: ends at the anus

Structures and Organs (cont'd.)

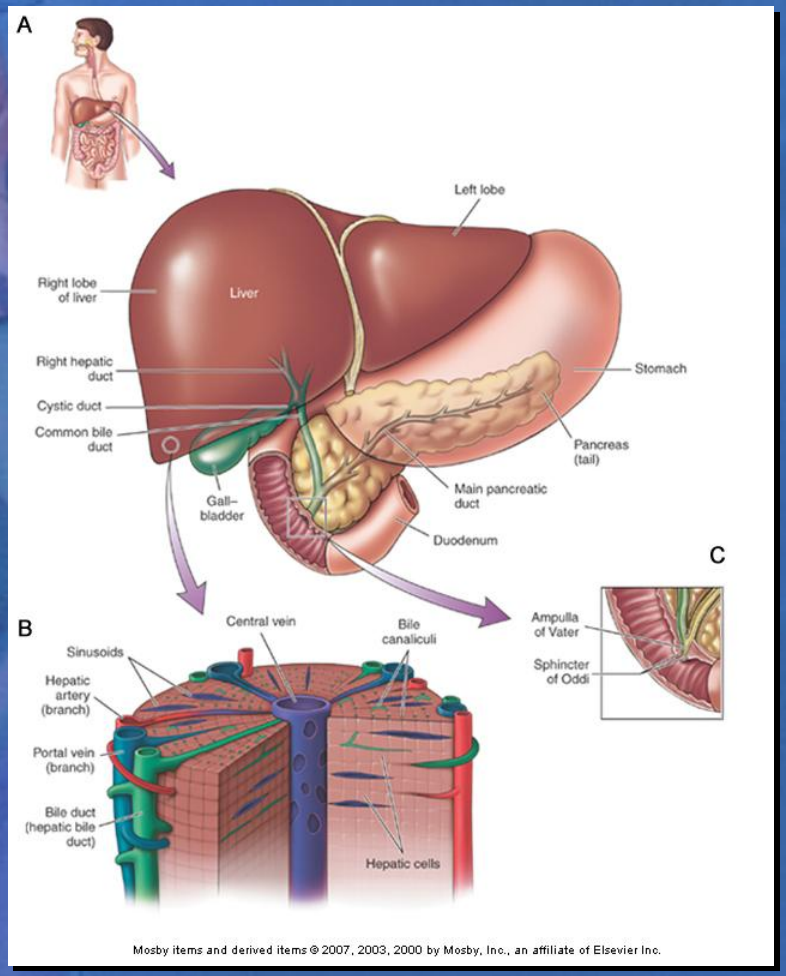
- Functions of the large intestine:
  - Absorption of water and certain electrolytes
  - Synthesis of certain vitamins by the intestinal bacteria
  - Temporary storage site of waste
  - Elimination of waste from the body

Structures and Organs (cont'd.)

Large intestine and clinical conditions.



Accessory Digestive Organs



- Three accessory organs:
  - Liver
  - Gallbladder
  - Pancreas

Accessory Digestive Organs (cont'd.)

- Liver: large, reddish-brown organ located in the mid and right upper abdominal cavity; largest gland in the body
- Two lobes:
  - Right lobe: larger lobe
  - Left lobe: smaller lobe separated by a ligament

Accessory Digestive Organs (cont'd.)

- Liver functions:
  - Synthesis of bile salts and secretion of bile
  - Synthesis of plasma proteins
  - Storage
  - Detoxification
  - Excretion

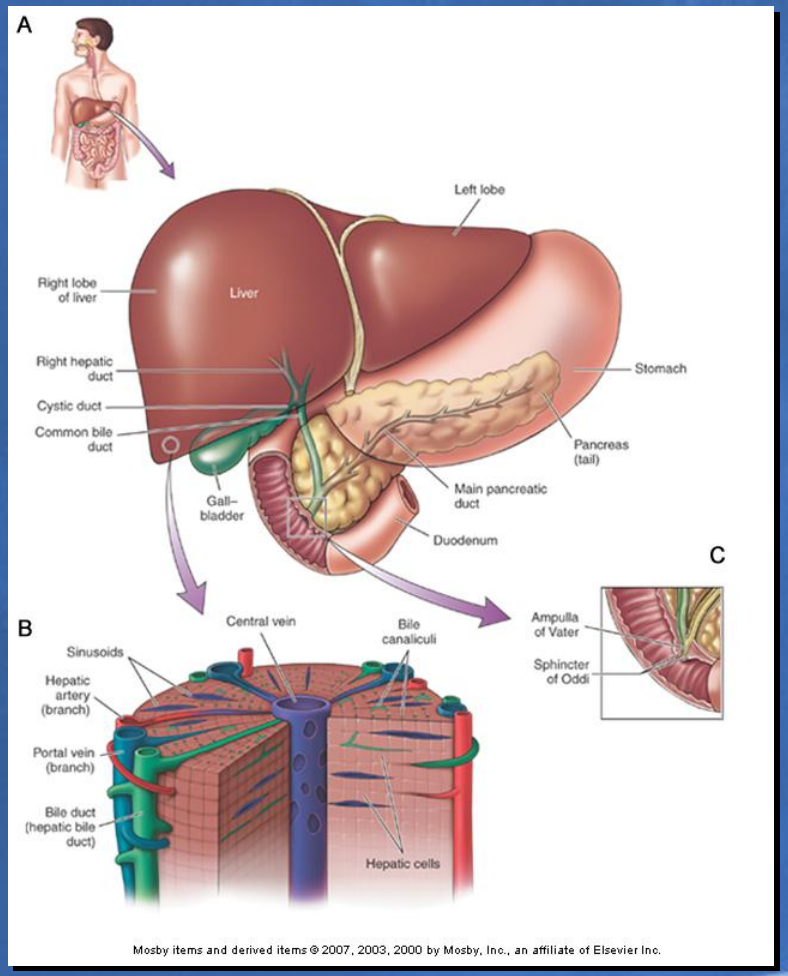
Accessory Digestive Organs (cont'd.)

- Liver functions (cont'd.):
  - Metabolism of carbohydrates
  - Metabolism of protein
  - Metabolism of fats
  - Phagocytosis

Accessory Digestive Organs (cont'd.)

- Blood supply to the liver:
  - Hepatic portal system: unique arrangement of blood vessels
  - Portal vein: drains blood from all the organs of digestion and delivers it to the liver
  - Hepatic artery: delivers oxygen-rich blood from the aorta to the liver
  - Hepatic veins: blood leaves the liver and empties into the vena cava

Accessory Digestive Organs (cont'd.)



Accessory Digestive Organs (cont'd.)

- Bile: greenish yellow secretion produced by the liver and stored in the gallbladder
- Composition of bile:
  - Water
  - Electrolytes
  - Cholesterol
  - Bile pigments
  - Bile salts

Accessory Digestive Organs (cont'd.)

- Biliary tree: ducts that connect the liver, gallbladder, and duodenum
  - Hepatic bile ducts: receive bile from the canaliculi within the liver lobules
  - Cystic duct: merges with the hepatic bile ducts to form the common bile duct; also connects with the gallbladder
  - Common bile duct: carries bile from both the hepatic ducts and the cystic duct to the duodenum

Accessory Digestive Organs (cont'd.)

- Gallbladder: pear-shaped sac attached to the underside of the liver
- Cholecystokinin (CCK): fat in the duodenum stimulates its release; enters bloodstream and causes gallbladder to contract and eject bile

Accessory Digestive Organs (cont'd.)

- Pancreas: located below the stomach; secretes both endocrine and exocrine substances
- Acinar cells: secrete the pancreatic enzymes in their inactive form
- Secretion control: under vagus and hormonal control

Accessory Digestive Organs (cont'd.)

Clinical conditions of the liver, gallbladder, and pancreas.

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