**Digestive System Functions**

- Digestion
  - Breakdown of food into molecules small enough to enter the body
    - Mechanical
    - Chemical (enzymatic)
- Absorption
  - Passage of molecules into the blood & lymph
    - Passive
    - Active

**Organs of the Digestive System**

- GI Tract = Alimentary Canal
  - Mouth
  - Esophagus
  - Stomach
  - Small Intestine
  - Large Intestine
- Accessory Structures
  - Teeth
  - Salivary glands
  - Gallbladder
  - Pancreas

**Layers of the GI Tract**

- Mucosa
  - Epithelium
  - Lamina propria
  - Muscularis mucosa
- Submucosa
  - Areolar CT
  - Blood vessels & glands
  - Submucosal plexus (Meissner)

**Layers of the GI Tract cont.**

- Muscularis Externa
  - Inner circular muscle
  - Myenteric plexus
    (plexus of Auerbach)
  - Outer longitudinal muscle
- Serosa or Adventitia
  - Connective tissue
  - Mesothelium
Serous Membrane of the Abdominal Cavity

- Peritoneum
  - Largest serous membrane in the body
  - Parietal peritoneum
    - Lines wall of abdominopelvic cavity
  - Visceral peritoneum
    - Covers organs in the cavity
- Peritoneal cavity
  - Potential space
    - Ascites — fluid buildup in this space

Folds of the Peritoneum

- Mesentery
  - Holds intestines together and attaches them to the posterior body wall
- Falciiform Ligament
  - Attaches liver to the anterior abdominal wall
- Lesser Omentum
  - Suspends the stomach & duodenum from the liver
- Mesocolon
  - Binds the large intestine to the posterior abdominal wall
- Greater Omentum
  - Drapes over the transverse colon and small intestine
Anatomy of the Digestive System

- Mouth
  - Where digestion begins
  - Mechanical and enzymatic (CHO & lipid)
- Cheeks, hard & soft palates, lips, oral cavity
- Tongue
  - Skeletal muscle covered by mucus membrane
  - Papillae – projections of lamina propria
  - Filiform – no tastebuds anterior 2/3 of tongue
  - Fungiform – most have tastebuds, numerous at tip
  - Circumvallate – posterior of tongue all have tastebuds
- Sour, salty, bitter, sweet, umami

Salivary Glands

- Secrete saliva as an exocrine gland
- 99.5% water
- 0.5% solutes
  - Ions – Na⁺, K⁺, Cl⁻, bicarbonate
  - Dissolved organics – urea, albumen, globulin, mucus
  - Digestive enzymes – salivary amylase & lingual lipase
- Parotid glands – duct empties by upper molar
- Submandibular glands – empties near lingual frenulum
- Sublingual glands – empties under tongue

Salivary Glands

Teeth

- Major regions
  - Crown
    - Above the gumline
    - Covered by enamel
  - Neck
    - Junction between crown and root
  - Root
    - Embedded in bone
Teeth

- Enamel (Crown)
- Calcium phosphate
- Calcium carbonate
- Hardest substance in body (95% Ca++ salts)
- Dentin
- Harder than bone
- 70% Ca++ salts
- Cementum (Root)
- Attaches root to periodontal ligament

Dentitions

- Deciduous (primary) or baby teeth
  - 6 mo – 32 mo
- Permanent (secondary) or adult teeth
  - 6 yrs to > 20 yrs

Esophagus

- Muscular tube to connect mouth to stomach
- UES
- LES
- Unique Histological Characteristics
  - Stratified Squamous Epithelium
  - Adventitia
Stomach
- Cardia
- Fundus
- Body
- Pyloric Antrum
- Pyloric Canal
- Pylorus
- Lesser curvature
- Greater curvature

Stomach Histology
- Gastric Pits
- Gastric Glands
- 3 Muscle Layers in Muscularis Externa
  - Inner Oblique
  - Middle Circular
  - Outer Longitudinal

Stomach Mucosa
- Surface mucous cells
  - In gastric pits
- Mucous neck cells
  - In gastric glands
- Parietal (oxyntic) cells
  - Secretes HCl
  - Secretes intrinsic factor
- Chief (zymogenic) cells
  - Secretes pepsinogen
- G-cells
  - Secretes Gastrin
  - Hormone
Accessory exocrine organs secreting into the small intestine

- Pancreas
  - Acinar cells secrete digestive enzymes
  - Ductal cells secrete bicarbonate
  - Pancreatic duct
  - Hepatopancreatic ampulla
  - Sphincter of Oddi

Accessory exocrine organs secreting into the small intestine

- Liver
  - Right & Left Lobes
  - Caudate & Quadrant Lobes
  - Biliary system
    - Left & Right hepatic Ducts
    - Common Hepatic Duct
    - Cystic Duct
    - Common Bile Duct
  - Specialized blood supply
    - Hepatic Artery
    - Hepatic Portal Vein
- Gall Bladder
  - Stores & Concentrates Bile

Liver Histology
Small Intestine

- Duodenum
  - Means Twelve
  - As long as the width of 12 fingers (10 inches)
  - Retroperitoneal
- Jejunum
  - Means Empty
  - Found empty in death
  - 3 feet
- Ileum
  - Means Twisted
  - 6 feet

Small Intestine

- Surface Area Adaptations
  - Circular Folds
    - Folds in mucosa and submucosa
    - 1 cm (0.4 inches)
    - Causes chyme to spiral
  - Villi
    - Gives velvety appearance
    - 0.5-1 mm
  - Microvilli
    - Projections of apical membrane
    - 1 µm

Histology of the Ileum

- Several microvilli from the duodenum
**Large Intestine**
- Cecum
- Blind pouch
- Ascending Colon
- Retroperitoneal
- Transverse Colon
- Descending Colon
- Retroperitoneal
- Sigmoid Colon
- Rectum
- Anal Canal

**Learning Objectives**
- Describe the functions of the digestive system
- List the organs of the digestive system
- What are the functions of the accessory organs
- Describe the hard and soft palates
- Describe the structures associated with the mouth and lips
Learning Objectives

- Describe the 3 pairs of salivary glands and their secretions
- Describe the difference between chemical and mechanical digestion
- Describe where chemical digestion of carbohydrates, lipids and proteins begin
- Describe the anatomy of a tooth
- Describe the 2 dentitions

Learning Objectives

- Discuss the different cells of the stomach mucosa and what their functions are
- Describe the area of the GI tract where most of the digestion and absorption takes place
- Describe the histology of the liver and its blood supplies
- List the different parts of the small and large intestine

Learning Objectives

- List the adaptations of the mucosa designed to increase surface area
- Describe the peritoneum and its many folds
- Define retroperitoneal and list organs of the digestive system which are retroperitoneal
- Describe the 4 main layers of the GI tract and discuss how these layers differ from area to area

Learning Objectives

- Define the following terms: peristalsis, bolus, chyme, haustra, haustral churning, tenia coli