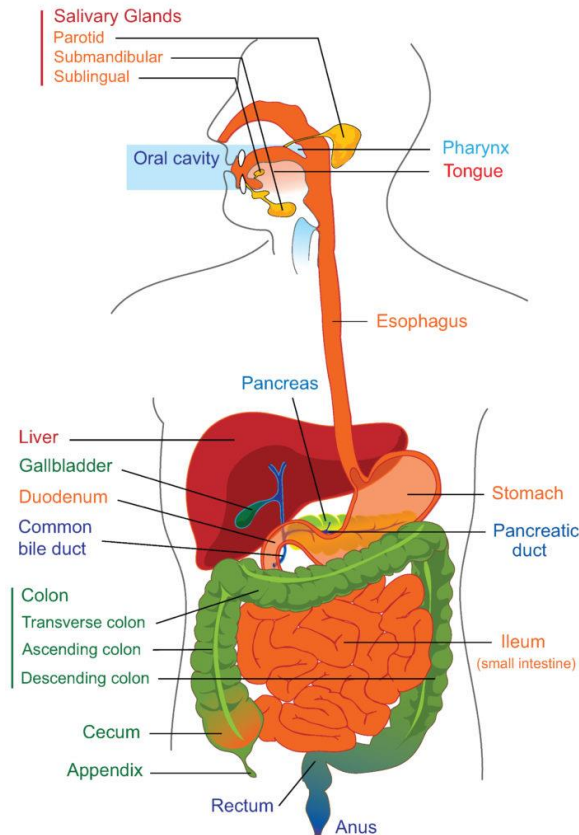
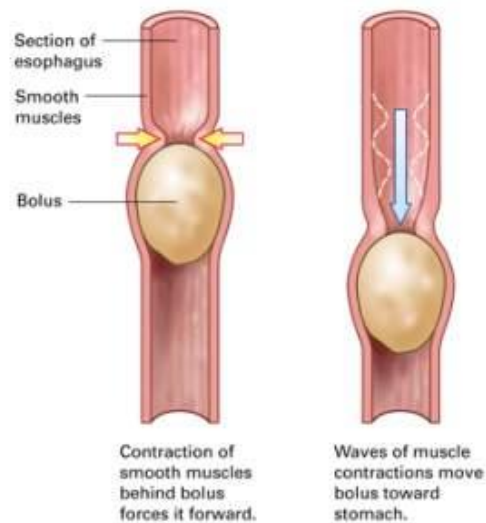


## Gastrointestinal System

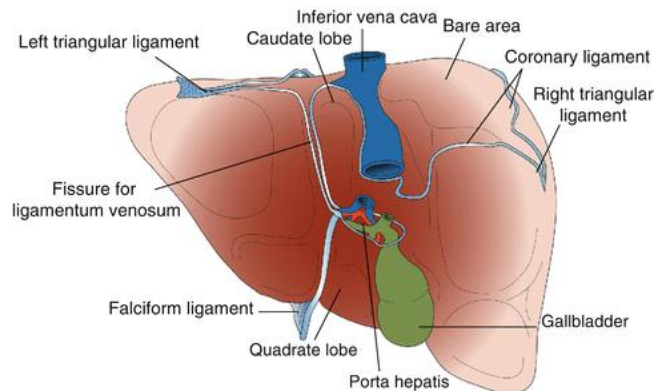
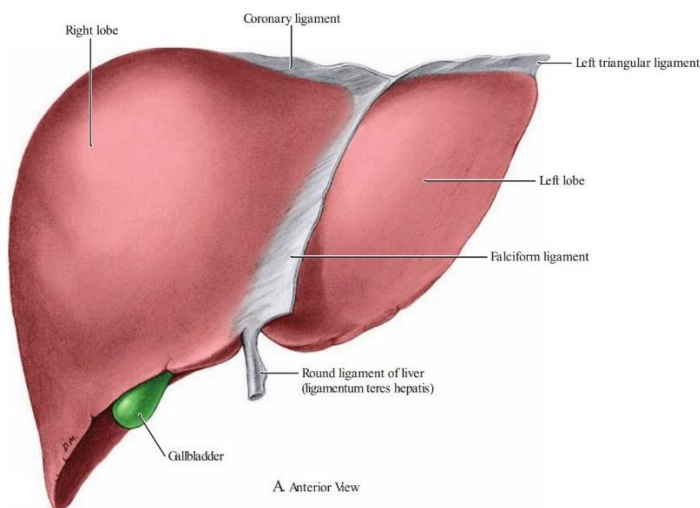


- **Key functions of digestive system**
  - Movement –allows mixing and passing of nutrients until they are eliminated
  - Secretion –enzymes, hormones, and other substances are secreted to help and promote digestion
  - Digestion –chemical breakdown of nutrients
  - Absorption –passing of nutrients through plasma membrane into blood or lymph
- **Mouth and stomach**
  - Digestion begins in the mouth with the presence of saliva and moves to pharynx, then larynx
  - Saliva
    - Act as enzymes that initiate breaking down of food
    - Secreted by salivary glands
  - Stomach
    - A flexible, muscular sac
    - Functions
      - Mixing and storing food
      - Dissolving and breaking down food via secretion
      - Controlling passage of food into small intestines
    - Protein digestion begins here
    - Peristalsis
      - Contraction and relaxation of smooth muscle in stomach to move nutrients
      - Allows nutrients to move small intestine

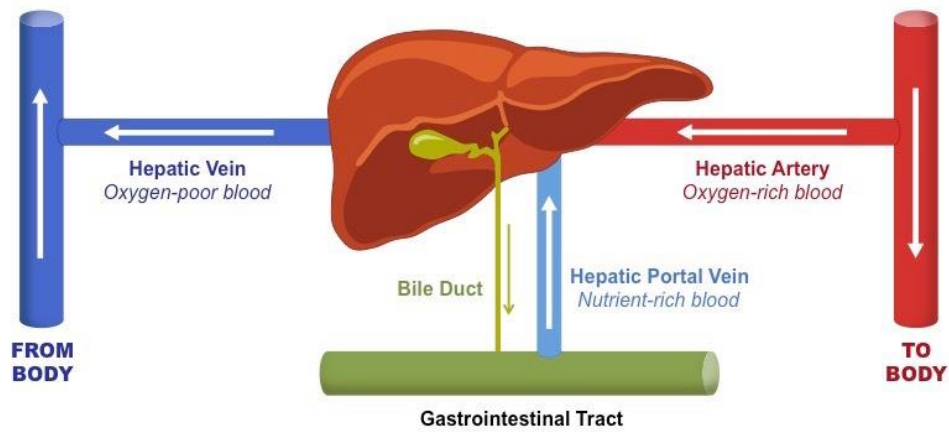


- **Liver**

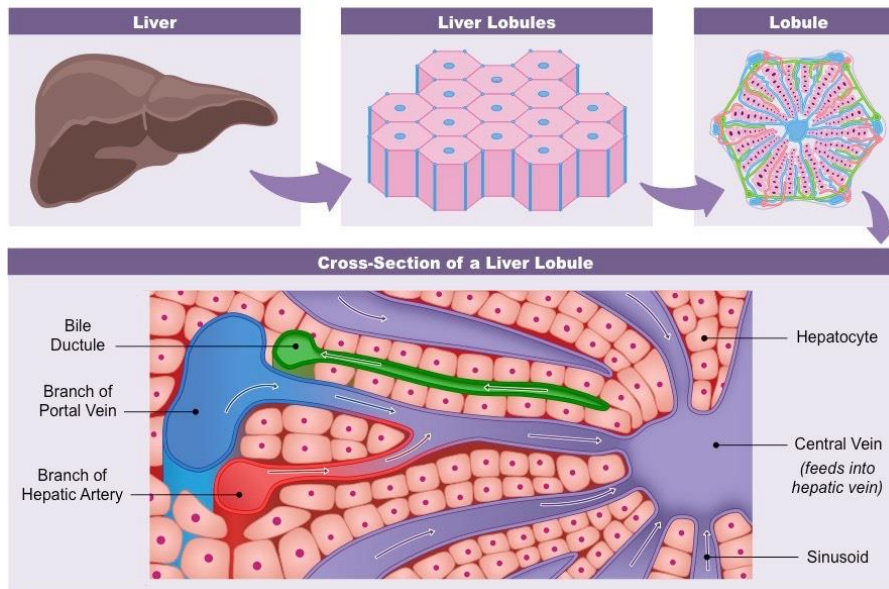
- Largest solid organ of body as well as largest gland
- Located below diaphragm on the right side of chest
- Made of 4 lobes
  - Right, left, quadrate, and caudat
- Attached to the wall by 5 ligaments
  - Falciform, coronary, right triangular, left triangular, and round ligament



- **Main function:**
  - Processes all of blood that passes through the digestive system
    - Hepatic portal vein -blood vessel that supplies nutrient rich blood to liver
    - Hepatic artery -blood vessel that supplies the liver with oxygen rich blood
    - Hepatic vein -blood vessel where blood leaves the liver

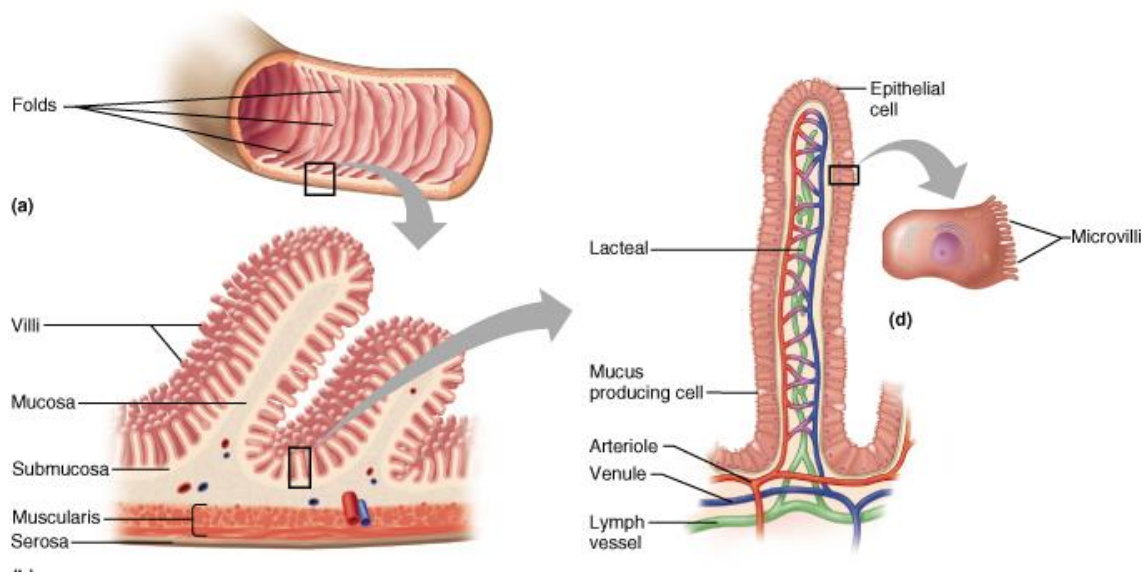


- Order of general blood flow through liver
  1. Hepatic portal vein/hepatic artery
  2. Liver
  3. Lobules
  4. Sinusoids
- Lobules and sinusoids
  - Lobules are functional units of liver made from many layers of liver cells

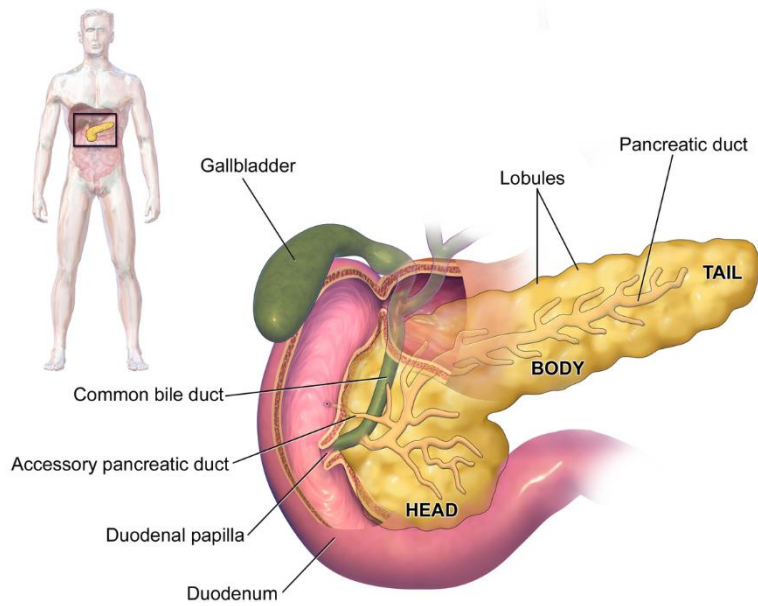


- Sinusoids are small channels where blood goes to once it leaves the lobules
- Functions of liver (except blood processing)
  - Production of bile, blood plasma membrane, and cholesterol
  - Storage of excess glucose in glycogen
  - Regulation of amino acids
  - Processing of hemoglobin
    - Hemoglobin stores iron
  - Conversion of toxic ammonia into urea (waste product found in urine)
  - Purification of blood
  - Regulation of blood clotting
  - Boosting immune factors and eliminating bacteria

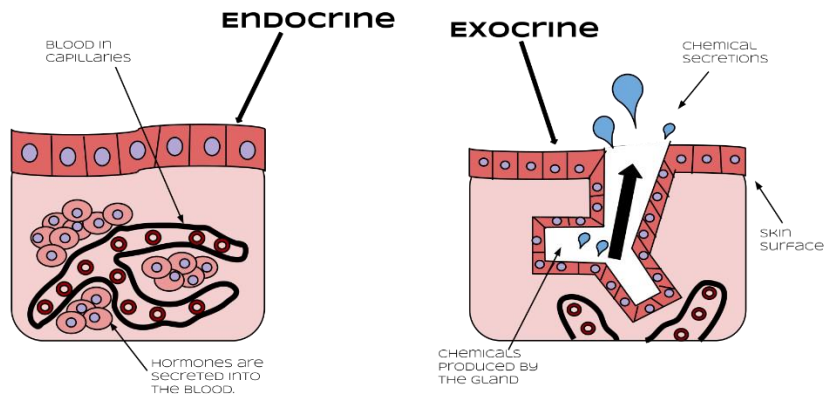
- **Small intestines**
  - Where absorption occurs
  - Enzymes are transported to the small intestines to aid digestion
    - Enzymes reaching to the small intestines come from pancreas, liver, and stomach
- **Bile and gallbladder**
  - Bile (secreted from liver) breaks down fat and gallbladder stores bile
- **Villi, chime, and microvilli**
  - Villi: tiny absorptive structures that increase surface area for interaction with chime
  - Chime: partially digested food that is semiliquid
  - Microvilli: epithelial cells at the surface of villi that further increase absorption in the small intestines -this is why the small intestines are called the “main absorption organ”



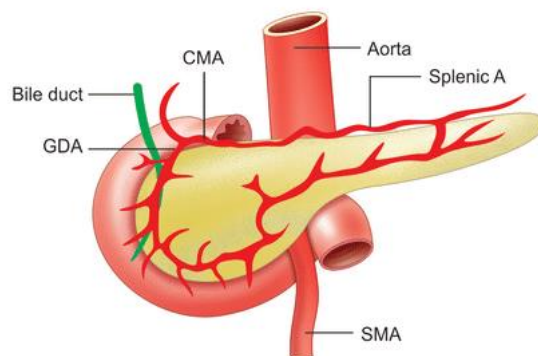
- **Large intestines/colon**
  - Function: concentrates, mixes, and stores waste material
  - Attached to rectum
    - Rectum -short tube for waste disposal
  - Process of eliminating waste
    - Rectal wall is distended as it's filled → nervous system stimulates body to expel waste from rectum → muscle sphincter attached to anus is stimulated → expelling of waste
    - Depends by volume of fiber and other undigested material present
      - Lesser volume = slower movement
- **Pancreas**
  - Located at the back of abdomen (behind stomach)
  - Divided into head (right side), body, and tail (left side)
    - Head (right) is wider and is near the duodenum
    - Tail (left) is narrower and is near the spleen
    - Body is between head and tail



- **Made of exocrine and endocrine tissues**
  - **Exocrine tissues contains many ducts that make up the pancreatic duct and secrete digestive enzymes**
    - **Main pancreatic duct is connected to bile duct**
  - **Endocrine tissue secrete hormones (like insulin) to bloodstream**



- **Blood supply to pancreas**
  - **Done by splenic artery, gastroduodenal artery, and the superior mesenteric artery**



- Digestive function
  - Secretion of enzymes to small intestines to aid in food breakdown, especially proteins and fats
  - Zymogens
    - Precursors to digestive pancreas enzymes
    - Secreted by acini (exocrine cells)
    - Are converted to active enzymes via chemical reaction (ex: pancreatic lipase and amylase)
  - Secretion of sodium bicarbonate to neutralize stomach acid that goes to small intestines
  - Wirsung's duct/main pancreatic duct: where pancreatic secretion enters to pancreas and exits to go to duodenum
- Role of hormones in pancreas
  - Hormones released in stomach and small intestines control secretions of pancreas