



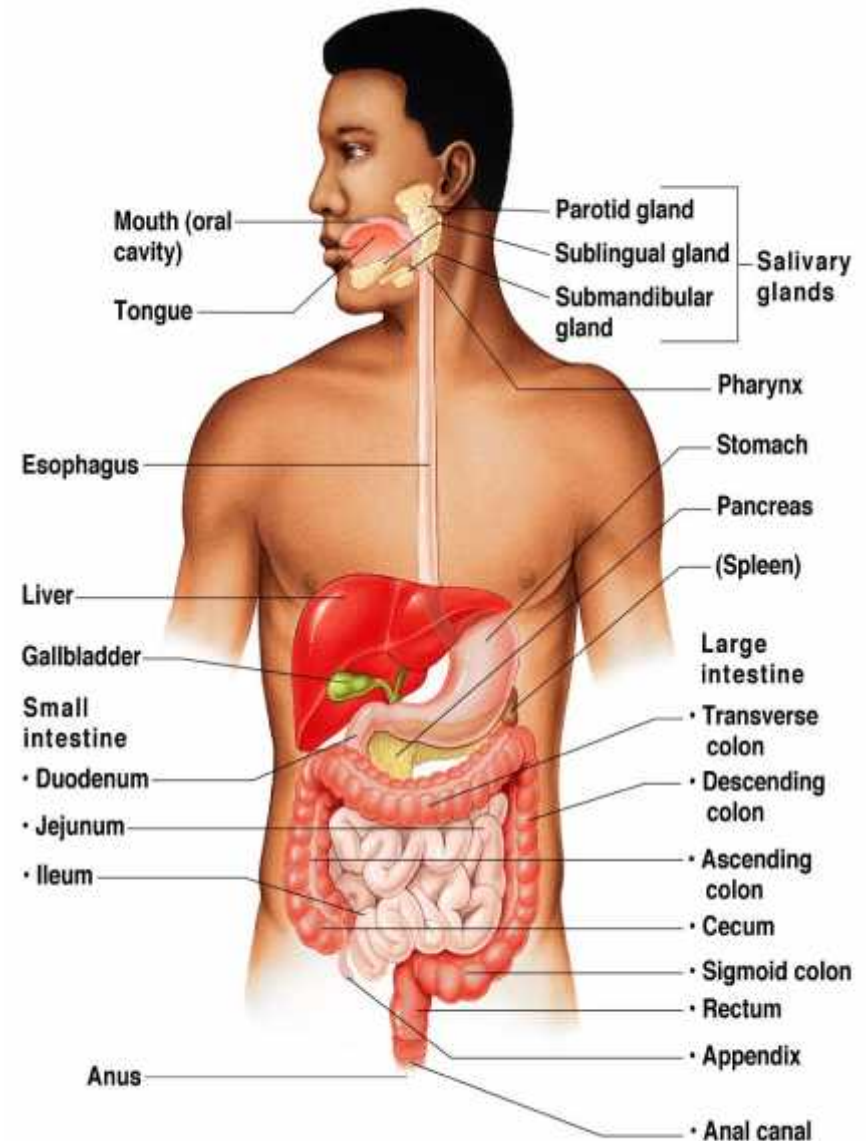
Lab 4: Digestive System
Ast. Lec. Mariam Ahmad Ali

Digestive system

- The digestive system is basically a tube with two openings: the **mouth**, and the **anus**
- The process of digestion has many stages, *the first of which starts in the mouth (oral cavity), where food enters.*
- Digestion involves the breakdown of food into smaller and smaller components which can be absorbed and assimilated into the body.
- The waste products of digestion are exit from the **anus**.

- 1: Mechanical processing and motility
 - Teeth, the tongue, and various muscle layers start the process and send food on its journey
- 2: Secretion
 - Release of enzymes & chemicals for digestion and absorption
- 3: Digestion
 - Chemical breakdown of food - small molecules absorbed
- 4: Absorption
 - Nutrients move into the blood
- 5: Elimination
 - Undigested and unabsorbed residues excreted

Digestion occurs in 5 stages



The first step- Chewing and swallowing

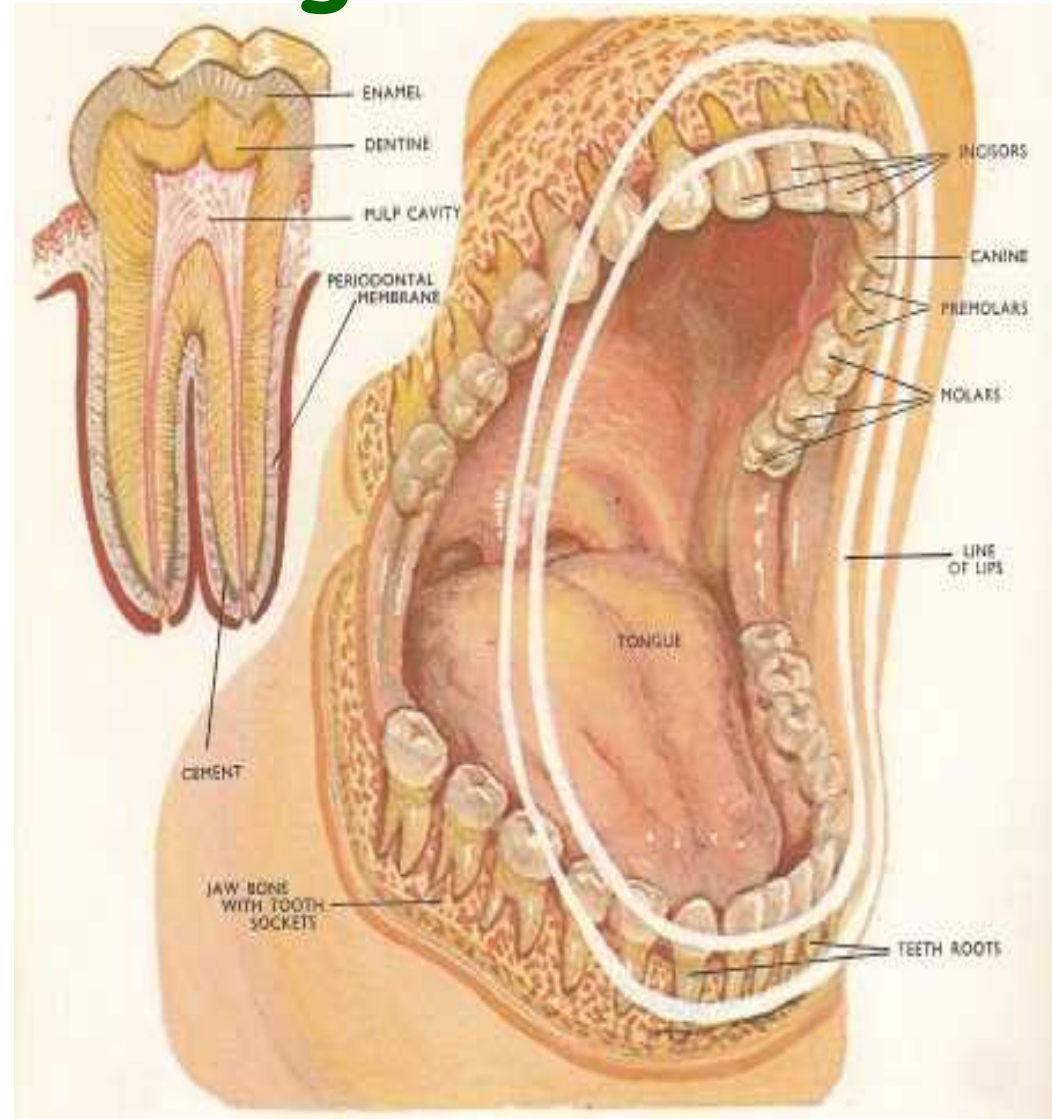
Types

– Mechanical (physical)

- Chew
- Tear
- Grind
- Mash
- Mix

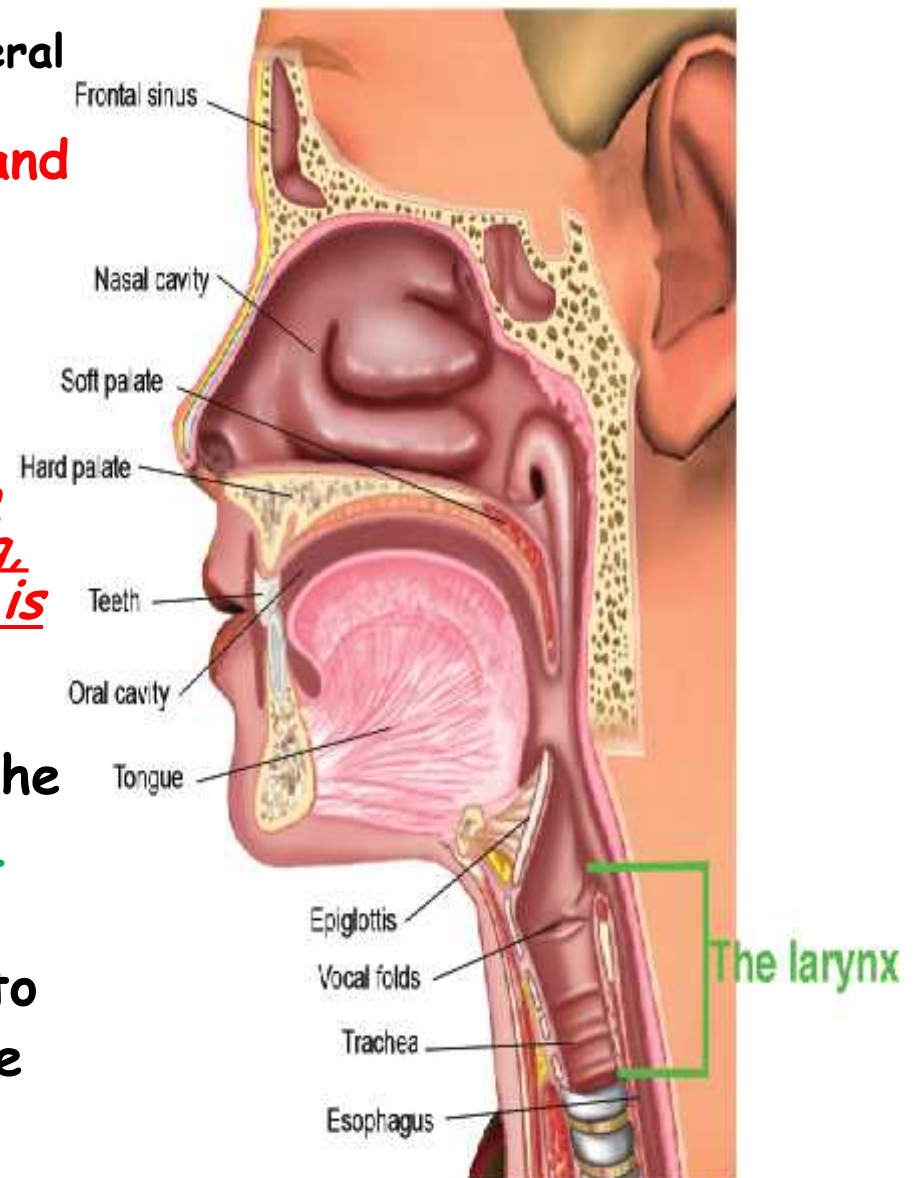
– Chemical

- Enzymatic reactions to improve digestion of
 - Carbohydrates
 - Proteins
 - Lipids

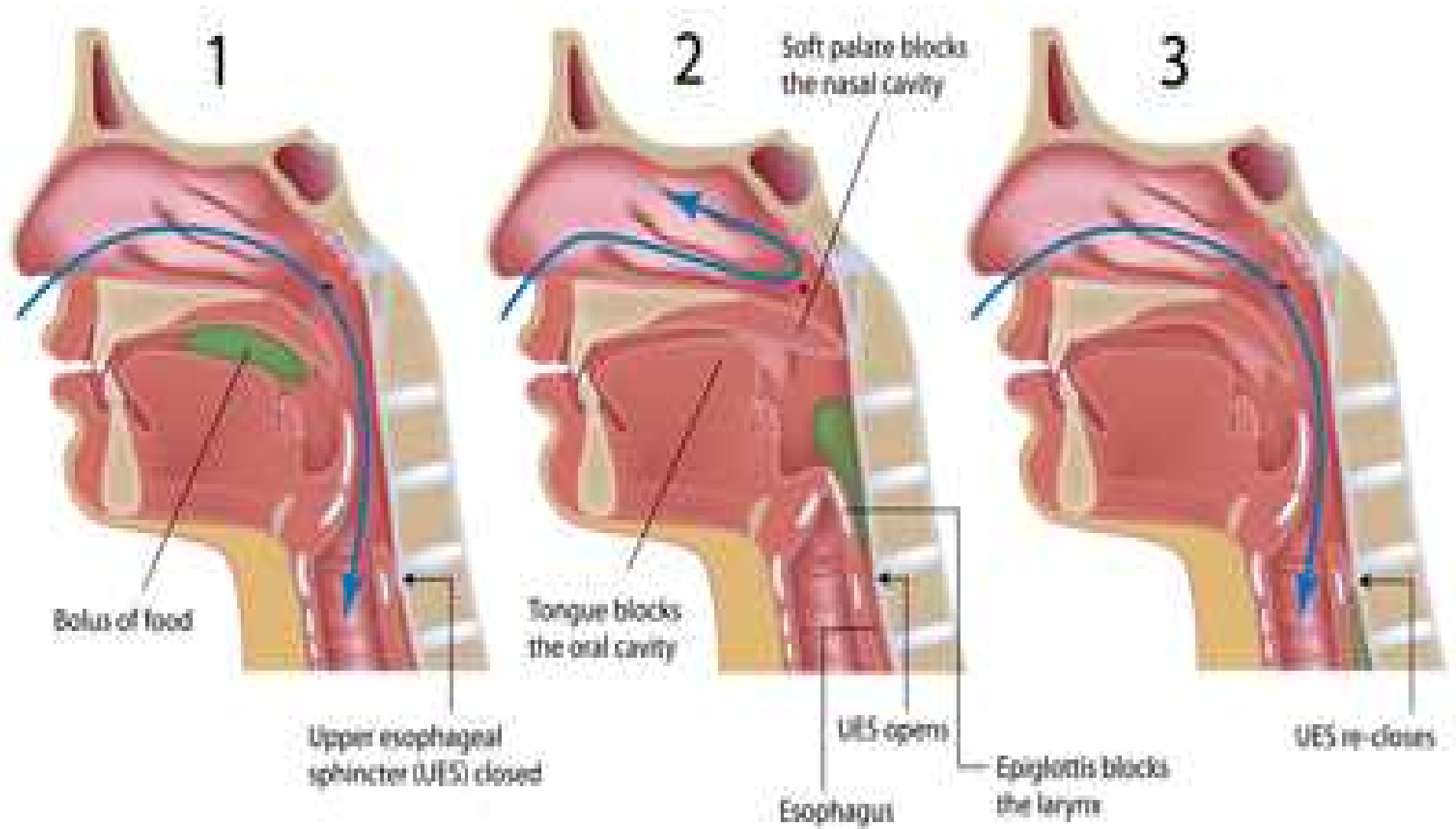


The first step- Chewing and swallowing

- Chewing mixes food with saliva from several salivary glands
- **Submandibular gland, Sublingual gland**
- Saliva contains **amylase**
 - helps break down starch.
- **Mucins**
 - Proteins that help bind food bits into lubricates ball for easier swallowing, this ball is called a **bolus** when it is swallowed
- Tongue muscle contractions force the **bolus** into the **pharynx, the throat.** This passageway connects with the windpipe, or **trachea**, which leads to the **lungs**. It also connects with the **esophagus**, which leads to the **stomach**

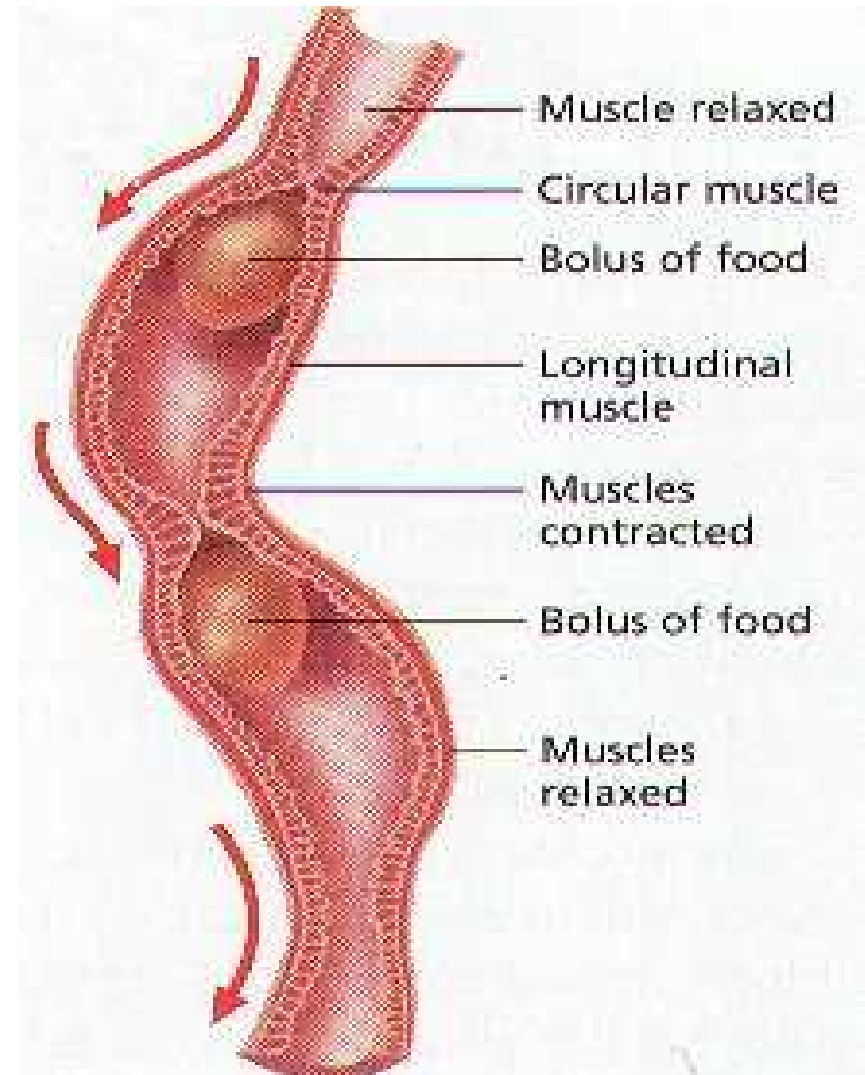


Swallowing



The Esophagus

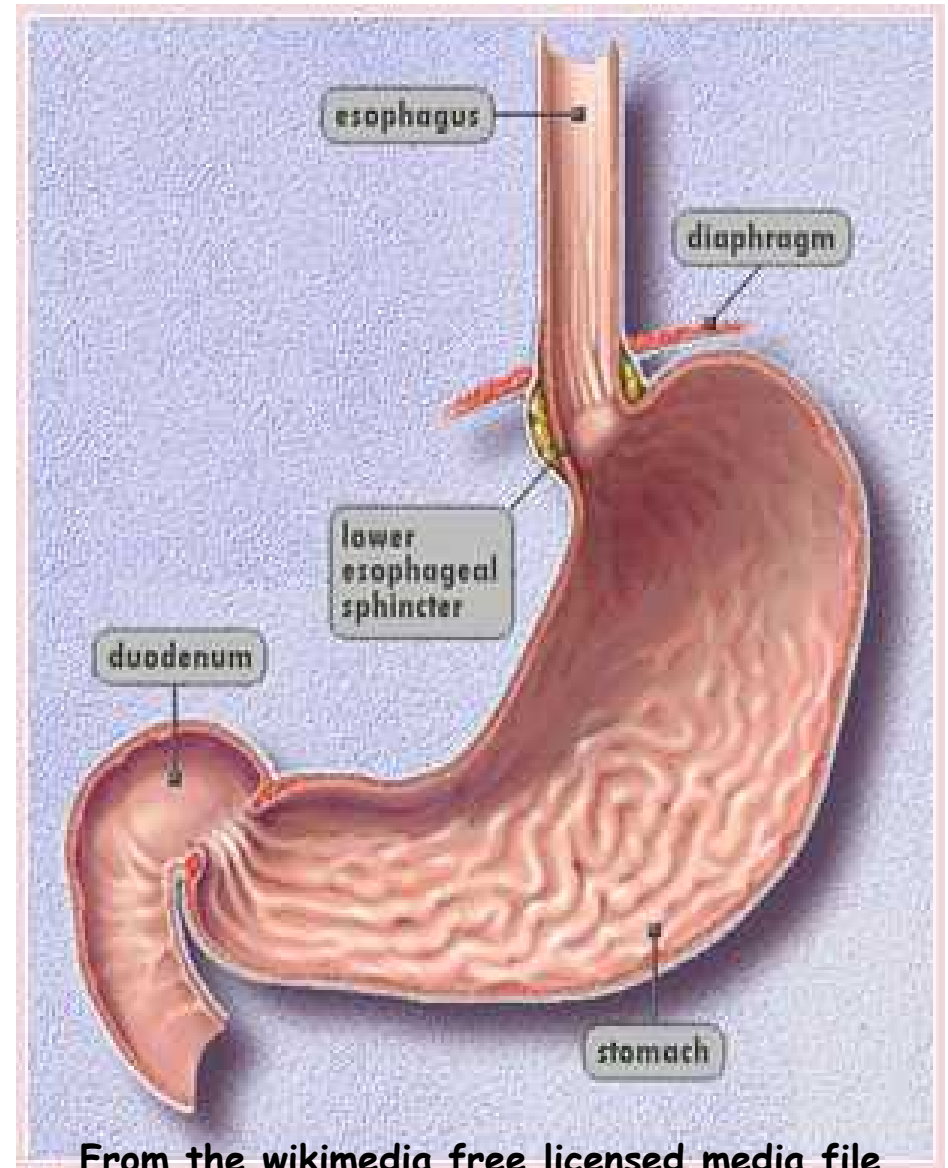
- Approximately 10" long
- Functions include:
 - Secrete **mucus**
 - Moves food from the throat to the stomach using muscle movement called peristalsis
- A good way to describe peristalsis is an ocean wave moving through the muscle.
 - Has no role in chemical digestion
- all it does is bring food (**BOLUS**) to stomach.
- Sphincters - ring of muscle that encircle tubes.
 - Contraction closes tubes
 - Keeps acid in stomach - usually!



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The Stomach- Digestion and Storage

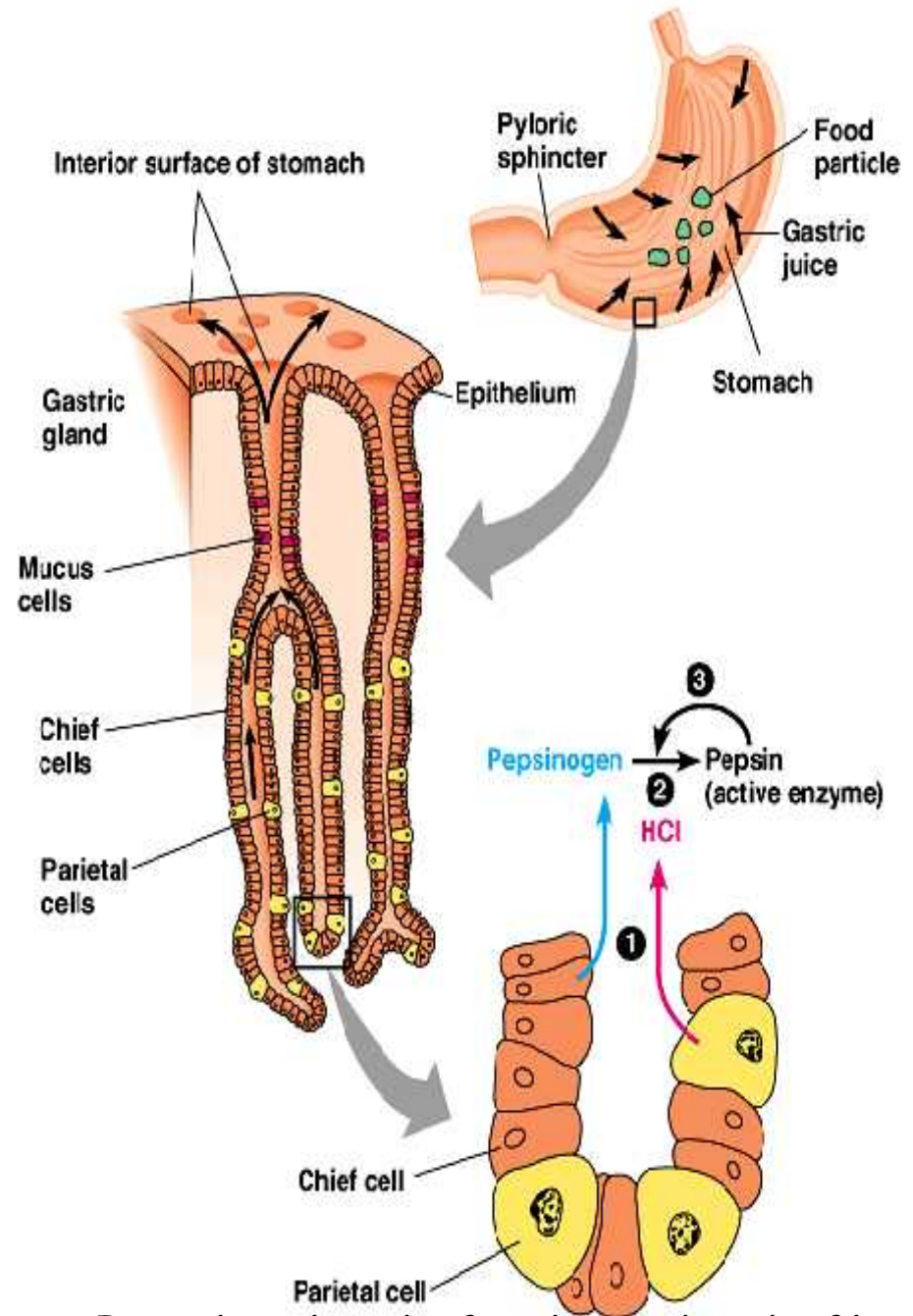
- The stomach acts as a temporary storage site for food.
- Food usually spends about 4 hours in the stomach.
- It has ridges which allow it to expand to store about 1.5 litres of food.
- The stomach is also the site of initial protein digestion.



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The Stomach- Digestion and Storage

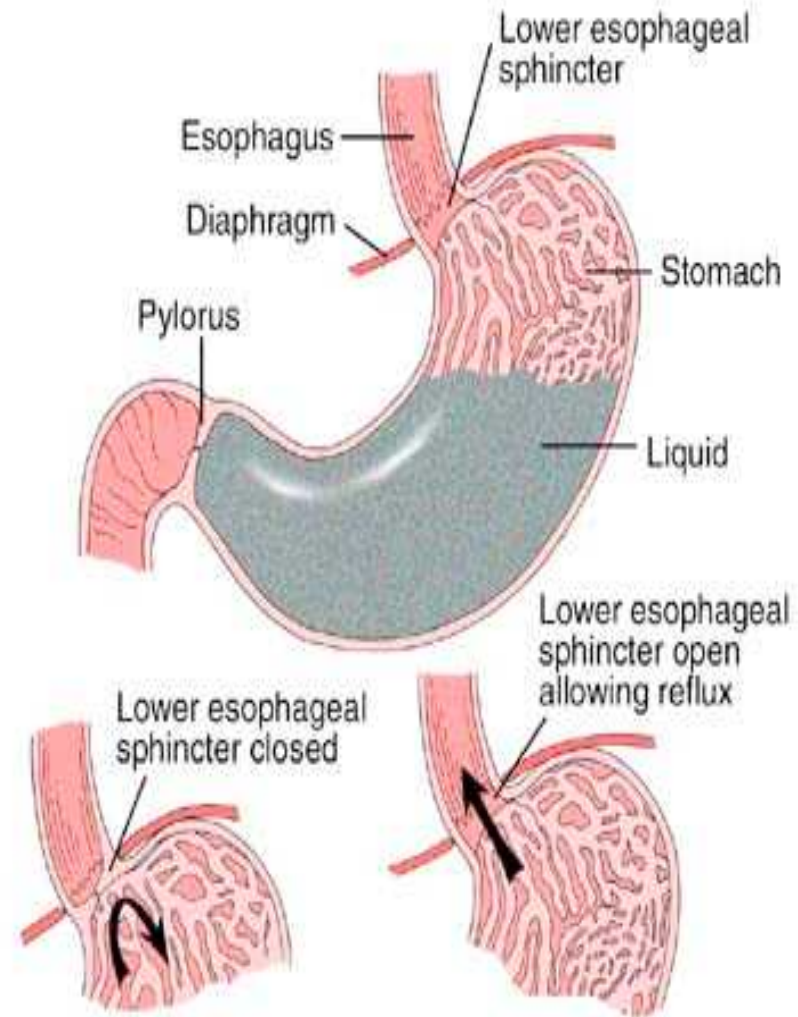
- Millions of cells lining the stomach secrete various fluids known collectively as gastric fluids.
- Gastric fluid consists of mucus, hydrochloric acid, pepsinogens and other substances.
- Mucus coats and protects the lining of the stomach.
- Hydrochloric acid kills any harmful substances that have been ingested and it also converts pepsinogen into pepsin.
- ***Pepsin*** is a protein digesting enzyme that breaks large protein chains into smaller chains.



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The Stomach- Digestion and Storage

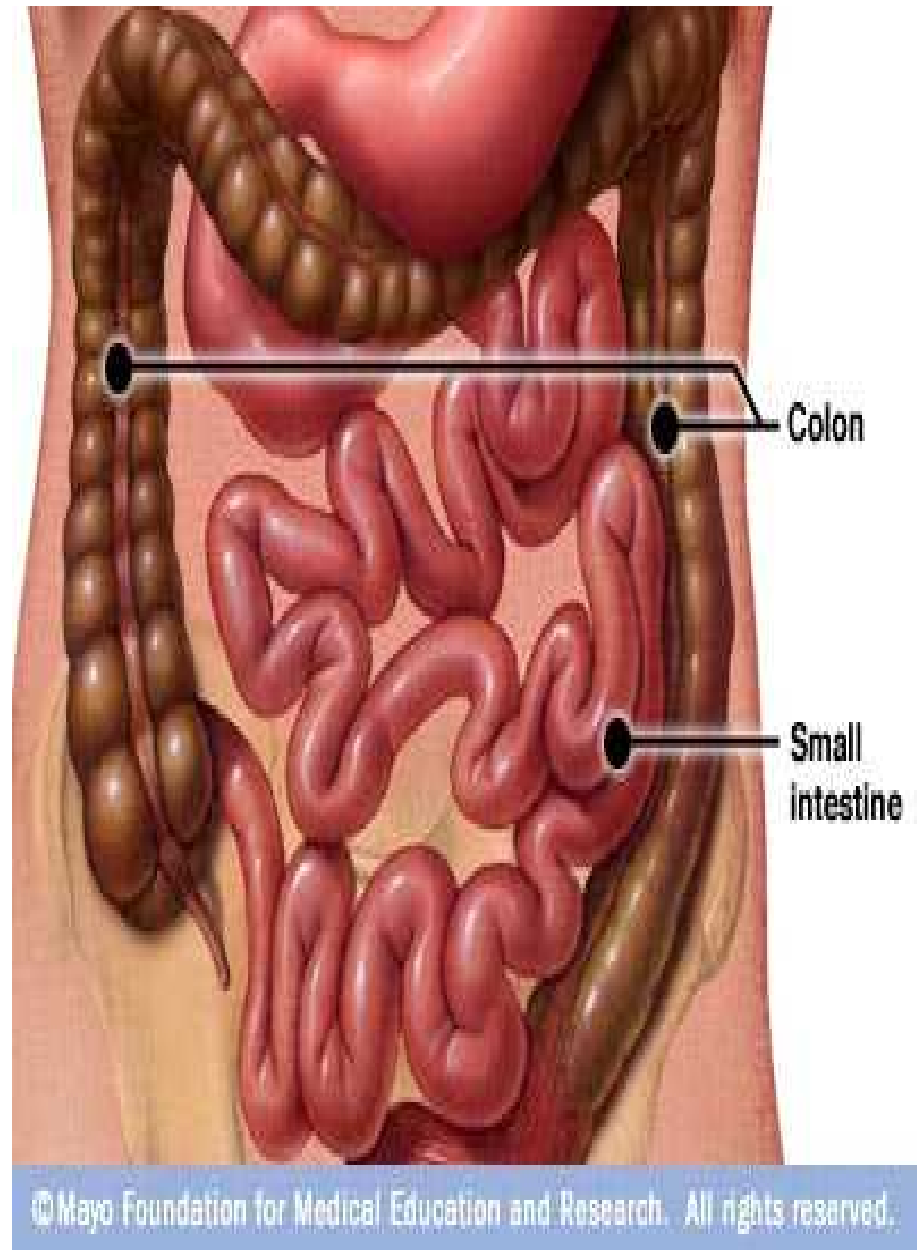
- Movement of food into and out of the stomach is controlled by circular muscles known as **sphincters**.
- One at the top of the stomach allows food from the esophagus to enter and prevents food from going back up into the esophagus.
- Another located at the bottom slowly releases partially digested food into the small intestine.
- Alcohol and some water are absorbed here - **food is not.**
- The partially digested food is called **chyme.**



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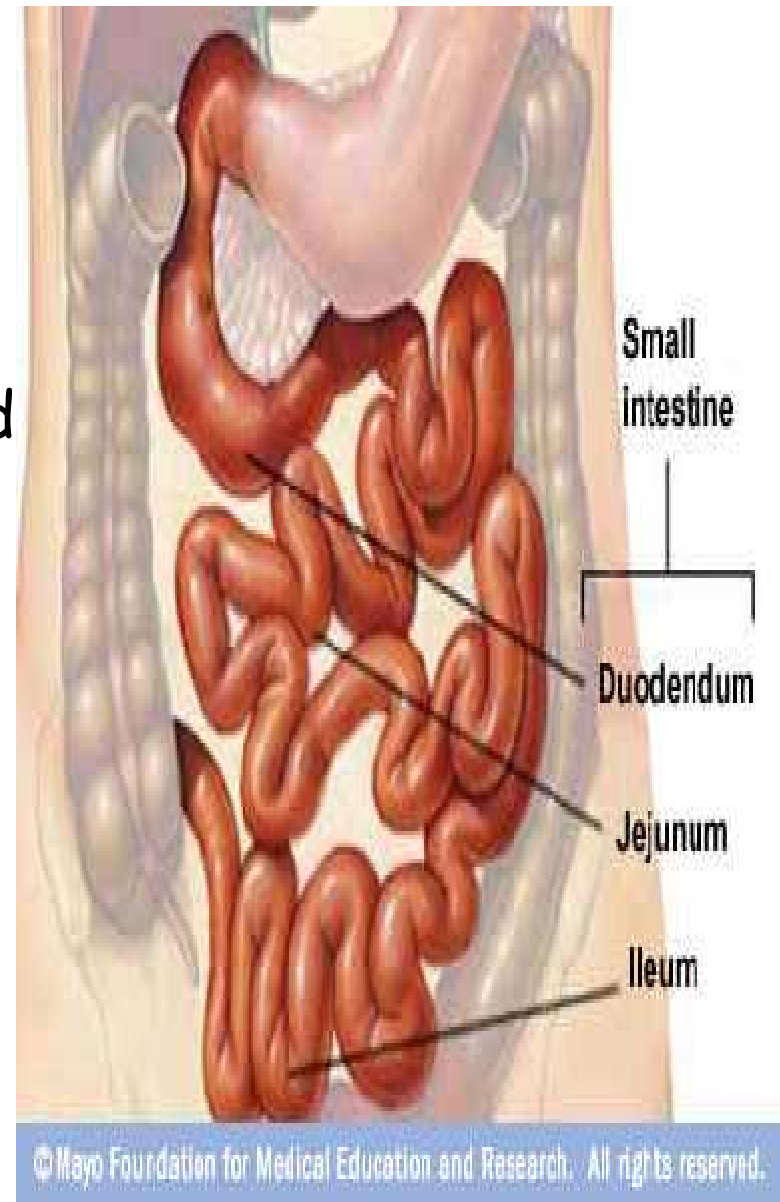
The Intestines

- The intestines are named for their diameter, not length.
- The small intestine is up to 7 m in length but only 2.5 cm in diameter.
- The large intestine (also known as the Colon) is only 1.5 m in length but 7.6 cm in diameter.



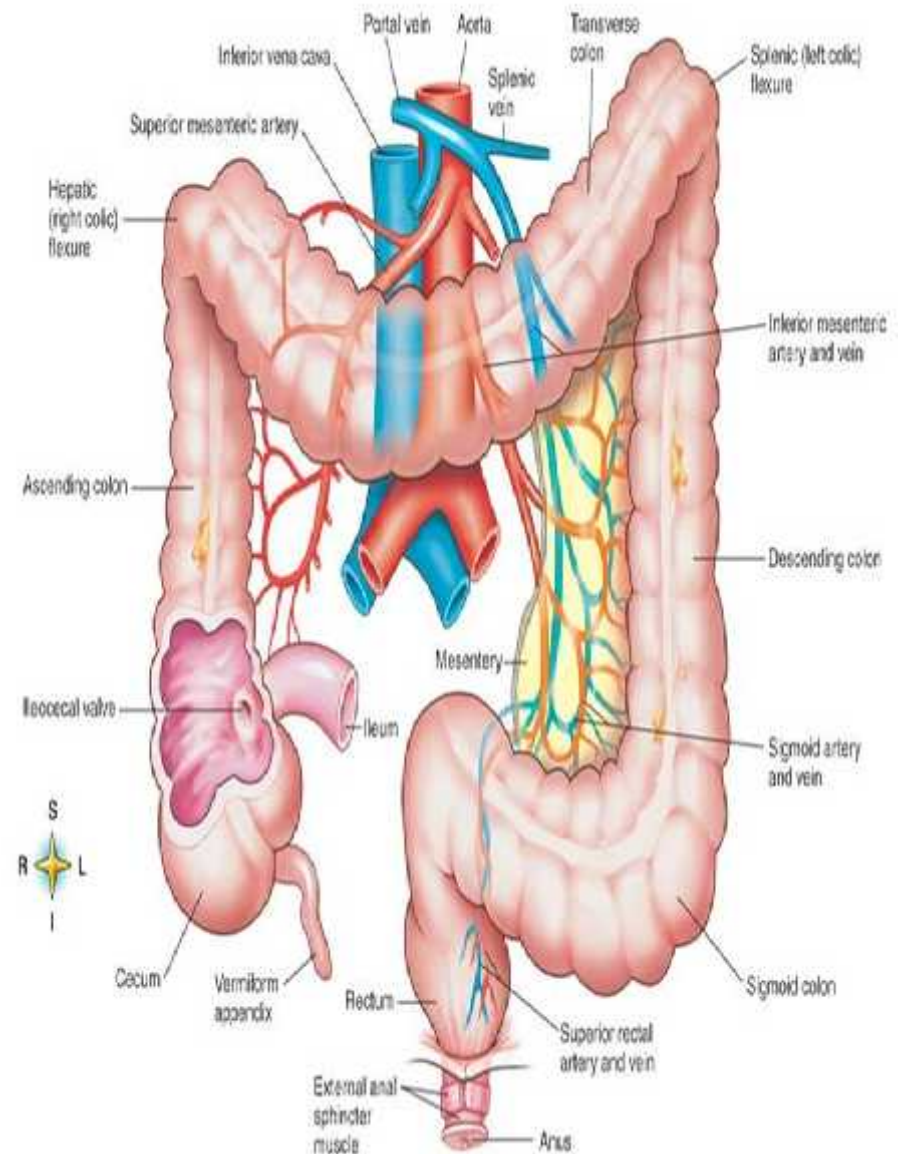
The small intestine

- Where much of the digestion and absorption of food takes place.
- It receives bile juice and pancreatic juice through the hepato-pancreatic duct, controlled by a sphincter
- The small intestine is where most chemical digestion takes place.
- Most of the digestive enzymes that act in the small intestine are secreted by the pancreas and enter the small intestine via the pancreatic duct



- 4-1/2 feet long
 - Absorbs water, salts and some vitamins
- Stores indigestible material for defecation
- Contains the:
 - Cecum (blind end of ascending colon).
 - Appendix located here.
- Colon- Ascending, Transverse, Descending and Sigmoid.
- The sigmoid Colon enters Rectum (last 20 cm of large intestine, where it opens at the Anus.

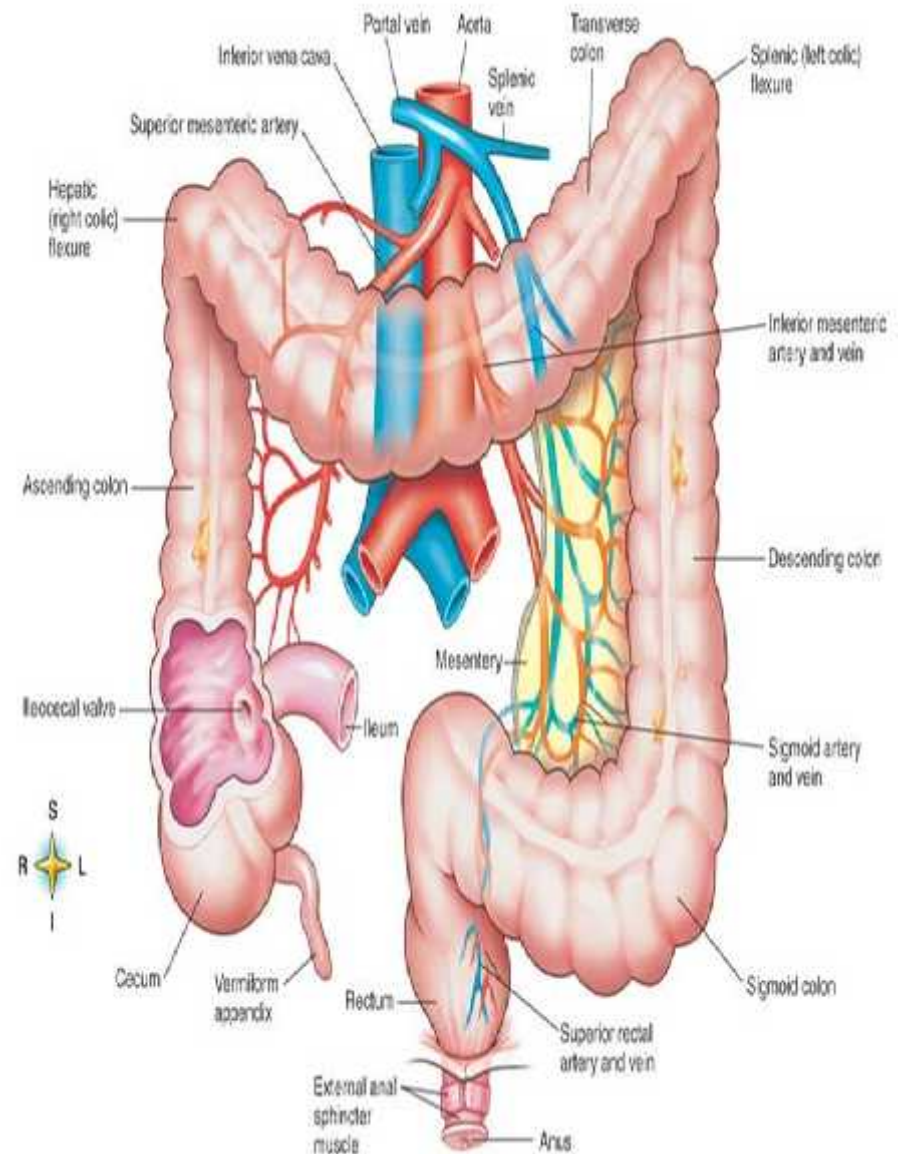
The large Intestine



- Functions

- Bacterial digestion
- Ferment carbohydrates
- Protein breakdown
- Absorbs more water
- Concentrate wastes
- Solid materials pass through the large intestine.
- These are undigestible solids (fibers).
- Water is absorbed.
- Vitamins K and B are reabsorbed with the water.
- Rectum- solid wastes exit the body.

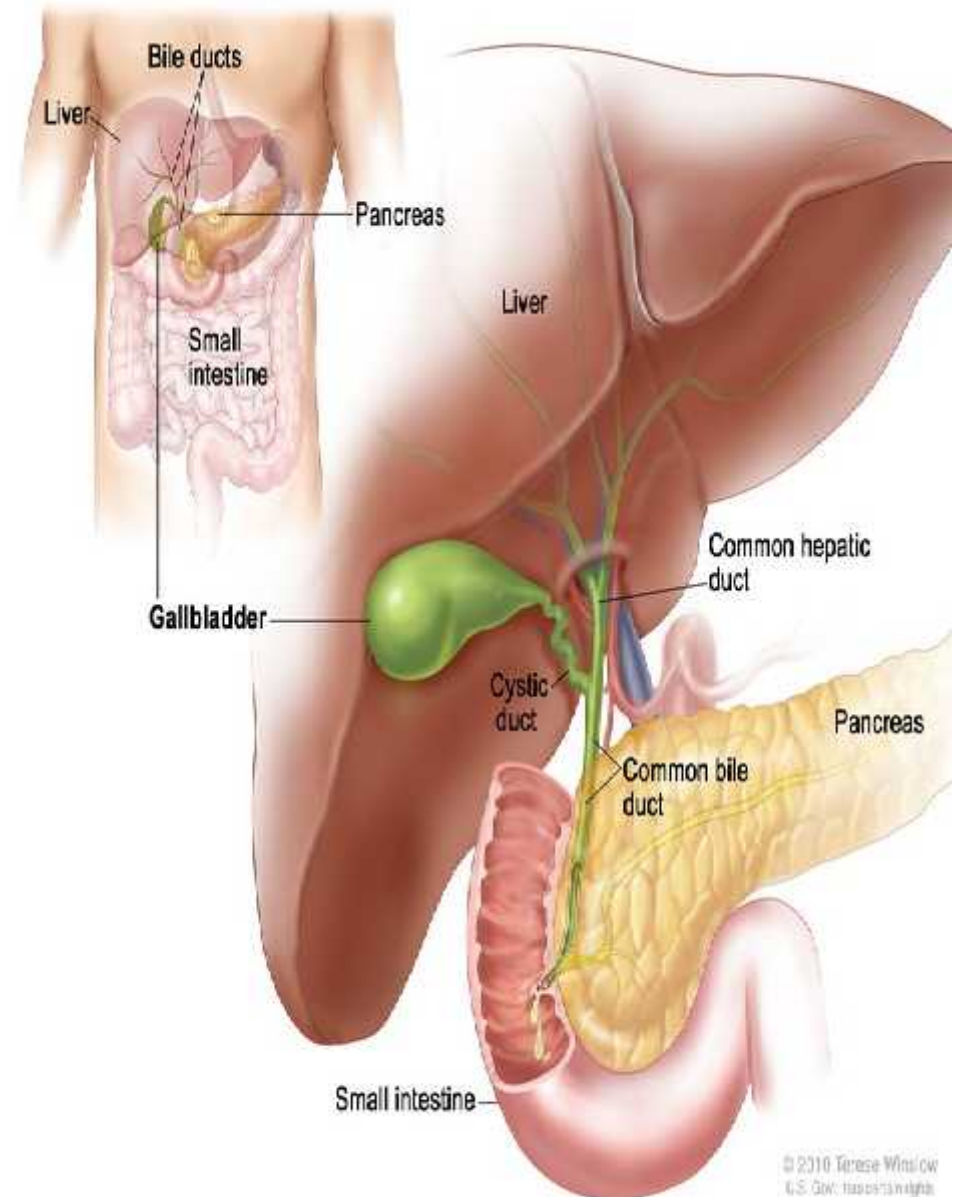
The large Intestine



The Accessory Organs

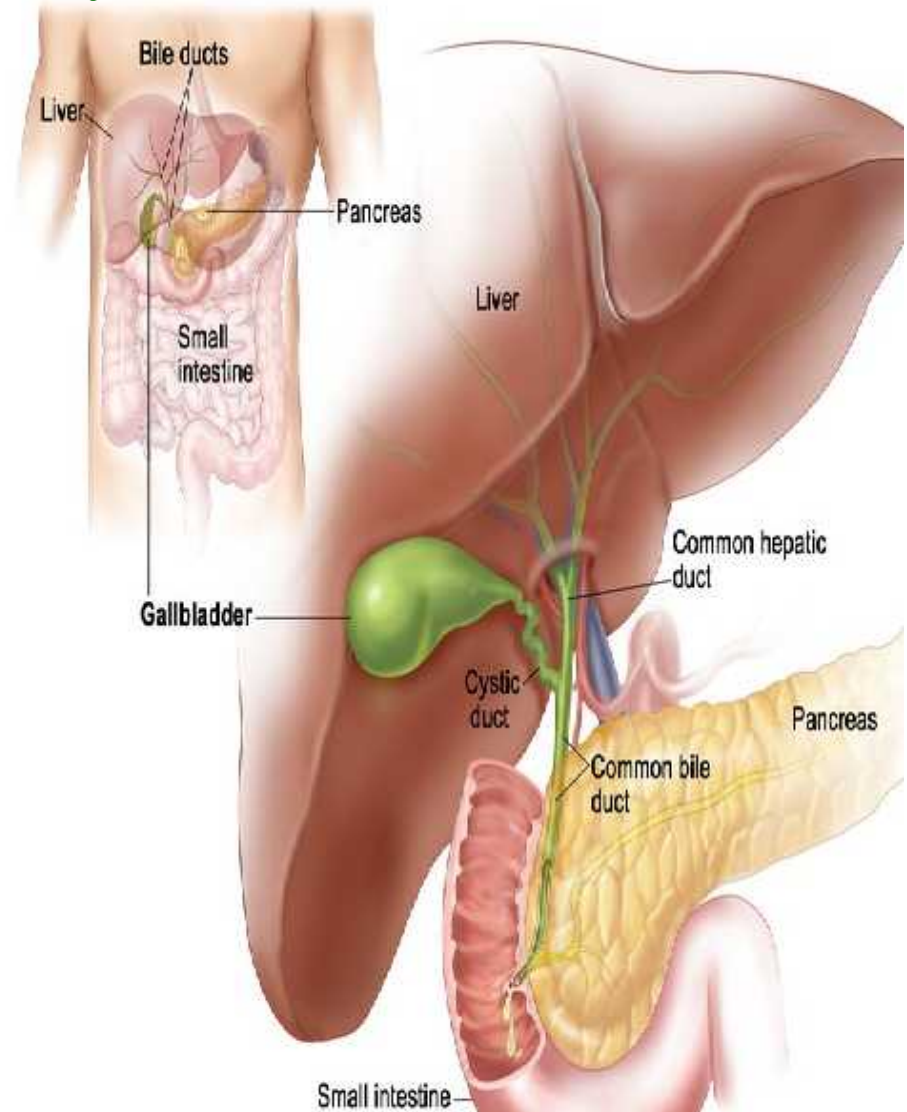
- The Liver:

- 100,000 *lobules* monitor and clean blood, produce bile for gallbladder.
- Detoxify blood, store iron, vitamins A, D, E and K.
- Helps regulate blood sugar (glycogen, glycerol, Amino acids), destroys old blood cells.
- Helps regulate cholesterol (bile salts).
- Makes urea which is worked on by kidneys



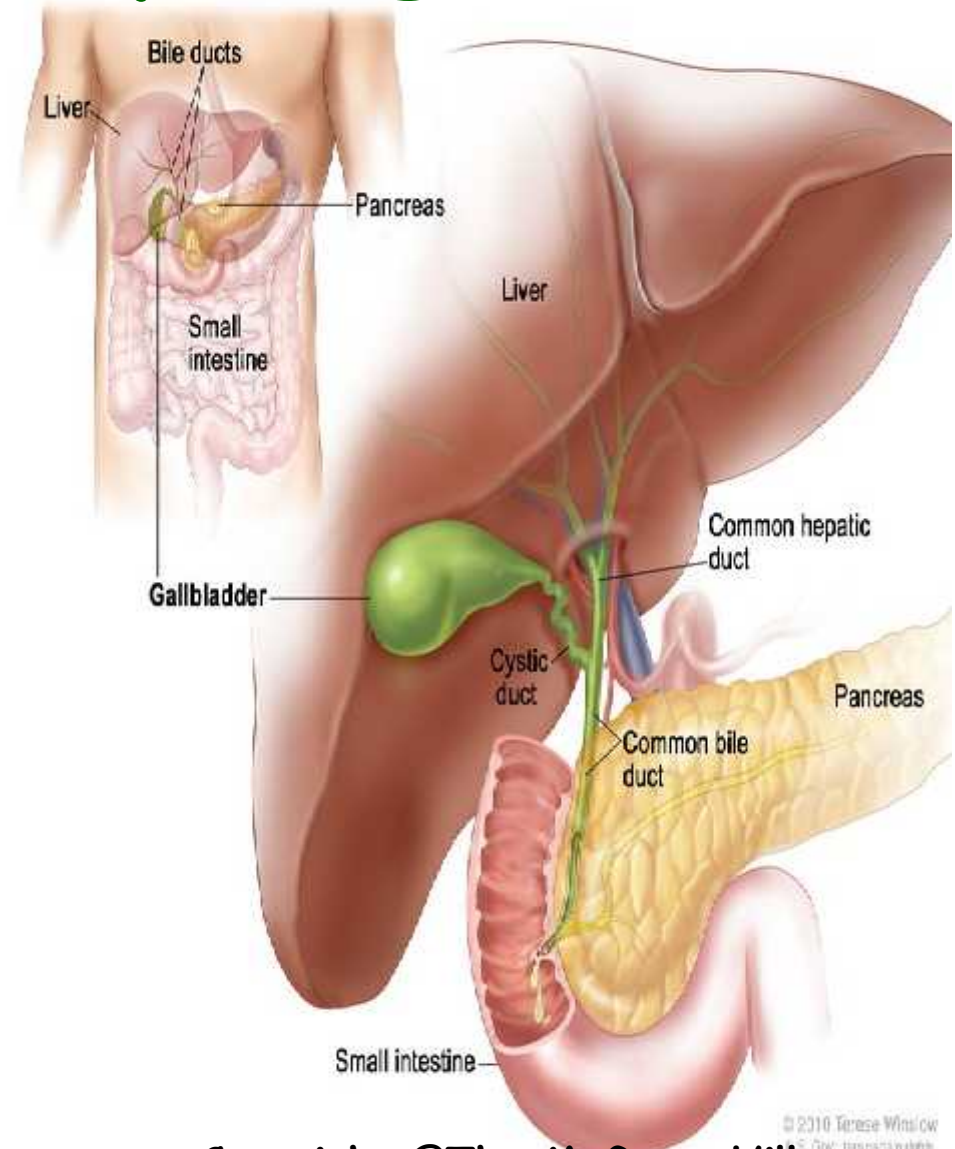
The Accessory Organs

- **The Gall Bladder:**
- Pouch structure located near the liver which concentrates and stores bile
- **Bile duct** - a long tube that carries BILE.
- The top half of the common bile duct is associated with the liver.
- The bottom half of the common bile duct is associated with the pancreas, through which it passes on its way to the intestine.
- Bile emulsifies lipids (physically breaks apart FATS)



The Accessory Organs

- The pancreas:
- An organ which secretes both digestive enzymes (exocrine) and hormones (endocrine)
- Pancreatic juice digests all major nutrient types.
- Exocrine pancreas produces NaHCO_3 , amylase (starch), trypsin (protein) and lipase (fat).
- Endocrine pancreas produces insulin and glucagon.



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