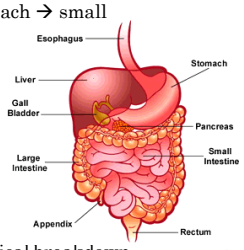
The Digestive System

Body Systems Part 4

The Digestive Tract

- Mouth→ esophagus → stomach → small intestine→ large intestine



2 major mechanisms:

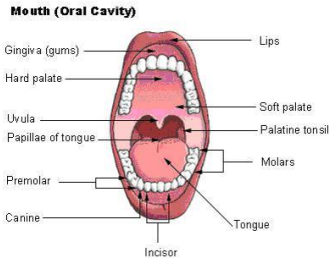
- Mechanical digestion– physical breakdown
- Chemical digestion– breakdown by enzymes

What's getting Broken down?

- Macromolecules:
  - Starch
  - Fatty Acids
  - Protein

- Micromolecules:
  - Carbohydrates→ glucose, fructose etc
  - Lipids→ simple fat globules
  - Protein chain→ single proteins

The Oral Cavity

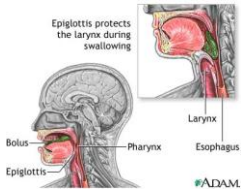


The Oral Cavity

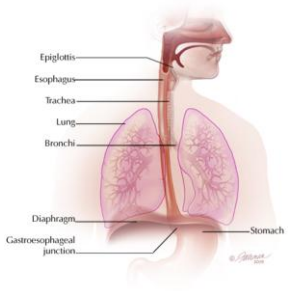
- **Mechanical Digestion in the Oral Cavity**
  - **Teeth**: Incisors, canines, pre molars and molars. Solid food masses are torn, ground, shaken.
  - **Tongue**: manipulates food during chewing pushing it back to the molars.
- **Chemical digestion in the Oral Cavity**
  - **Salivary glands**: on the sides of the mouth, produce *amylase* a chemical enzyme that breaks down starch and helps moistens food
- Result is a moistened ball-like mass called a *bolus* that moves down into the digestive tract

Oral Cavity Continued

- The bolus passes through the pharynx and glides over the *epiglottis* (a trap door to prevent food from entering the trachea)
- Food then drops into the *esophagus*



The Esophagus



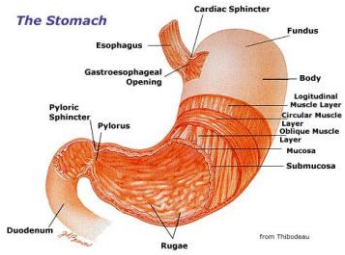
The Esophagus

- A muscular tube, 2cm in diameter that connects the pharynx to the stomach
  - **Cardiac sphincter**: point of connection between the esophagus and stomach
  - The cardiac sphincter prevents reflux of food from the stomach to esophagus. *What happens when the constriction is weak?*

The Esophagus Continued

- **Mechanical Digestion in the esophagus**:
  - *peristalsis* occurs in the digestive tract. Peristalsis is a series of **muscle contractions.** In the esophagus it allows the *bolus* to move down from esophagus and into the stomach.
  - Ex. An orange being pushed through a nylon sock.

The Stomach



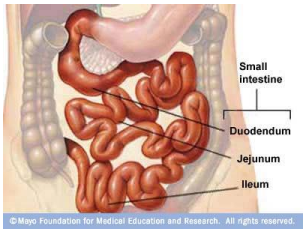
The Stomach

- A J-shaped organ that can hold app. 1.5 L of food
- The stomach is where most of the chemical digestion occurs
  - **Hydrochloric acid**, pH of 2 : (1) breaks down carbohydrates and fats. (2) sterilizes upper digestive tract
  - **Pepsinogen**: converted to enzyme *pepsin* in the stomach which breaks down proteins
  - **Rennin**: an enzyme found in the stomach of children, clots milk to allow for greater absorption of nutrients

The Stomach Continued

- The resulting liquefied paste is called *chyme*
- *Chyme* is then released into the small intestine, controlled by the *pyloric sphinctor*
- Peristalsis continues in the stomach (mechanical), which allows the movement of chyme from the stomach to the small intestine

The small intestine



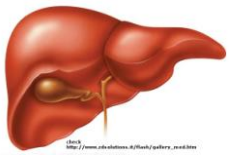
Small intestine

- Is the major site of digestion and absorption in to the body's internal system
- three major parts : duodenum, jejunum, ileum
- The small intestine is approximately 6m long. Called small because of the diameter

Small intestine continued

- Mechanical digestion occurs in the small intestine, through segmented movements
- Chemical digestion occurs with chemicals released from the liver and pancreas (intestinal juices)
- 80% of all absorption occurs in the small intestine. The remaining occurs in the stomach and the large intestine

The Liver (duct)

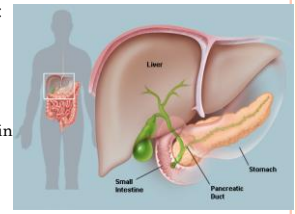


- produces enzymes for digestion, filters poisons, wastes and harmful substances out of the bloodstream (detoxification)
- Releases *bile* a fat metabolizer by stimulating the gall bladder
- Releases CCK- cholecystokinin which stimulates the gall bladder to contract and release bile

The Pancreas

- Pancreatic fluid contains:**sodium bicarbonate** ($NaHCO_3$). This neutralizes the acidity of the fluid arriving from the stomach raising its pH to about 8.
- Pancreas also releases:
  - Pancreatic amylase
  - Pancreatic lipase

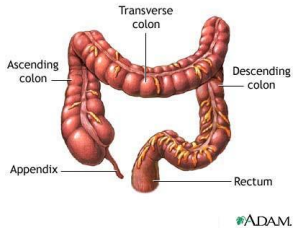
  Proteases:
  - Pancreatic trypsin
  - Pancreatic chymotrypsin
  - Pancreatic elastine



Sidebar on cell division

- Cells in the stomach are constantly dividing. In fact stomach cells and intestinal cells have the shortest lifespan and fastest division rate. Why?

Large intestine



The large intestine

- Consists of the: caecum, colon and rectum
- The main function of the large intestine is to reabsorb water and vitamins
- The large intestine is called large because of its larger diameter, in length it is 1.5 m long
- The large amounts of water secreted into the stomach and small intestine by the various digestive glands must be reclaimed to avoid dehydration. If the large intestine becomes irritated, it may discharge its contents before water reabsorption is complete causing **diarrhea**. On the other hand, if the colon retains its contents too long, the fecal matter becomes dried out and compressed into hard masses causing **constipation**.

Questions

- Draw a diagram to explain how food ingested into the digestive tract is really still part of the outside world
- Explain how peristalsis moves a bolus of food from the mouth to the stomach. What is the role of the epiglottis?
- Make a list of enzymes in the different organs of the digestive system. What macromolecules get broken down?
- List ways that mechanical and chemical digestion differ.
- What is the function of hydrochloric acid in the stomach. State the normal pH level of the stomach
- Comment on the appropriateness of names “small” and “large” intestines.

Homework

- Reading
- questions