

Digestive System

I. Digestive Processes

- A. Ingestion, Movement of food (peristaltic contractions), Digestion, (mechanical and chemical), Absorption and Defecation

I. GI tract

A. GI Tract-(hollow tube from mouth to anus)

1. Four layers

- a) mucosa (inner most layer containing glandular epithelium), submucosa (contains blood vessels), muscularis (smooth muscle moves food by peristalsis) and serosa (protective outer layer)

B. Mouth

1. **Functions:** Mechanical break down of food, initiates chemical break down of carbohydrates, lubricates food and allows for taste

C. Throat (Pharynx)

1. Nasopharynx- back of nasal cavity
2. Oropharynx- back of oral cavity
3. **Epiglottis**- flap of tissue that blocks off trachea to prevent food from entering the lungs.

D. Esophagus (10")

1. Muscular tube that extends from the throat (glottis) to the stomach.
 2. The food is moved down the esophagus by waves of contraction called peristalsis.
 3. At the bottom of the esophagus is the esophageal sphincter which prevents the back flow of material from the stomach.
- a) **Hiatal hernia**- a protrusion of the esophageal and/or stomach into the thoracic cavity.

E. Stomach

1. **Functions:** Storage and mixing of food, initiate protein digestion, absorbs water, alcohol, and many drugs and acts as a barrier to bacteria-acidic (pH = 1)
2. **Structure of the stomach**
 - a) divided into four regions: cardia, fundus, body and pylorus.
 - b) Rugae- large folds in the lining of the stomach.
3. **Microscopic structure of the stomach**
 - a) Stomach lining with many gastric pits
4. **How it works**

- a) **Pepsinogen** produced by the **zymogenic (chief) cells**—inactive form of the enzyme pepsin.
 - b) Pepsinogen mixes with **HCL** which was made by the **parietal cells**.
 - c) Pepsinogen is converted to pepsin which breaks down proteins.
 - d) **Mucus** from the **mucous cells** protects the stomach lining from pepsin and HCL.
5. **Ulcer:** A sore in the lining of the esophagus, stomach or duodenum.
- a) Caused by the over production of stomach juices and/or **bacteria**.
 - b) Treatment: antacids, modified diet, surgery, and antibiotics.
6. **Emptying time for the Stomach**
- a) Carbohydrates – 2 hours
 - b) Proteins – 4 hours
 - c) Lipids – 6 hours
7. **Pyloric Sphincter**
- a) Regulates the flow of food from the stomach to the small intestine.
 - b) Pyloric Stenosis- inherited
 - (1) pyloric valve won't open
 - (2) common among young children.
 - (3) surgery to open passageway.

F. Small Intestine

- 1. **1" in diameter**
- 2. **21 feet long**
- 3. **3 parts:**
 - a) Duodenum~first 10"
 - b) Jejunum~next 8'
 - c) Ilium~last 12'
- 4. **Structure**
 - a) designed to allow for maximum surface area
 - (1) To allow for higher absorption of nutrients.
- 5. **Function**
 - a) Most of the digestion and absorption of foods occur here.

G. Large intestine (colon)

- 1. **Function**
 - a) Reabsorbs water

- b) With help of bacteria, the colon produces several vitamins.
- c) Forms feces.

2. Composition of feces

- a) undigested food
- b) **bilirubin** (dark yellow)
 - (1) a product of RBC recycling.
 - (2) the liver makes it and secretes it into feces.
 - (3) Jaundice results when the liver is not properly functioning.

II. Accessory Structures

A. Liver

1. Large (41 lbs) accessory organ; several lobes.
2. **Functions:**
 - a) detoxification
 - b) destroys and recycles RBCs
 - c) converts foodstuffs (fat $\rightleftharpoons$ sugar)
 - d) produces clotting proteins
 - e) produces bile
 - (1) bile emulsifies fat
 - f) stores many nutrients (e.g. glucose $\rightleftharpoons$ glycogen, vitamins and minerals)

B. Gallbladder

1. Stores, concentrates and releases bile to the duodenum.
2. **Gall stones**- calcified bile that causes pain when passed through the bile duct.

C. Pancreas

1. **Both an endocrine and exocrine gland.**
2. **Exocrine** portion is composed of **cells** of **acini**, and these make-up most of the pancreas.
3. **Cells of acini produce:**
 - a) Pancreatic juices; digestive enzymes.
 - b) Sodium bicarbonate
 - (1) to neutralize acidic food leaving the stomach.
4. **Endocrine** portion is called the **Islets of Langerhans**, which are made-up of two kinds of cells. **What are they? Alpha and beta. Alpha produces glucagon; beta = insulin.**