

# The Digestive System

## A. General Information

1. Functions of the Digestive System
  - a. [ingestion](#) - eating
  - b. secretion – 7 liters of water, acid, buffers & enzymes
  - c. mixing & [propulsion](#) - “motility” - alternating relax & contract cycle
  - d. [digestion](#) - mechanical & chemical break down into smaller molecules
  - e. absorption – entrance into epithelial cells of GI tract, and then the bloodstream
  - f. [defecation](#) - elimination of waste, indigestible & non-absorbed substances, bacteria, & sloughed cells from the GI tract ([feces](#))
2. Digestive tube = [alimentary canal](#) = [GI tract](#)
  - a. [mouth](#)
  - b. pharynx
  - c. [esophagus](#)
  - d. stomach
  - e. [small intestine](#)
  - f. large intestine
3. Accessory glands and organs
  - a. salivary glands
  - b. [pancreas](#)
  - c. [liver](#)
  - d. [gallbladder](#)
  - e. mesenteries - connective tissue that holds abdominal organs in place.

## B. The Mouth

1. Lips or labia
2. Tongue functions
  - a. [speech](#)
  - b. swallowing ([deglutition](#))
  - c. taste - food must be dissolved to be tasted
3. Roof of mouth
  - a. [hard palate](#) - anterior
  - b. soft palate – posterior arch
  - c. [uvula](#) - closes off nasal cavity when swallowing
4. Four types of teeth
  - a. incisors for [cutting](#)
  - b. [cuspid \(canines\)](#) for tearing
  - c. [bicuspid \(premolars\)](#) to crush & grind
  - d. molars to crush & grind

5. Three pairs of salivary glands: sublingual, submandibular , & parotid
  - a. [moisten food](#) - dissolving for taste & softening/digestion
  - b. buffer [acid](#) foods & kill bacteria – prevent infection & tooth [decay](#)
  - c. [water](#) conservation during dehydration – small reserve
  - d. controlled by [ANS](#)
  - e. [smell](#), sight,sound or thought of food may stimulate production

C. The Pharynx ([throat](#))

1. Funnel shaped tube connecting nose & mouth to [esophagus](#)
2. Region shared by respiratory and [digestive](#) systems

D. The Esophagus ([eating gullet](#) or swallowing tube)

1. Secretes mucus and transport food to stomach - 25 cm, or [10 in](#) long
2. Does [NOT](#) produce digestive enzymes or aid in absorption
3. It pierces the diaphragm (esophageal [hiatus](#))
4. Moves food using [peristalsis](#) - coordinated contractions muscles  
(peristalsis also occurs in the [small & large intestines](#))
5. A ball of food in the esophagus is called a [bolus](#)
6. GERD (gastroesophageal reflux disease) – when the lower sphincter fails to close properly, [heartburn](#) results; made worse by [alcohol](#), smoking, overeating & acid stimulating foods (tomatoes, OJ, coffee, onions chocolate, mint & fat)

E. The Stomach – [J shaped](#)

1. Regions of the stomach
  - a. cardia – superior opening
  - b. [fundus](#) - rounded portion superior & to the left of the cardia
  - c. [body](#) - large central portion inferior to the fundus
  - d. [pylorus](#) - connects stomach to duodenum
2. Two sphincter control the passages of materials in and out of the stomach:
  - a. [cardiac](#) - between the esophagus and the stomach
  - b. [pyloric](#) - between the stomach and the small intestine
3. Functions of the stomach
  - a. mix saliva, [food](#), & gastric juice to form [chyme](#)
  - b. [reservoir](#) for holding food before release into the small intestine
  - c. secretes gastric juices containing:
    - i. [hydrochloric acid](#) (HCl) – kills bacteria
    - ii. [pepsin](#) - digests protein
    - iii. [intrinsic factor](#) - aids absorption of vitamin B12
    - iv. [gastric lipase](#) - breaks down fat molecules

- d. secretes [gastrin](#) into the bloodstream – a hormone that stimulates secretion of gastric juice, assists sphincter contractions/relaxations, increases stomach motility, & promotes the growth of gastric mucosa
- e. very little absorption – only salt, sugar, some water & [alcohol](#)

#### F. The Pancreas – two functions

1. Exocrine – secreting pancreatic juice (digestive enzymes)
2. [Endocrine](#) - secreting 4 hormones, including [insulin](#)

#### G. The Liver

1. [Heaviest](#) gland & 2nd largest organ; covered by visceral peritoneum
2. Functions of the liver
  - a. carbohydrate metabolism – maintain blood [glucose](#) levels
  - b. [lipid](#) metabolism – break down & synthesize lipoproteins (i.e. cholesterol)
  - c. [protein](#) metabolism – break down amino acids so they can be used for ATP production or converted into carbohydrates or fats (the byproduct, toxic ammonia, is converted into [urea](#) and excreted in urine)
  - d. processing drugs & hormones – [filter/detoxify](#) the blood
  - e. excretion of [bilirubin](#) - old, broken down [RBCs](#) are absorbed from the blood and secreted into bile
  - f. synthesis of [bile salts](#) - used in the small intestine to breakdown and absorb fats & cholesterol
  - g. [storage](#) - stores glycogen, [vitamins](#) (A, B12, D, E, & K) and minerals ([iron](#) & copper)
  - h. phagocytosis – eats/destroys old RBCs, WBCs, & some [bacteria](#)
  - i. activation of [vitamin D](#) - the skin, liver & kidneys work together to produce

#### H. The Gallbladder

1. Stores [bile](#)
2. Insufficient bile salts or excess cholesterol, may cause [gallstones](#) (4 F's)

#### I. The Small Intestines

1. Three regions
  - a. [duodenum](#) (12) - shortest region
  - b. [jejunum](#) (empty) - about 1 meter (3 ft)
  - c. [ileum](#) (twisted) – about 2 meters (6 ft)

2. Two sphincters
  - a. [pyloric](#) - between stomach & small intestine
  - b. [ileocecal](#) - between small intestine & large intestine
3. Major site of [digestion](#) & absorption (90%)
  - a. digestive enzymes end in “ase,” i.e. lactase (not enough = lactose intolerance – diarrhea, gas, cramps & bloating after consuming dairy products)
  - b. [villi](#) (tufts of hair) - small, finger-like extensions from SI mucosa that increase the surface area available for digestion & absorption

## J. The Large Intestine

1. About 1.5 meters (4-5 ft) long and 6.5 cm (2.5 in) wide, it has six regions
  - a. cecum – a small pouch from which the [appendix](#) hangs
  - b. [ascending](#) colon – travels up right side of abdomen
  - c. [transverse](#) colon – moves laterally to the left
  - d. [descending](#) colon – drops down the left side of the abdomen
  - e. [sigmoid](#) colon – S shaped
  - f. [rectum](#) - connects to the exterior opening ([anus](#))
2. Functions of the large intestine
  - a. [resident](#) bacteria decompose undigested items and produce some B vitamins & vitamin K
  - b. absorption of some water, ions & vitamins
  - c. [peristalsis](#) drives contents of colon into rectum
  - d. [defecating](#) - emptying of the rectum
    - i. internal anal sphincter - [involuntary](#)
    - ii. external anal sphincter - [voluntary](#)
    - iii. [diarrhea](#) - feces passes through the GI too quickly, so there is not enough time for absorption; caused by lactose intolerance, stress, massive over eating, & irritating microbes
    - iv. [constipation](#) - difficult defecation/decreased motility due to excessive water absorption (dry, hard feces); caused by poor habits, insufficient dietary fiber, insufficient fluid intake, lack of exercise, stress, & certain drugs (Laxatives are habit-forming, so instead – exercise, eat fiber & drink [half your body weight in ounces](#) - more if pregnant, breast feeding, exercising, ill, in a hot climate, etc.)