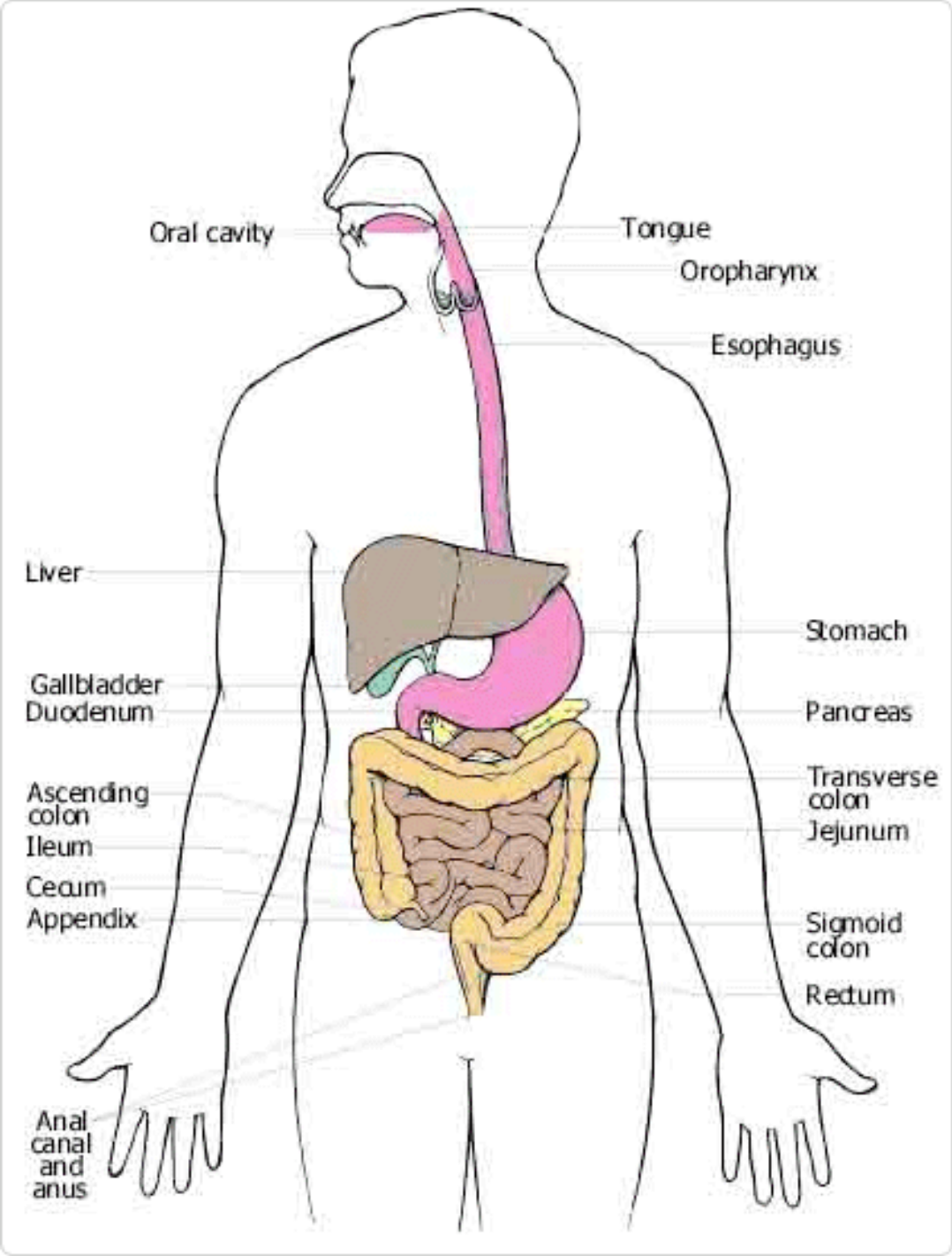
Journey Through the Digestive System


Oral cavity
Tongue
Oropharynx
Esophagus
Liver
Stomach
Gallbladder
Duodenum
Pancreas
Transverse colon
Ascending colon
Jejunum
Ileum
Cecum
Appendix
Sigmoid colon
Rectum
Anal canal and anus

Digestion vs. Absorption

Digestion

- Breakdown of food into smaller particles
- Consists of six processes…
  - Progress of food and liquids
  - Softening of food via bodily secretions
  - Mechanical breakdown of different components, such as: carbohydrates, fats, and proteins
  - Process of reabsorbing nutrients (particularly water)
  - Production of nutrients like vitamin K and biotin
  - Emission of waste

Absorption

- Major function in small intestine
- Movement of molecules across the circulatory system after progressing through the gastrointestinal (GI) tract

Mechanical vs. Chemical

Chewing Food

- First step of the digestion process
- Process of mastication (chewing) food with teeth to break it apart
- Process is mixed with saliva, consisting of enzymes to start chemical digestion
- Also involves peristalsis, which will be mentioned later

Saliva Breakdown

- Accomplished through the use of digestive enzymes
- Digestive enzymes with water break apart complex molecules into smaller ones
  - Fats, proteins, and carbohydrates will be made smaller
    - They can then be absorbed for use by cells
- Digestive enzymes control reaction time/speed

Enzymes

Types

- Nuclease
- Protease
- Collagenase
- Lipase
- Amylase
- Elastase
- Trypsin
- Chymotrypsin

Amylase and Lipase

Amylase

- Cut starch molecule extensions at specific points
- Depending on the type of amylase, the results are…
  - Simple sugars (glucose or fructose)
  - Compound sugars (maltose or malt sugar)
  - Special forms of starch (dextrine)

Lipase

- Enzymes that break apart fat into:
  - Blood
  - Gastric juices
  - Pancreatic secretions
  - Intestinal juices
  - Adipose tissues
- Lipases use the process of hydrolysis to break triglycerides into
  - their component fatty acid
  - glycerol molecules

nProtease

- Enzymes that branch from the protease family
  - nProtease is a synthetic form of this family
  - Used to break apart and digest proteins

Parts To Know…

- Appendix- Attached to the first portion of the large intestine
  - Serves no function in modern humans, but believed to be part of ancestors' digestive systems
- Enzymes in Digestion:
  - Amylase breaks down carbs in the mouth, found in saliva
  - Proteases and peptidases break down proteins
  - Lipases break down fats
  - Carbohydrases break down carbohydrates
  - Nucleases break down nucleic acids
- Secretory Glands- In the stomach, pancreas, and small intestine
  - Release enzymes

Mouth and Esophagus

1- Food is consumed

2- Salivary glands produce saliva

3- Saliva moistens food for easy swallowing

4- Amylase breaks down carbohydrates in food

Digestion

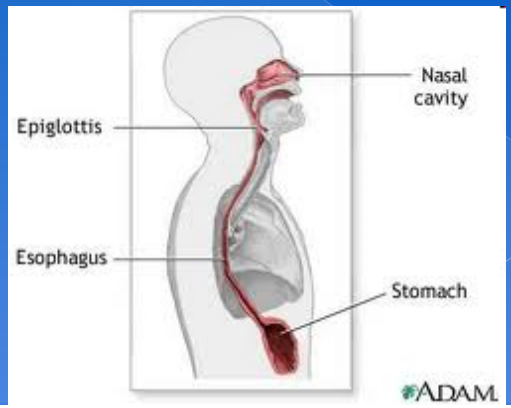
5- Food is swallowed and moves into throat (pharynx)

6- Through the process of peristalsis, food is forced down into the esophagus and into the stomach

- The food will later be digested to the point where it will be absorbed

Esophagus

- The esophagus is the muscular tube that will be the bridge for the food travelling from the mouth to the stomach
- It is also the location of Peristalsis
  - Peristalsis is when food is moved through the intestinal tracts due to the smooth muscles found in the body



Parts To Know…

- Esophagus- Muscular Tube that c expands
  - After food is chewed and softened it is carried from the throat to the stomach through the esophagus
- Epiglottis- Flap of cartilage behind tongue and before larynx
  - At rest: allows oxygen to flow to respiratory system
  - When swallowing: folds to prevent food/drink going into windpipe
- Salivary Glands- Digestive glands that create saliva
  - Produce saliva in order for food to be dissolved far enough to be tasted
    - Saliva also cleans teeth

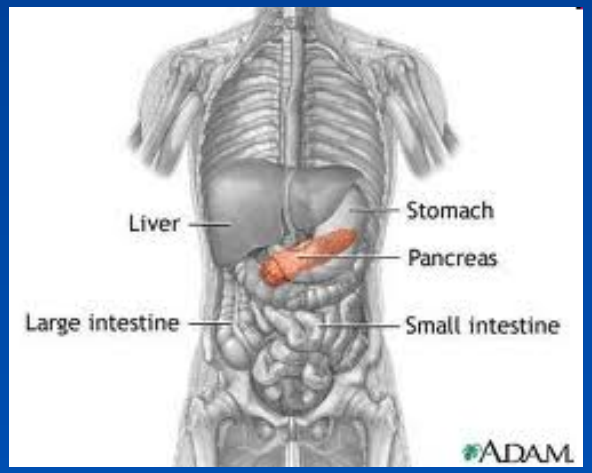
Stomach

- Only proteins are digested in the stomach
- Stomach mixes food, acid, and enzyme bath which is then squeezed into the intestines creating chime
  - Chime- food turned into semi-liquid in small intestine
    - Dissolves foods and kills microorganisms

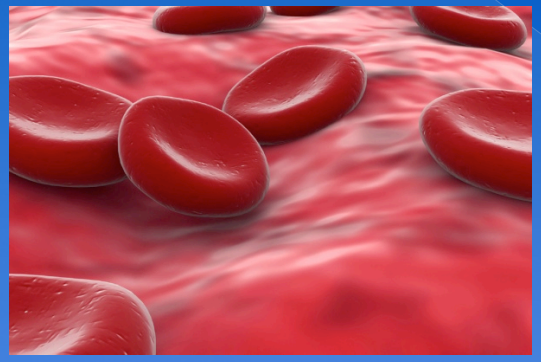
Stomach's Digestive Processes

- Hydrochloric Acid converts pepsinogen into pepsin
  - Pepsin-breaks down proteins (polypeptides) into peptides
    - Makes digestion of proteins easier
- HCL also dissolves food and kills microorganisms
- An ulcer is an open sore surface on the body that refuses to heal
  - Caused by gastric juice piercing mucus lining of stomach
    - The mucus keeps all the food gliding along without damaging the GI tract
      - Protecting the stomach against HCL and pepsin

Pancreas



- DIGESTION
  - Make digestive enzymes
  - Regulate balance of blood glucose
- Attached to small intestine by a duct which pancreatic juices travel through
  - Aid in digestion of:
    - Starch
    - Protein



Liver

- DIGESTION
- Produces bile, complex carbohydrates, proteins
  - The bile will later mechanically break down the liquid parts of fat
    - Contains vitamins, and minerals
    - Keeps track of cholesterol and toxins

Bile and Bicarbonate

BILE

- Fluid secreted by the liver
- Gets rid of waste products
  - feces, bilbrubine
    - Bilbrubine-the breakdown of red blood cells
- Leaves liver from heptic duct
- Enters the large intestine through the gall bladder

BICARBONATE

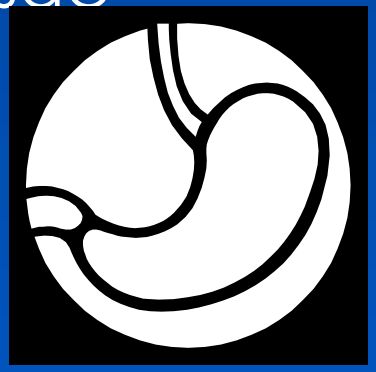
- It keeps the blood ph level constant
  - Not too acidic or basic

Gallbladder

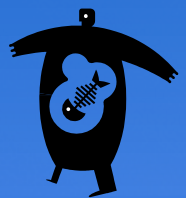
- DIGESTION
- Stores Bile in anticipation of fatty food in small intestine
- Hormones from intestine alert gallbladder to constrict and release bile into the duct
  - The bile goes and breaks down the food even further

Parts To Know…

- Stomach- A hollow organ resembling sac layered with muscles and nerves
  - Stores meals
  - Mixes food into mushy mixture
  - Cleaning system to kill toxic food
  - Digestive center to digest the food

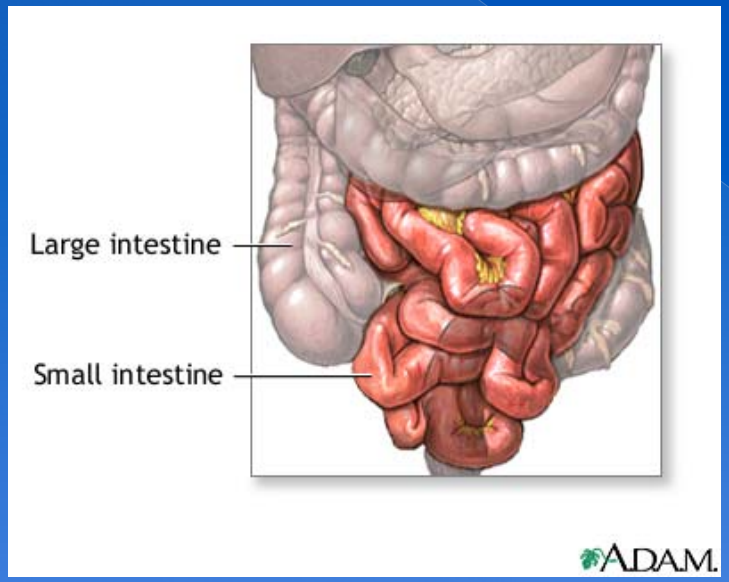


- Liver- Largest organ in the body consisting of four lobes
  - Cleans blood
  - Processes nutrients
  - Secretes Bile
- Gallbladder- Small green pear-like sac
  - Converts salts and water into a thick bile substance
    - Only in presence of fatty foods



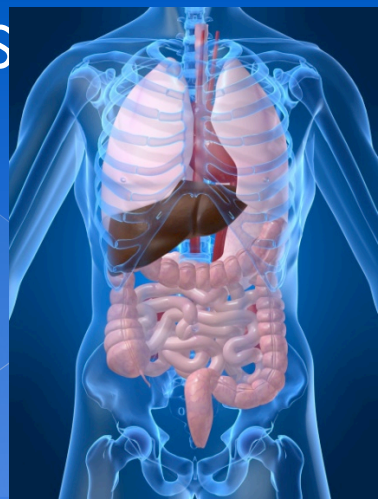
Small Intestine

- The small intestine is a very long, folding organ ranging from 18-23 feet long.
- Where chemical digestion takes place



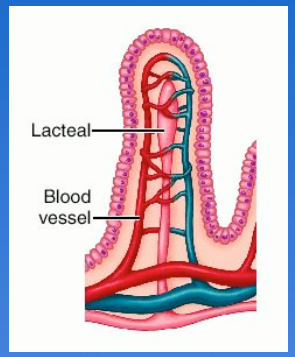
Small Intestine

- Villi bring in new blood filled with oxygen
- The muscles of the intestine work to digest the food
  - Churn
  - Knead
  - Soak with gastric juices
- The intestines also send small waves though they are too subtle to accomplish much



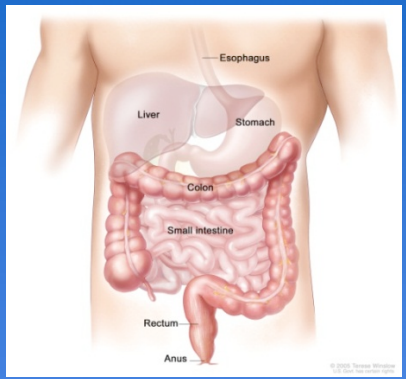
Villi

- Villi are muscles with one vein that move in a swaying motion
- Absorb the nutrients in the food
- Increase the surface area of the small intestine
  - The number of villi decreases the farther down the intestine

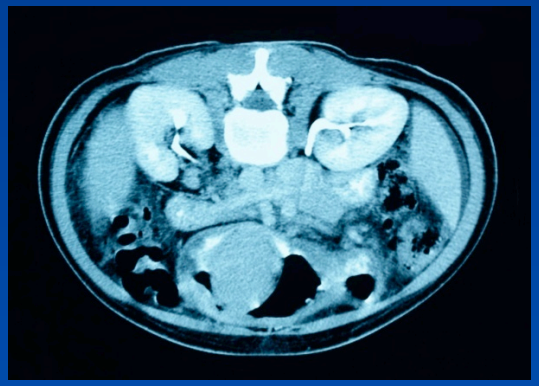


Large Intestine

- Food takes 16 hours to pass
- Absorbs water and electrolytes
- Invaginalions- the equivalent of villi in the small intestine
- The large intestine is roughly 25 percent of the small intestine's size, only 5 feet long!



Large Intestine



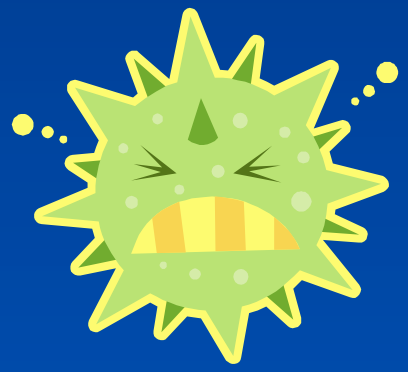
- Materials that reach the large intestine have very little function in body
  - The substances are neglected by the small intestine
    - Liquid and fiber
- The beginning half of the colon absorbs the liquids and renews them to the bloodstream
- The final half compacts the fluids into feces

Parts To Know…

- Pancreas- Beneath the stomach,
  - Discharges digestive enzymes into the gut and secretes insulin and glucagon into the blood stream to maintain blood sugar during and after digestion
- Small Intestine- Most digestion and absorption takes place here, 6.7 to 7.6 meters long.
  - Mesentary supports and suspends intestines, contains areas of fat and extensive blood vessel web
  - Villi (finger-like projections) increase the surface area. 90% of nutrients and water are absorped
  - Three parts (Duodenum, jejunum, ileum)

- Large Intestine- Contains the cecum, clon, rectum, anus and is 1.5 meters with a smooth inner wall.
  - Digestion is completed in the upper half with enzymes that travel from the small intestine
  - Waste is compacted
- Rectum- 12 cm, stores feces, end of large intestines.

Bacteria

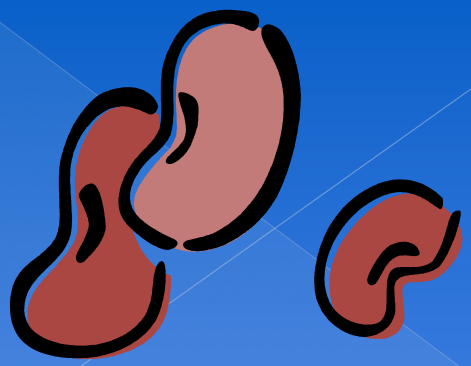


- Types: Eschericia coli, Acidophilus spp.
- Live inside large intestine
- Gain nutrients by fermenting our foods
  - Ferment-conversion of carbohydrates to carbon dioxide and alcohol
- As they ferment these foods, they give off helpful substances such as vitamins K and B and some amino acids
  - Often the main source of nutrients
- Produce hydrogen sulfide and methane-sometimes escapes by flatulence (gas)

Fiber

- Contains water in the feces
- Prevents feces from becoming too hard
  - If this occurs, bacteria have too much time to ferment, and release cancer-causing byproducts

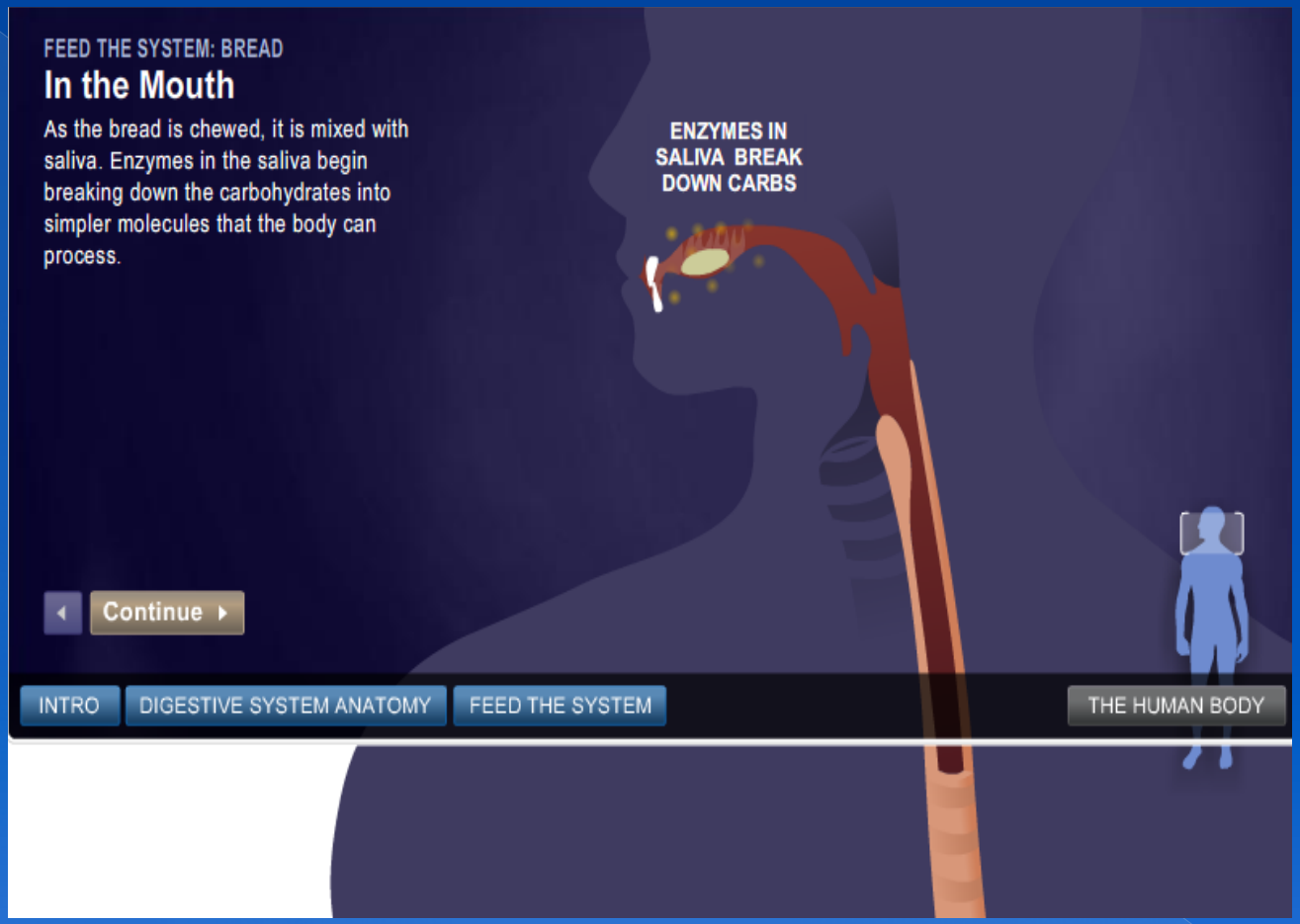




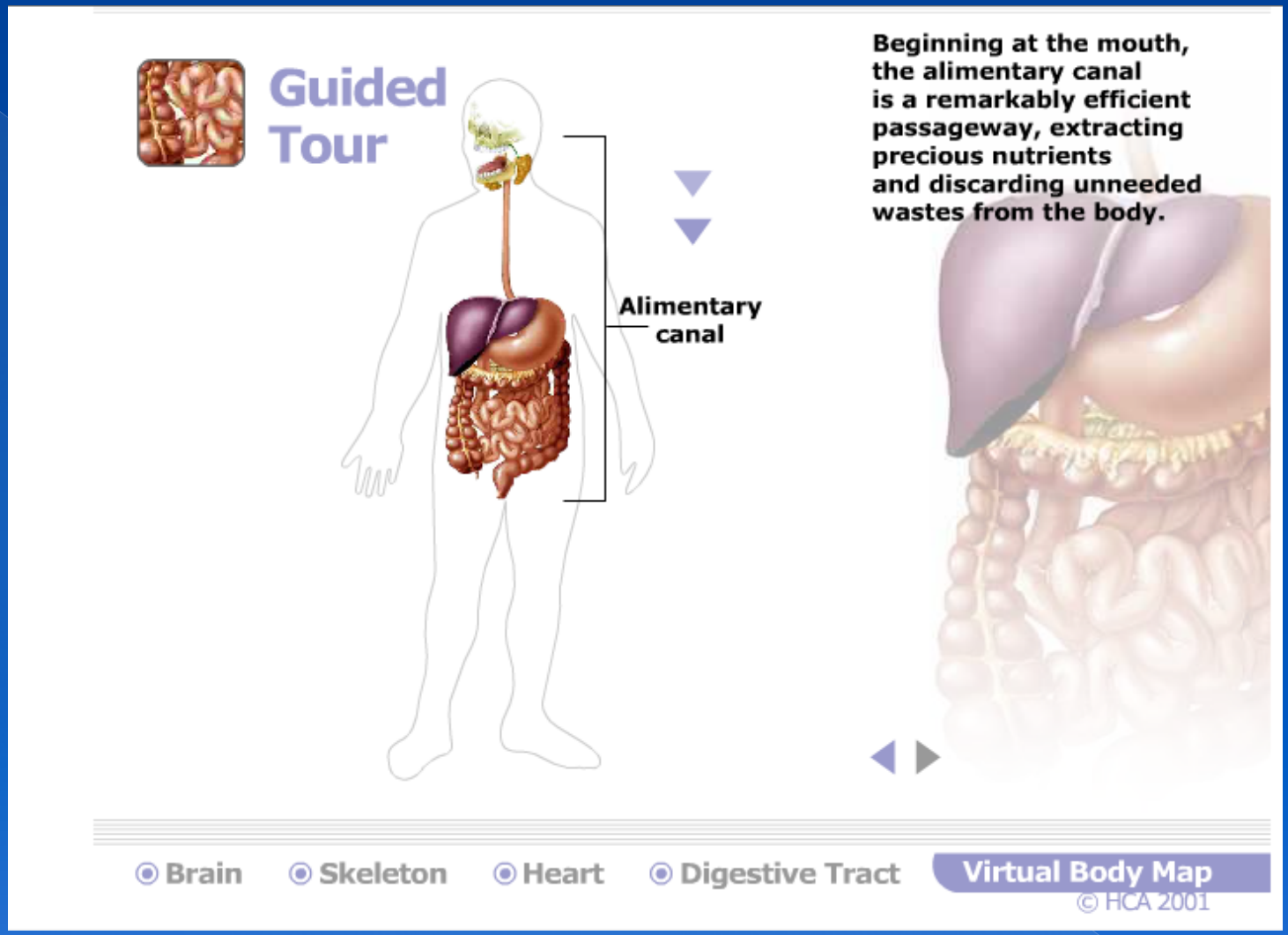
Number 3

- Diarrhea-extremely loose, water-filled feces
  - Caused when too little water is absorbed by the large intestine on its path to the rectum-the feces move too slowly
- Constipation-much harder, almost dry feces
  - Caused when too much water is absorbed by the large intestine on its path to the rectum
    - Often occurs because of bacteria or viral infections

Sites to Refer To…



http://science.nationalgeographic.com/science/health-and-human-body/human-body/digestive-system-article.html



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