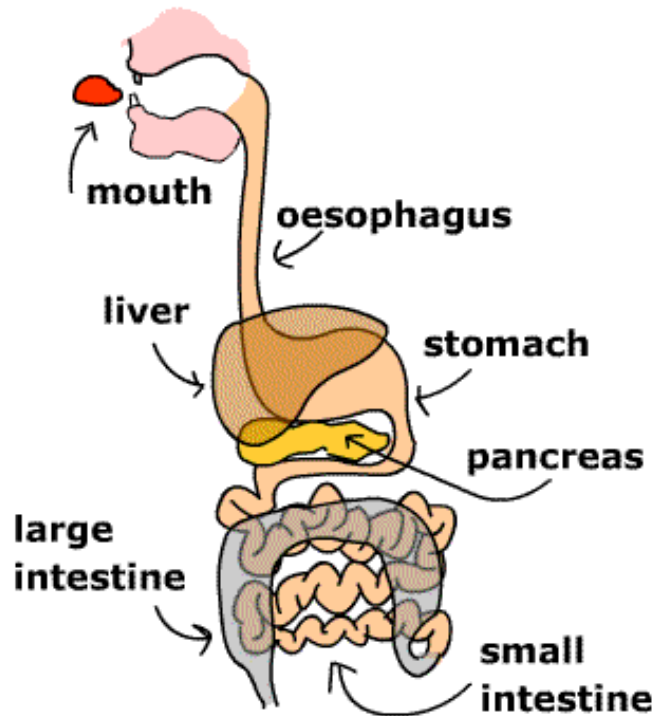


The Digestive & Excretory Systems

Lesson 15

The Digestive System



- Your body will be able to break down, absorb, and store nutrients from the food you put into your mouth
- Any food your body cannot use will be eliminated

This process is called...

DIGESTION

- It occurs in an amazing system called the **digestive system**

The Four Stages of Digestion

- Digestion takes place in four stages
 1. Ingesting
 2. Digesting
 3. Absorbing
 4. Eliminating

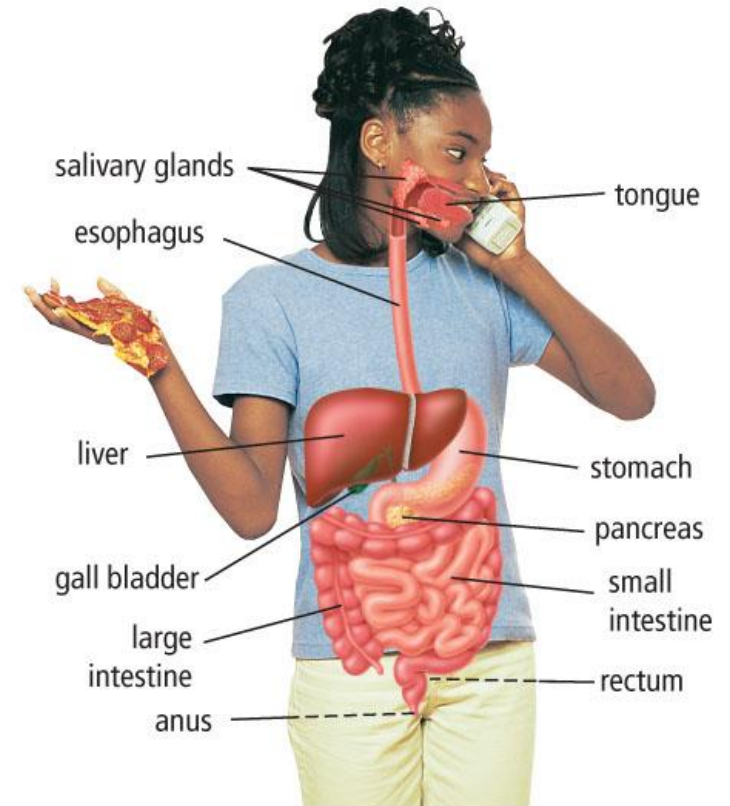
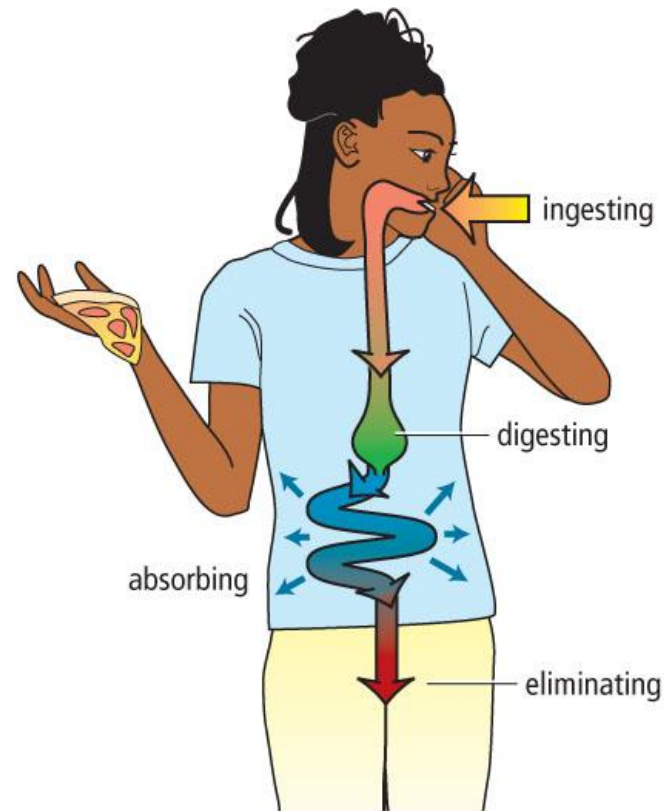
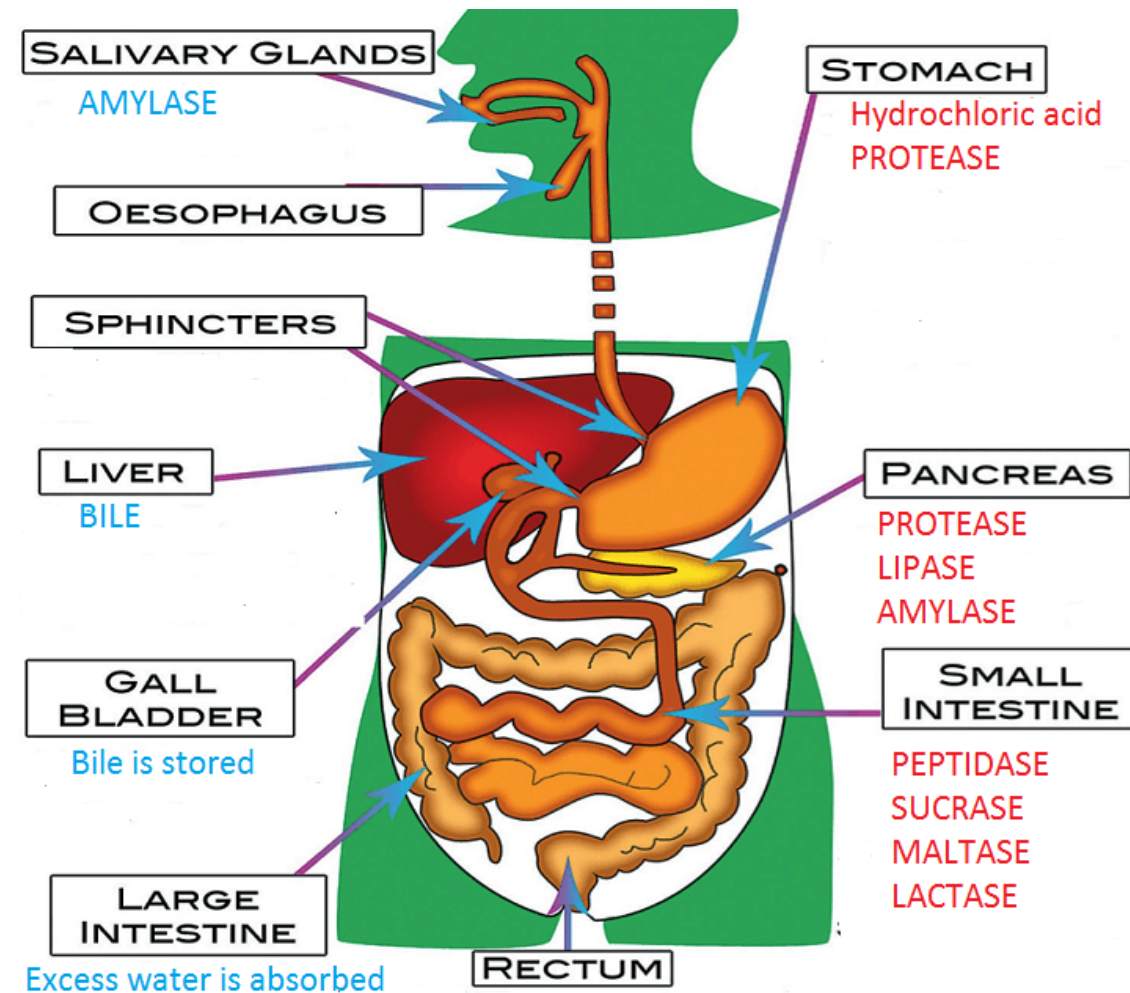


Figure 2.12 The four stages of digestion in the digestive system

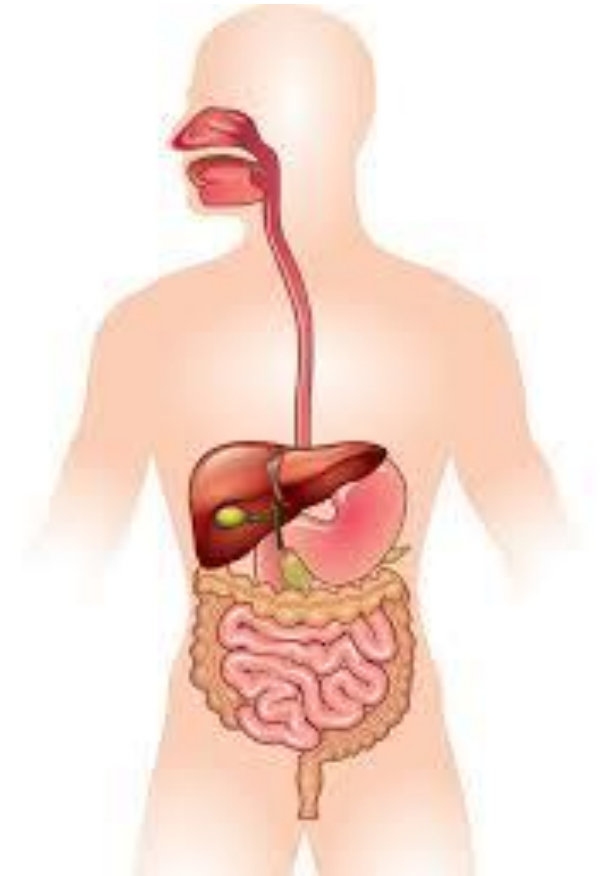
Enzymes are important proteins for digestion

- Many different chemical reactions are occurring in your body
 - Many could not happen normally at body temperature because they would be happening TOO SLOWLY
- An **enzyme** is a protein found in our body that helps speed up these chemical reactions
 - There are many different types of enzymes
 - During the digestion process, one enzyme or more will be present in each organ



Digestion occurs a long a big tube

- Your digestive system is basically one big tube
 - Starts at your mouth and ends at your anus
 - The shape changes along its length
 - Getting bigger in some places and smaller in others
- The process of digestion breaks down food into small pieces
 - So nutrients can be absorbed into your body for maintenance, growth, and repair
- Any materials that cannot be absorbed are eliminated in the feces



Stage 1: Ingesting

The Four Stages of Digestion

To get a better idea of how digestion works, imagine the journey of a favourite food through the four stages of the digestion process.

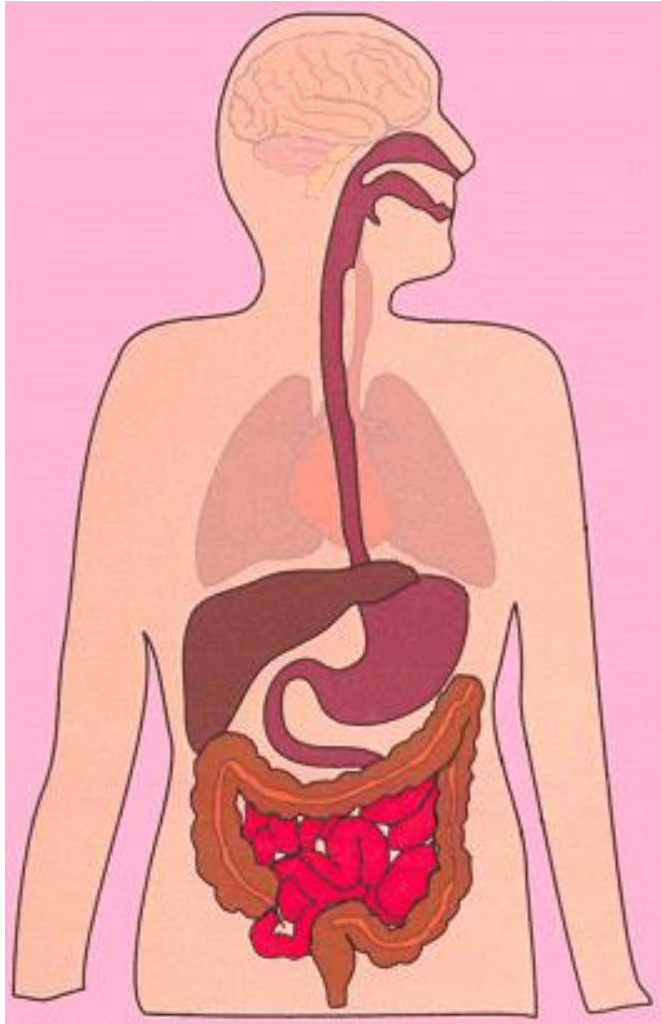
Stage 1: Ingesting –

- Ingesting or ingestion is the starting point of the digestion process
 - Starts when you bite off a piece of apple or take a sip of milk



Stage 2: Digesting

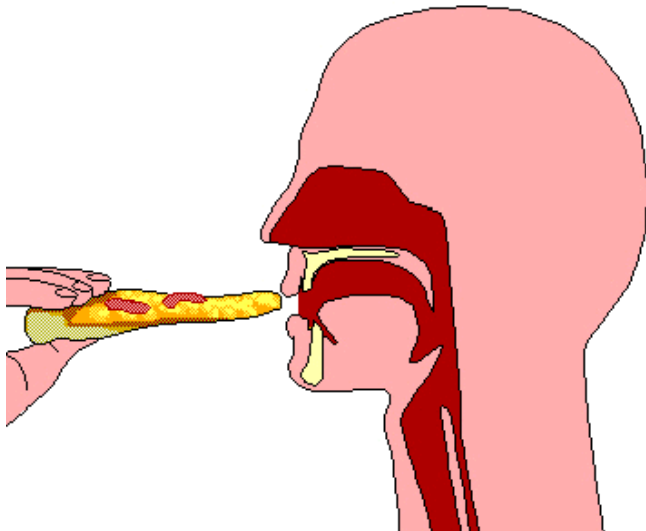
The Four Stages of Digestion



- You start digesting your food the moment you start chewing
- This process involves several body structures along the digestive tube
 - Mouth
 - Esophagus
 - Stomach
 - Small intestine

Mouth

Stage 2: Digesting

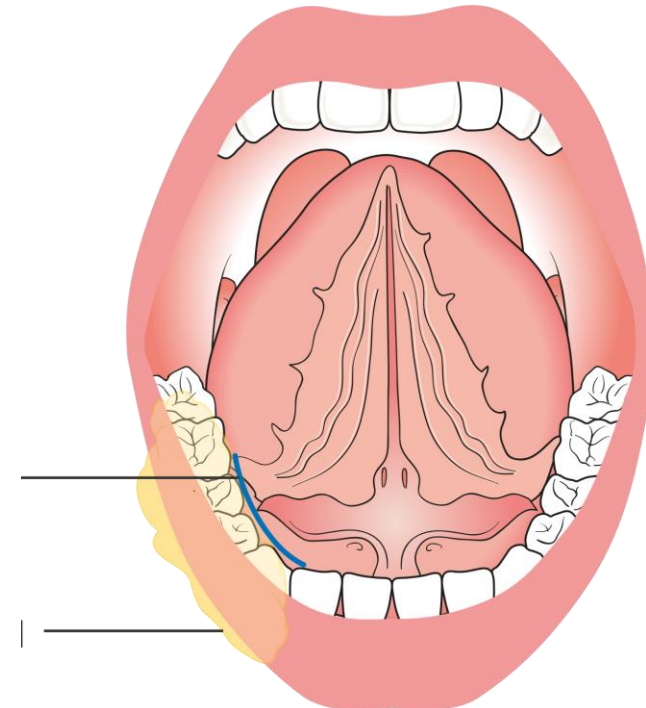
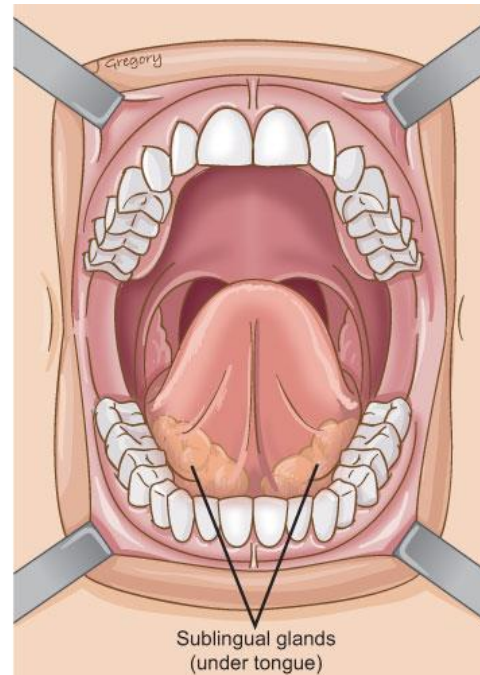
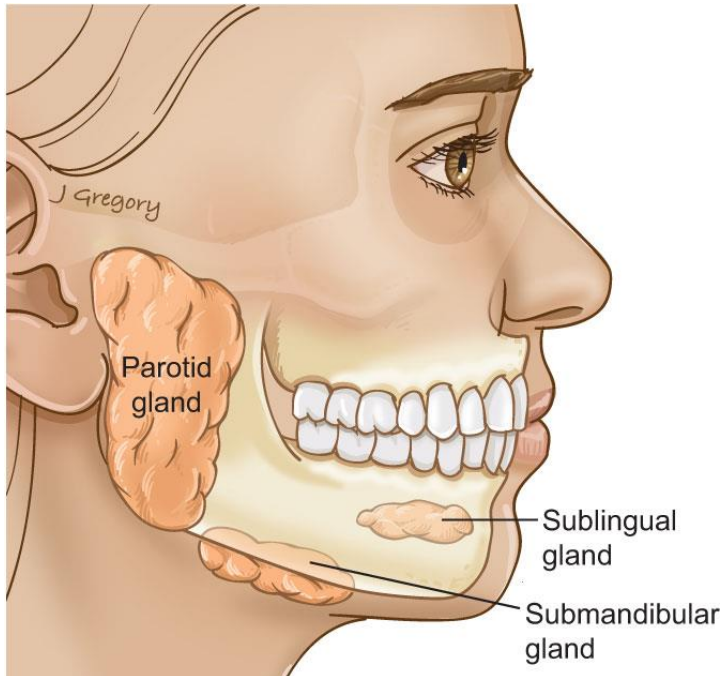


- When food enters your mouth, it undergoes both **mechanical** and **chemical digestion**
- **Mechanical digestion** occurs when you use your teeth and tongue to chew food into pieces small enough for you to swallow
- **Bolus** = each small piece of food
 - Before swallowing, the bolus is covered in **saliva** to help it continue its journey

Mouth

Stage 2: Digesting

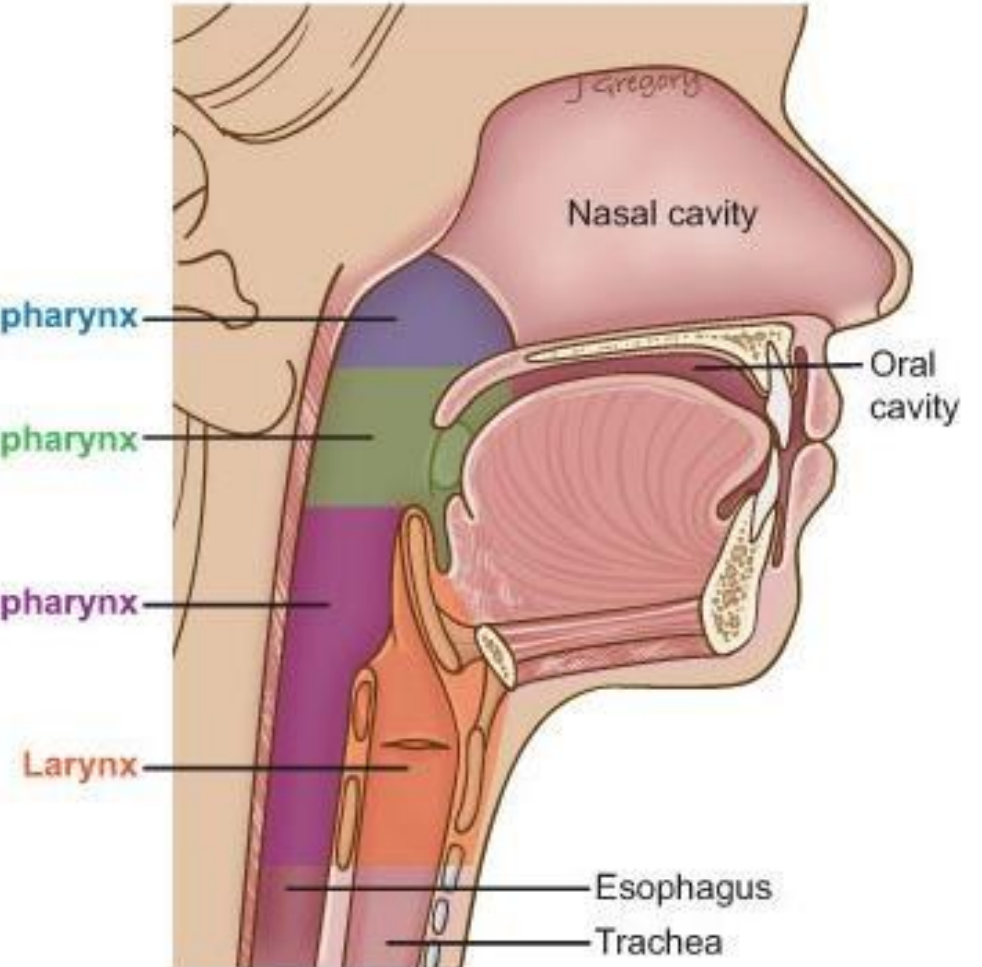
- **Saliva** is produced from salivary glands in your mouth
 - Contains an enzyme called **amylase**
 - **Chemical digestion** occurs when **amylase** begins to break down the food bolus → breaks down complex carbohydrates into simple carbohydrates



Esophagus

Stage 2: Digesting

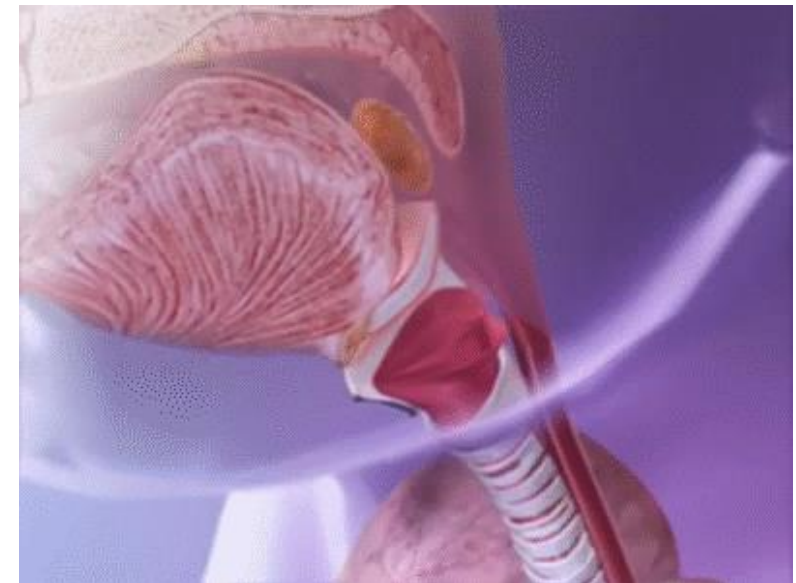
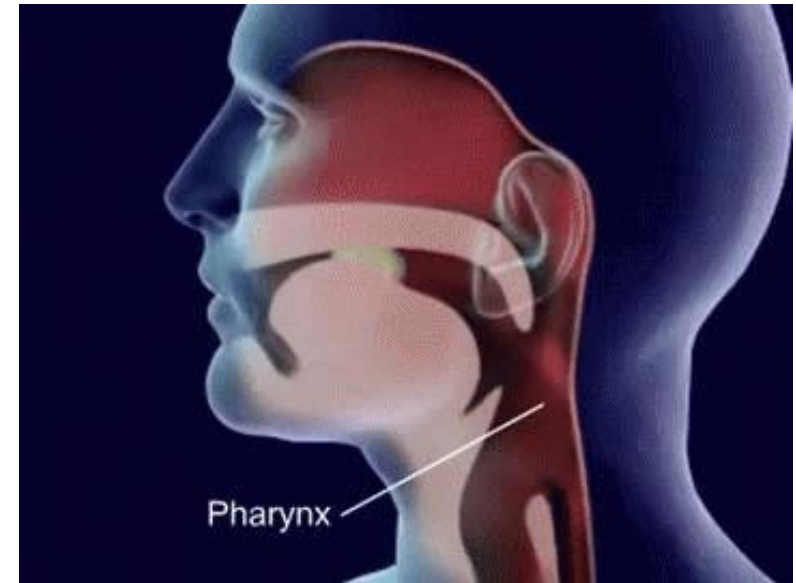
- As the food moves from your mouth, it passes through the **pharynx**
 - Where your airway passage and the rest of your digestive system meet
 - Imagine two tubes coming together and joining into one



Esophagus

Stage 2: Digesting

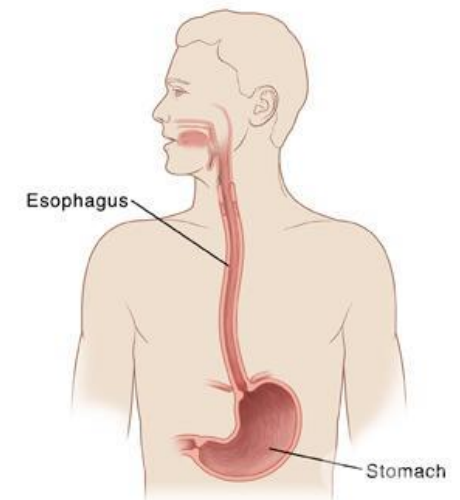
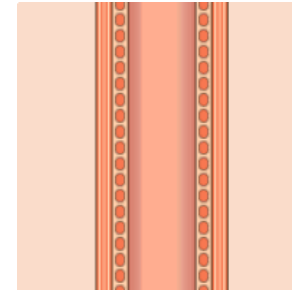
- **Epiglottis** = a small flap of flesh that covers the airway tube (trachea) when you swallow
 - Since each tube has a different function, one for breathing and one for digesting food, our body needs to keep the two tubes separate
- When you swallow, the **epiglottis** covers the trachea and the food carries on to the **esophagus**
 - **Esophagus** = part of the digestive tube that connects the pharynx and the stomach



Esophagus

Stage 2: Digesting

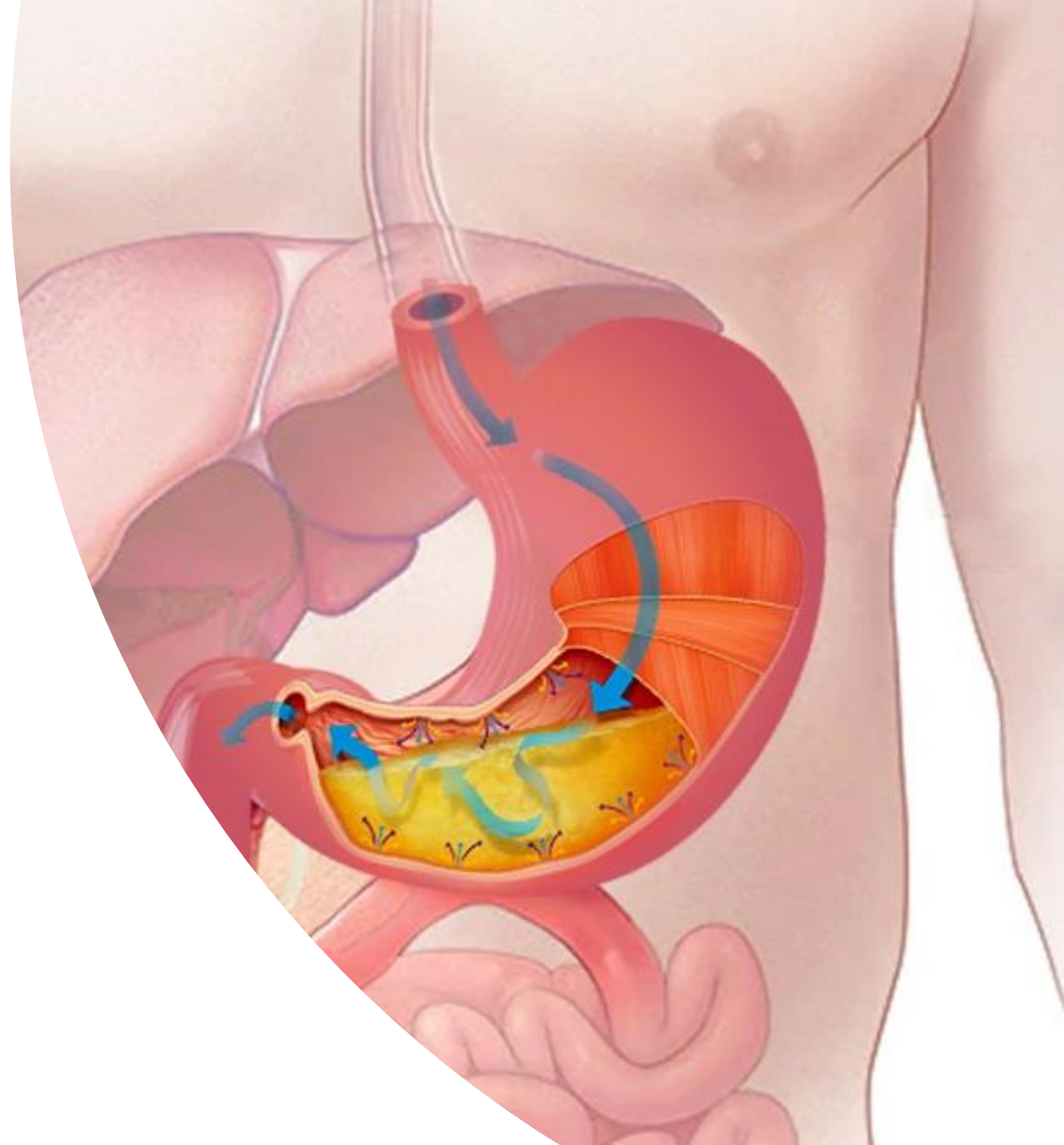
- The **esophagus** is a long muscular tube
- The **bolus** is pushed through the esophagus in a process called **peristalsis**
 - Peristalsis = like using your hands to squeeze toothpaste out the tube
 - The action of your hands squeezing the tube is like the muscles of the esophagus pushing each bolus to the stomach



Stomach

Stage 2: Digesting

- Like a stretchable muscular bag
- Can stretch to hold about 2L of food or liquid
- **Gastric juices** (hydrochloric acid, mucus, enzymes) are secreted by your stomach's lining
 - Very acidic and so your stomach is lined with mucus to protect it from acid damage
 - Acidity is necessary in order for the enzyme, **pepsin**, to function in breaking down protein

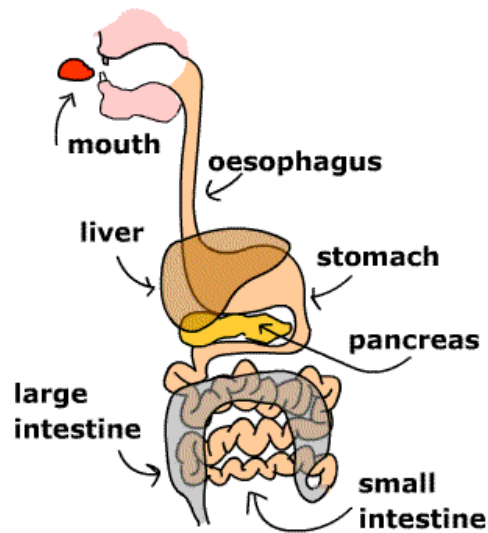




Stomach

Stage 2: Digesting

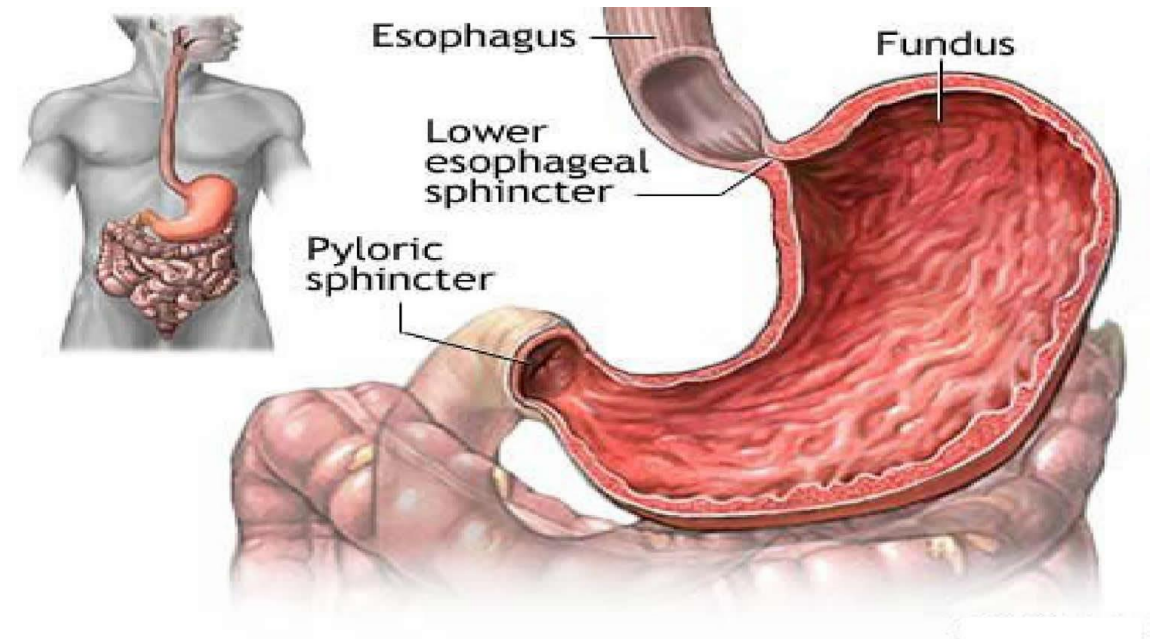
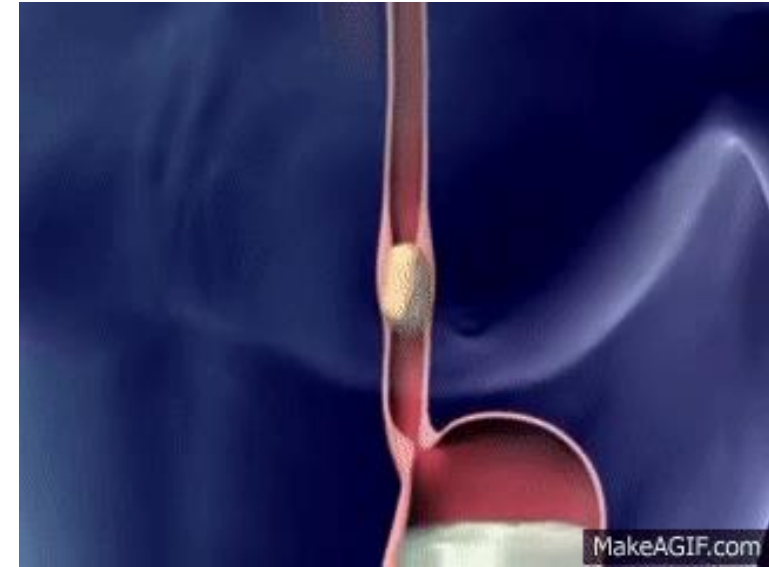
- As each bolus drops into the stomach,
 - Gets covered by gastric juice
 - Slowly mixed around by contractions of the stomach muscles
 - Breaks down into a liquid called **chyme** (this process can take two to six hours)



Stomach

Stage 2: Digesting

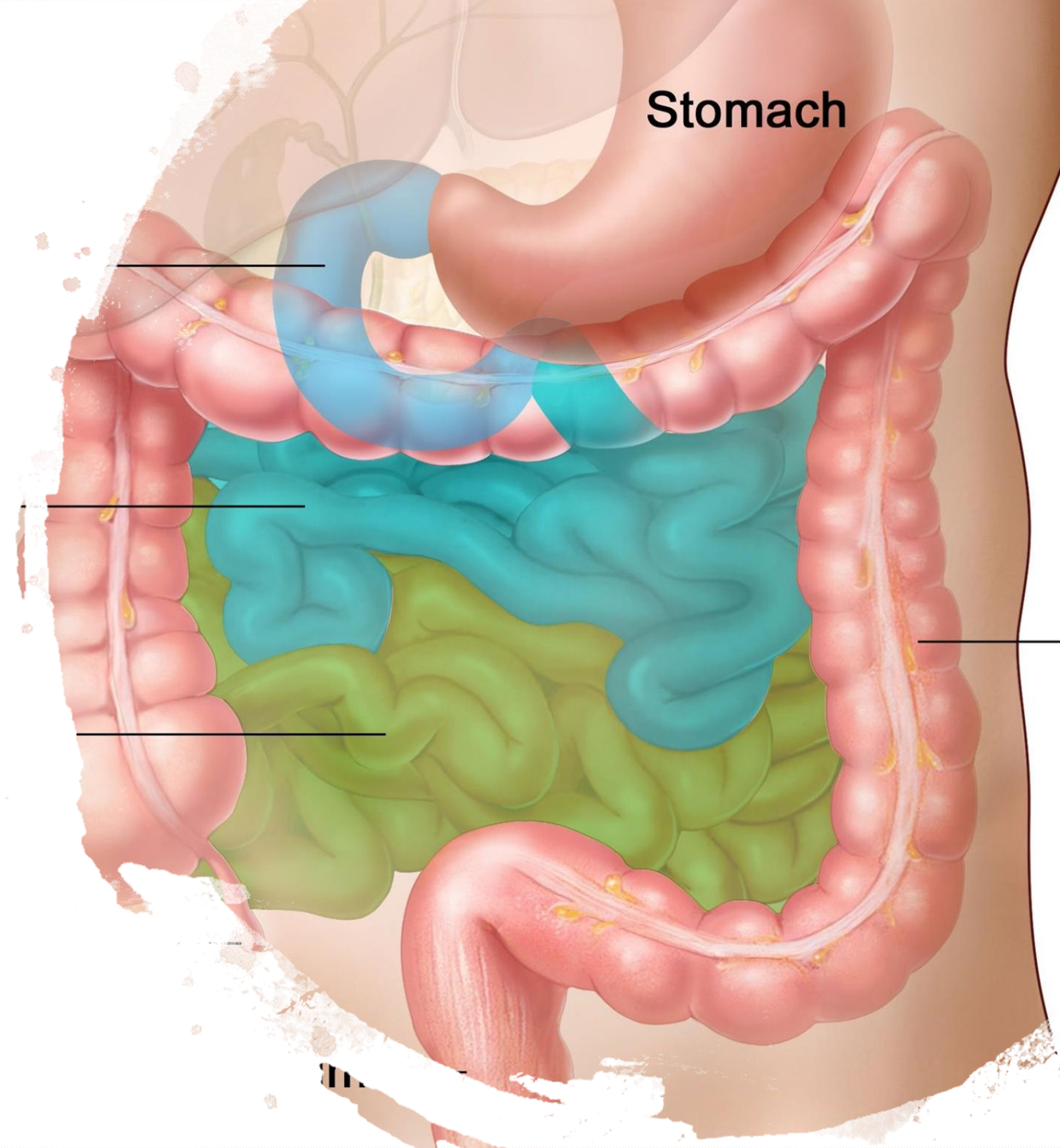
- **Sphincters** are found throughout the body
 - Round muscles that, when open, allow materials to move through them
- The stomach has two **sphincters**
 - The first is between the esophagus and the stomach
 - Regulates the entry of each bolus into the stomach
 - The second regulates the flow of chyme out of the stomach and into the small intestine



Small Intestine

Stage 2: Digesting

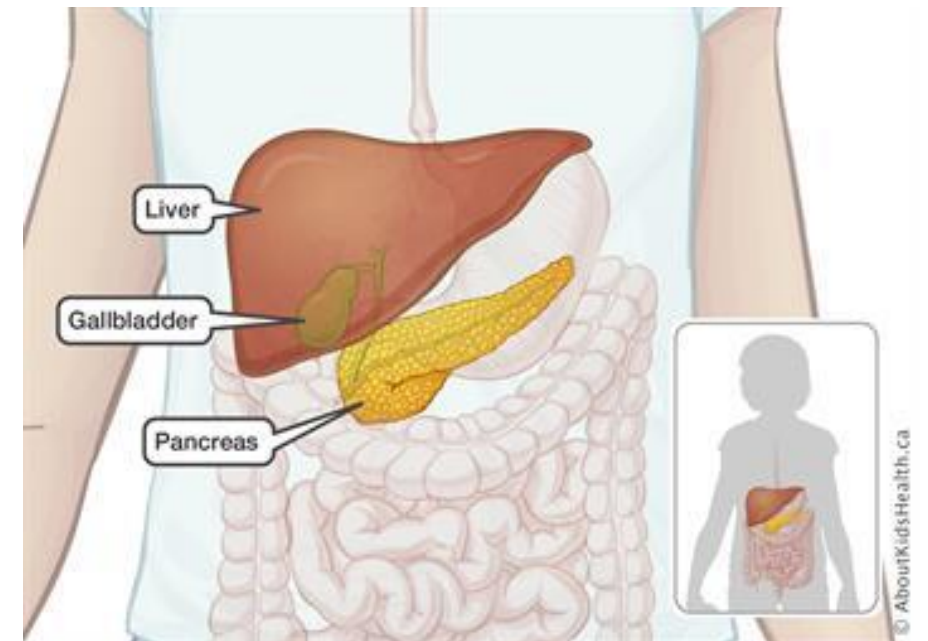
- Once the liquid chyme leaves the stomach, it empties into the small intestine
- This organ is a tube about 6m long and 2.5cm in diameter
- **Duodenum** = first metre of the small intestine
 - Stage 2 of the digestion process is complete once the food particles leave



Small Intestine

Stage 2: Digesting

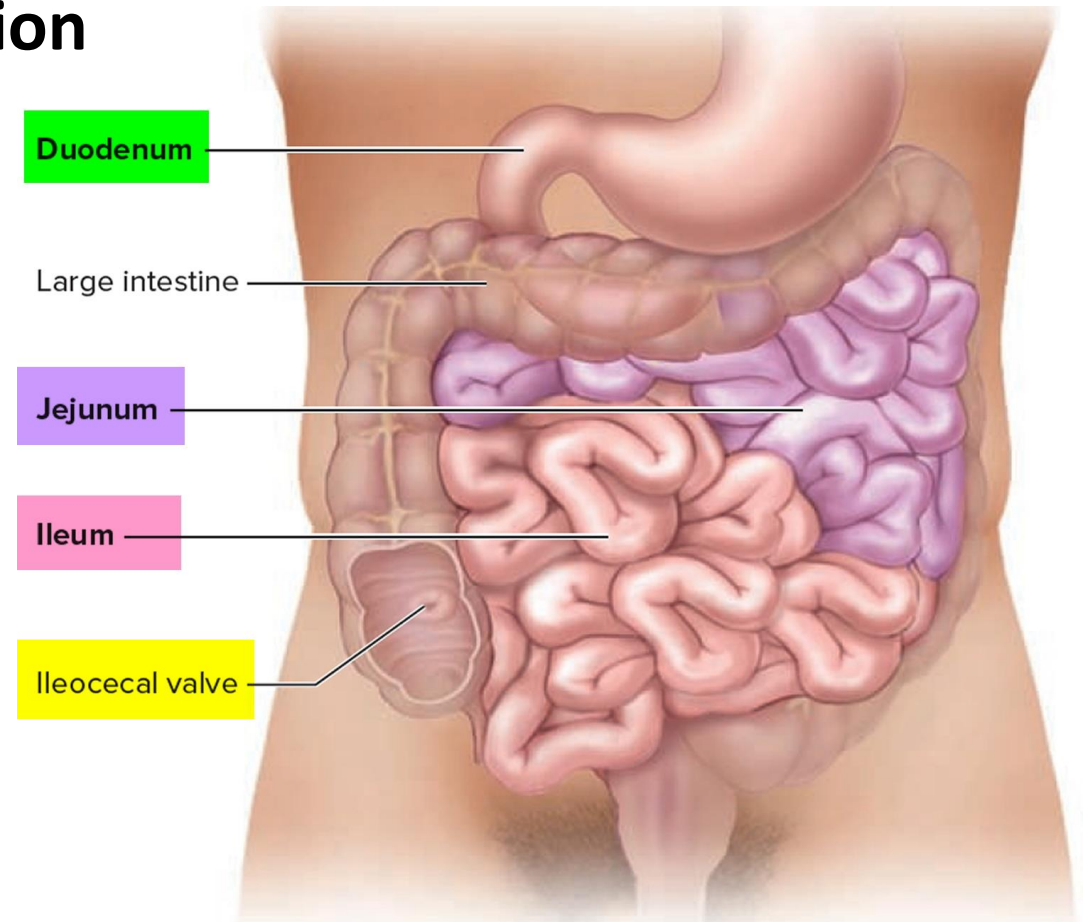
- Within the first 30cm of the small intestine are ducts or tubes that connect to other organs
 - Pancreas, liver, gall bladder
- **Pancreas** = produces **digestive enzymes** that pass into the small intestine to further breakdown carbohydrates, protein, and fat in the chyme
- **Liver** = produces **bile** which is used to break the globs of fat into smaller droplets (like dish detergent breaking down grease)
 - Stored in the **gall bladder**

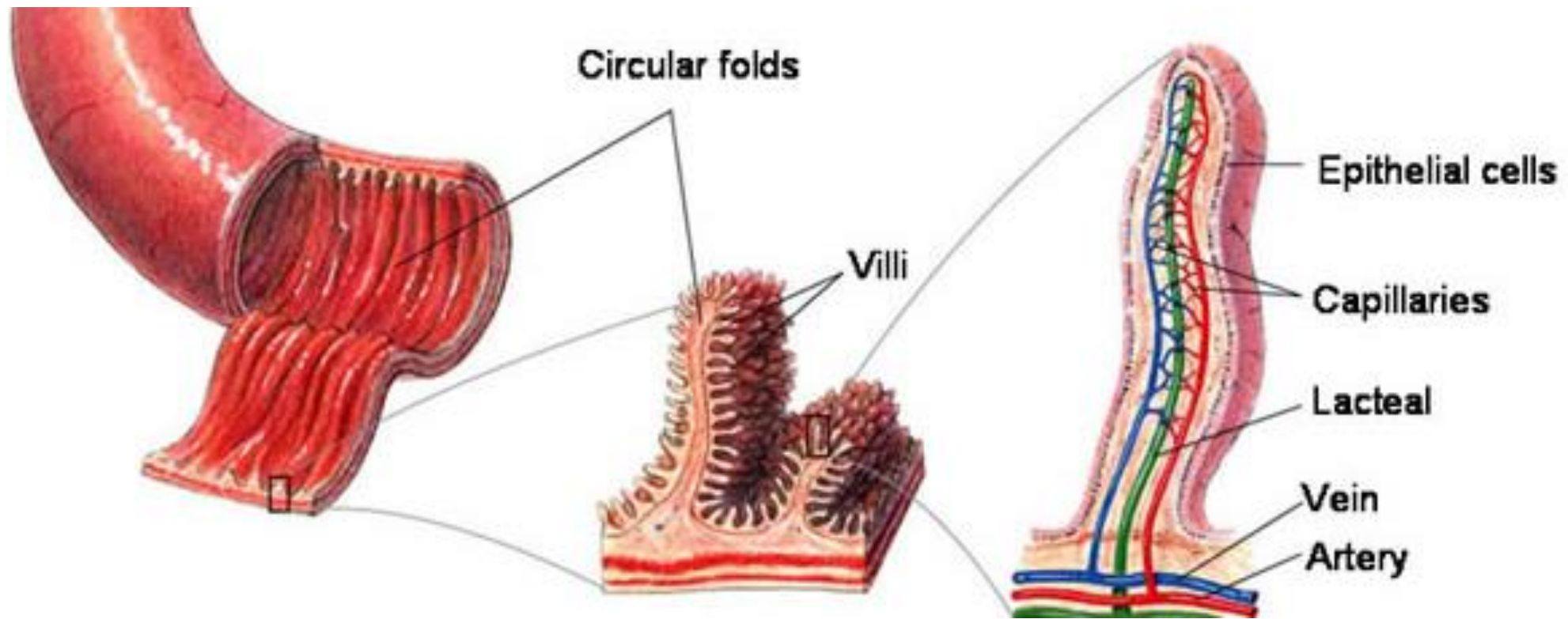


Stage 3: Absorbing

The Four Stages of Digestion

- At this stage, the nutrients are ready to be absorbed by the remaining 5m of the small intestine = **absorption**
 - Small intestine
 - Duodenum (stage 2)
 - Jejunum (stage 3)
 - Ileum (stage 3)
 - Large intestine





Small Intestine

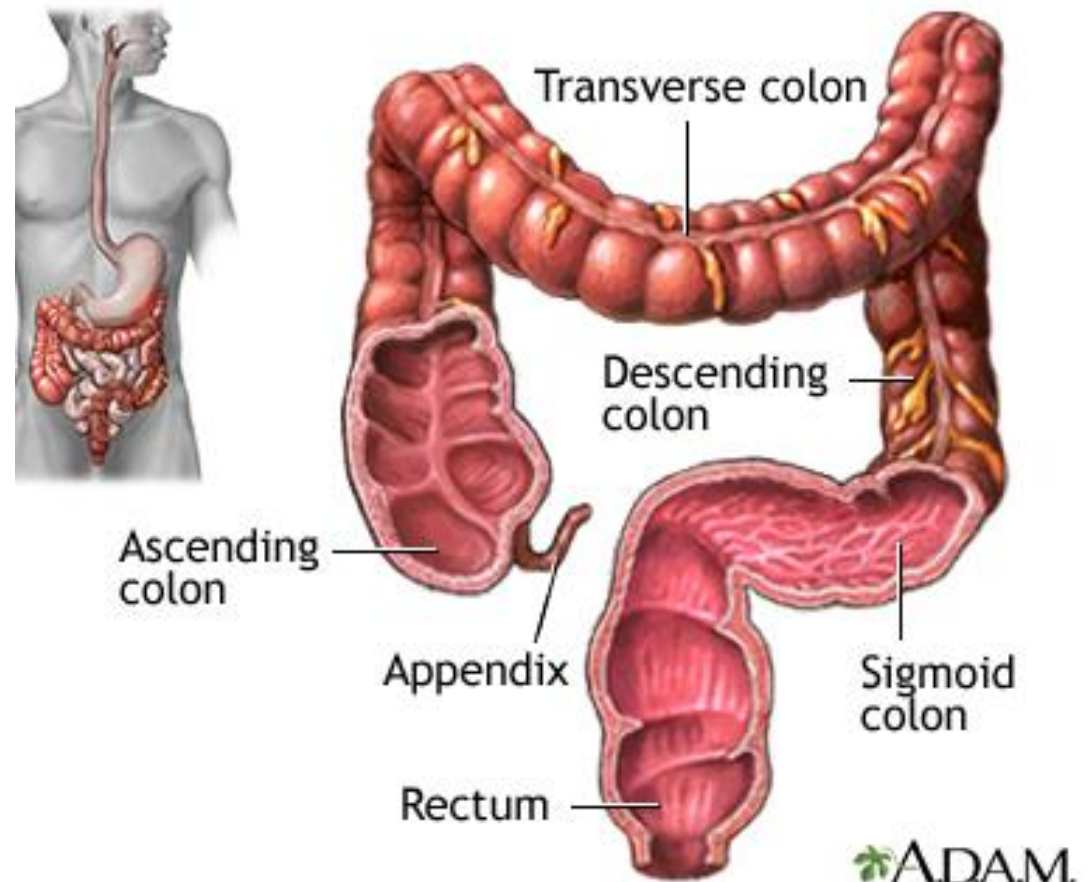
Stage 3: Absorbing

- **Villi** (singular: villus) = look like folds in the walls of the small intestine to increase the rate of absorption
 - Increases surface area available to take in nutrients
 - The size of a tennis court = 250 m² vs 0.5 m² without villi
- Food typically takes 5 to 6 hours to pass through via peristalsis

Large Intestine

Stage 3: Absorbing

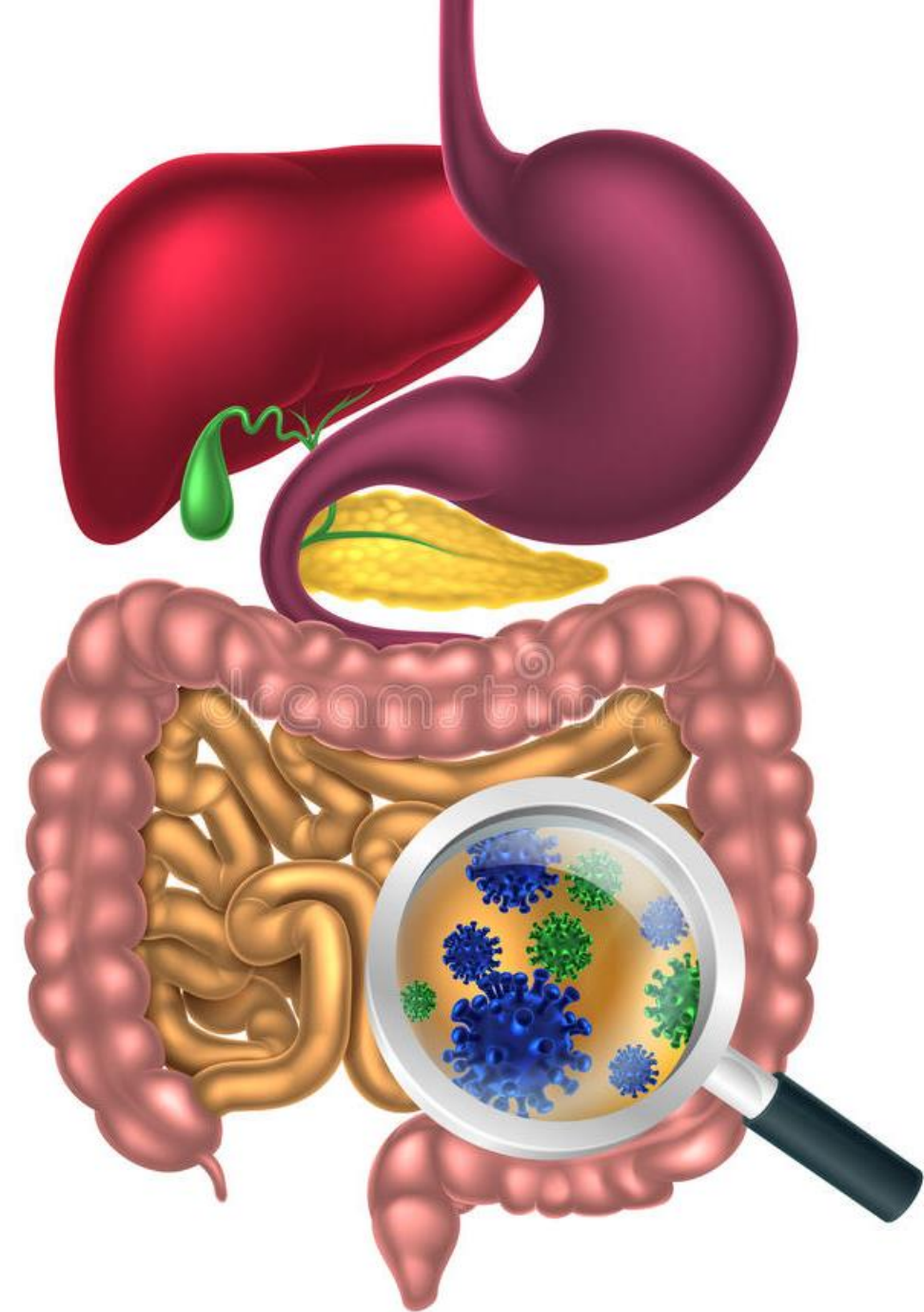
- 5 cm wide and 1.5 m long
- To take in undigested material from the small intestine and reabsorb the water and some minerals
- **Peristalsis** continues to move the undigested food along the digestive tube
- By the time the undigested material leaves the large intestine, 90% of the water that entered the small intestine has been reabsorbed
 - Takes about 12 to 24 hours



The role of bacteria in digestion

Stage 3: Absorbing

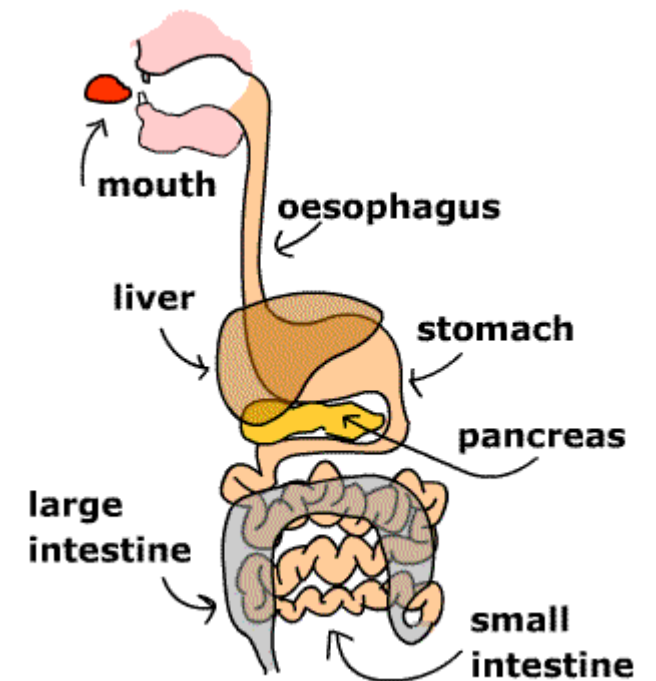
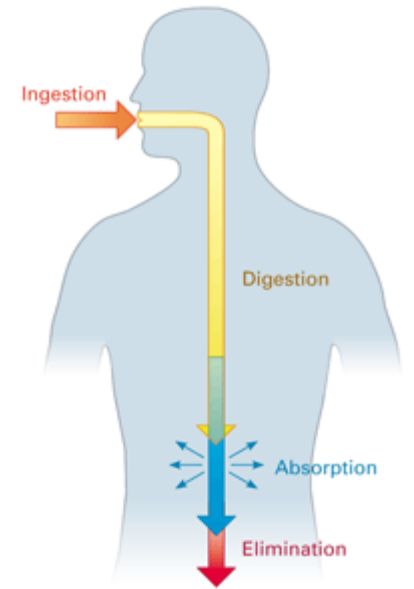
- Many different types of bacteria live in your digestive system
- Beneficial bacteria assist in the breakdown and absorption of food
 - In the large intestine, bacteria use undigested material to make vitamin K which helps your blood to clot
- Sometimes we ingest bacteria that are not beneficial, such as salmonella → FOOD POISONING (X_X)



Stage 4: Eliminating

The Four Stages of Digestion

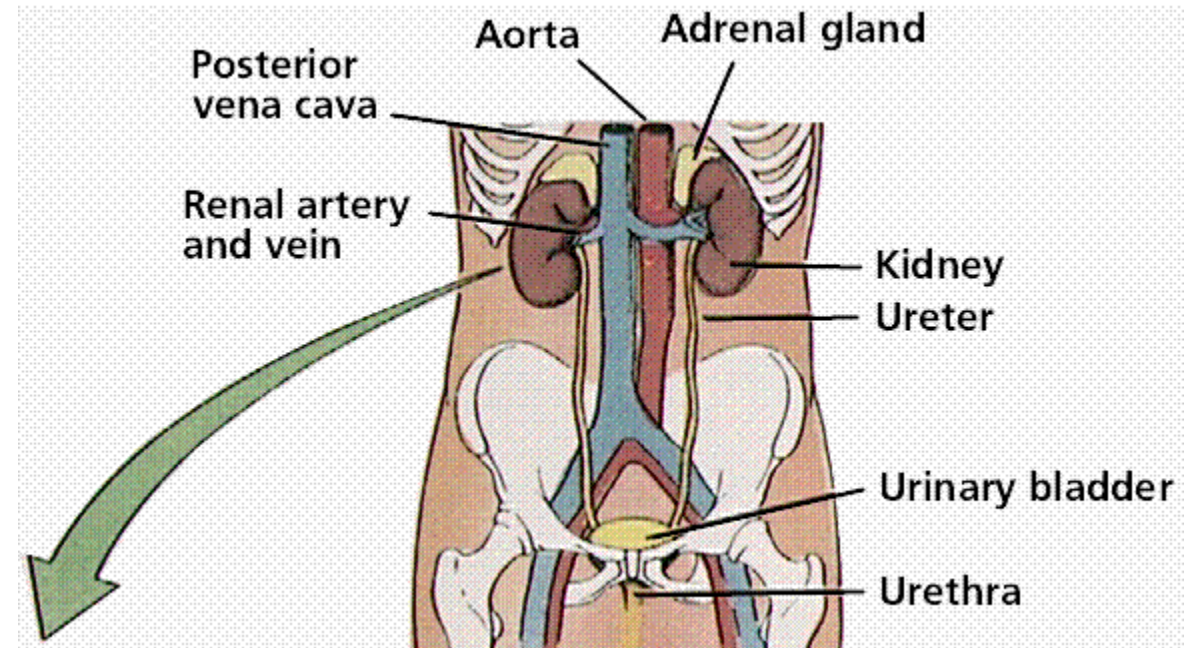
- Any undigested materials left at this point in the digestion process are called **feces**
 - Solid waste products of the digestion process that are stored in the rectum until they are eliminated through the anus = **elimination**
 - **Elimination** = the end of the digestion process
- The whole process, from ingesting food to eliminating waste, takes approximately 20 to 30 hours



Excretion

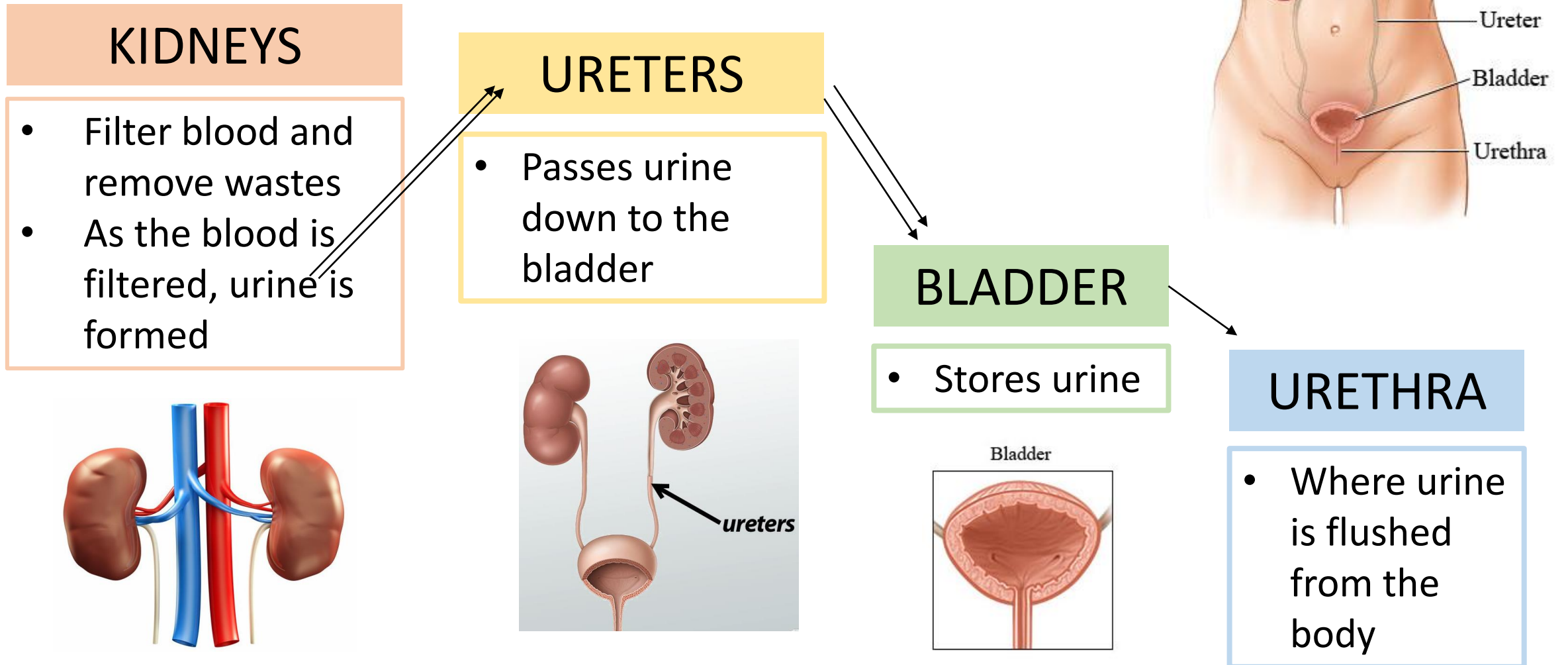
Stage 4: Eliminating

- As part of the digestive system,
 - **Excretion** = removal of liquid wastes through the urinary tract
- Main organs involved
 - Two kidneys
 - Ureters = two tubes that carry urine
 - Bladder
 - Urethra



Excretion

Stage 4: Eliminating



Summary

- There are four stages of digestion
 - Ingesting
 - Digesting
 - Absorbing
 - Eliminating
- The digestive system is basically a long tube along which organs perform different functions as the nutrients pass through them
- The excretory system removes liquid wastes from the body in the digestive process through the urinary tract