

Digestive System - Structure and Function

The **digestive system** is where we eat and digest food break it down (digest it), send the usable parts through the blood to the body organs and tissues and get rid of the waste that the body can't use. There are many organs in the digestive system. The main digestive organs, which make up the GI Tract (gastrointestinal tract), are those through which food passes through the body. They include the **mouth, pharynx, esophagus, stomach, small intestine, and large intestine**. The *accessory digestive organs* break down food through action like chewing or with chemicals like saliva. They include: the **teeth, tongue, salivary glands, liver, pancreas and gall bladder**.

1) The **mouth (oral cavity)** is where digestion begins. In the mouth are the **teeth, tongue** and the **salivary glands**.

2) The **teeth** chew the food and begin mechanical digestion. The **tongue** moves the food around to help break it down and mix it with saliva. **Saliva** is secreted by the salivary glands to begin the chemical breakdown of starchy foods (like bread). Food is chewed and rolled into a ***bolus*** (lump) to be swallowed.

3) When you swallow food, it passes through the **pharynx** (back of the throat) down into the **esophagus**. The esophagus is a long, muscular tube about 10 inches long (25 cm). Food passes down it to reach the stomach. The muscles of the esophagus contract to squeeze the food downward. This is called ***peristalsis***. Food must pass through the **cardiac sphincter** at the bottom end of the esophagus to enter the **stomach**. This muscular valve keeps the stomach contents, once mixed with stomach acids, from re-entering the esophagus and burning its unprotected lining.

4) The **stomach** is a storage tank for digesting food. Its walls contain a layer of muscle that can stretch if a lot of food is eaten. It can hold up to a gallon of food. When the stomach is empty, it shrinks back down and its walls fold up into wrinkles called ***rugae***.

The lining of the stomach has lots of **goblet cells** that make and secrete a slimy mucous to protect the stomach lining from the powerful acids used to digest food. There are also gastric pits that make the **gastric juice**. Gastric juice is a mixture of the chemicals that digest food. It includes; hydrochloric acid (HCL) which kills bacteria on the foods you eat and helps the other chemicals work. Another chemical in gastric juice is pepsin, the chemical that digests proteins. The stomach is where protein digestion begins.

The **stomach** does both mechanical and chemical digestion. It churns the food and mixes it with the gastric juices. By the time it leaves the stomach, the food is broken down into a creamy paste called **chyme**. Now it is ready to move on to the **small intestine**. The **pyloric sphincter** is the muscular valve that regulated release of chyme into the small intestine.

The Digestive System - Structure and Function (continued...)

5) The digested food from the stomach (*chyme*) empties into the duodenum. It is here that the **pancreas** gland sends its **pancreatic juice** into the food. Also bile made in the liver and stored in the gall bladder enters here. **Bile** helps break down fats. The small intestine is where digestion is completed and all the food nutrients are taken off (absorbed) into the blood.

6) The **liver** and the **gall bladder** are accessory organs of the small intestine. The liver is a large organ, weighing about 3 pounds. It has 4 lobes. The gall bladder is a tiny, green sac about 4 inches long (10 cm). The liver is one of the most important organs of the body. Only a small part of what it does has to do with digestion. It makes bile, which breaks down fat. It also takes the blood coming from the digestive tract and changes all the nutrients into forms the body can use, storing some. It cleans alcohol and drugs from the blood, stores vitamins and reuses the iron in old, worn out red blood cells. The gall bladder stores bile made in the liver.

7) The **small intestine** is about 6 feet long (2 meters) in an adult*, a hollow tube that twists and turns in a jumbled mass tucked inside the curve of the large intestine. It is divided into 3 parts: the **duodenum**, the **jejunum** and the **ileum**. * If you could relax all the muscle of the small intestine you can stretch it out to about 20 feet long (6 meters).

Inside the small intestine, the lining has tiny fingers called villi. Villi absorb the nutrients from the food passing through the small intestine. The nutrients then pass into the capillaries and are transported around the body to supply all our body systems.

Once all nutrients are extracted from the chyme, it is passed into the large intestine.

8) The **large intestine** is about 4.5 feet long (1.5m) and wider than the small intestine. It is made up of the **cecum, appendix, colon, rectum and anal canal**. Food waste passes from the small intestine (ileum) into the cecum, then up the ascending colon, across the transverse colon, down the descending colon, through the sigmoid colon and into the rectum, where it is passed from the body through the anal canal.

The large intestine absorbs any left over water, vitamins and electrolytes (like sodium and chloride) in the food waste passing through it.

The **appendix** does have some tissue that might help the immune system (lymphoid), but its tiny, twisted shape also traps bacteria, so often leads to serious inflammation, that can lead to death if not removed - **appendicitis**.

The Digestive System - Structure and Function

1

The mouth is where digestion begins with the **teeth**, **tongue** and the **salivary glands**.

2

The **teeth** chew food to begin mechanical digestion. The **tongue** moves the food around to mix it with saliva from the **salivary glands** for the start of the chemical breakdown of starchy foods.

3

When you swallow food, it goes down into the **esophagus**, a long, muscular tube about 10 inches long (25 cm) to the stomach.

4

The **stomach** is a storage tank for digesting food. It does both mechanical and chemical digestion and it churns the food and mixes it with the gastric juices.

5

The **pancreas** makes an enzyme that lowers the acidity of the food coming out of the stomach into the small intestine. It also makes insulin, which lowers sugars in the bloodstream.

7

The **small intestine** is a long tube where digestion is completed and all the food nutrients are absorbed into the blood. The

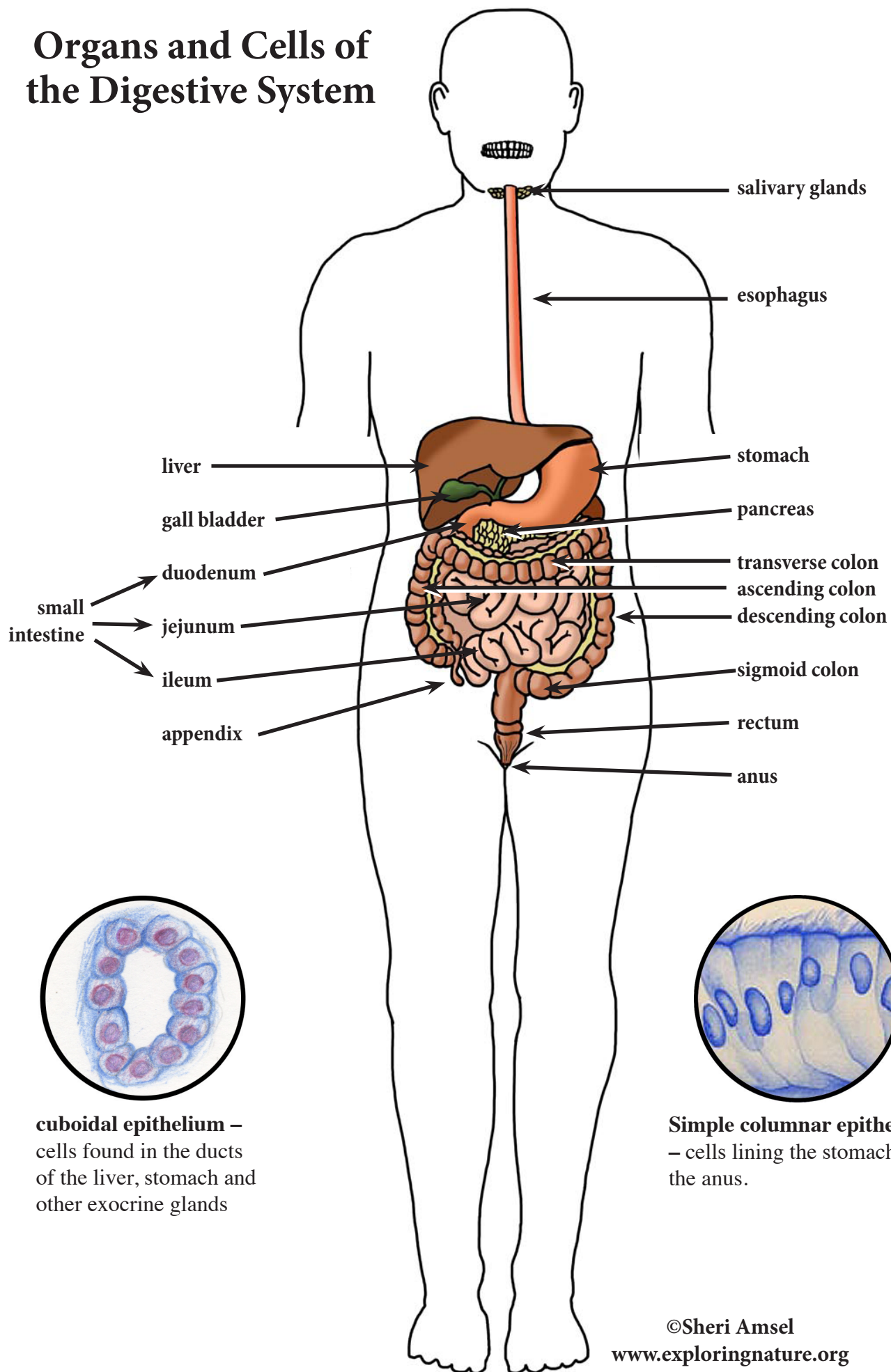
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large intestine absorbs any left over water, vitamins and electrolytes (like sodium and chloride) in the food waste passing through it.

6

The **liver** and the **gall bladder** are accessory organs of the small intestine. The liver makes bile, which breaks down fat and stores it in the gall bladder. The liver also filters the blood and stores vitamins and nutrients for when the body needs them.

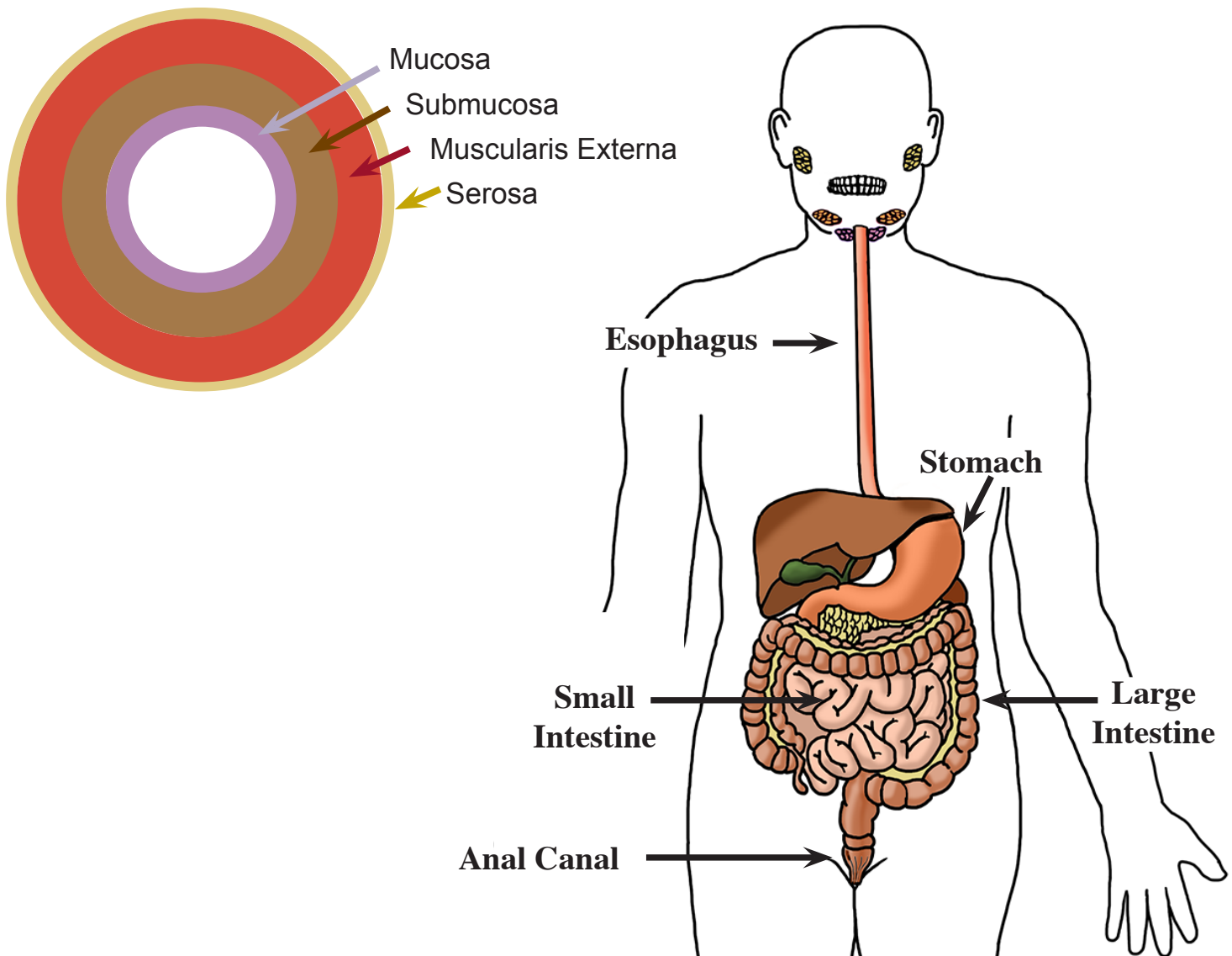
Organs and Cells of the Digestive System



The Structure and Function of the Digestive System

The function of the digestive system is to take in food, break it down into nutrient molecules (digest it), absorb nutrient molecules (usable parts) into the bloodstream, dispose of the waste (indigestible parts) out of the body. From the esophagus to the anus, the wall of each of the organs of the alimentary canal are all made up of four basic layers with many cell types. The different types of cells of the digestive system work together to provide and maintain the functionality and homeostasis of the body.

1. Mucosa - Epithelial Cells (inside layer)
2. Submucosa - Connective Tissue
3. Muscularis Externa - Muscle Tissue
4. Serosa - Epithelial Cells/Connective Tissue (outer layer)



LS3.A: Structure and Function - Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.