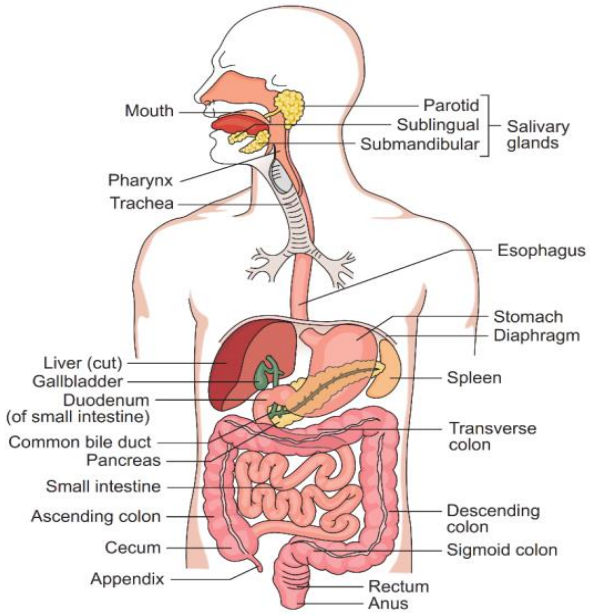
The Digestive System

The digestive system is composed of a continuous tract beginning with the oral cavity and ending at the anus. This tract, called the alimentary canal or the gastrointestinal (GI) tract, is complemented by accessory organs that convert food and fluids into a form that permits the body to absorb nutrients.

The food we eat contains a variety of nutrients, which are used for building new body tissues and repairing damaged tissues. Food is also vital to life because it is our only source of chemical energy.



The GI tract is divided into two sections:

the upper GI tract, which consists of the **oral cavity** (mouth), **oesophagus**, and **stomach**,

and the **lower GI tract**, which consists of the **intestines**.

The **three** main functions of the digestive system are **digestion**, **absorption**, and **elimination**.

The Upper Gastrointestinal Tract Digestion

begins in the oral cavity where food is broken apart by mastication, which is a technical term for chewing. Saliva produced by the salivary glands moistens the food

From the pharynx, the food bolus passes into the oesophagus where it is lubricated with mucus before being carried into the stomach by wavelike muscular contractions called peristalsis [from the Greek word peristaltiko (clasping and compressing)].

The cardiac sphincter (from the Greek word sphingein: to bind tight) is a ring-like muscle that controls the flow from the oesophagus into the stomach.

The stomach is the center of the system, both physically and functionally. Its first job is to act as a temporary storage place for the food while it does its second job: secreting acid and enzymes to help break down proteins, fats, and carbohydrates.

The partially digested food (chyme) passes through the pyloric sphincter, a muscle at the distal end of the stomach, and into the duodenum.

The Lower Gastrointestinal Tract

The lower GI tract begins with the small intestine, which extends from the pyloric sphincter to the first part of the large intestine. Although it is about 20 feet in length, it is known as the small intestine because it is smaller in diameter than the large intestine.

The small intestine is divided into three parts:

the duodenum [from the Greek dodekadaktylon (12 fingers long)], jejunum [from the Latin word jejunus (empty, fasting, hungry), and ileum [a Latin word meaning “flank, groin”]. From the duodenum, chyme moves into the jejunum and from there into the ileum. The ileocecal sphincter controls the flow from the ileum into the cecum, the first part of the large intestine.

Accessory Organs

The salivary glands, liver, gallbladder, and pancreas, although not part of the alimentary canal, play a key role in the digestive system.

1-Salivary Glands

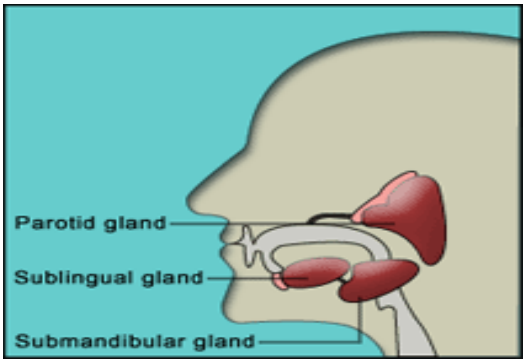
The senses of taste and smell stimulate the salivary glands to secrete saliva, a watery liquid that contains enzymes that begin the digestive process. Saliva also helps eliminate bacteria in the mouth and keeps the teeth and tongue clean.

There are three types of salivary gland :

1-Parotid gland : Is the largest of the three major pairs of salivary glands. It is a serous gland and located anteriorly and inferiorly to the ear between the skin and the masseter muscle of chewing. The parotids produce about 25% of saliva and it is a serous (watery) secretion which is also rich in proteins.

2-Submandibular gland: is a serous gland, located inferiorly to the mandible and it has a muscular covering and empties its contents by way of the submandibular duct into the floor of the mouth on both sides. This gland secretes 70% of the saliva in the mouth. These glands produce a more viscid (thick) secretion, rich in mucin and with a smaller amount of protein. Mucin is a glycoprotein that acts as a lubricant.

3-Sublingual gland : is the smallest of the three, is a mucus gland and as its name implies, lies under the floor of the mouth and on either side of the tongue. Covered by a thin layer of tissue at the floor of the mouth, they produce approximately 5% of the saliva and their secretions are very sticky due to the large concentration of mucin. The main functions are to provide buffers and lubrication.



2-Liver

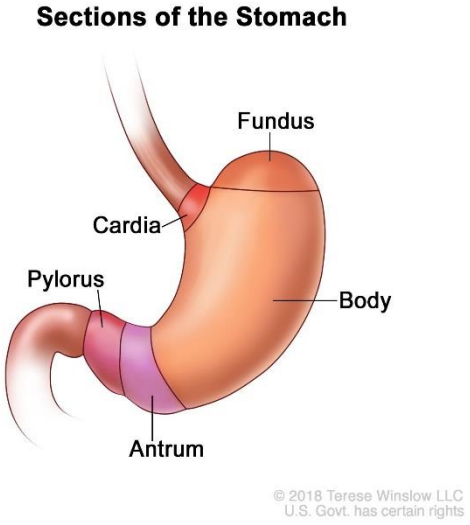
3-Gallbladder

4-Pancreas

Stomach

The stomach is a J shaped expanded bag, located just left of the midline between the esophagus and small intestine. It is divided into **four main regions** and has **two borders** called the **greater** and **lesser curvatures**. The **first section is the cardia** which surrounds the cardial orifice where the esophagus enters the stomach. The **fundus is the superior**, dilated portion of the stomach that has contact with the

left dome of the diaphragm. The **body** is the largest section between the fundus and the curved portion of the J.



This is where most gastric glands are located and where most mixing of the food occurs.

Finally the pylorus is the curved base of the stomach. Gastric contents are expelled into the proximal duodenum via the pyloric sphincter. **The inner surface** of the stomach is contracted into numerous longitudinal folds called **rugae**. These allow the stomach to stretch and expand when food enters. The stomach can hold up **to 1.5 Liters** of materials. The **functions of the stomach include**:

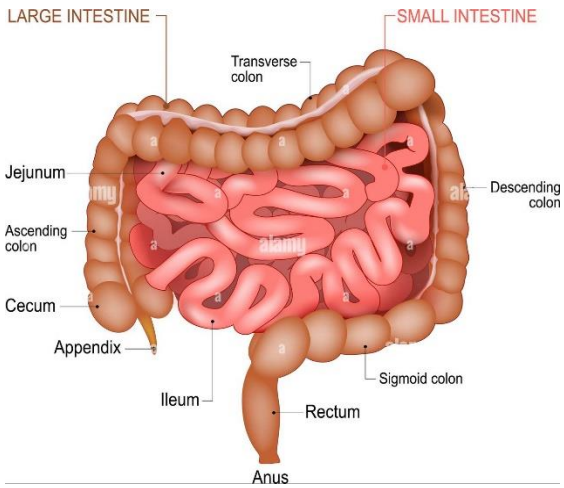
The short-term storage of ingested food.

Mechanical breakdown of food by churning and mixing motions.

Chemical digestion of proteins by acids and enzymes. Stomach acid kills bugs and germs. Some absorption of substances such as alcohol.

Small Intestine

The 20 or so feet of small intestine extend from the pyloric sphincter of the stomach to the ileocecal valve separating the ileum from the cecum. It is compressed and folded over but still occupies a large proportion of the abdominal cavity.



The Small Intestine has 3 Regions

Duodenum – about 10 inches long. It is the proximal **C-shaped** region that curves around the head of the pancreas. The duodenum serves a crucial function as it receives digestive secretions from the pancreas (pancreatic juices) and bile from the liver at the greater duodenal papilla that immediately mix with the contents passing through the pyloric sphincter from the stomach.

Jejunum – about 8 feet long. The start of the jejunum is marked by a sharp bend, the duodenojejunal flexure. It is in the jejunum where the majority of digestion and absorption occurs.

Ileum – about 12 feet long. This is the final and longest segment and continues the absorption of nutrients. The ileum empties into the cecum at the ileocecal junction.

The large intestine

extends around the periphery of the small intestine like a frame. It consists of the appendix, cecum, ascending, transverse, descending and sigmoid colon, and the rectum. It has a length of approximately 4.5 feet and a width of about 3 inches.

The **cecum** is the expanded pouch that receives material from the ileum and starts to compress food products into fecal material. Food then travels along the **colon**. The wall of the colon is made up of several pouches (**haustra**) that are held under tension by three thick bands of muscle (taenia coli).

The rectum is the final 15cm of the large intestine. It expands to hold fecal matter before it passes through the anorectal canal to the anus. Thick bands of muscle, known as sphincters, control the passage of feces.

Functions of Large Intestine

1) Reabsorb water and compact feces.

2) Absorb vitamins and electrolytes and helps make Vitamin K.

3) Stores fecal matter.

Large Intestine