

6.1 - Digestive System

- **Digestion** is the biochemical breakdown of
- large, insoluble food molecules into small, soluble molecules.
- This process is essential because only small molecules can enter cells and be used in the body.
- Molecules produced by digestion pass through the wall of the
- intestine, enter the bloodstream and travel to the cells, where they are reassembled into new structures.

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5 Steps to digestion:

Step	Process
Ingestion	Food taken into the mouth for processing in the gut
Digestion	Mechanical digestion by the action of teeth and the muscular walls of the gut-Chemical digestion by enzymes, mainly in the stomach and small intestine
Absorption	Soluble products of digestion absorbed into the blood stream or lymphatic system if its a fat
Assimilation	Products of digestion absorbed from blood into cells (such as liver or muscle) and used or stored
Egestion	Undigested food and dead cells from the lining of the gut, together with bacteria from the gut flora, expelled from the body as feces

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Why we need enzymes:

Digestion of large molecules occurs very slowly at body temperature.

Enzymes are essential to speed up the rate of digestion so that it is fast enough to process nutrients to supply our needs.

Enzyme	Source	Substrate	Product	Optimum pH
Amylase	Salivary glands	Starch	Maltose	7.0
Pepsin	Gastric glands	Protein	Polypeptides	2.0
Lipase	Pancreas	Triglyceride	Fatty acids and glycerol	7.0

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MOUTH

- mechanically and chemically breaks down food

teeth: bite, cut and grind food to increase surface area
tongue: -positions food for chewing
 -mixes food with saliva
 -rolls food into a bolus and moves it to the back of the mouth
 -has taste buds

Saliva: produced in the salivary glands. Moistens food and has the enzyme amylase. Amylase breaks down starch --> glucose; pH 7

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PHARYNX

- site of tonsils
- swallowing process begins here (involuntary muscles)
- **epiglottis** covers the end of the trachea when swallowing preventing food from entering the trachea

1. As food moves to the back of the mouth, the soft palate seals off the nasal cavity.
 2. During swallowing, the larynx rises and is sealed off by the epiglottis. This forces the bolus into the esophagus and prevents entry into the trachea. As the bolus moves into the esophagus the larynx relaxes.

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ESOPHOGUS

- moves food bolus to stomach through involuntary muscle contractions (**peristalsis**)
- secretes mucus for lubrication

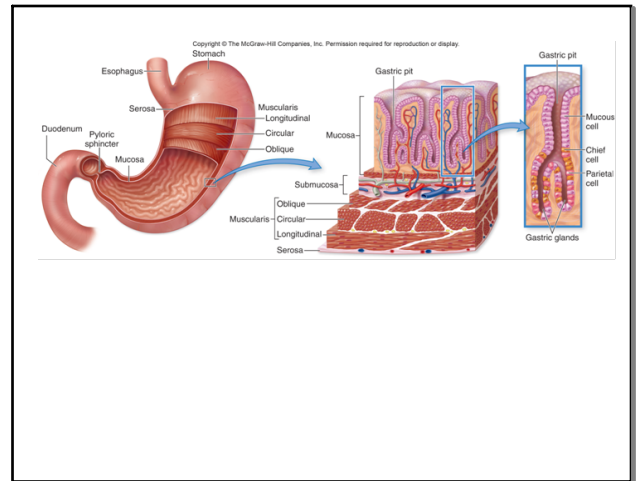
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STOMACH

- **cardiac sphincter** prevents bolus from re-entering esophagus
- stomach walls contract to mix food
- with **gastric secretions** (mucus, gastrin, HCl, pepsinogen)
- **pyloric sphincter** controls the flow of chyme into the duodenum
- pH stomach acid = 1.5-2
- Enzyme pepsin breaks down proteins into amino acids.
- Food is now called **chyme**
- Inside of stomach has ridges called **rugae**.
- Increase surface area for release of digestive juices (found in gastric pits)



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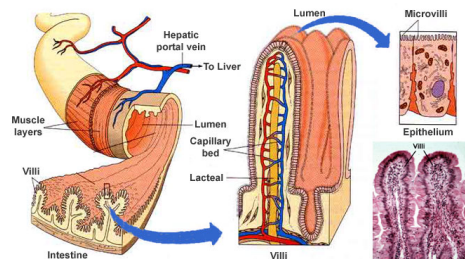
SMALL INTESTINE

- 3 parts of the small intestine: duodenum, jejunum, ileum
- **intestinal glands** secrete enzymes, mucus and hormones to aid digestion
- **Absorption** (uptake of nutrients into blood stream) takes place in the SI.
- **Assimilation** is the use of the absorbed products of digestion in cells
- **chyme** enters the duodenum
- **duodenum** receives **bile** from the liver and gallbladder and digestive enzymes (trypsin, lipase, amylase, and bicarbonate ions) from the pancreas
- digestion finishes in the **jejunum** (almost all absorption takes place here)
- villi are present to increase surface area
- some absorption occurs in the **ileum**
- pH = 8. Enzyme Lipase produced in the pancreas is released into the small intestine breaks down triglycerides into fatty acids and glycerol

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90% of all absorption takes place in the jejunum and ileum
10% takes place in the stomach, and large intestine

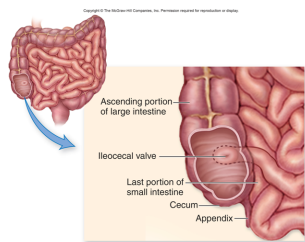
- Small intestine has folds called **villi**. These increase surface area and is where absorption takes place.
- The villi also have microvilli that further increase surface area.
- Each villus has a network of capillaries and a lacteal.
- A lacteal is part of the lymphatic system and carries lipoproteins directly to cells



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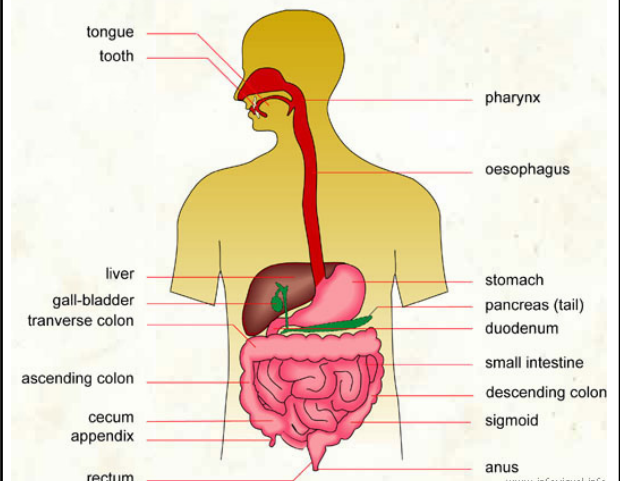
LARGE INTESTINE

- absorption of water
- formation, storage and egestion of feces
- absorption of vitamins
- minimal food absorption
- divided into segments: ascending, transverse and descending colon
- ends in the **rectum** and **anus**



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DIGESTIVE SYSTEM



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