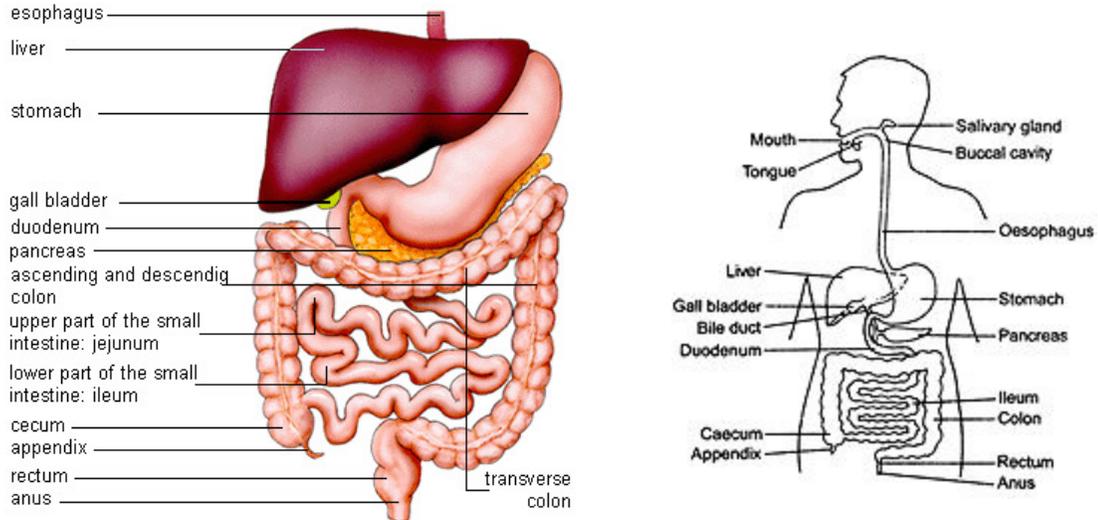


1. **Human digestive system:** structure and major functions



- a. **Mouth:** Mechanical breakdown of food by chewing and secret **neutral** salivary
- b. **Oesophagus:** to push food down by peristalsis movement.
- c. **Stomach:** Mechanical mixing and breakdown of food by peristalsis. Secret **acidic** gastric juice
- d. **Small intestine:** (Duodenum & ileum) intestinal glands secret **alkaline** Intestinal juice
- e. **Large intestine:** colon absorbs water and mineral salts. Faeces are stored temporarily in the rectum.
- f. **Liver:** secret **alkaline** bile to help digestion of fats by breaking fats into minutes fat globules to form an emulsion (emulsification) to increase the surface to volume ratio for easy digestion by the lipase.
- g. **Pancreas:** secret **alkaline** pancreatic juices

2. **Peristalsis Movement**

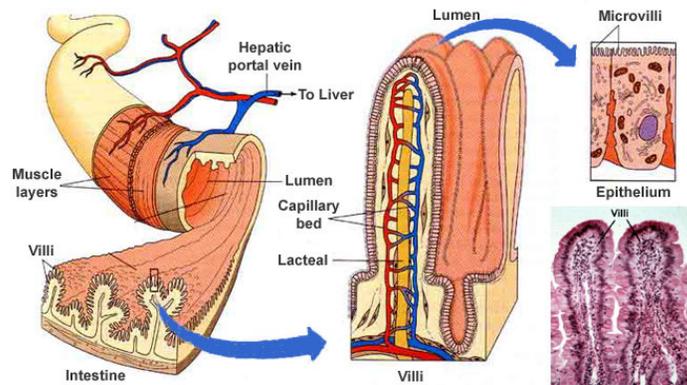
- The wall of the oesophagus is made up of 2 layers of muscles: **Longitudinal muscle** on the outside and **Circular muscles** on the inside. These 2 layers of muscles caused wave-like contraction (one contracts and the other relax) to mix the foods and push it down along the gut.



3. Summary of Enzymes functions in Human Digestive System

Parts	Secretion	Source	Enzyme	Action
Mouth	Saliva (neutral)	Salivary glands	Salivary amylase	Starch → maltose
Stomach	Gastric juice (Acidic)	Gastric glands	pepsin	Proteins → polypeptides
			rennin	Soluble caseinogen → insoluble casein
			Hydrochloric acid	Kill harmful bacteria, denature salivary amylase, change pepsinogen → pepsin, Prorennin → rennin
Small intestine	Bile (Alkaline)	Liver	--	Bile salts emulsify fats
	Pancreatic juices (Alkaline)	pancreas	amylase	Starch → maltose
			trypsin	Proteins → polypeptides
			lipase	Fats → fatty acids + glycerol
	Intestinal juice (Alkaline)	Intestinal glands	maltase	Maltose → glucose
			erepsin	Polypeptides → amino acids
Lipase			Fats → fatty acids + glycerol	

4. Absorption of nutrients:

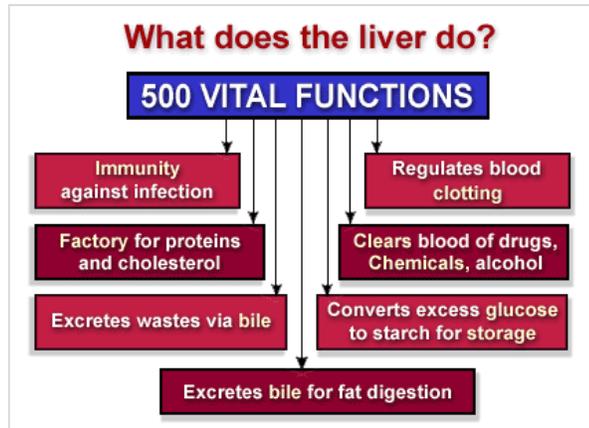
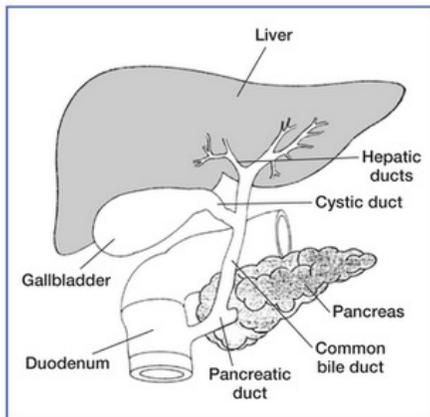


- Products of digestion are: **water, minerals, simple sugars, amino acids, fatty acids and glycerol**. The small intestine adapts for its functions by providing:
 - i. A large absorption surface by:
 - The inner walls of the small intestine have numerous folds.
 - The walls are also lined with villi.
 - The epithelial cells of the villi have numerous microvilli.
 - ii. A long path to provide sufficient time for absorption.
 - iii. Richly supplied of blood capillary and lymphatic capillaries that carry absorbed food substance away so as to maintain a concentration difference for diffusion.
 - iv. A single cell thick epithelium to enable easy diffusion.

- **Glucose** and **amino acids** are absorbed by diffusion into the blood capillary or by active transport.
- **Glycerol** and **fatty acids** diffuse into the epithelium, combined into minute fat globules and enter the **lacteals**.
- **Water and Minerals** are absorbed by the ileum and colon.
- Undigested food discharge as faeces through the anus.

5. Usage of different nutrients by the body:

- **Glucose:** used for cells respiration, excess glucose converted to glycogen and store in liver & muscles.
- **Amino acids:** used for making new proteins and protoplasm. Excess amino acid **cannot be stored** and are de-aminated in the liver.
- **Fats:** are used for synthesis of cell membranes. Excess fats are stored as fat cells under the skin.



6. Functions of the Liver:

- Regulation of blood sugar level:**
 - Too high blood sugar level, Insulin is secreted by pancreas. Liver convert glucose into glycogen for storage in liver and muscles.
 - Too low blood sugar, glucagon is secreted by pancreas. Liver convert glycogen to glucose.
- Production of bile:** bile helps in the digestion of fats and is temporarily stored in the gall bladder before use.
- Breakdown of alcohol:** liver break down alcohol into simple substances that can be used for respiration.
- Deamination of amino acids:** excess amino acids were converted into glucose with the amino group removed and converted to urea.