6.1 Types of digestion

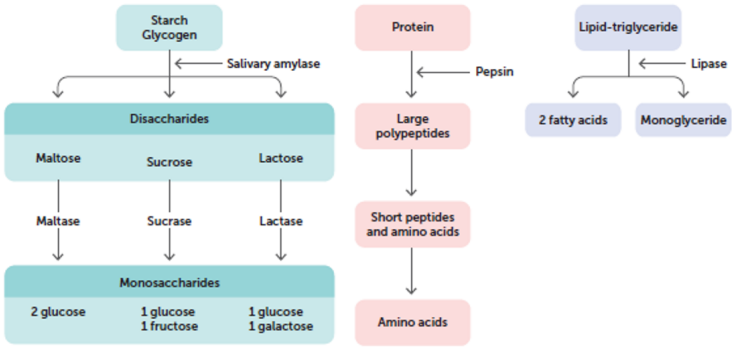
- digestion is the process of breaking down of carbohydrate, protein and fat molecules into products small enough to be absorbed into the blood and into cells
- Stomach acid (hydrochloric acid)

Mechanical digestion

- Physical breakdown of food particles into smaller pieces to increase the surface area
    - Teeth cut, grind and tear food
    - Churning action in the stomach breaks the food down further
    - Gallbladder releases bile into the small intestine. Bile salts act as emulsifying agents, breaking fat down into smaller droplets
    - The increased SA allows more effective chemical digestion, as the chemicals can access more food (in the small intestine)

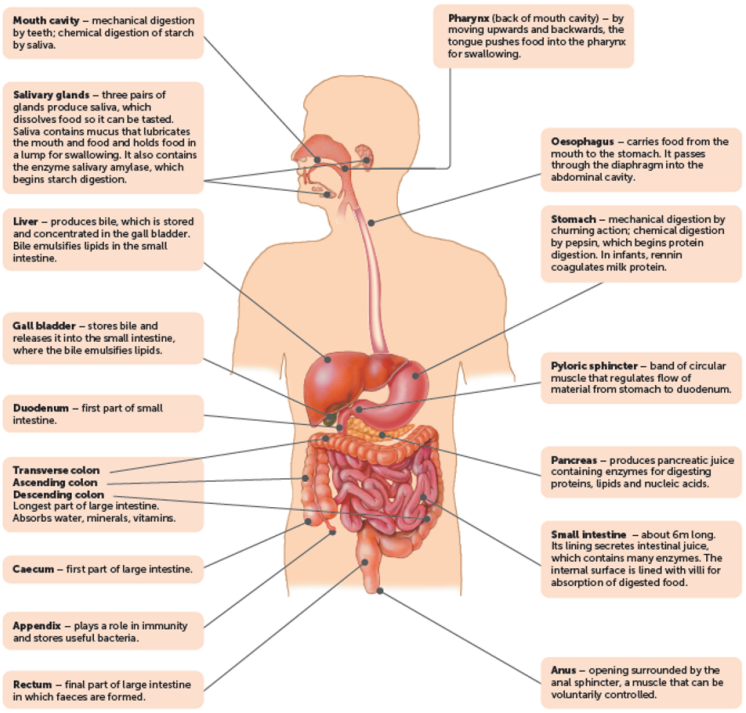
Chemical digestion

- Uses enzymes to break down large, complex molecules into smaller, simpler molecules. These smaller molecules are then enough to be absorbed into the bloodstream.
    - Carbohydrates plot into monosaccharides such as glucose, fructose and galactose
    - Proteins are split into peptides and amino acids
    - Lipids split into fatty acids and glycerol
    - Nucleic acids are split into nucleotides



6.2 The alimentary canal

- continuous tube that runs from the mouth to the anus. Together with associates organs such as the pancreas and the gallbladder, the alimentary canal makes up the digestive system
- Lining of the alimentary canal is the surface through which nutrients are absorbed



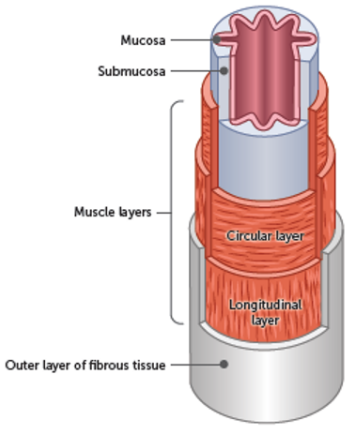
Mouth

- Intake of food
    - Ingestion
- Food is chewed
    - Mastication
- As food is chewed, it's mixed with saliva, which contains mucus to lubricate the food and a digestive enzyme (salivary amylase)
    - Begins the chemical digestion of starch into the disaccharide maltose
- Action of jaws and teeth (incisors, canines, premolars and molars) begins mechanical digestion
- After chewing the tongue shapes the food into a rounded lump (Bolus)
- To swallow the tongue moves upwards and backwards, pushing the boils into the back of the mouth, the pharynx, which leads to the the oesophagus

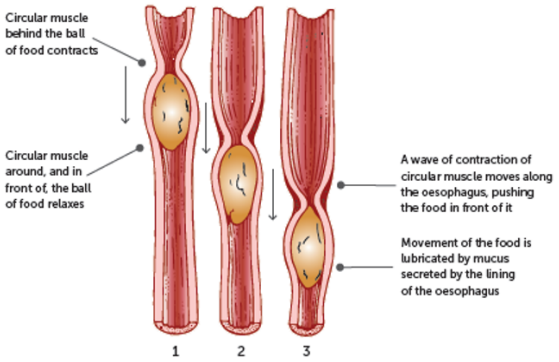
Oesophagus

- 23-25cm long
- Connects pharynx to stomach
- Wall has double layer of muscle (as well as the rest of the alimentary canal)
- Circular muscle has muscle fibres arranged in a circle, and longitudinal muscle has fibres arranged along the length of the canal.
- As food enters the pharynx and oesophagus, the circular muscle behind it contracts to narrow the tube.
- Contraction of successive bands of circular muscle causes the constriction to move in a wave (**Peristalsis**)
- This movement pushes the food in front of it, assisted by the secretion of mucus that lubricates the inner lining

Structure of oesophagus

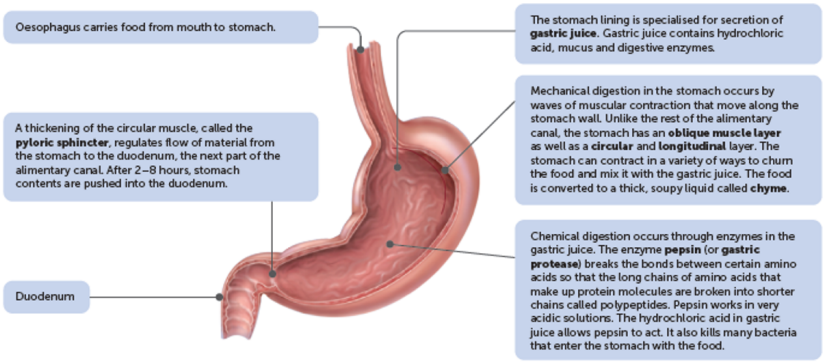


Process of peristalsis



Stomach

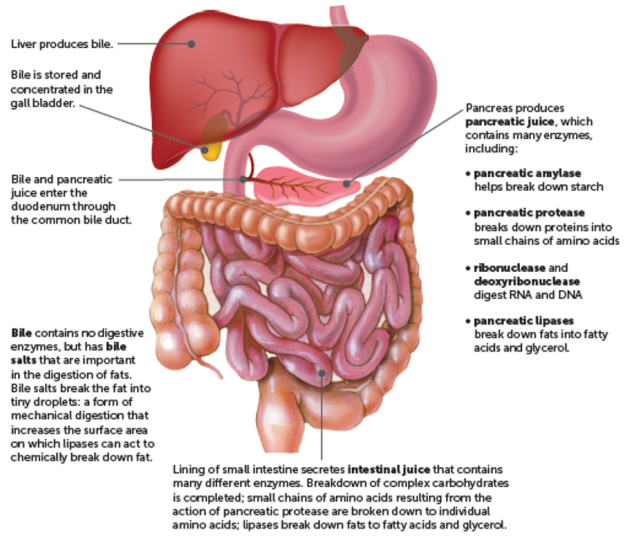
- Oesophagus opens into the stomach, an enlarged section of the alimentary canal.
- Food undergoes mechanical and chemical digestion
- Nutrients are not absorbed into the bloodstream through the stomach because the internal surface is covered by a thick layer of mucus



Small intestine

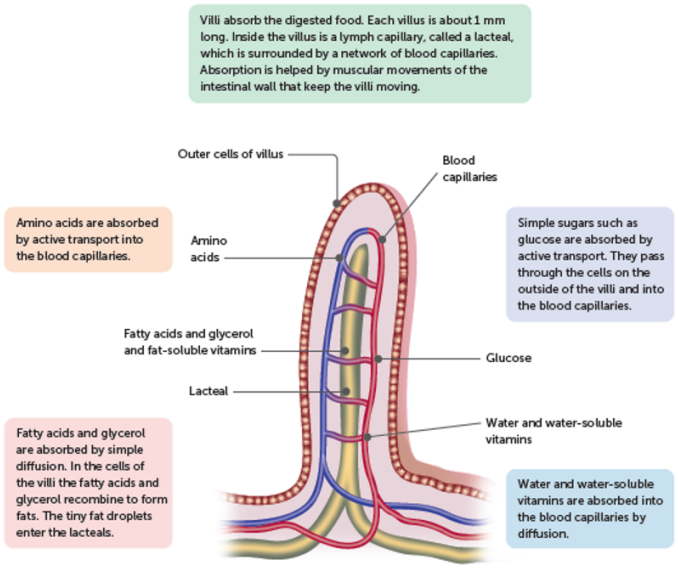
- Longest part of alimentary canal
- 6-7m in length
- Receives material pushed through the pyloric sphincter from the stomach.
- **Three regions:**
  - Duodenum
    - first part
    - extends from the bottom end of the stomach in a curve around the pancreas.

        - Most chemical digestion occurs here before the chyme moves further along the small intestine.
    - Jejunum
        - Middle section
        - It's lining allows effective absorption of carbohydrates and proteins
    - Ileum
        - Final part
        - Where, B12, Bile salts, and any remaining products of digestion are absorbed
- Digestion continues in the small intestine under the influence of pancreatic juice, bile and intestinal juice
- Mechanical digestion also continues in the small intestine (**Segmentation**)



Absorption of nutrients

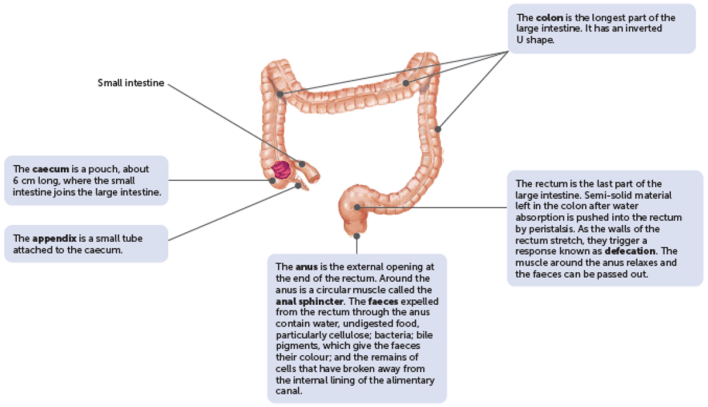
- products of digestion, along with substances such as vitamins, minerals and water, are absorbed through the wall of the small intestine into the blood
- The lining of the small intestine has folds, villi and microvilli, to maximise the absorption of nutrients



Large intestine

- 1.5m long
- Made up of caecum, colon, rectum and anus
    - Additionally, the appendix attaches to the caecum

- No villi in the large intestine, and no digestive juices are secreted, although the lining does secrete a large amount of mucus.
- Movement of material through the large intestine is fairly slow **(18-24 hours)** for materials to pass through. During this time, most of the remaining water is absorbed so the contents become more solid
- Bacteria break down much of the remaining organic compounds. Some bacteria produce vitamins, which are then absorbed through the walls into the blood. Mineral nutrients are also absorbed.
- The semi solid material left after water absorption and bacterial action makes up the faeces



6.3 The effect of diet on the alimentary canal

- Healthy diet is important for a healthy digestive system

Constipation

- occurs if the movements of the large intestine are reduced and the contents remain there for a long period of time.
- As water is absorbed, the faeces become drier and harder than usual.
- Defecation becomes difficult and possibly painful.
- It may be caused by a lack of roughage (cellulose, or insoluble fibre) in the diet

Diarrhoea

- Characterised by frequent defecation of water faeces.
- Caused by irritation of small or large intestine
    - increases peristalsis so that the contents of the intestines move through before there is adequate absorption of water
- This irritation may be a result of bacteria, virus, parasite, cancer, coeliac disease or lactose intolerant

Bowel cancer

- Or colorectal cancer
- An uncontrolled growth of cells in the wall of the large intestine
- Research suggests that bowel cancer may be linked to diet, high alcohol consumption and smoking.
- A diet high in red and processed meat, and low in fibre (fruit and vegetables), may increase the risk of developing bowel cancer

Coeliac disease

- Unable to tolerate gluten, which is found in wheat, rye and barley
- If they eat food containing gluten, their immune system responds by damaging or destroying the villi in the small intestine
- Without healthy villi, nutrients cannot be absorbed, and the person becomes malnourished no matter how much food they eat