

Nutrition:

- Needed to:
 - Supply us with fuel for energy
 - Provide materials for growth and repair of tissues.
 - Help fight diseases and keep our bodies healthy.

The 7 Nutrients:**- Carbohydrates**

- Contain elements: Carbon, Hydrogen, Oxygen.
- Made up of simple sugars - can be in the form of glucose, lactose, fructose, sucrose.
- Can also be in form of large polysaccharides - starch and glycogen are complex carbohydrates which are made up of smaller units joined together in a long chain.
- Ex. Pasta, rice, sugar

- Lipids

- Contain elements: Carbon, Hydrogen, Oxygen.
- Fats and oils made up of fatty acids and glycerol.
- Used to make cell membranes, insulation, protection of organs, and as an energy store.
- Ex. meat, butter, eggs, cheese, milk olive oil, etc

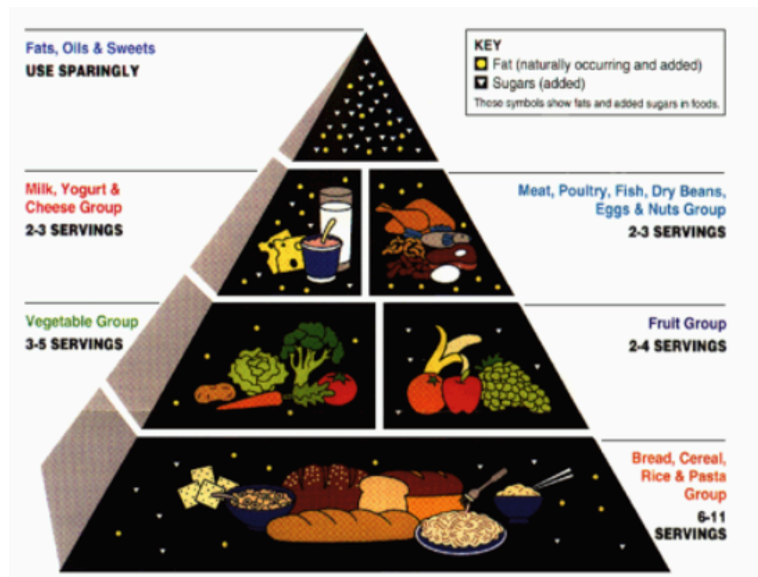
- Proteins

- Contain elements: Carbon, Nitrogen, Hydrogen, Oxygen.
- Made up of long chain of amino acids.
- Needed for growth and repair of tissues.
- Ex. meat, fish, cheese, eggs, beans, peas (plants generally have less protein)

| | | |
|--------------|-----------|---|
| Vitamins | Vitamin A | <ul style="list-style-type: none"> - Maintains the retina in the eye. - Found in carrots, liver, butter, margarine. |
| | Vitamin C | <ul style="list-style-type: none"> - Sticks together cell lining surfaces to make connective tissues. - A lack can lead to scurvy - a weakening of immune function. <ul style="list-style-type: none"> - Loss of teeth, pale skin, sunken eyes. - Found in fruit, vegetables, citrus |
| | Vitamin D | <ul style="list-style-type: none"> - Helps bones absorb calcium. - Found in liver oils, eggs, (made by skin in sunlight). |
| Mineral Ions | Calcium | <ul style="list-style-type: none"> - Needed for making teeth and bones. - Found in dairy products, fish, bread, vegetables. |
| | Iron | <ul style="list-style-type: none"> - Used to make haemoglobin in red blood cells for healthy blood. - Found in Red meat, liver, eggs, vegetables (some - spinach, etc) |
| Water | | <ul style="list-style-type: none"> - Needed for almost all bodily functions - need a constant supply to replace water lost through urinating, breathing, sweating. - To stay hydrated, maintain osmosis correctly in cells, provides a solvent for enzymes and molecules, important on blood plasma. |
| Fibre | | <ul style="list-style-type: none"> - Aids the movement of food through the gut. - Mostly made from cellulose from plant cell walls. - A lack will lead to constipation. - Too much will lead to diarrhoea. |

A Balanced Diet:

- Supplies all the essential nutrients in the right proportions.



Factors of Energy requirement:

- Energy requirements will vary between people depending on:

| | |
|----------------|--|
| Activity Level | The more active, the more energy is required. |
| Age | The younger a person, the more energy is required. - Younger need energy to grow, and are generally more active. |
| Pregnancy | Pregnant women need more energy than other women. - They need to provide the energy their babies need to develop. |

Digestive Enzymes:

- Large molecules like starch, proteins, and fats cannot pass through walls of digestive system.
- Smaller molecules like sugars, amino acids, glycerol and fatty acids can pass through walls.
- Break down large insoluble molecules into smaller soluble molecules.

| Enzyme class | Enzyme | Source | Reactants | Products |
|---------------|---------|--------------------------|-----------|--------------------------|
| Carbohydrases | Amylase | Salivary glands/pancreas | Starch | Maltose |
| | Maltase | Small intestine walls | Maltose | Glucose |
| Proteases | Pepsin | Stomach | Protein | Amino Acids |
| | Trypsin | Pancreas | Protein | Amino Acids |
| Lipases | Lipase | Pancreas | Lipids | Glycerol and Fatty Acids |

The 5 steps of nutrition:

1. Ingestion

- Taking food into the body.

2. Digestion

- Breaking down food.
- The chemical and mechanical breakdown of food - from large insoluble molecules into small soluble molecules that can be absorbed into the blood (to travel to the rest of the body).

3. Absorption

- Moving food into cells.

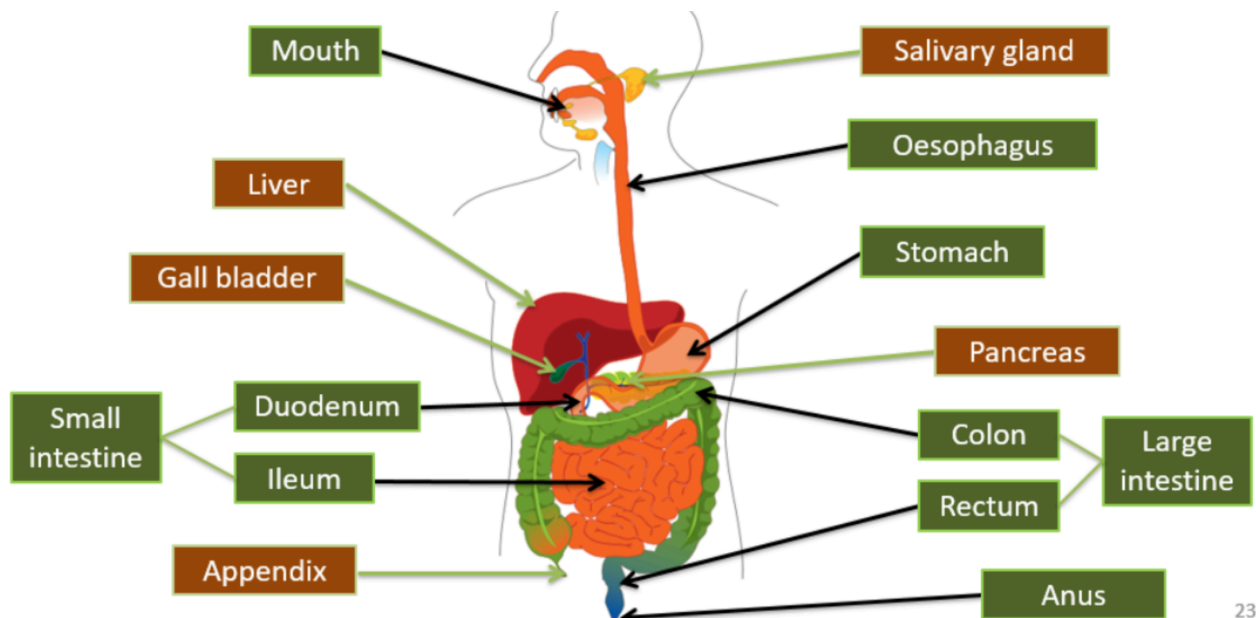
4. Assimilation

- Making food part of cell.

5. Elimination (egestion)

- Removing unused food.

The structure of the body:



The organs:

Mouth (ingestion, digestion):

- Food is taken into the body through the mouth.
- The salivary glands produce saliva containing water and amylase (chemical digestion). The amylase breaks down starch into Maltose.
- The chewing action of the teeth, with support of tongue movement, breaks down large particles into smaller particles - gives larger surface area for enzymes to work on (mechanical digestion)
- The saliva helps group the particles into a "bolus" (a ball of food particles)

Oesophagus (ingestion):

- The circular and longitudinal muscles help with "peristalsis" - squeezing of muscles to move the food from the mouth down to the stomach.

Stomach (digestion):

- Food is held in the stomach for several hours.
- The stomach muscle walls move and churn the food, breaking the food into smaller molecules (mechanical digestion)
- Protease enzyme, pepsin breaks down proteins into amino acids.
- The walls secrete Hydrochloric acid to give the pepsin an ideal acidic environment, while also killing bacteria (chemical digestion)
- A sphincter (ring of muscle) holds food in stomach until ready to be released into the duodenum.
- Digested food (after mixed with acid and enzymes) is called chyme.

Duodenum (digestion):

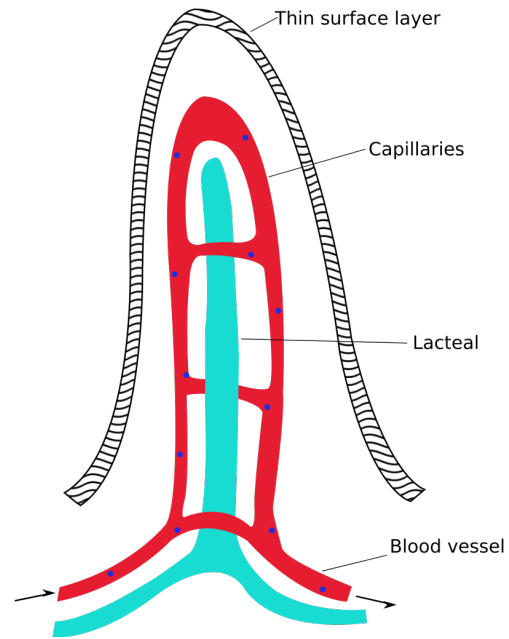
- Pancreatic Juice is brought into the Duodenum to break down the burger molecules into even smaller ones to increase surface area for absorption in the Ileum.
- Bile is also added in this stage:
 - It is not an enzyme, and is made in the liver, stored in the gallbladder.
 - It emulsifies lipids - they become small fat droplets to increase surface area for lipase to work.
 - It neutralizes the stomach acid for pancreatic juice enzymes to work properly, and to prevent the acid from damaging anything without a protective layer - Bile and pancreatic juice are both alkali.

Ileum (absorption, digestion):

- Enzymes from pancreatic juice (as well as maltase) are still active and working.
- Molecules are small enough to be absorbed into the blood.
- It has a very large surface area due to villi and microvilli lined along the walls.

Villi & Microvilli (part of the ileum):

- Villi are very long, and have enough time to break down and absorb all food before it reaches the end.
- They increase surface area for absorption in the ileum.
- Each villus is covered with microvilli to further increase surface area for absorption.
- Each villus contains a network of blood vessels (blood capillaries) and a lacteal (to absorb fats).
- The lacteal connects to the lymphatic system and immune system.
- The blood vessels join up to form the hepatic portal vein, which leads to the liver (which is used to detoxify and breakdown chemicals).
- The food molecules are transported in blood to tissues around the body, where they get assimilated into cells.

**Large Intestine (Absorption, Elimination):**

- **Colon:**
 - Absorbs water from the remaining food.
 - This water is used for other bodily functions such as regulating body temperature, etc.
- **Rectum:**
 - Stores the indigestible fibre called faeces.
- **Anus:**
 - Expels the faeces through sphincter.

Peristalsis:

- The squeezing action (waves of circular muscle contraction).
- The alimentary canal has muscular tissue.
- The circular muscle and longitudinal muscle work to squeeze balls of food (boluses) through the gut - if not, they would get clogged up with old food.
- The squeezing action (waves of circular muscle contraction)

Alimentary Organs vs Accessory Organs:

- Alimentary Organs are part of the Alimentary Canal - these include:
 - Mouth, Oesophagus, Stomach, Duodenum, Ileum, Colon, Rectum, Anus.
- Accessory Organs are exception, not part of the Alimentary Canal - these include:
 - Salivary Gland, Liver, Gallbladder, Pancreas.