**Unit 3: Chemistry of food**

**Nutrition**

Nutrition refers to the essential substances and food needed for organisms to grow and stay healthy.

**Functions of nutrients**

* **Carbohydrates –** is our main source of energy
* **Protein –** essential for growth and repair of muscle and other body tissues.
* **Fat –** a source of energy and is important in relation to fat soluble vitamins.
* **Vitamins –** play an important role in many chemical processes in the body, such as metabolism, immunity, etc.
* **Water –** helps regulate body temperature, transport nutrients, support digestion, maintain blood volume, etc.
* **Minerals –** a nutrient that the body needs in small amounts to support normal functions in the body, such as bone health, nerve function, hormone production, etc.

**Major groups of organic compounds**

**Carbohydrates**

Carbohydrates are the primary source of energy for the body.

It also has other functions such as:

* **Supporting digestive health**
* **Supporting immune function**
* **Supporting physical activity**

**Chemical composition of Carbohydrates**

Carbohydrate can contain different kinds of sugar units

* Monosaccharide – **one** sugar unit
* Disaccharides – consists of **two** monosaccharides.
* Polysaccharides – consists of **many** monosaccharides.

**Lipids**

Lipids is composed of mainly carbon, hydrogen and oxygen (C H O).

**Fatty acids** and **glycerol** are the building blocks of lipids.

Some of its functions are:

* **Cell signaling**
* **Insulation**
* **Hormone production**

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| **Basic units (monomers)** | **Larger molecules (macromolecules)** |
| Fatty acids and glycerol | Fats and oils |

**Chemical composition of Lipids**

**Protein**

Protein contain the elements Carbon(C), Hydrogen(H), Oxygen(O), Nitrogen(N). Sometimes also Sulfur (S) and Phosphorus (P).

The building blocks of Protein are **Ammo acids.**

Functions of protein:

* **Growth**
* **Cell repair and replacement**
* **To produce enzymes**
* **To produce antibodies**

Protein is found in:

* **Lean meat, Fish, Egg white, Cheese.**
* **Plant – Beans, cereals like wheat and maize**

**Disparities between Monosaccharide, Disaccharides and Polysaccharides**

**Monosaccharide**

The simplest form of carbohydrates and made up of only a single sugar molecule. Cannot be broken down into smaller carbohydrate molecules e.g. glucose, fructose and galactose.

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| **Monosaccharide** | **Found in** |
| Glucose | Photosynthesis plants, blood of animals |
| Fructose | Fruit sugar |
| Galactose | Milk |

**Disaccharides**

Contain two monosaccharide units which have been joined together by condensation. For example:

* **Sucrose** – a compound of **glucose** and **fructose** and is transported within plants.
* **Lactose –** a compound of **galactose** and **glucose** and is found in milk.
* **Maltose –** a compound consisting of **two** glucose molecules; forms a digestive tract of humans during starch digestion.

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| **Disaccharide** | **Monosaccharide** | **Found in** |
| Maltose | Glucose + Glucose | Germinating seeds |
| Lactose | Glucose + Galactose | Milk |
| Sucrose | Glucose + Fructose | Sugar cane |

**Polysaccharides**

Composed of many monosaccharide units joined together in chains. For example:

* **Starch –** is a straight chain of glucose molecules.
* **Glycogen –** has a more highly branched structure of glucose polymer molecules.
* **Cellulose -** composed of a long chain of glucose units which links to a linear and rigid structure. These bonds cannot be broken down by human digestion enzymes, which means it is not a source of energy for humans.However, it provides dietary fiber and promotes bowel movements.

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| **Polysaccharide** | **Monosaccharide** | **Found in** |
| Starch | Glucose | Plant – rice, wheat, potatoes |
| Glycogen | Glucose | Animal – muscle and liver |
| Cellulose | Glucose | Plant cell wall |

**Types of fatty acids**

**Monounsaturated fats**

Mostly from plants; liquid at room temperature.

E.g. olive, peanut oils, avocadoes

* **Have a single double bond between carbon atoms in the fatty acid chain.**
* **Thick or soft liquids**
* **Liquid at room temperature but start to solidify at refrigerator temperature.**

**Polyunsaturated fats**

Either liquid or soft at room temperature.

E.g. sesame, soy, corn, sunflower-seed oils, nuts, seeds.

* **More than one double bond.**
* **Liquid in room and refrigerator temperature.**

**Uses of polyunsaturated fats**

* Assists the body in getting rid of newly formed cholesterol.
* Keeps the blood cholesterol level down and reduces cholesterol deposits in artery walls.

**Vitamins**

The word *vitamin* comes from the Greek word meaning *life.*

Vitamins are essential organic compounds which the body needs in small quantities in order to maintain normal physiological and function.

**The two groups of vitamins**

* **(C) Water soluble –** vitamins B and C
* **(D) Fat soluble –** vitamins A, D, E, K

**Water soluble vitamins**

Vitamins that dissolve in water and are **NOT** stored in the body for future use.

**Vitamin C**

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| **Function** | **Sources** | **Deficiency** |
| Fight against infection.  Maintain healthy gums | Potatoes, Citrus fruits, red pepper. | Results in scurvy. |

**Excess and deficiency of nutrients**

**Protein deficiency**