

Macronutrients

→ The ~~no~~ types of nutrients which are required in larger quantity by the body are called macronutrients. These include carbohydrates, proteins and lipids.

Carbohydrates = These are the macromolecules found most abundantly in human body and main source of energy. Carbohydrates are composed of mainly carbon, hydrogen and oxygen. These are important structural component in human body, also main component of cell wall in bacteria and plants. They also work as storage component in both animals and plants.

Carbohydrates can be classified into:

- ① Monosaccharides
- ② Disaccharides
- ③ Polysaccharides

① Monosaccharides = These are the fundamental structure of carbohydrates working as building block. Monosaccharides may be composed of 3-carbon sugar (Triose), 5-C sugar (Pentose), 6-carbon

sugar (Hexose). Their empirical formula is $(CH_2O)_x$.

Main examples are glucose, fructose and galactose.

Glucose is the most important monosaccharide which is main source of energy in both animals and plants. Glucose is the ultimate form of any carbohydrate that can be used directly by cell for production of energy. Fructose is fruit sugar mainly found in fruits.

② Disaccharides: Two monosaccharides unite to form the disaccharide. For example glucose unite with glucose forming maltose, glucose unite with fructose forming sucrose and glucose with galactose forms lactose. These are also simpler forms of carbohydrates they can be broken down by enzymes into simpler form and then utilized by cells.

③ Polysaccharides: These are the complex form of carbohydrate formed by union of hundreds of monosaccharides. For example starch, glycogen, cellulose etc. Polysaccharides work as structural component in cell wall like cellulose,

also present in cell membrane. They ~~can be~~ used
are used as storage sugar in animals in the form
of glycogen and also in plants in the form of
starch. This storage sugar can be used in future
for energy source.

Proteins

Proteins are the biomolecules present in
animals, plants, micro-organisms etc. They work as
structural components in many parts of human
being for example hair, skin, nails, muscle,
cartilage, even bones etc. Proteins can also
be used as energy sources whenever carbohydrates
and lipids are depleted. Proteins are composed of
amino acids. Amino acids are the building blocks
which unite together by the process of hydrolysis
resulting in formation of complex structure.

Types of Protein

- ① Simple proteins
- ② Complex / conjugated proteins
- ③ Derived proteins

① Simple proteins
of two globular

② Conjugated
non-protein
For example
etc

③ Derived
degraded

Lipid

fat
structure
for
lipid
degraded
etc

① Simple proteins = These are simply formed by union of two or more amino acids. These are mostly globular proteins e.g. albumin, globulin, ~~etc~~ etc

② Conjugated proteins = Types of proteins which contain non-protein group along with amino acids
For example: phospho-proteins containing phosphate group etc

③ Derived proteins = These are mainly derived by the degradation of polypeptides ~~or~~ for example oligopeptide etc

Lipids - Lipids are the polymers composed of fatty acids as the building blocks. Lipids are also structural component of cell membrane. They are important for storage of food, insulation of body organs. Lipids are insoluble in water. When carbohydrates are depleted lipids are used as source of energy.

They are classified into:

- ① Simple lipids
- ② Compound lipids
- ③ Derived lipids

Simple lipids

They are composed of Fatty acids plus glycerol

e.g. Fats, oil etc

Compound lipids

They are composed of Fatty acids plus glycerol along with them other groups like,

Phospholipids composed of phosphate + lipid,

Glycolipids containing carbohydrates etc

Derived lipids

These are formed by decomposition of simple and

compound lipids for example vitamin D, sterols etc