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The Core Molecules of Life-Role and Significance

Muhammad Irfan*

**Department of Biotechnology,University of Agricultural Sciences, India*

***Corresponding author:** Email: muhammadi@gmail.com

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Commentary

The living body contains 92 natural elements. Out of which, most essentials and common with many natural molecules are carbon, hydrogen, oxygen, nitrogen, sulfur and phosphorous. The fundamental building blocks of life are primarily made of these elements. There are 19 trace elements which are available and required in smaller quantities in living organisms. Of all these, carbon is considered most important as major organic structures such as carbon chains are formed out of carbon atoms and which are back bone of carbohydrates and fatty acids.

Most of the life's structure and function depends on four important macromolecules

which are major building blocks in any living organism. They are Carbohydrates, Proteins, Lipids and Nucleic Acids. Different polymer structures of these macromolecules and their interaction with each other decides regulate organism's structure and function.

All carbohydrates contain carbon, hydrogen and oxygen in the ratio 1:2:1. Carbohydrates can be monosaccharaides, Disaccharides, Polysaccharides. Monosaccharaides like glucose and fructose are simplest form of monosaccharaides, contains single sugar molecule. Disaccharides have two monosaccharide molecules united by glycosidic bond. Maltose is a Disaccharide (Two glucose molecules united together). Polysaccharides are formed when three or more monosaccharaides are linked together. These are the complex in nature and common examples are cellulose, glycogen and starch.

Of all the organic molecules, proteins or polypeptides are most abundantly found in living organisms, comprising of 50% of cell dry weight. Proteins are polymers made out of amino acids. The common structure of amino acid has carbon atom linked to carboxyl group and amino group, hydrogen atom and variable R group. The functional protein attains its final structure in four levels i.e., primary, secondary, tertiary and quaternary strictures. Primary structure forms from a single polypeptide which is a simple chain of amino acids and are part of protein that are directly coded by DNA. The interactions between carboxyl groups and amino groups of amino acids in primary structure make up secondary structure. There are two common forms of secondary structures called α-helix and β-pleated sheet. Because of strength and density of these structures, they are mostly found in biological proteins. Tertiary structures are formed from further interactions between aqueous environment, R group and amino acid side chains. Tertiary structure defines individual conformation of polypeptide. Multiple interactions between different polypeptides make up quaternary structure. Quaternary interactions happen in proteins which are formed out of several polypeptides. Proteins play major role in biochemical catalysis, defense against foreign bodies, signaling ad transport, responses to stimuli, storage and providing structural support

Lipids are made up of fatty acids. Lipids present in body as unsaturated, saturated and trans fats. They play role in cellular membrane structures, energy storage and functions like signaling in the body cells. Lipids are classified into 8 categories viz., fattu acids, glycerolipids, Glycerophospholipids, Sphingolipids, Sterols, Prenols, Saccharolipids, and Polyketides.

Nucleic acids are composed of monomer molecules called nucleotides. A nucleotide contains 5-carbon sugar, phosphate group and nitrogenous base. If sugar is ribose then the polymer is called RNA (ribonucleic acid) and if sugar iis deoxyribose derived from ribose,then the polymer is called DNA (deoxyribonucleic acid). They create and encode genetic information in all living cells inside and outside of nucleus.