Biochemistry & Clinical Pathology
(2114)

Introduction to Biochemistry

INTRODUCTION TO BIOCHEMISTRY

- *Biochemistry involves various applications of chemistry to the study of biological processes at the cellular and molecular levels.*
- *It emerged as a distinct discipline around the beginning of the 20th century, when scientists combined different concepts of chemistry, physiology and biology in order to investigate the chemistry of living systems by:*

A. *Studying the structure and behavior of the complex molecules (i.e. biomolecules) found in biological materials and*
B. *the ways, in which these molecules interact (biological reactions)*

PRINCIPLES OF BIOCHEMISTRY

- *Cells (basic structural units of living organisms) are highly organized and constant source of energy is required to maintain the ordered state.*
- *Living processes comprises thousands of chemical reactions. Precise regulation and integration of these reactions are required to maintain life*
- *Certain important reactions e.g. Glycolysis is found in almost all organisms.*
- *All organisms use the same type of molecules: carbihydrates, proteins, lipids, nucleic acids etc.*

BIO-MOLECULES

- *Just like cells are building blocks of tissues likewise molecules are building blocks of cells.*
- *Animal and plant cells contain approximately 10, 000 kinds of molecules (bio-molecules)*
- *Water constitutes 50-95% of cells content by weight.*
- *Ions like Na+, K+ and Ca+ may account for another 1%*
- *Almost all other kinds of bio-molecules are organic (C, H, N, O, P, S)*
- *Infinite variety of molecules contain C.*
- *Most bio-molecules considered to be derived from hydrocarbons.*
- *The chemical properties of organic bio-molecules are determined by their functional groups. Most bio-molecules have more than one.*

MAJOR CLASSES OF SMALL BIO-MOLECULES

1. AMINO ACIDS

- *Building blocks of proteins.*
- *Mainly 20 amino acids occurring.*
- *Contains amino group and carboxyl group function groups at the same carbon atom.*
- *R -Group (side chains) /Functional Groups determines the chemical properties of each amino acids.*
- *Chemical behaviour determines how the protein folds and iheir biological functions.*
- *Individual amino acids in protein connected by peptide bond (polypeptides).*
- *Polypeptides act as transport proteins, structural proteins, enzymes, antibodies, cell receptors.*

CARBOHYDRATES (SUGARS)

- *Carbohydrates most abundant organic molecule found in nature.*
- *Initially synthesized in plants from a complex series of reactions i.e. photosynthesis.*
- *Basic unit is called monosaccharides.*
- *Monosaccharides can form larger molecules e.g. glycogen, plant starch or cellulose by polymerization*

Functions

- *Store energy in the form of starch (photosynthesis in plants) or glycogen (in animals and humans).*
- *Provide energy through metabolism various biochemical pathways and cycles.*
- *Supply carbon for synthesis of other compounds like amino acids, nucleic acids etc.*
- *Form structural components of cells and tissues.*
- *Intercellular communications*

FATTY ACIDS

- *Are monocarboxylic acid contains even number C-atoms*
- *Two types: saturated (C-C) and unsaturated (C=C)*
- *Fatty acids are components of several lipoid al molecules.*
- *Lipids are triacylglycerol, streiods (cholestrol, sex hormones), fat soluble vitamins.*

Functions

- *Storage of energy in the form of fat*
- *Membrane structures*
- *Insulation (thermal blanket)*
- *Synthesis of hormones*