

دولة ليبيا

وزارة التعليم العالي

إدارة التعليم الخاص



جامعة الساحل الغربي

قسم العلوم الطبية

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Biochemistry

Proteins and Amino acids

Major Concepts

- A. To know what are proteins and their biomedical importance.
- B. To learn what are amino acids, their classification and properties.
- C. To learn the classification and properties of proteins.
- D. Learn the structure of protein.

BIOMEDICAL IMPORTANCE OF PROTEINS

Proteins are organic compound, its consist of CHON elements

- 1- Proteins are the main structural components of the cytoskeleton. They are the sole source to replace Nitrogen of the body.
- 2- Biochemical catalysts known as enzymes are proteins.
- 3- Proteins known as immunoglobulin serve as the first line of defense against bacterial and viral infections.
- 4- Several Hormones are protein in nature.
- 5- Structural proteins furnish mechanical support and some of them like actin and myosin are contractile proteins and help in the movement of muscle fibre, microvilli, etc.

- 6- Some proteins present in cell membrane, cytoplasm and nucleus of the cell act as receptors.
- 7- The Transport proteins carry out the function of transporting specific substances either across the membrane or in the body fluids.
- 8- Storage proteins bind with specific substances and store them, e.g. iron is stored as ferritin.
- 9- Few proteins are constituents of respiratory pigments and occur in **electron transport chain** or respiratory chain, e.g. cytochromes, hemoglobin, myoglobin.
- 10- Under certain conditions proteins can be catabolized to supply energy.
- 11- Proteins by means of exerting osmotic pressure help in Maintenance of electrolyte and water balance in body.

COMPOSITION OF PROTEINS

In addition to C, H, and O which are present in carbohydrates and lipids, proteins also contain N. The nitrogen content is around 16 per cent of the molecular weight of proteins. Small amounts of S and P are also present. Few proteins contain other elements such as I, Cu, Mn, Zn and Fe, etc. Amino acids: Protein molecules are very large molecules with a high molecular weight ranging from 5000 to 25,00,000. Protein can be broken down into smaller units by hydrolysis. These small units the monomers of proteins are called as amino acids.

Proteins are made up from, 20 such standard amino acids in different sequences and numbers. So an indefinite number of proteins can be formed and do occur in nature. Thus proteins are the un branched polymers of L- α -amino acids.

The L- α -amino acid has a general formula as shown below:

R is called a side chain and can be a hydrogen, aliphatic, aromatic or heterocyclic group. Each amino acid has an amino group $-NH_2$, a carboxylic acid group $-COOH$ and a hydrogen atom each attached to carbon located next to the $-COOH$ group. Thus the side chain varies from one amino acid to the other.

AMINO ACIDS

CLASSIFICATION AND STRUCTURE OF AMINO ACIDS

Amino acids can be classified into 3 groups depending on their reaction in solution.

A. Neutral

B. Acidic

C. Basic.

Essential Amino Acids:

Nutritionally, amino acids are of two types: (a) Essential and (b) Non-essential. (c) There is also a third group of semi-essential amino acids.

(a) Essential amino acids: These are the ones which are not synthesized by the body and must be taken in diet. They include valine, leucine, isoleucine, phenylalanine, threonine, tryptophan, methionine and lysine.

(b) Non-essential amino acids: They can be synthesized by the body and may not be the requisite components of the diet.

(c) Semi-essential amino acids: These are growth promoting factors since they are not synthesized in sufficient quantity during growth. They include arginine and histidine. They become essential in growing children, pregnancy and lactating women.

@- Proteins linked by Peptide bond.

Reference:

Textbook of Medical Biochemistry

Eighth Edition

Dr. (Brig) MN Chatterjea BSc MBBS DCP MD (Biochemistry).

Type of Proteins (amino acids)

1. Simple proteins as Albumin

2. Conjugated proteins as

amino acid with DNA — chromosome

amino acid iodine — Thyroxine

amino acid phosphor — Kazin in milk

amino acid iron — Hemoglobin

— in Enzyme, Hormone, skin, hair