Insulating Effect

Lipids exert an insulating effect on the nervous tissue.

Integral part

Lipids are integral part of cell protoplasm and cell membranes.

Precursor

Some lipids act as precursors of very important physiological compounds .e.g. cholesterol is precursor of steroid hormones.

CHAPTER 1

Proteins

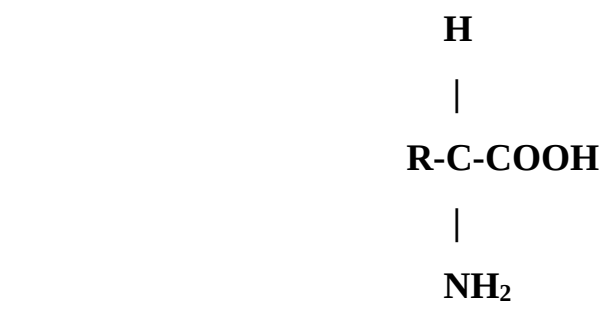
Definition

The proteins are extremely complicated molecules and are nitrogenous compound made up of a variable no. of amino acids joined to each other by specific type of covalent bond called peptide bond or peptide linkage.

Derivation

The name protein derived from Greek "protos" which means the first or the supreme. "Proteins are polymers of amino acids"

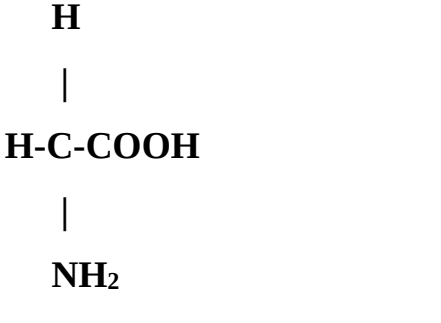
General formula of amino acid



Amino Acids have two characteristics functional groups the amino group _ NH_2. The functional group _COOH which is Carboxylic group.
R represents the side chain which varies from one Amino acid to other Most amino acid have one _NH_2 group and other _COOH group but some have more than one of these. They are 20 amino acid which have been found to occur in all proteins and for which genetic codons exist. If R changes the amino acid changes structurally

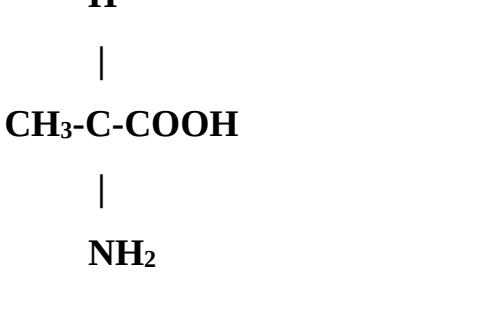
For Example

If R is H



GLYCINE

If R is CH_3



ALANINE

"Amino acids are building blocks of proteins"

Functions of proteins

Proteins present in cytoplasm as well as the cell membrane of cells with out exceptions.

Mammalian muscles contain	20%
Blood plasma	7%
Cows	3.5%
Cereals	12%

Beans, nuts, pulses, contain 20% proteins.

Besides forming structural elements of body and important food constituents as well. They are also present in daily use articles such as silk, leather, and wool. A group of substances called enzymes which are biocatalyst of the body,

"Enzymes are mainly protein in nature."

Hormonal effect

Many of the hormones which regulate the chemicals and other process or the body are also protein in nature.

Structure of proteins

Each type of proteins contains a specific number of amino acids, Different kinds of proteins have different shapes are related to their particular function in life processes.

Proteins molecules have different several different level of structure.

Primary structure of proteins

Definition

Linear sequence of Amino acids.

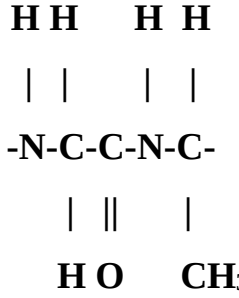
Amino group is in one side and left hand side and carboxylic group on right hand side.

Length

Length is vary according to proteins, length of chain depend upon type of proteins which is under discussion. But it must be polypeptide long chain.

No additional hydrogen bonding in primary structure of proteins and it is present in other structure.

Only covalent bond is present in primary structure.



Secondary structure

Definition

The regular arrangements of amino acid that are located near to each other in linear sequence these arrangements are termed as **Secondary structure** of polypeptide

Tertiary structure

Definition

The tertiary structure of a proteins means it's over all three "Dimensional shape" Complex secondary structure will take on three dimensional structures.

In which there is folding, looping and binding of chain including all of its secondary structure. The final shape may be a globe or an irregular shape and is entirely determined by intermolecular forces and bond polypeptides chain form a complex structure known as proteins structure.**e.g**

Myoglobin: It has been calculated that if the chain of myoglobin could be extended the length of its molecule would be 20 times its width.

Quaternary structure

Definition

- **Association of multiple polypeptides, not found in all proteins**.

The structure formed by aggregation of two or more polypeptide chain is called quaternary structure the aggregation of such polypeptides chain form one functional macromolecule. Each poly peptide chain is called subunit.

e.g. Hemoglobin, Collagen etc.

Biological role of Proteins

Proteins have following some important role:

1. Proteins as structural material

Proteins are the structural material for the plant and animal.

Protein form the major part of dry weight of plant and animal protein are the major part of all the membrane system of cell.

Proteins take an essential part in the formation of protoplasm which is the essence of all forms of life.

2. Energy source

Proteins provide energy to body proteins is breakdown into amino acid during digestion the deamination of these amino acid take place.

Ammonia is released and different compounds are formed.

The compound enters into the respiratory pathway (glycolysis and Kreb's cycle) at different points.

3. Defense of body

Proteins are used against disease in higher animals.

Antibodies and interferon are proteins in nature in they defend the body from attack of bacteria and viruses (immunoglobulin).

Protein is an integral part of all viruses which are very important from a pathogenic point of view.

4. Dietary protein

The supply of nitrogen and sulphur is regulated by dietary protein

e.g. each one gram of dietary protein furnishes 4.1 kcal or 4100cal.

5. Enzymes

Some proteins act as enzymes, enzymes play important role in metabolic reaction, and they enter and speed up specific chemical reaction.

6. Hormones

The hormones are protein in nature have great effect a metabolic and reproduction.

7. Reserve food

Most part of fruits and vegetables is composed of proteins. Thus proteins are as storage composed

e.g albumin is stored in egg white casein present in milk.

Certain proteins are present cell membrane bind vitamin hormones etc. to mediate the cellular action.

8. Contractility

Most proteins are involved in contractility e.g. dyne in cilia and flagella.

Tubulin in spindle fibres.

Actin and myosin in muscles.

9. Exchange of gases

They execute their activities in the transport of O_2 and CO_2 by hemoglobin. Some act as hormones e.g. insulin, growth hormones and parathyroid hormones etc.

Muscles proteins have a role in contraction of muscle fibres.e.g Antarctic fish contain antifreeze proteins which protect their blood from freezing.

Homeostatic control

The function is the homeostatic control of volume of the circulating blood and that of the interstitial fluids through plasma protein.
Plasma proteins take part in blood coagulation and transport of substances such as hormones drugs, metal like iron and copper.

Blood clotting

They are involved in blood clotting through thrombin fibrinogen and other protein factors.
The proteins present in blood plasma act as a colloidal particles and exert and osmotic pressure of 25_30mmHg.
The role of proteins in the plasma membranes where they act as transporting or carrier molecules and receptors.

Heredity transmission

They perform hereditary transmission by nucleoproteins of the cell nucleus.

Chromosomes movement

Movement of organs in plant cells is due to movement of chromosomes.
During anaphase of cell division

CLASSIFICATION OF PROTEINS

Proteins have been classified in several ways. The following classification is based upon physicochemical properties of proteins.

A protein may belong to one of the three types, i.e.

I. **Simple proteins.**

II. **Compound or conjugated proteins.**

III. **Derived proteins.**

SIMPLE PROTEINS

On hydrolysis, these proteins yield only amino acids or their derivatives. These consist of the following types.

1. Albumins:

These are water-soluble proteins and occur in both plant and animal kingdoms.

Examples are serum albumin, ovalbumin and lactalbumin m animals and legume in plants.

2. Globulins:

These are insoluble in water but soluble in dilute salt solutions and are heat-coagulable to a variable extent.

They are found in animals,

e.g. lactoglobulin, myosin in muscle, ovoglobulin, serum globulins and also in plants, e.g. legumin.

3. Globins

These are rich in histidine but are not basic. They unite with heme to form hemoglobin.

Hemoglobin of different species differs only with respect to globin, but the heme part is the same in all cases.

4. Prolamins

These are soluble in 70 to 80% ethanol but are insoluble in water and absolute alcohol. Examples are gliadin of wheat and zein of maize. These are rich in the amino acid proline but deficient in lysine.

5. Histones

These are very strongly basic proteins as they are rich in arginine. In combination with deoxyribonucleic acid (DNA) they form nucleoproteins (nucleohistones). The association of DNA and histones gives rise to complexes called nucleosomes.

6. Protamines

These are present in sperm cells like histones; they form nucleoproteins with nucleic acids and are rich in arginine. These proteins lack in both tyrosine and tryptophan.

7. Albuminoids

These are also called scleroproteins [sclero = hard] and occur only in animals; they do not occur in plants. These proteins includes

i) Collagen

ii) Elastin

iii) Keratin

COMPOUND OR COUNJUGATED PROTIENS

In these molecules the protein is attached or conjugated to some non – protein groups which are called prosthetic groups. The following types of proteins belongs this group.

i) Nucleoproteins.
ii) Phosphoprotien
iii) Lipoproteins
iv) Carbohydrate - containing proteins
v) Chromoproteins
vi) Metalloproteins

DERIVED PROTEINS

This class of proteins includes substances which are derived from simple and conjugated proteins. These proteins are sub divided into primary and secondary derived proteins.

i) **Primary derived proteins**: These are synonymous with denatured proteins. Denaturation takes place when some or all of the cross -linkages which normally keep the molecular structure of protein intact are split.

ii) **Secondary derived proteins**: These substances are intermediate formed in the progressive hydrolysis of protein molecule. The are of different sizes and different amino acid composition and are roughly grouped according to their molecular size into

a) Proteoses
b) Peptones
c) Peptides
d) Polypeptides
e) Oligopeptides