Protein

By

Lec.Najlaa N.Hussein

Medical Chemistry

First stage

Collage of Dentistry

Lect. 3

Proteins:-

Proteins are complex organic compounds. The basic structure of protein is a chain of amino acids. They provide energy for the body.

Protein is an important component of every cell in the body. Hair and nails are mostly made of protein. Your body uses protein to build and repair tissues. also use protein to make enzymes, hormones, and other body chemicals. Protein is an important building block of bones, muscles, cartilage, skin, and blood.

Types of protein:-

Proteins are made up of amino acids. There are 20 different amino acids that join together to make all types of protein. Some of these

amino acids can’t be made by our bodies, so these are known as essential amino acids. It’s essential that our diet provide these.

In the diet, protein sources are labeled according to how many of the essential amino acids they provide.

• A complete protein source is one that provides all of the essential amino acids. these sources called high quality proteins. Animal-based foods; for example, meat, fish, milk, eggs, and cheese are considered complete protein sources.

• An incomplete protein source is consist of one or less than one of the essential amino acids.

• Every function in the living cell depends on proteins.

• The transport of materials in body fluids depends of proteins.

• The receptors for hormones and other molecules are proteins.

Recommendations:-

It's recommended that 10–35% of your daily calories come from protein. Below is the Recommended Dietary Allowances (RDA) for different age groups.

Recommended Dietary Allowance for Protein	
	Grams of protein needed each day
Children ages 1 – 3	13
Children ages 4 – 8	19
Children ages 9 – 13	34
Girls ages 14 – 18	46
Boys ages 14 – 18	52
Women ages 19 – 70+	46
Men ages 19 – 70+	56

The general properties of proteins:-

1. High molecular weight substances.

2. It constitutes more than 50% of the dry weight of the cell.

3. It presents in different shapes; fibrous and globular.

4. The globular is soluble in water and diluted salt solution with different degrees.

5. The chemical and physical properties depend on the amino acids forming the protein.

6. The biological properties and 3D conformation depend also on the constituting amino acids.

7. All proteins are amphoteric compounds.

8. They precipitate by heat and in alcohols .

Classification of proteins:-

Proteins can be classified according to three different criteria:

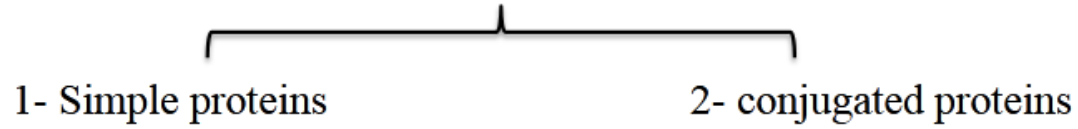
A) proteins can be classified on the basis of the chemical composition.

B) proteins can be classified on the basis of shape.

C) proteins can be classified on the basis of their biological function.

a- According to their chemical composition:

Proteins can be classified on the basis of their chemical composition into two main classes:



1- Simple proteins:

proteins which upon hydrolysis give only amino acids. Example: ribonuclease A, chymotrypsin.

2- Conjugated proteins:

are proteins which yield upon hydrolysis amino acids and

non-protein part is called the prosthetic group.

-Conjugated proteins are classified on the basis of the chemical nature of their prosthetic groups:

i) nucleoproteins

ii) Glycoproteins (contains carbohydrate part)

iii) Lipoproteins (contains lipid part)

iv) Hemoproteins (contains heme)

v) Metalloproteins (contains metal)

vi) Phosphoproteins (phosphorylated protein).

Examples of conjugated proteins:

Class	*Prosthetic group*	*Example*
Lipoproteins	Lipids	β_1-Lipoprotein of blood
Glycoproteins	Carbohydrates	Immunoglobulin G
Phosphoproteins	Phosphate groups	Casein of milk
Hemoproteins	Heme (iron porphyrin)	Hemoglobin
Flavoproteins	Flavin nucleotides	Succinate dehydrogenase
Metalloproteins	Iron	Ferritin
	Zinc	Alcohol dehydrogenase

b- According to their shape

Proteins can be classified on the basis of their chemical composition into two main classes:

1- Globular proteins

2- Fibrous proteins

1- Globular proteins:

- They are generally soluble in water.

- The polypeptide chains are tightly folded into a globular shape.

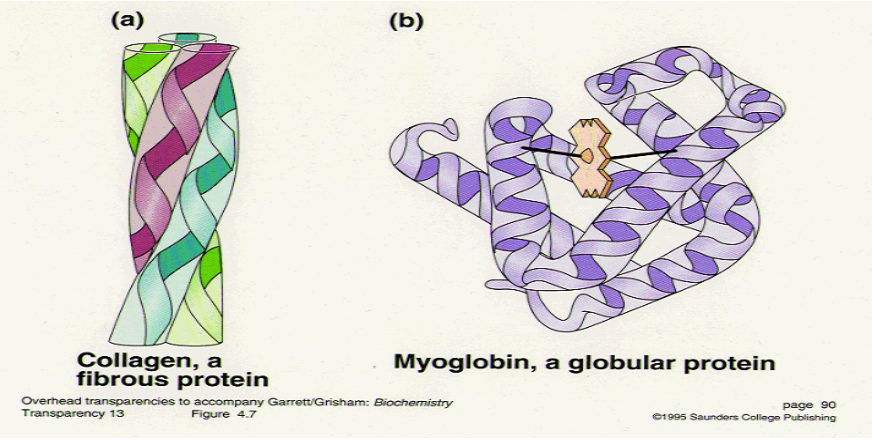
Example: enzymes, hemoglobin, myoglobin

2- Fibrous proteins:

- They are insoluble in water

- Their polypeptide chains are arranged in long strands (elongated in the form of fibers). Example: Collagen, elastin, keratin

	Fibrous	Globular
Shape	Long and narrow	Round / spherical
Purpose	Structural	Functional
Acid Sequence	Repetitive amino acid sequence	Irregular amino acid sequence
Durability	Less sensitive to changes in pH, temperature, etc.	More sensitive to changes in pH, temperature, etc.
Examples	Collagen, myosin, fibrin, actin, keratin, elastin	Enzymes, haemoglobin, insulin, immunoglobulin
Solubility	(Generally) insoluble in water	(Generally) soluble in water



c- According to their biological function:-

Proteins can be classified on the basis of their biological function into:

1- Catalytic function (enzymes)

2- Transport function (hemoglobin, albumin, transferrin)

3- Nutrient and storage proteins [e.g., casein & ferritin]

4- contractile or mobile proteins [e.g., actin, myosin]

5- Structural function [Keratin, elastin, collagen]

7- Regulatory function, some hormones are proteins (Growth hormone (GH)

8- Some toxins are proteins

9- Defense (Antibodies and coagulating factors).