

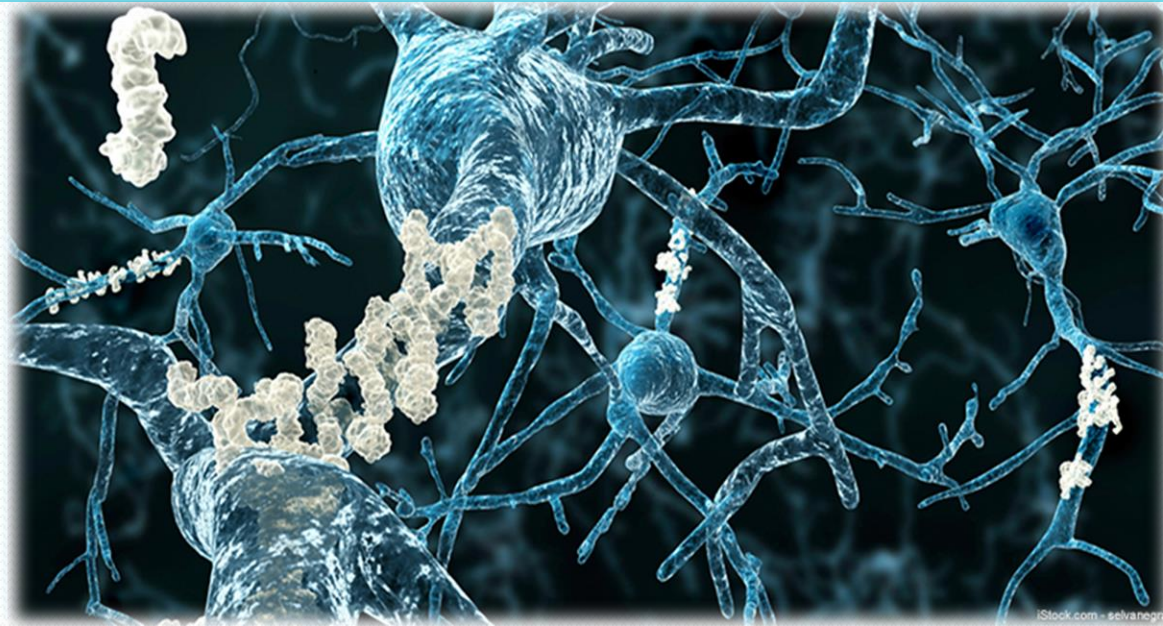
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PROTEINS

Dr Syed Gohar Taqi Kazimi

Department of Chemistry

University of Sargodha



INTRODUCTION

Gerhardus Johannes Mulder, a Dutch chemist first discovered the protein in 1837. However, the name protein is given by Berzelius in 1838. **Mulder** found that nearly all proteins had the same **empirical formula (elemental analysis)**.

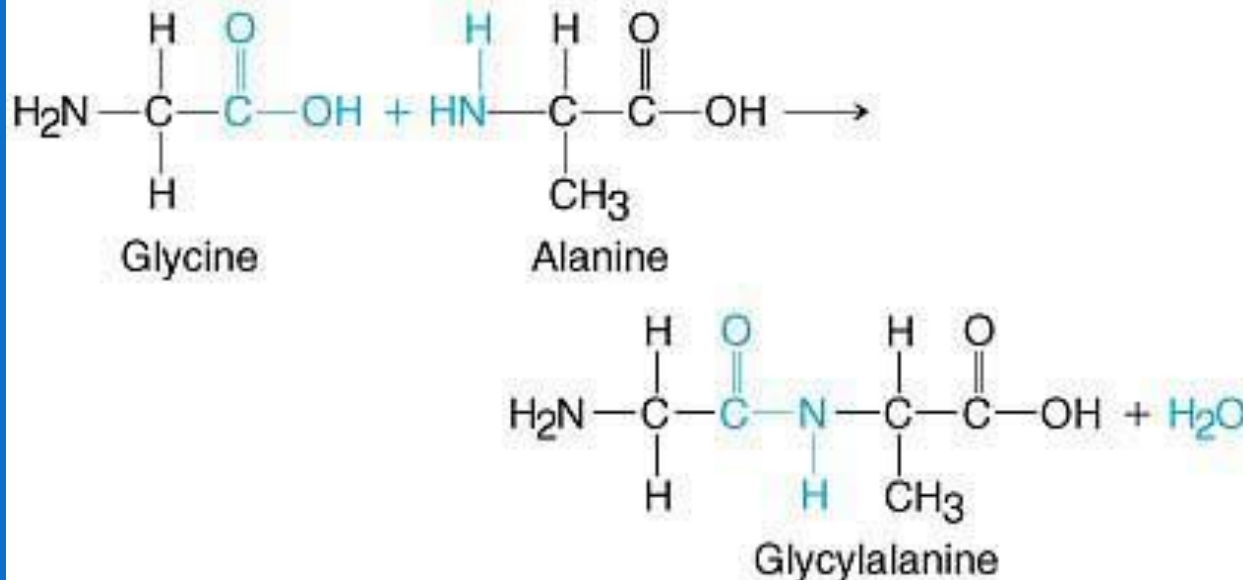
Definition:

These are naturally occurring large **biomolecules** or **macromolecules**, consisting of one or more long chains of **amino acid** joint together through **peptide bond**.

- Proteins consist of **carbon, nitrogen, hydrogen, oxygen** and sometimes **sulphur** too.
- Most abundant organic compound present in all type of cell & all parts of cell.

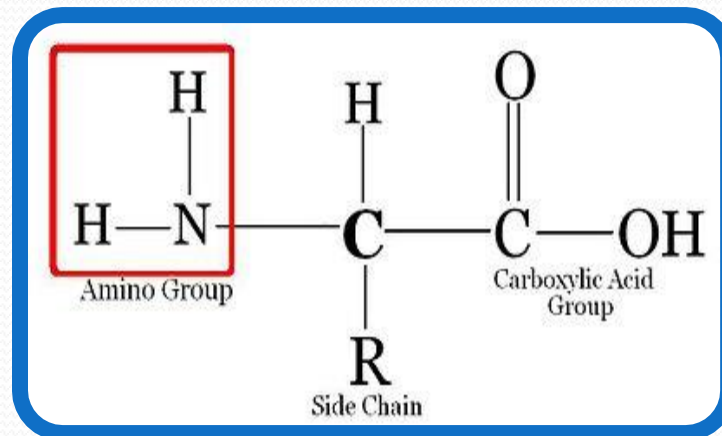
Polypeptide proteins:-

- ❖ Amino group of one amino acid react with carboxyl group of another releasing a molecule of water.
- ❖ For example; Glycine & alanine
- ❖ The linkage between the hydroxyl group of carboxyl group of one amino acid and hydrogen of amino group of another amino acid release water and C-N link to form a bond called peptide bond.



Amino Acids:-

- ❖ Biologically important organic compound containing amino (-NH₂) and carboxyl acid (-COOH) functional groups usually along with alkyl side chain.
- ❖ Proteins are made up of 20 types of amino acids.
(Histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.)
- ❖ Amino Acids are linked together to form polypeptide protein.



FUNCTIONS

- Main **structure of body** is made up by protein.
- Main function in **Muscles formation**.
- **Enzymes** control the metabolism of cell, play role in **digestion** & enzymes are protein in nature.
- **Hormones** regulates metabolic process in body, Hormones are protein in nature.
- **Transportation** inside and outside of the cell is done by “Lipoproteins” which carries the proteins.

- **Nutrient** movement depend upon the protein.
- Protein provide **Envelop** particularly **minerals** and **lipids**.
- **Antibodies** are the weapon of body, which fight against **disease** and antibodies are protein in nature.
- Movement of organ, movement of chromosome during anaphase of cell division caused by proteins.

CLASSIFICATION

(On the Bases of Amino Acids)

❖ **Simple Proteins:**

These proteins yields only amino acids upon hydrolysis.

❖ **Conjugate Proteins:**

Which can yield something other than amino acids.
(when combine with anything adopt their name)
(e.g protein attach with “Phosphorus” called
“phosphoproteins”)

❖ **Derived Proteins:**

Product of simple and conjugate protein, (Shape changed by the action of some process) e.g., Yogurt

CLASSIFICATION

(On The Bases of Structure)

Fibrous protein:

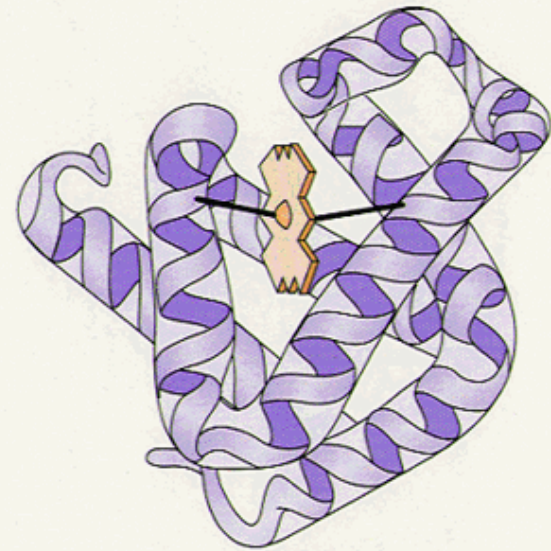
- Consist of **molecules** having **one** or **more** polypeptide chains in a form of **Fibrils**.
- **Secondary** structure is most important in them.
- They are **insoluble** in **aqueous** media.
- They are **non-crystalline** & **elastic** in nature.
- They perform structural role in cell and organism.
- E.g Silk fiber from silk worm and Spider's web.
- E.g Myosin in muscles cells



Collagen, a fibrous protein

2. Globular Protein

- **Spherical** and **Ellipsoidal** due to **multiple** folding of polypeptide chain .
- **Tertiary structure** is most important in them.
- **Soluble** in aqueous media.
- **Crystallized** and **in-elastic** in nature.
- E.g. Enzymes & Hormones.

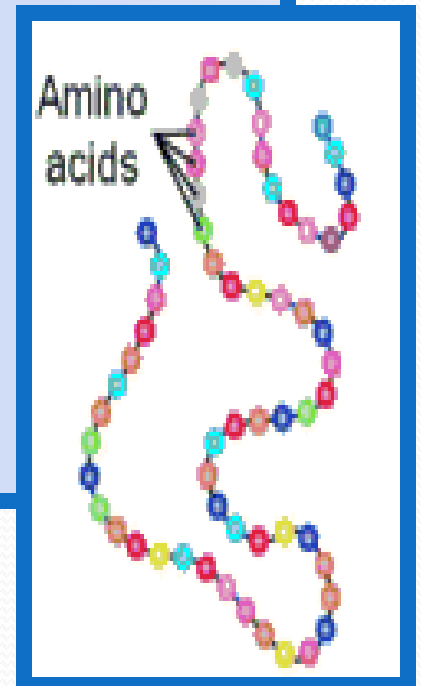


Myoglobin, a globular protein

STRUCTURE OF PROTEIN

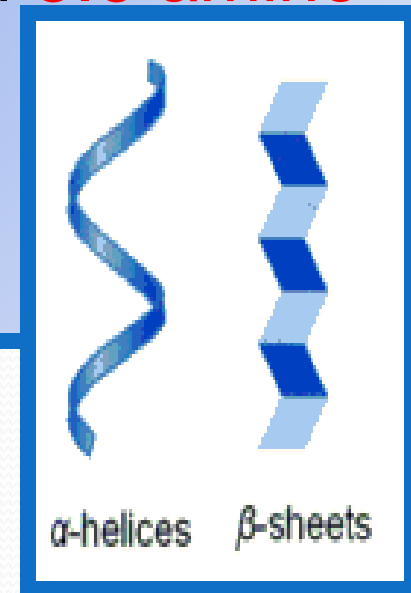
1. Primary Structure

- Primary structure comprises the **no. and sequence** of amino acid in a protein molecule.
- **F.Sanger** was the **1st** scientist who determined the sequence of amino acids in a molecule.
- He concluded that **insulin** is composed of **51** amino acid in **2 chains**, one chain have **21 amino acids** and other have **30 amino acids**. They held together by **Disulphide bridges**.
- **10,000** proteins in human body which are made by specific arrangement of **20** types of amino acids.



2. Secondary Structure

- The **polypeptide** chain in a protein molecule usually don't lie flat.
- They usually coil into **helix** or in **Regular configuration**.
- The most important structure is **α -Helix**.
- In uniform geometric structure with **3.6 amino acid** in each turn of helix.
- **β -plated** sheets is formed by **folding back** of the polypeptide.

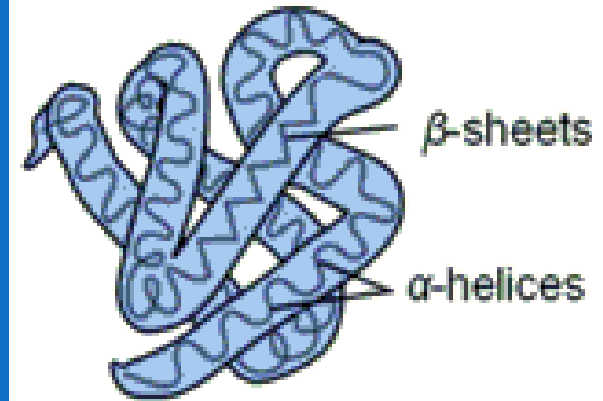


3. Tertiary structure:

- A polypeptide chain bend and folds upon it self forming a **Globular** shape.
- It maintains by 3 types of **bonds**, **Ionic**, **Hydrogen** and **Disulfide**.

4. Quaternary Structure:

- Polypeptide tertiary chains are aggregated and held together by **Hydrophobic** interactions **Hydrogen** and **ionic** bonds.
- Hemoglobin the **oxygen** carrying protein of **Red Blood Cells** (RBCs) exhibit such a structure



TYPES OF PROTEINS

1. Enzymes
2. Structural Proteins
3. Signaling Proteins
4. Regulatory Proteins
5. Transport Proteins
6. Sensory Proteins
7. Motor Proteins
8. Defense Proteins
9. Storage Proteins

proteins provide many essential functions in the body:



digestive enzymes help facilitate chemical reactions



support the regulation and expression of DNA and RNA



antibodies support immune function



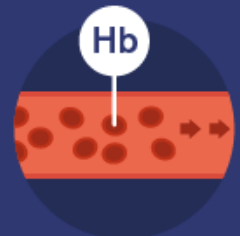
support muscle contraction & movement



provide support to the body



hormones help coordinate bodily function



move essential molecules around the body

SOURCES

- Egg
- Fish
- Almonds
- Chicken Meat
- Oat
- Yogurt
- Peanuts
- Cheese
- Beans
- Dry Fruits
- Milk
- Beef

(World Standard, 37%)
(1 large egg contains 6 grams of protein, with 78 calories)



DAILY REQUIREMENT

- 56-91 grams per day for the average sedentary man.
- 46-75 grams per day for the average sedentary woman.
- If you're eating animal products (like meat, fish, eggs, or dairy) every day, then you're probably already doing pretty well, protein-wise.
- A common recommendation for gaining muscle is 1 gram of protein per pound of body weight, or 2.2 grams of protein per kg.

SYMPTOMS OF LOW SUPPLEMENTATION

- Low immunity
- Sluggish **metabolism**.
- losing weight
- Trouble **building muscle** mass
- Low **energy levels** and fatigue
- Poor concentration and trouble learning
- Moodiness and mood swings
- Muscle, **bone and joint pain**
- Slow wound healing

DISADVANTAGES

- Overall, there is **no evidence** that a reasonably high protein intake has any adverse effects in healthy people trying to stay healthy.
- High protein diet can cause kidney damage and osteoporosis.
- A higher protein intake has been shown to disturb blood pressure and can cause diabetes, which are two of the main risk factors for kidney disease.
- High cholesterol.

ADVANTAGES

- **Cheap, easily available**
- **Easy to store**
- **Help Improve Muscle Mass**
- **Help Manage Your Weight By Filling You Up**
- **Stabilize Blood Sugar Levels**
- **Help Improve Your Mood**
- **Promote Healthy Brain Function and learning**
- **Help maintain strong bones**
- **Promote Heart health**
- **Slow Aging and promote Longevity**

