

Structure of Protein

Proteins are large and complex biomolecules made up of long chains of amino acid residues that play a crucial role in cells. They are essential in our day-to-day life for good health and benefit in growing something faster. Proteins are made up of smaller units called amino acids. The protein consists of hydrogen, carbon, oxygen, sulfur, and nitrogen.

What is Protein?

Proteins are very complex molecules involved in some chemical processes that are important for life. Protein is made of small units of amino acids. These proteins help in metabolism, communication, and movement in our body.

There are four levels in the structural hierarchy of proteins. They are:

Primary Structure of Protein

In the primary structure of proteins, the polypeptide chain are linked together to form a sequence of amino acids called polypeptide chain. The primary structure of this level contains mainly amino acids which are present in the chain. Peptide bonds are present in the primary structure of the protein.

The primary structure of protein is important as it determines the final fold and hence the function of the protein. Any change in the sequence of amino acids completely changes the entire protein.

If two amino acids are there to form a chain of proteins it is called a dipeptide bond. Similarly, if three amino acids are ready to form a link it is called tripeptide.

Characteristics of peptide bond:

- A peptide bond is rigid and planar
- It is not able to charge but it is polar.
- It has a partial double bond character.

Secondary Structure of Protein

This secondary structure of proteins contains a folding structure polypeptide chain. The secondary structure is formed by the H-bonds. It is formed mostly with the alpha helix and beta pleated sheets. Example: Myoglobin.

- The proteins do not exist in just simple chains of polypeptides.

- These polypeptide chains usually fold due to the interaction between the amine and carboxyl group of the peptide link.
- The structure refers to the shape in which a long polypeptide chain can exist.
- They are found to exist in two different types of structures α – helix and β – pleated sheet structures.
- This structure arises due to the regular folding of the backbone of the polypeptide chain due to hydrogen bonding between -CO group and -NH groups of the peptide bond.
- However, segments of the protein chain may acquire their own local fold, which is much simpler and usually takes the shape of a spiral an extended shape or a loop. These local folds are termed secondary elements and form the proteins secondary structure.

There are some types of secondary structure

- ✓ Alpha Helix
- ✓ Beta plated sheet
- ✓ Strand
- ✓ Loops

Tertiary Structure of Protein

The tertiary structure of proteins is in the form of a 3-dimentional structure of the monomeric and multimeric structures. This 3D structure of a polypeptide is simply called the tertiary structure of the protein. This tertiary structure is because of the lowest energy and greatest stability state of the polypeptide chain. The structure came from folding secondary structure of the protein.

Function of tertiary structure is that it has a unique function like interacting with other molecules.

- This structure arises from further folding of the secondary structure of the protein.
- H-bonds, electrostatic forces, disulphide linkages, and Vander Waals forces stabilize this structure.
- The tertiary structure of proteins represents overall folding of the polypeptide chains, further folding of the secondary structure.
- It gives rise to two major molecular shapes called fibrous and globular.

- The main forces which stabilize the secondary and tertiary structures of proteins are hydrogen bonds, disulphide linkages, van der Waals and electrostatic forces of attraction.

Quaternary Structure

The quaternary structure of proteins is in the form of a 3-Dimensional structure of macromolecules which is a combination of individual polypeptide chains. This quaternary structure is also formed from a special combination of tertiary structures. Quaternary structure is also known as oligomeric proteins. Example: Hemoglobin

Functions of quaternary structure:

- It helps in the chromosome replication process.
- It helps in metabolism

Importance of Protein

- Protein helps in maintaining good shape and fit for our body.
- Protein repairs the body's damaged tissues.
- Protein is used to build bones, skin, and muscles.