

# Topic: Protein; Structure

**B.Sc. Botany Hons. III**

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## Structures of Proteins

### Primary Structure of Proteins:

Primary structure of proteins refers to the total number of amino acids and their sequence in that particular protein.

A fixed number of amino acids are arranged in a particular sequence. The sequence of amino acids in the protein determines its biological role. Different proteins have different sequences. Therefore, the study of total number and sequence of amino acids in a protein is the study of its primary structure.

Primary structure differentiates normal protein from abnormal one. Normal adult haemoglobin (HbA) is made up of 2  $\alpha$ -chains and 2  $\beta$ -chains. Each  $\alpha$ -chain has 141 amino acids and each  $\beta$ -chain has 146 amino acids arranged in a specific sequence. Any change in the sequence results in an abnormal haemoglobin.

Like in sickle cell haemoglobin (HbS), the amino acid valine is present at the 6th position of P-chain instead of glutamic acid in the normal haemoglobin.

### **Secondary Structure of Proteins:**

It refers to the twisting of the polypeptide chain into a helical form.

Three types of helical structures are found-

- (a) Alpha helix
- (b) Beta pleated and
- (c) Reverse turn.

#### **a. Alpha helix:**

$\alpha$  means the first and the structure described below was the first among the helical structures to be discovered, hence known as alpha ( $\alpha$ ) helix.

The salient features of this structure are as under-

- i. Here the polypeptide is twisted or coiled to form a right handed helical



structure.

ii. The distance between each turn of the coil is 5.4 Å.

iii. There are 3.6 amino acids per turn.

iv. The 'R' groups are seen protruding out of the helix.

v. There are intra chain hydrogen bonding, wherein the hydrogen of —NH group combines with oxygen of -CO group of the 4th amino acid behind it. So every peptide group participates in hydrogen bonding.

vi. This type of structure is found in many proteins in combination with other structures. Pure  $\alpha$ -helix structure is seen in hair protein, i.e., keratin.

