



# **SNS COLLEGE OF TECHNOLOGY**

**AN AUTONOMOUS INSTITUTION**

**Approved by AICTE New Delhi & Affiliated to Anna University Chennai  
Accredited by NBA & Accredited by NAAC with “A++” Grade, Recognized by UGC**

**COIMBATORE**

## **DEPARTMENT OF CIVIL ENGINEERING**

**19GET277 – BIOLOGY OF ENGINEERS**

**IV YEAR / VII SEMESTER**

**UNIT 1- INTRODUCTION TO LIFE**





# Protein



Proteins are composed of amino acids, arranged into different groups. These fundamental amino acids sequences are specific and its arrangements are controlled by the DNA. Since our body cannot synthesize these essential amino acids by its own, we should have plenty of protein foods in our everyday diet to keep our body metabolisms stable.



# Sources of Protein



EGG



MEAT

## SOURCES OF PROTEINS



PULSES



MILK & MILK PREPARATIONS



FISH



# Functions of Proteins

- **Enzymes:** Enzymes mostly carry out all numerous chemical reactions which take place within a cell. They also help in regenerating and creating DNA molecules and carry out complex processes.
- **Hormones:** Proteins are involved in the creation of various types of hormones which help in balancing the components of the body. For example hormones like insulin, which helps in regulating blood sugar and secretin. It is also involved in the digestion process and formation of digestive juices.
- **Antibody:** Antibody also known as an immunoglobulin. It is a type of protein which is majorly used by the immune system to repair and heal the body from foreign bacteria. They often work together with other immune cells to identify and separate the antigens from increasing until the white blood cells destroy them completely.
- **Energy:** Proteins are the major source of energy that helps in the movements of our body. It is important to have the right amount of protein in order to convert it into energy. Protein, when consumed in excess amounts, gets used to create fat and becomes part of the fat cells.

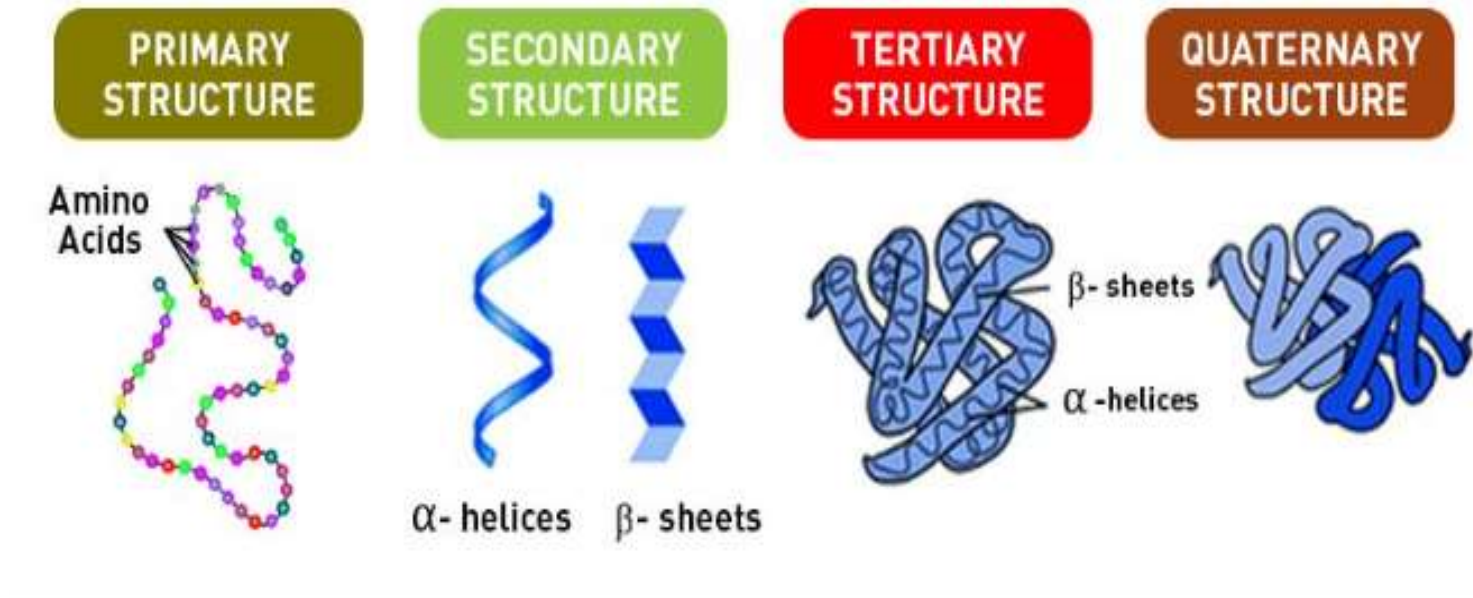


# Biological role of Protein

Aspect	Functions	Examples
Storage	Legume Storage, albumin, and proteins.	Supplies food during the early stage of the seedling or embryo.
Hormone Signalling	Counterpart activities of different body parts.	Glucagon and Insulin.
Transport	It transport substances throughout the body through lump or blood cells.	Hemoglobin.
Contraction	To carry out muscle contraction.	Myosin.
Digestive Enzyme	Breaks down nutrients present in the food into smaller portions so that it can be easily absorbed	Pepsin, Amylase, and Lipase



# Structural classification of proteins





# Classification of protein on the basis of composition

This Classification of protein is based on shape or structure and composition. They are classified into three types;

- fibrous
- globular
- derived protein.

## **Fibrous protein:**

- They are elongated or fiber like protein.
- Axial ratio (length: breadth ratio) is more than 10
- They are static in nature with simple structure.
- They have less biological functions
- They are mostly present in animals

Examples;

Fibrous proteins are further classified as- simple and conjugated

### **i. Simple fibrous protein:**

Examples; Scleroprotein (Keratine, elastin, collagen, fibroin etc)

Scleroprotein or Albuminoids: they make animal skeleton and they are water insoluble.

### **ii. Conjugated fibrous proteins:**

Examples; pigments present in chicken feather.





## **Globular protein:**

- They are spherical or globular in shape.
- Axial ratio is always less than 10
- They are dynamic in nature (can flow or move) with higher degree of complexity in structure.
- They have variety of biological functions
- Examples; enzymes, hormones etc
- Globular protein is further classified on the basis of composition or solubility.

## ***Simple or homo globular protein:***

They are composed of amino acids only.

Some examples are;

### **a. Protamine**

- They are positively charged (basic) proteins mostly present in animals and fishes (sperm)
- Protamines binds with DNA in embryonic stage and later replaced by histone
- It is soluble in water and ammonium hydroxide solution
- It is not coagulated by heat
- It precipitate out in aqueous solution of alcohol
- Protamine are rich in arginine and lysine whereas devoid of sulfur containing and aromatic amino acids.

### **b. histone:**

- They are basic protein but weak base in comparison to protamine.
- Histone is low molecular weight protein and are water soluble.
- It is not coagulated by heat.

- Histone is present in nucleic acids as nucleohistone binding with DNA.



### **c. Albumin:**

- It is the most abundant protein in nature
- It is most commonly found in seeds in plants and in blood and muscles in animals.
- Molecular weight of albumin is 65000 KD
- It is water soluble and can be coagulated by heat
- Plant albumins; Leucosine, Legumelins etc
- Animal albumins; serum albumin, myosin, lactalbumin, ova-albumin etc

### **d. Globulin:**

- Pseudoglobulin (water soluble) and Euglobulin (water insoluble)

### **e. Glutelins:**

- Water insoluble. Eg. Glttenin (wheat), glutelin (corn), oryzenin (rice)



### **f. Prolamine:**

- They are storage protein found in seeds.
- They are water insoluble. But soluble in dilute acid or detergents and 60-80% alcohol.
- They are coagulated by heat
- Prolamine is rich in proline and glutamine
- Examples; Gliadin (wheat), zein (corn), Hordein (barley), Avenin (oats)



## **Complex or conjugate or hetero globular protein:**

- These proteins in which protein are always linked by non-protein moiety to become functional. So, they are composed of both protein and non- protein components. The non-protein component is known as prosthetic group.
- On the basis of prosthetic group, they are classified as follows;

### **a. Metalloprotein:**

- They have metal prosthetic group.
- Some metals such as Hg, Ag, CU, Zn etc, strongly binds with proteins such as collagen, albumin, casein by –SH group of side chain of amino acids.

Eg. Ceruloplasmin; contains copper as prosthetic group

- Some other metals such as Calcium weakly binds with protein. Eg. Calsequestrin, calmodulin
- Some metals such as Na, K etc do not binds with protein but associate with nucleic acids protein.



## **b. Chromoprotein:**

They have colored prosthetic group.

Some examples are;

Haemoprotein: Haemoglobin, myoglobin, chlorophyll, cytochrome, peroxidase, haemocyanin

Flavoprotein: Riboflavin (Vit B2) give yellow/orange color to FAD requiring enzymes

## **c. Glycoprotein/Mucoprotein:**

They have carbohydrate as prosthetic group

Eg. Antibody, complement proteins, Heparin, Hyaluronic acid



#### **d. Phosphoprotein:**

They have phosphate group as prosthetic group.

Eg. Caesein (milk protein binds with calcium ion to form calcium salt of caseinate)

Ovovitellin; present in egg yolk

Calcineurin

#### **e. Lipoprotein:**hey have lipid as prosthetic group.

Eg. Lipovitelline, chylomicrons



## **Derived protein:**

- These proteins are the derivatives of either simple or complex protein resulting from the action of heat, enzymes and chemicals.
- Some artificially produced proteins are included in this group.
- They are classified as primary derived protein and secondary derived protein.

### **i. Primary derived protein:**

- The derived protein in which the size of protein molecules are not altered materially but only the arrangement is changed.
- Some examples are;

#### **a. Proteans:**

- Obtained as a first product after the action of acid or enzymes or water on protein.
- They are insoluble in water.
- Eg. Edestan, [myosin](#)

#### **b. Metaprotein:**

They are produced by further action of acid or alkali on protein at 30-60°C.

They are water insoluble but soluble in dil acid or alkali.

Also known as Infraprotein.

Eg. Curd





### **c. Coagulated protein:**

- They are produced by the action of heat or alcohol on protein.
- They are insoluble in water.

Eg. Coagulated egg

### **ii. Secondary derived protein:**

- The derived protein in which size of original protein are altered.
- Hydrolysis has occurred due to which size of protein molecule are smaller than original one.

### **Examples; a) Proteoses:**

- They are produced by the action of dilute acid or digestive enzymes when the hydrolysis proceeds beyond the level of metaprotein.
- They are soluble in water
- They are not coagulated by heat. • Eg. Albumose, Globulose etc.



## **Classification of protein on the basis of biological functions:**

### **1. Catalytic protein:**

They catalyze biochemical reaction in cells. Eg. Enzymes and co-enzymes

### **2. Structural protein;**

They make various structural component of living beings.

Eg. Collagen make bone, Elastin make ligaments and keratin make hair and nails

### **3. Nutrient protein:**

They have nutritional value and provide nutrition when consumed.

Eg. Casein in milk

### **4. Regulatory protein:**

They regulate metabolic and cellular activities in cell and tissue.

Eg. Hormones



### **5. Defense protein:**

They provide defensive mechanism against pathogens.

Eg. [Antibodies](#), complement proteins

### **6. Transport protein:**

They transport nutrients and other molecules from one organ to other.

Eg. Haemoglobin

### **7. Storage protein:**

They stores various molecules and ions in cells.

Eg. Ferritin store Iron

### **8. Contractile or mobile protein:**

They help in movement and locomotion of various body parts.

Eg. Actin, myosin, tubulin etc