

SNS COLLEGE OF ALLIED HEALTH SCIENCE
Affiliated to The Tamil Nadu Dr M.G.R Medical University, Chennai



DEPARTMENT OF OPERATION THEATRE AND ANAESTHESIA
TECHNOLOGY

COURSE NAME: BIOCHEMISTRY

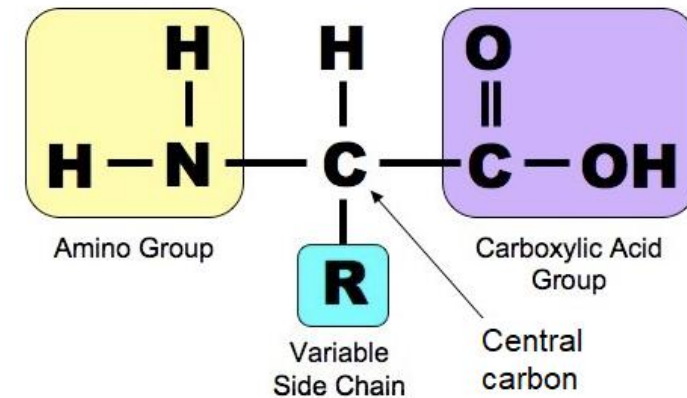
UNIT : 3

TOPIC : PROTEIN - CLASSIFICATION

FACULTY NAME: MITHRA V

PROTEINS (DEFINE)

- Complex, large macromolecules essential for life
- Polymers made up of smaller units called **amino acids**
- **Bond Type:** Amino acids linked via **peptide bonds**
- **Bond Formation Mechanism:**
 - Carboxyl group ($-\text{COOH}$) of one amino acid
 - Reacts with amino group ($-\text{NH}_2$) of another
- **Role in Body:**
 - Metabolism regulation
 - Cell signaling & communication
 - Structural support & movement



PEPTIDE VS POLYPEPTIDE

- **Dipeptide:**

- 2 amino acids joined by 1 peptide bond

- **Tripeptide:**

- 3 amino acids joined by 2 peptide bonds

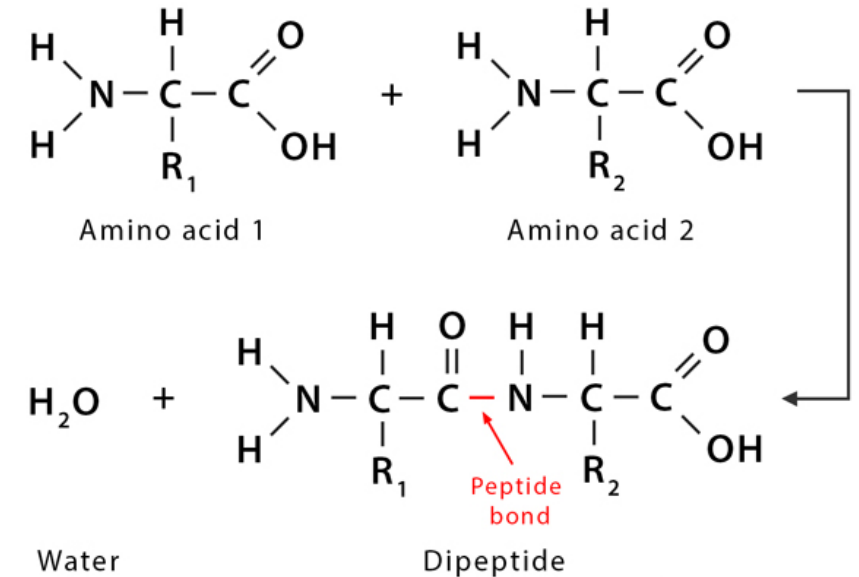
- **Polypeptide:**

- Chain of >10 amino acids linked by multiple peptide bonds

- **Peptide Bond Characteristics:**

- Covalent bond

- Planar, rigid, partial double bond character



Classification – Based on Shape

- **Fibrous Proteins (Scleroproteins):**

- **Structure:** Long, elongated, thread-like, coiled
- **Solubility:** **Insoluble in water** & dilute salts
- **Function:** Provide **structural support, strength, protection**
- **Location:** Connective tissues, skin, hair, muscles

- **Examples:**

- **Collagen:** Abundant protein in animals (tendons, ligaments, skin)
- **Keratin:** Hair, nails, horns, feathers
- **Actin & Myosin:** Muscle contraction

Fibrous Protein

Fibrous proteins are elongated and structural, providing support and strength to tissues.



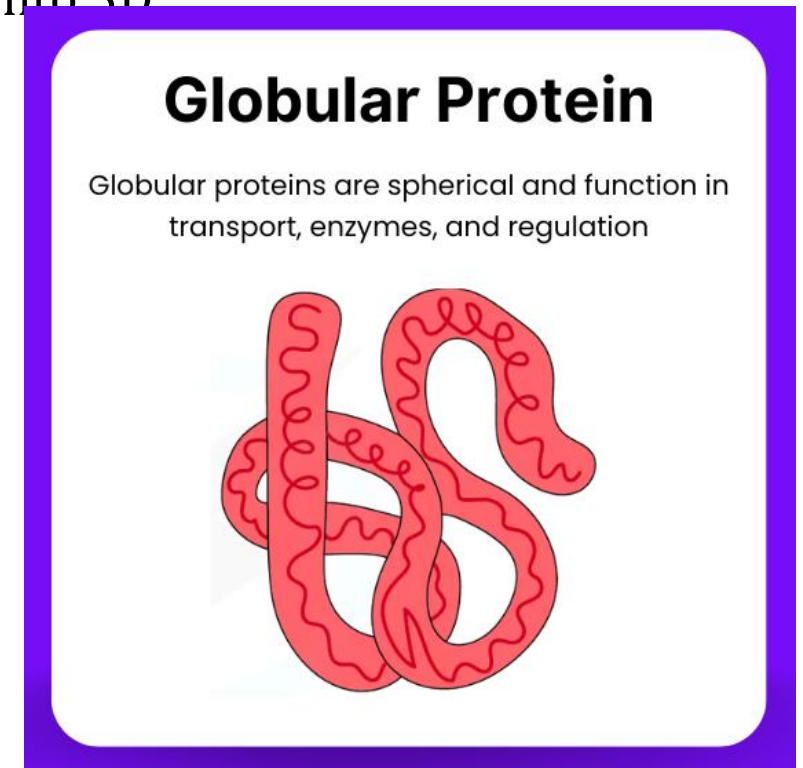
Classification – Based on Shape

- **Globular Proteins:**

- **Structure:** Compact, folded into **spherical or oval** shape, coiled into 3D
- **Solubility:** **Soluble in water** & aqueous solutions
- **Function:** Dynamic roles – transport, catalysis, regulation
- **Location:** Blood, cytoplasm, hormones

- **Examples:**

- **Albumin:** Maintains osmotic pressure in blood
- **Insulin:** Regulates blood glucose
- **Hemoglobin:** Oxygen transport



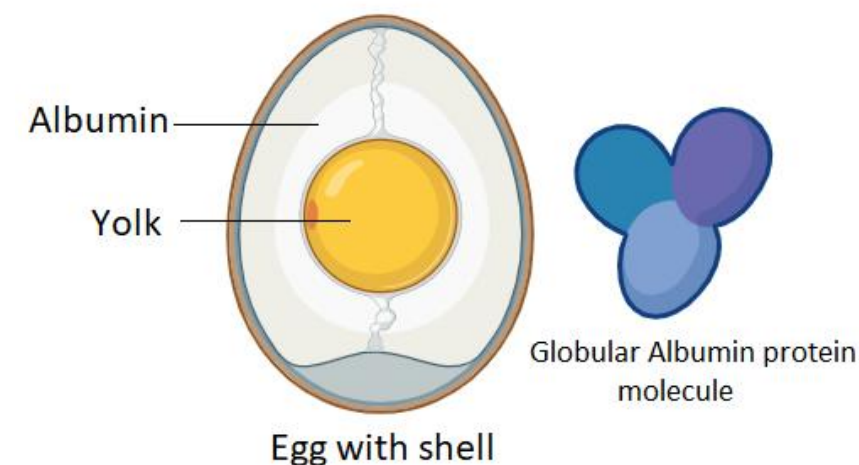
Classification – Based on Constitution

- **Simple Proteins:**

- **Composition:** Contain **only amino acids** (no non-protein part)

- **Solubility-based Subgroups:**

- **Albumins:** Soluble in water, coagulated by heat (e.g., egg white)
 - **Globulins:** Soluble in salt, insoluble in water (e.g., immunoglobulins)
 - **Prolamins:** Soluble in 70–80% alcohol (e.g., gliadin in wheat)
 - **Glutelins:** Soluble in dilute acid/alkali (e.g., glutenin in wheat)
 - **Histones:** Basic, DNA-binding (in nucleus)
 - **Protamine:** Small, basic, sperm cells



Classification – Based on Constitution

- **Conjugated Proteins:**

- **Composition:** Protein + **Non-protein prosthetic group**

- **Function:** Transport, protection, catalysis, storage

Type	Prosthetic Group	Example
Nucleoproteins	Nucleic acid (DNA/RNA)	Ribosomes, Chromatin
Glycoproteins	Carbohydrates (<4%)	Immunoglobulins, Mucins
Mucoproteins	Carbohydrates (>4%)	Mucin (saliva, gastric mucus)
Lipoproteins	Lipids	LDL, HDL, Chylomicrons
Chromoproteins	Colored pigment	Hemoglobin (heme), Rhodopsin
Metalloproteins	Metal ions	Ferritin (Fe), Ceruloplasmin (Cu)
Phosphoproteins	Phosphate group	Casein (milk), Pepsin

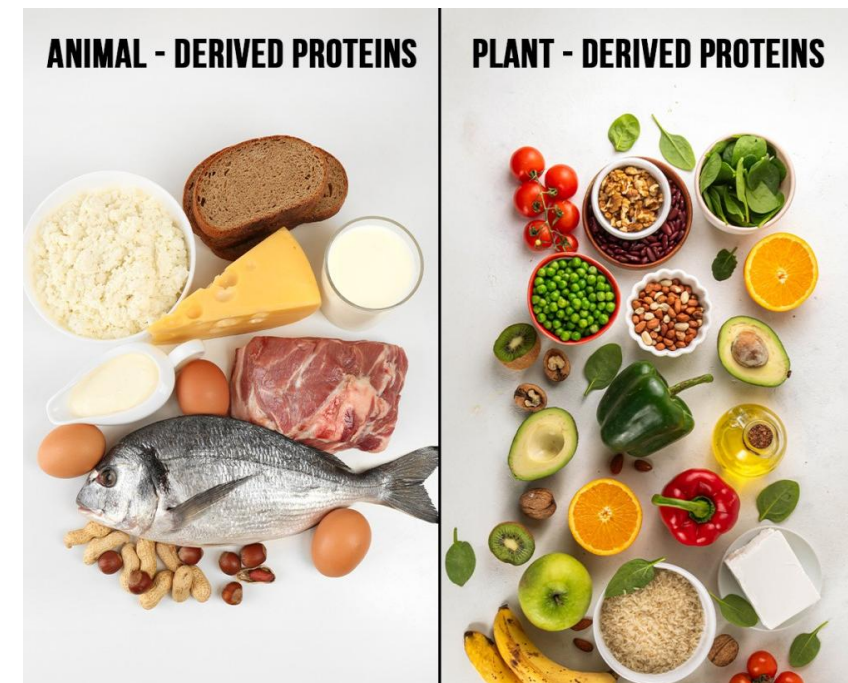
Classification – Based on Constitution

- **Derived Proteins:**

- **Origin:** Not naturally occurring; formed by **partial or complete breakdown** of native proteins
- **Proteoses:** Soluble in water, not coagulated by heat.
- **Peptones:** Smaller, diffuse through membranes
- **Peptides:** Short chains (di-, tri-, polypeptides)

- **Clinical Relevance:**

- Detected in urine during **proteinuria**
- Used in **protein hydrolysates** for nutrition



Classification – Based on Nature of Molecules

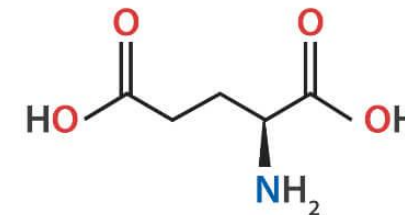
- **Acidic Proteins:**

- **Negatively charged** at physiological pH (exist as **anions**)
- High content of **acidic amino acids** (Aspartic acid, Glutamic acid)
- **Examples:** Blood group antigens and Casein (milk)

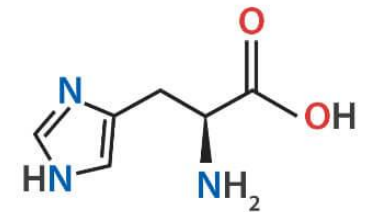
- **Basic Proteins:**

- **Positively charged** at physiological pH (exist as **cations**)
- Rich in **basic amino acids** (Lysine, Arginine, Histidine)
- **Examples:** **Histones** (DNA packaging in nucleus), **Ribosomal proteins** and **Protamine** (sperm)

Acidic vs Basic Amino Acids

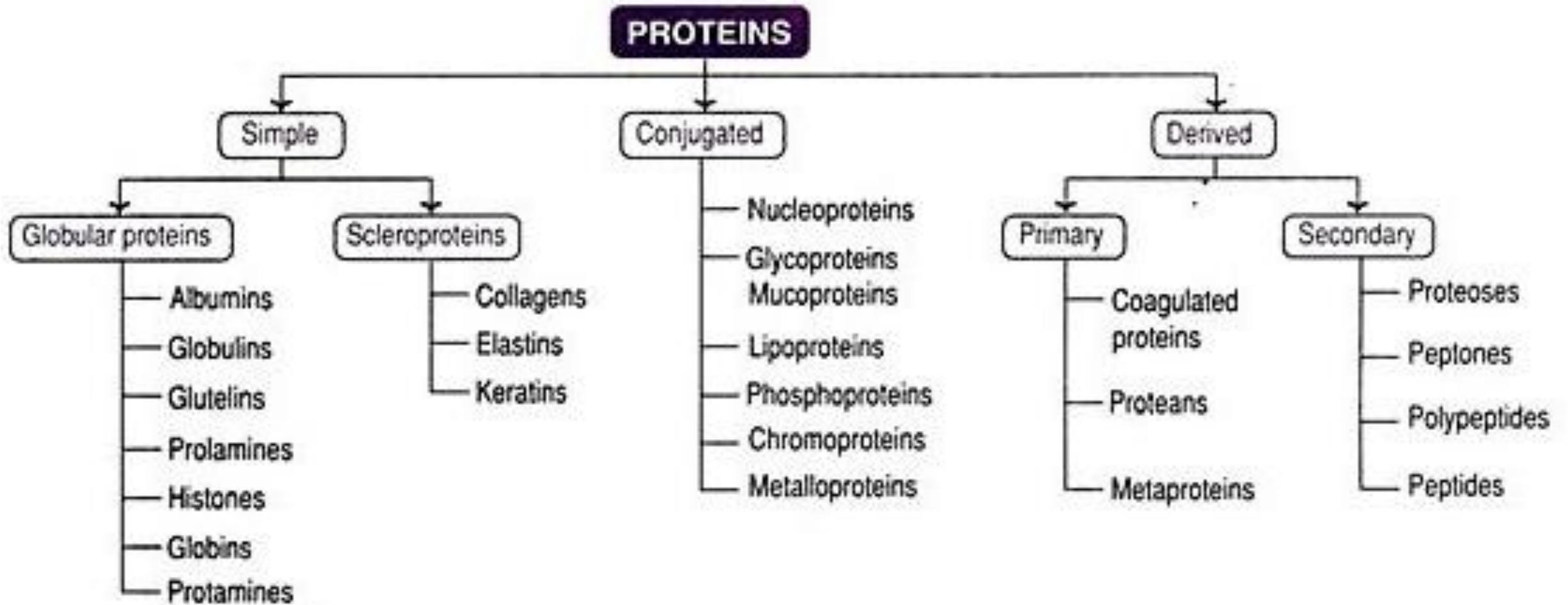


Glutamate
(acidic amino acid)



Histidine
(basic amino acid)

SUMMARY



REFERENCES

- **Lehninger Principles of Biochemistry** – *David L. Nelson, Michael M. Cox*
- **Harper's Illustrated Biochemistry** – *Victor W. Rodwell, David A. Bender, et al.*
- **Textbook of Medical Biochemistry** – *M.N. Chatterjea, Rana Shinde*
- **NCBI Bookshelf – Biochemistry: Proteins** ⇌ <https://www.ncbi.nlm.nih.gov/books/NBK557845/>
- **Protein Data Bank (PDB)** – *RCSB PDB* ⇌ <https://www.rcsb.org>
- **Journal: Journal of Biological Chemistry (JBC)** – *ASBMB* ⇌ <https://www.jbc.org>

THANK YOU