

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 : PROTEINS – FUNCTIONS AND PROPERTIES

FACULTY NAME: MITHRA V

FUNCTIONS OF PROTEINS

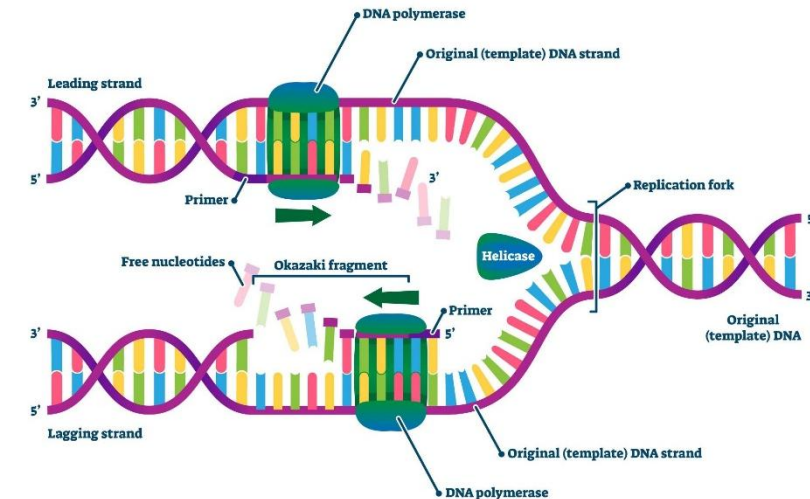
- **Hormonal Proteins**

- Secreted by **endocrine glands** as hormones.
- Regulate body functions (e.g., insulin controls blood sugar)

- **Enzymatic Proteins**

- Act as **catalysts** for chemical reactions.
- Speed up metabolism
- Help in **DNA replication**
- **Amylase:** breakdown starches into sugars.
- **Pepsin:** breaks down proteins into smaller polypeptides.
- **DNA polymerase:** Synthesizes DNA

DNA POLYMERASE



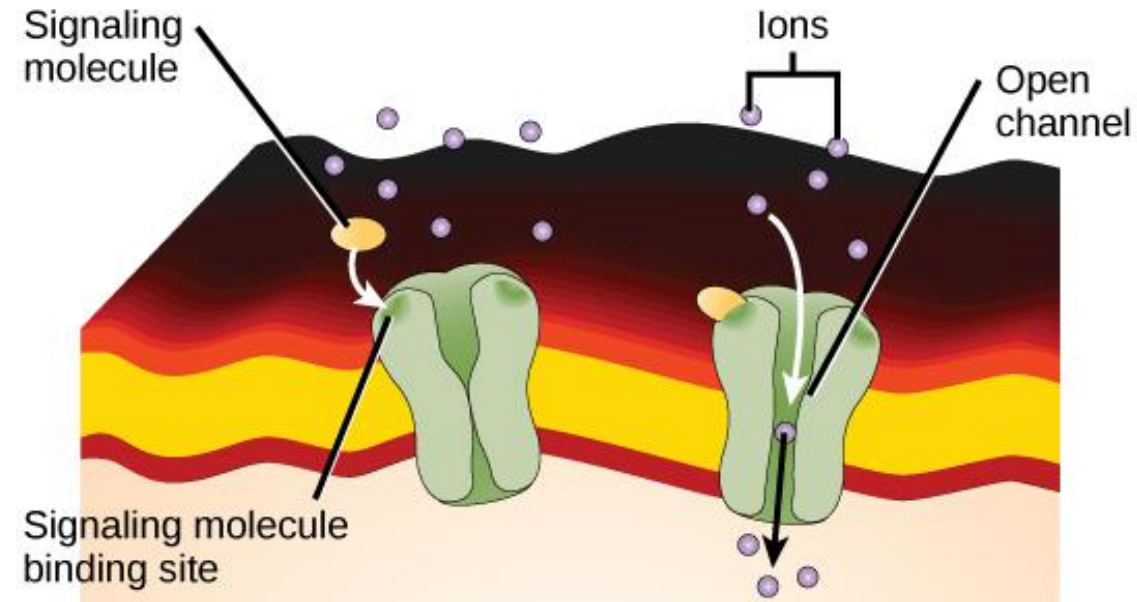
FUNCTIONS OF PROTEINS

- **Structural Proteins**

- Fibrous proteins - provide **strength and shape**.
- Components of muscles, bones, skin, hair, cartilage.
- Excess protein can be converted to fat for storage.

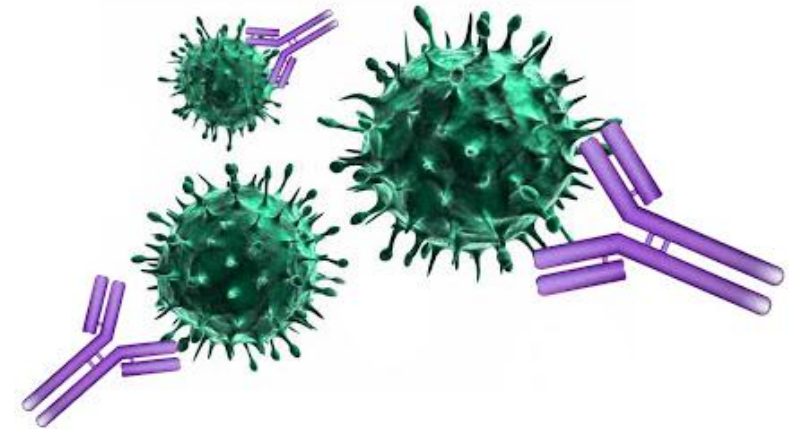
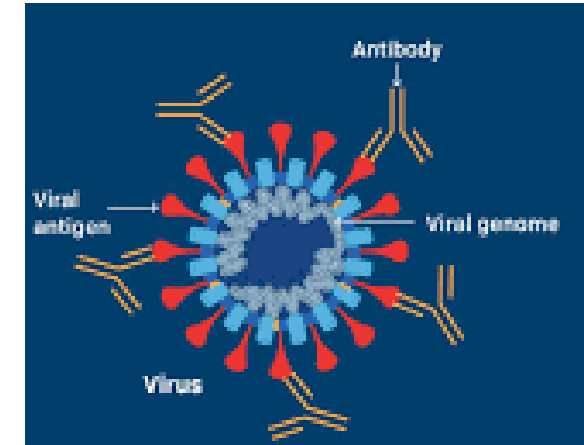
- **Receptor Proteins**

- Present on cell surfaces; control what substances **enter or leave the cell**.
- Enable cells to detect and respond to signals (**hormones, neurotransmitters**, etc.).



FUNCTIONS OF PROTEINS

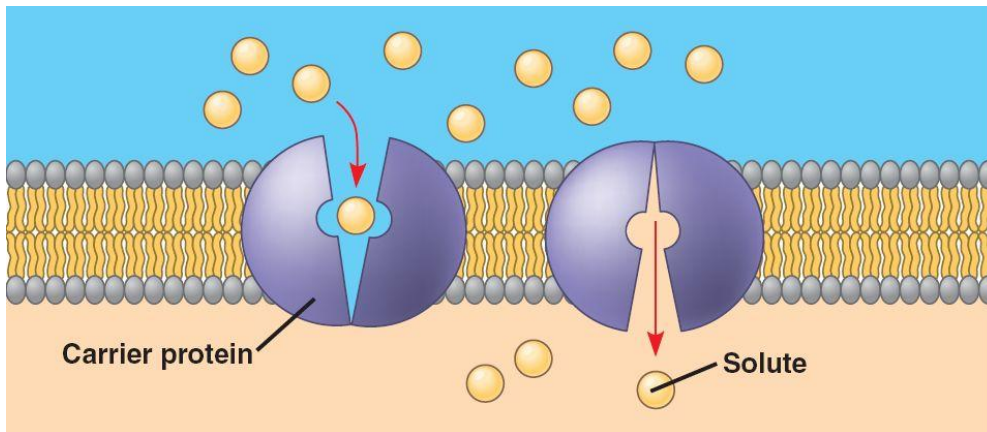
- **Defensive Proteins (Antibodies/Immunoglobulins)**
 - Produced by **white blood** cells to **fight pathogens**.
 - Identify, neutralize, **destroy antigens**.
 - Part of immune system for healing and protection.
- **Storage Proteins**
 - Store minerals and nutrients (e.g., **casein** in milk, **ovalbumin** in egg whites).
 - Provide amino acids or ions (like iron in ferritin, potassium, etc.) when needed.



FUNCTIONS OF PROTEINS

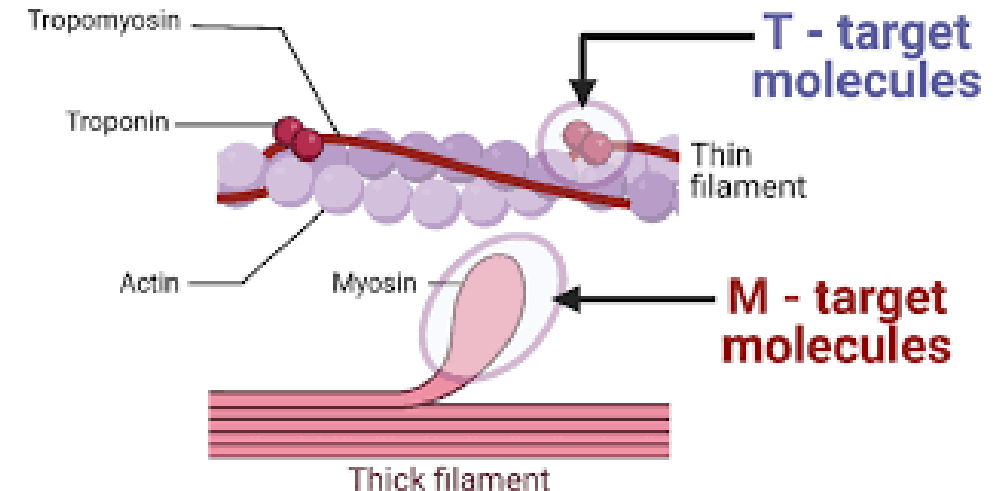
• Transport Proteins

- Carry vital substances throughout the body (e.g., hemoglobin carries O₂)
- Move molecules across cell membranes or in blood.



• Contractile Proteins

- Responsible for movement (e.g., actin and myosin in muscles).
- Regulate force and speed of muscle and heart contractions.

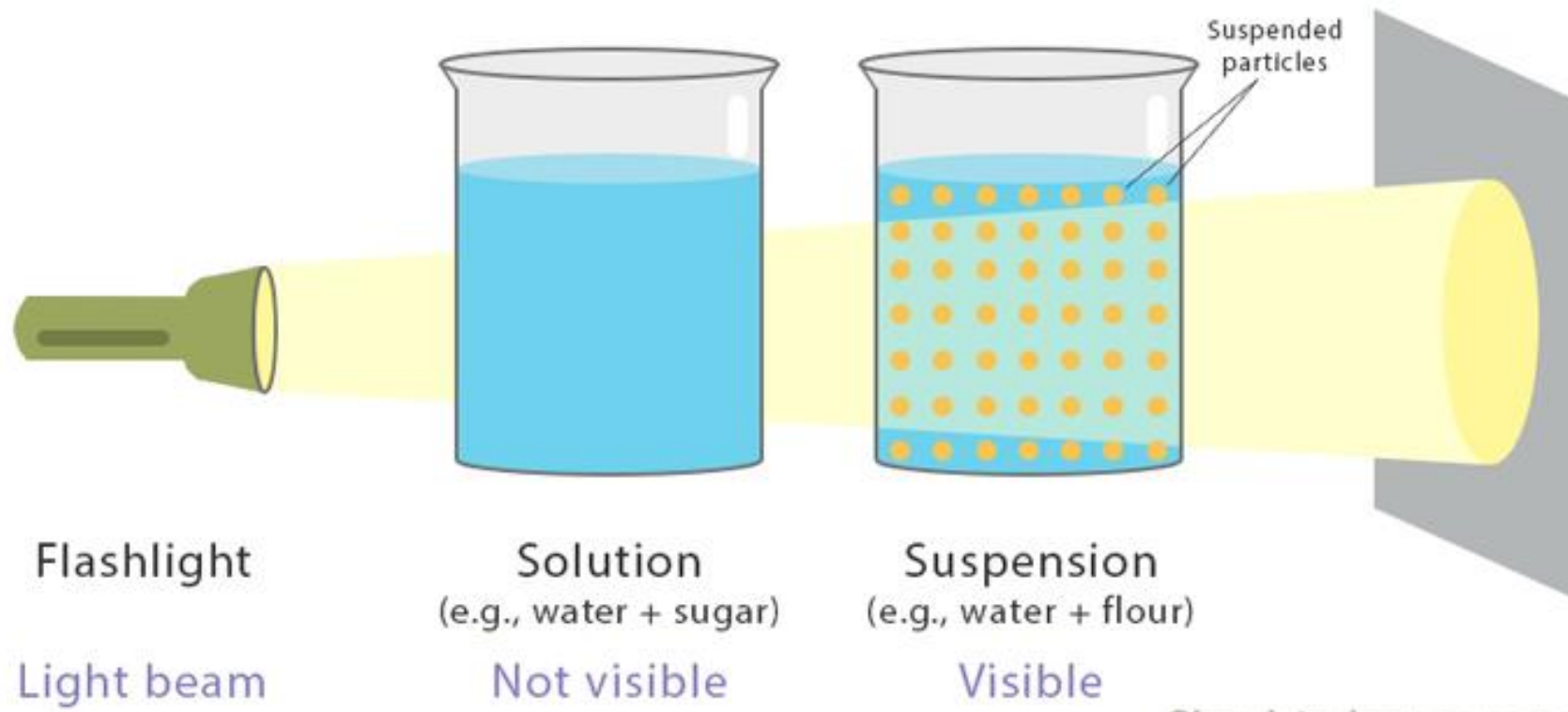


PHYSICAL PROPERTIES

Property	Description	Example
MOLECULAR WEIGHT	Ranges from ~5 kDa (insulin) to million Da	Hemoglobin: ~64.5 kDa (tetramer)
SHAPE/CONFORMATION	Globular (spherical), fibrous (elongated, thread like)	Globular: Myoglobin Fibrous: Collagen and Keratin
SOLUBILITY	Depends on surface hydrophilicity/hydrophobicity	Albumin and Myosin
COLLOIDAL NATURE	Form colloids in solution → high viscosity, light scattering (Tyndall effect)	Egg white (albumin solution) becomes viscous when beaten
OPTICAL ACTIVITY	Rotate plane-polarized light	All natural proteins are laevorotatory (L-amino acids)

Tyndall Effect

Scattering of light by particles in a medium



CHEMICAL PROPERTIES

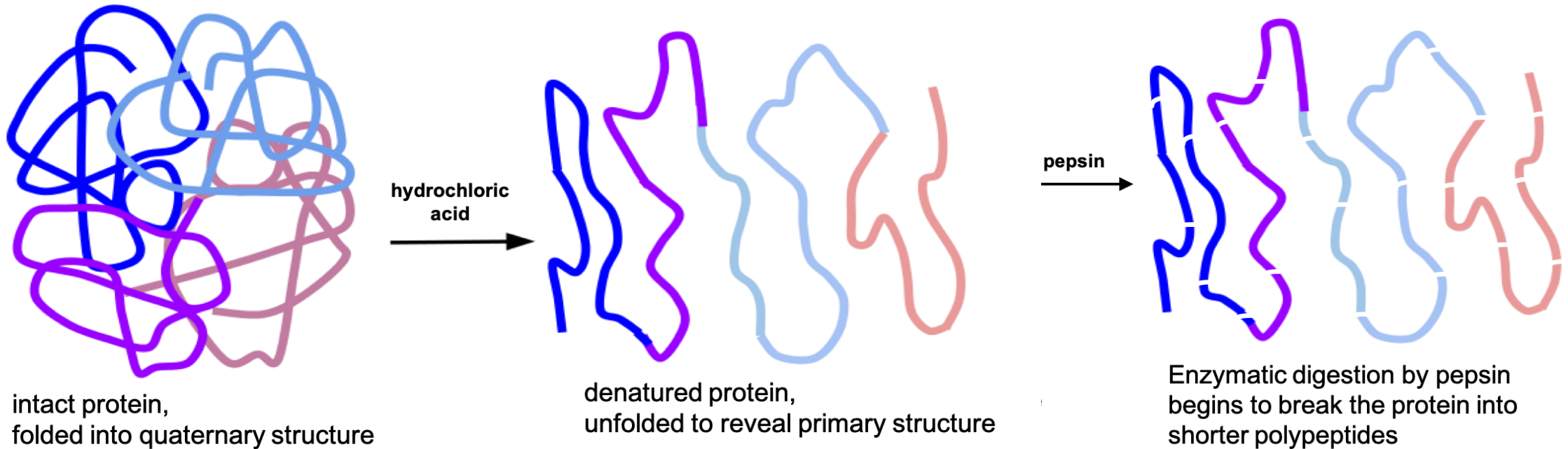
Property	Description	Example
ZWITTERION	Proteins contain both acidic ($-\text{COOH}$) and basic ($-\text{NH}_2$, side chains) Hybrid molecule, +vely & -vely charged <i>ionic groups</i>.	At physiological pH ~ 7.4, most proteins are negatively charged Glycine at pH = 6.0 is zwitterionic
ISOELECTRIC PH (PI)	Isoelectric point (pI) – The pH at which an amino acid or protein has zero net charge, so it doesn't move in an electric field to anode or cathode.	• Pepsin (highly acidic): pI ≈ 1.0 • Lysozyme (basic): pI ≈ 11 • Serum albumin: pI $\approx 4.7 \rightarrow$
PEPTIDE BONDS	$-\text{CO}-\text{NH}-$ linkage; partial double-bond character $\rightarrow$ planar, rigid	Gives proteins their secondary structure backbone

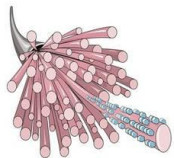
BIOLOGICAL PROPERTIES

Denaturation of Proteins

Agent/Type	Mechanism	Example
HEAT	Breaks H-bonds, hydrophobic interactions	Boiling egg → egg white albumin coagulates (solid)
STRONG ACID/BASE	Disrupts ionic bonds and H-bonds	Curdling of milk by lactic acid
ORGANIC SOLVENTS	Disrupts hydrophobic core	Alcohol disinfection → denatures microbial proteins
MECHANICAL AGITATION	Shearing forces break weak interactions	Whipping egg white → temporary foam

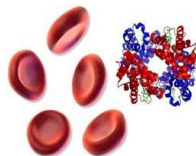
- Hydrochloric acid (HCL) in the stomach - pH of 1.5-3.5.
- **Acidity of the stomach causes food proteins to denature, unfolding their three-dimensional structure to reveal just the polypeptide chain.**



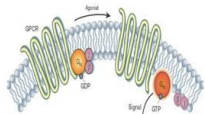


Structural Proteins

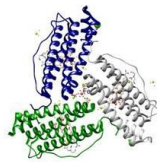
Transport Proteins



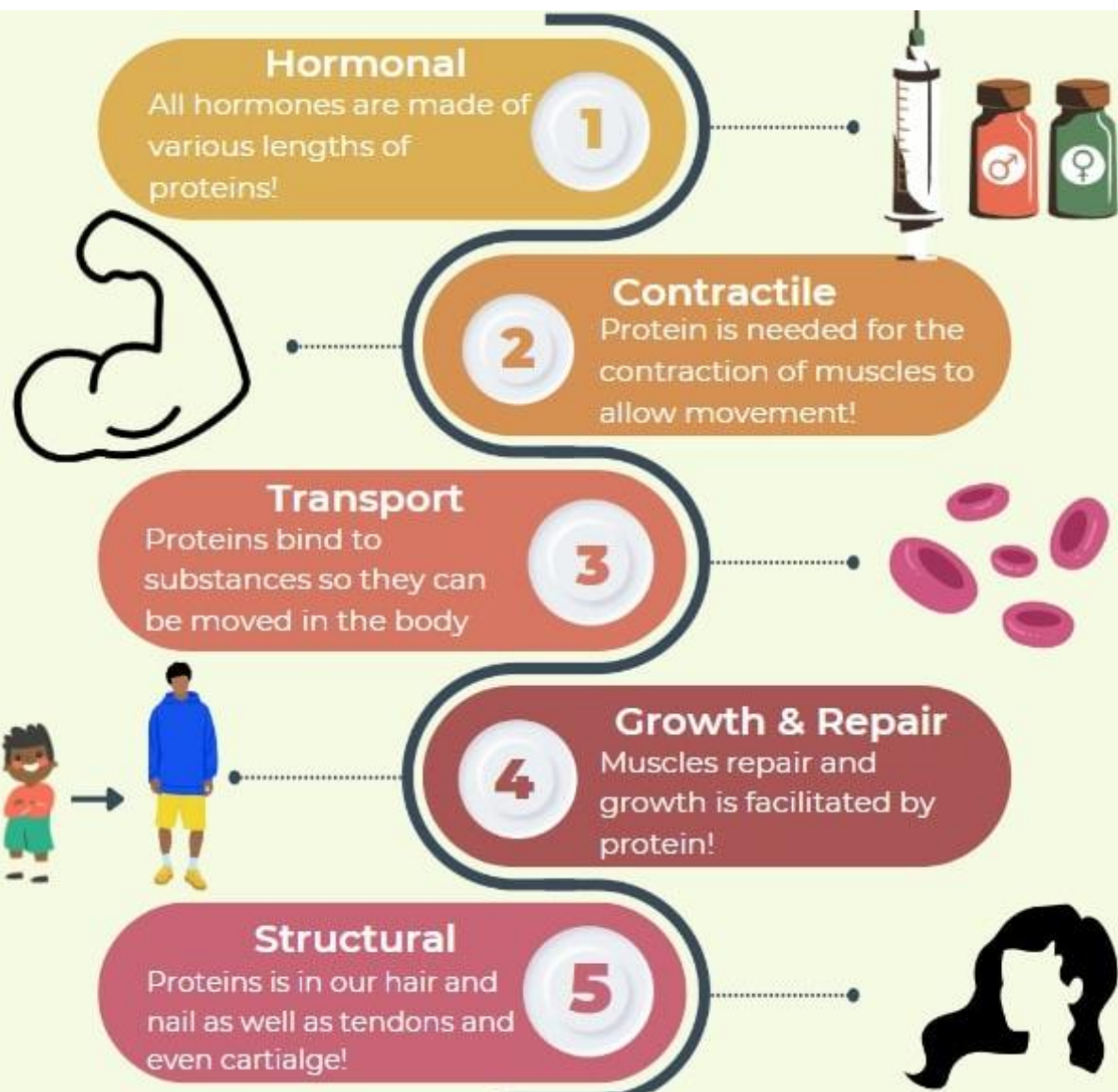
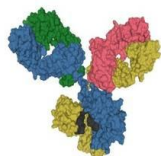
Regulatory Proteins



Storage Proteins



Defensive Proteins



REFERENCES



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THANK YOU