

LECTURE 3

3.0 PROTEINS

- Complex organic substances present in all living matter (plants, animals and microorganisms).
- ALL proteins, apart from consisting of C, H and O also contains N and sometimes may contain S as well as P.

3.1 AMINO ACID

- Structural units of all proteins are amino acids. General formula $\text{RCN}(\text{NH}_2)\text{COOH}$.
- There are 200 such amino acids.
 - * Aliphatic monomeric monocarboxylic amino acids Glycine, Alanine, Valine, Leucine, Isoleucine, Serine, Threonine and Proline.
 - * Sulphure containing amino acids. Cysteine cystine & methionine.
 - * Mono amphoteric Dicarboxylic amino acids. Aspartic acid and glutamic acid.
 - * Basic Amino acids.
Lysine, Arginine and Histidine
 - * Aromatic amino acids.
Phenyl alanine, tyrosine and Tryptophan
 - * Derivatives of other amino acids
4 – Hydroproline and 5-Hydrolysine.

3.1.1 Properties of Amino acids

- Optical Activity
- Zwitterion formation (Electrostatically neutral form).
- Isoelectric point –pH at which the amino acid consist of mainly Zwitterion e.g. for Glycine $\text{pH}_i = 5.97$

3.2 CLASSIFICATION OF PROTEINS

- can be based on solubility, coagulation or prosthetic groups.
- Simple proteins

proteins that will yield only amino acids on hydrolysis e.g. Asbamins, globalins, colutelins, protamines etc.

- Complex proteins

Proteins that contains non-protein entities attached to the polypeptide chain e.g. phosphoproteins, Glycoproteins, Lipoproteins, Chromoproteins, Nucleoproteins etc.

3.2.1 **Properties of Proteins**

- Amphoterism

- Solubility

- Colour Reactions e.g. Biuret reaction

- Hydrolysis using 6 mHCL, or 5MNaOH or action of proteolytic enzymes.

- Oxidation Reduction reaction

- Sensory characteristics – Tasteless, odourless and Colourless.

- Molecular weight – they are High Mw cpds.

e.g. Insulin – 5,700, Myosin – 620,000 Ribonuclease – 12,000.

- Structure of proteins – are joined by (prh) peptide bonds.

* primary eg mw, aa composition and linear sequence of the aa residues along the polypeptide chain.

* Conformation:

- Secondary structure

- Tertiary structure

- Quaternary structure

3.2.2 **Protein Denaturation**

Term used to describe changes in the physico-chemical properties of soluble proteins. It can be described as any modification in the conformation of a protein.

- Factors that can cause protein Denaturation.

- Heat
- Strong acids (low pH)
- Strong bases (High pH)
- Some solvents such as ethanol
- Conc solution of salts

- Phenolic substances.
- Changes that may accompany denaturation
 - Coagulation (Loss of solubility)
 - Gel formation
 - Higher Digestibility (Higher susceptibility to Enzyme hydrolysis)
- Renaturation
Reverse of denaturation (slow and practically irreversible).
- Application
 - Denaturation of Enzymes e.g. Blanching of fruit and vegetables.
Pasteurization of milk etc.
 - Preparation of cheese –Acidification of milk proteins souring of milk (yoghurt)
 - Flavour and texture modification through exposure of – SG groups eg Eggs, meta/wheat proteins.