Tikrit University
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Protein Metabolism

Subject name: Animal Nutrition

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SCAN ME

Lecturers link

Protein Metabolism

PROTEINS: Proteins are complex organic compounds of high molecular weight. In common with carbohydrates and fats they contain carbon, hydrogen and oxygen, but in addition .they all contain nitrogen and generally sulphur.

Proteins are found in all living cells, where they are intimately connected with all phases of activity that constitute the life of the cell. Each species has its own specific proteins, and a single organism has many different proteins in its cells .and tissues. It follows therefore that a large number of proteins occur in nature.

Proteins account for more than 50% of the dry mass of most cells.

Protein functions include structural support ,storage, transport, cellular communications ,movement, and defense against foreign, substances.

Enzymatic proteins:

Function: Selective acceleration of chemical reactions. Example: Digestive enzymes catalyze the hydrolysis of bonds in food molecules.

***- Enzymes** are a type of protein that acts as a catalyst to speed up chemical reactions.

***- Enzymes** can perform their functions repeatedly, functioning as workhorses that carry out the processes of life.

Storage proteins:

Function: Storage of amino acids.

Examples: Casein, the protein of milk, is the major source of amino acids for baby mammals . Plants have storage proteins in their seeds .

Ovalbumin is the protein of egg white, used as an amino acid source for the developing embryo.

Hormonal proteins:

Function: Coordination of an organism`s activities.

Example: Insulin, a hormone secreted by the pancreas, causes other tissues to take up glucose , thus regulating blood sugar concentration.

Contractile and motor proteins:

Function: Movement.

Examples: Motor proteins are responsible for the undulations of cilia and flagella Actin and myosin proteins are responsible for the contraction of Muscles.

Defensive proteins:

Function: Protection against disease.

Example: Antibodies inactivate and help destroy viruses and bacteria.

Transport proteins:

Function: Transport of substances.

Examples: **Hemoglobin,** the iron-containing protein of vertebrate blood, transports oxygen from the lungs to other parts of the body. Other proteins transport molecules across cell membranes.

Receptor proteins :

Function: Response of cell to chemical stimuli.

Example: Receptors built into the membrane of a nerve cell detect signaling molecules released by other nerve cells.

Structural proteins :

Function: Support.

Examples: Keratin is the protein of hair, horns , feathers, and other skin appendages. Insects and spiders use silk fibers to make their cocoons and webs, respectively .

Collagen and elastin proteins provide a fibrous framework in animal connective tissues.

DNA repair proteins :

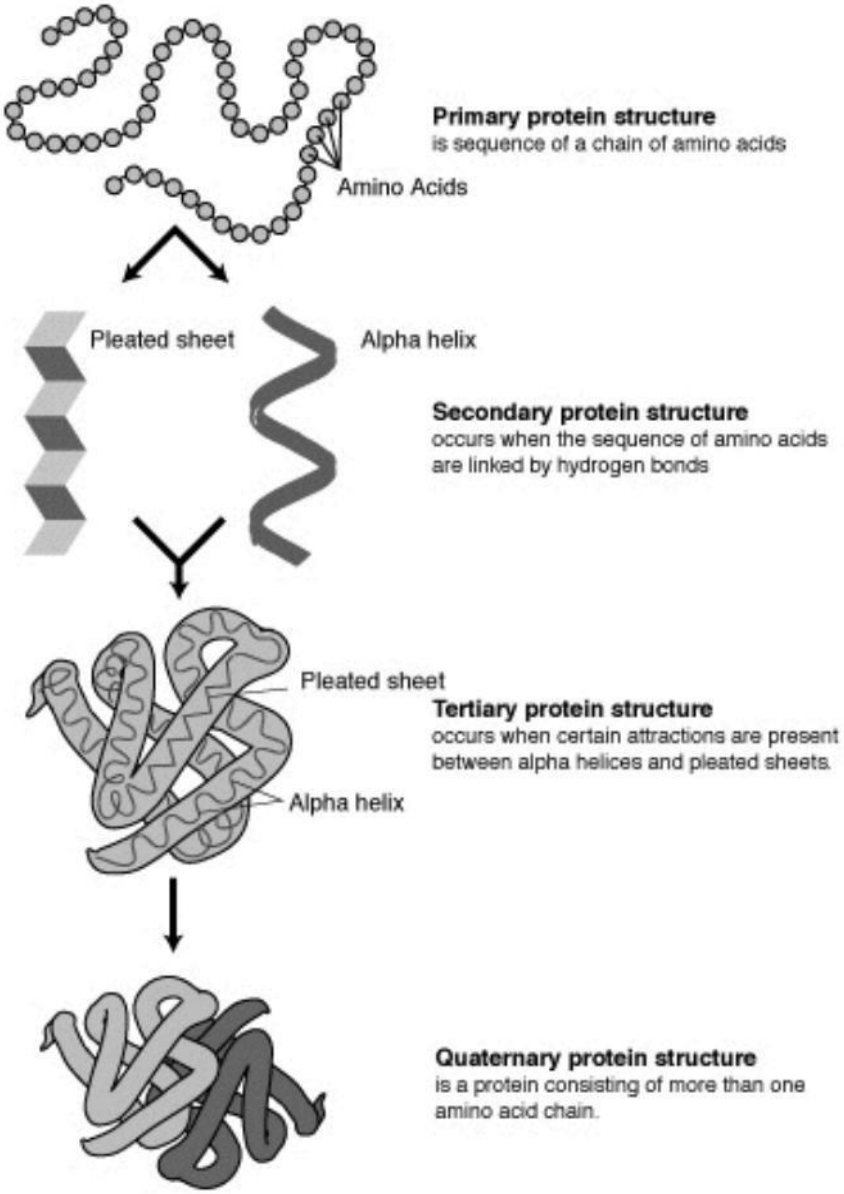
Amino acids are the building blocks (monomers) of proteins.

Amino acids are organic molecules with carboxyl and amino groups.

Amino acids differ in their properties due to differing side chains, called R groups.

Polypeptides are unbranched polymers built from the same set of 20 amino acids .

A protein is a biologically functional molecule that consists of one or more polypeptides.



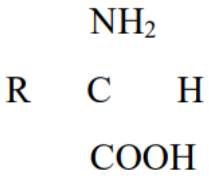
Four Levels of Protein Structure:

1- **The primary structure** of a protein is its unique sequence of amino acids.
2- **Secondary structure**, found in most proteins consists of coils and folds in the polypeptide chain.
3- **Tertiary structure** is determined by interactions among various side chains (R groups).
4- **Quaternary structure** results when a protein consists of multiple polypeptide chains.

AMINO ACIDS:

Amino acids are produced when proteins are hydrolysed by enzymes, acids or alkalis. Although over 200 amino acids have been isolated from biological materials only 20 of these are commonly found as components of proteins.

Amino acids are characterised by having a basic nitrogenous group, generally an amino group (–NH2), and an acidic carboxyl unit (–COOH). Most amino acids occurring naturally in proteins are of thetype, having the amino group attached to the carbon atom adjacent to the carboxyl group, and can be represented by the general formula:



Amino Acid Polymers

*- Amino acids are linked by peptide bonds.
*- A polypeptide is a polymer of amino acids.
*-Polypeptides range in length from a few to more than a thousand monomers (amino acids).
*- Each polypeptide has a unique linear sequence of amino acids, with a carboxyl end (C-terminus) and an amino end (N-terminus).

A functional protein consists of one or more polypeptides precisely twisted, folded, and coiled into a unique shape.
The sequence of amino acids determines a protein`s three-dimensional structure. A protein`s structure determines its function.
Bioinformatics uses computer programs to predict protein structure and function from amino acid sequences.

Sickle-Cell Disease:

A Change in Primary Structure A slight change in primary structure can affect a protein`s structure and ability to function .
How does the primary structure change ?
Sickle-cell disease, an inherited blood disorder, results from a single amino acid substitution in the protein hemoglobin