PROTEINS

Proteins are large biomolecules, or macromolecules, consisting of one or more long chains of amino acid residues. Proteins perform a vast array of functions within organisms, including catalysing metabolic reactions, DNA replication, responding to stimuli, providing structure to cells and organisms, and transporting molecules from one location to another. Proteins differ from one another primarily in their sequence of amino acids, which is dictated by the nucleotide sequence of their genes, and which usually results in protein folding into a specific 3D structure that determines its activity.

A linear chain of amino acid residues is called a polypeptide. A protein contains at least one long polypeptide. Short polypeptides, containing less than 20–30 residues, are rarely considered to be proteins and are commonly called peptides, or sometimes oligopeptides. The individual amino acid residues are bonded together by peptide bonds and adjacent amino acid residues. The sequence of amino acid residues in a protein is defined by the sequence of a gene, which is encoded in the genetic code. In general, the genetic code specifies 20 standard amino acids; but in certain organisms the genetic code can include selenocysteine and—in certain archaea—pyrrolysine. Shortly after or even during synthesis, the residues in a protein are often chemically modified by post-translational modification, which alters the physical and chemical properties, folding, stability, activity, and ultimately, the function of the proteins. Some proteins have non-peptide groups attached, which can be called prosthetic groups or cofactors. Proteins can also work together to achieve a particular function, and they often associate to form stable protein complexes.

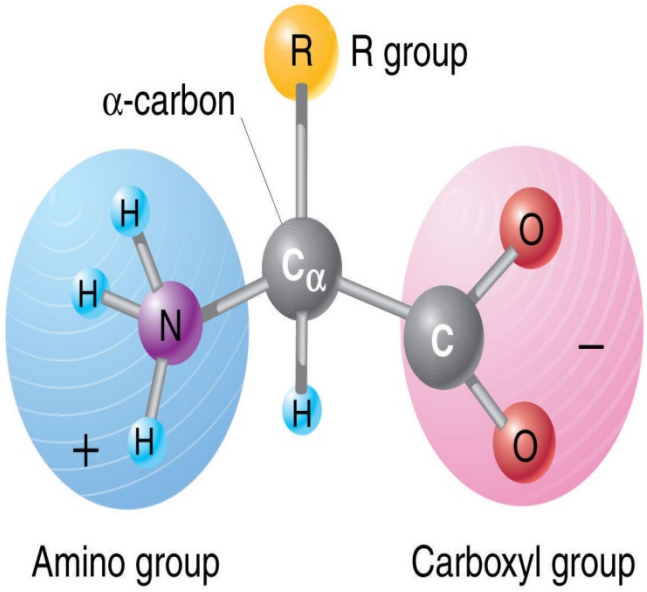
Once formed, proteins only exist for a certain period and are then degraded and recycled by the cell's machinery through the process of protein turnover. A protein's lifespan is measured in terms of its half-life and covers a wide range. They can exist for minutes or years with an average lifespan of 1–2 days in mammalian cells. Abnormal or misfolded

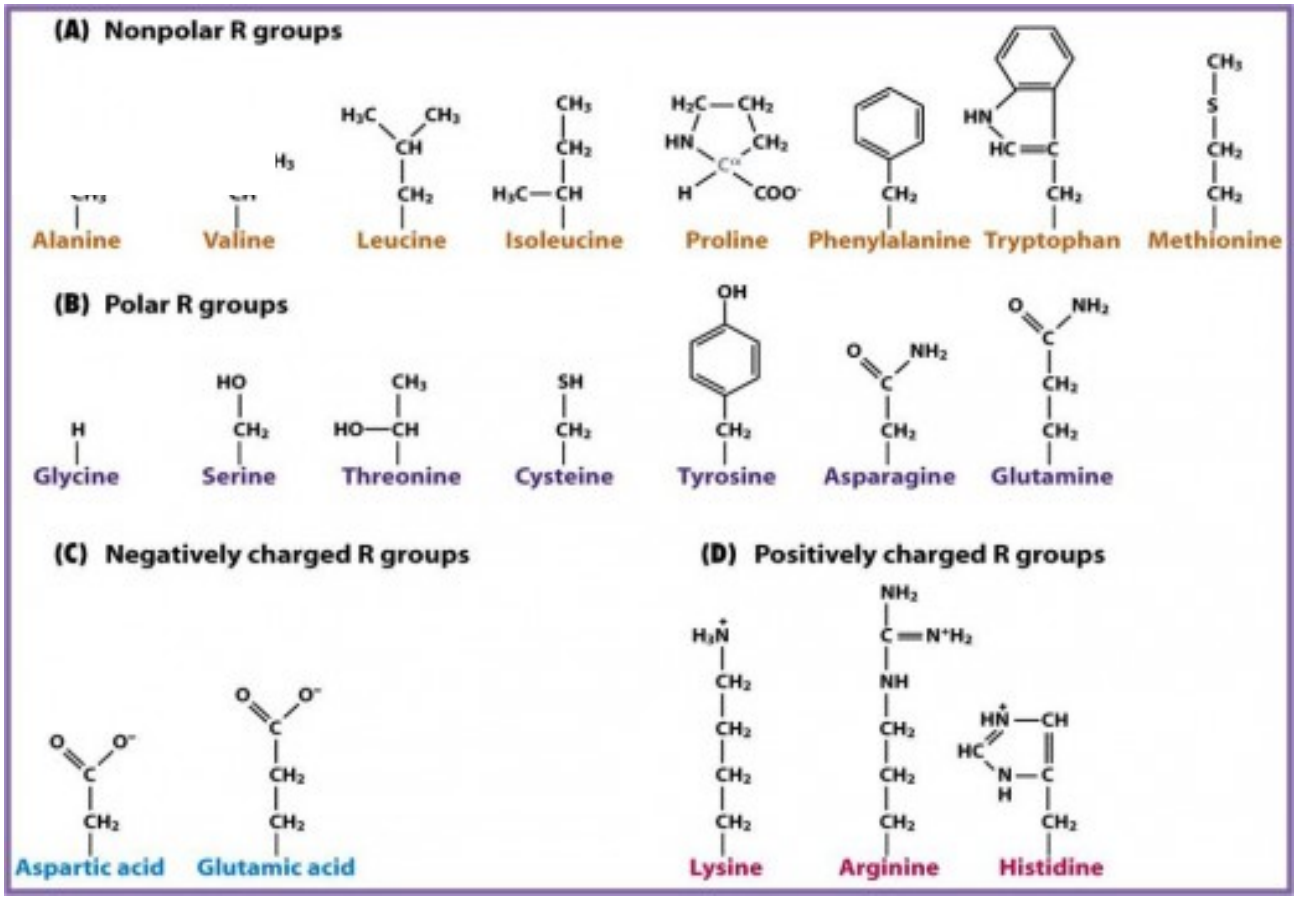
proteins are degraded more rapidly either due to being targeted for destruction or due to being unstable.

Like other biological macromolecules such as polysaccharides and nucleic acids, proteins are essential parts of organisms and participate in virtually every process within cells. Many proteins are enzymes that catalyse biochemical reactions and are vital to metabolism. Proteins also have structural or mechanical functions, such as actin and myosin in muscle and the proteins in the cytoskeleton, which form a system of scaffolding that maintains cell shape. Other proteins are important in cell signaling, immune responses, cell adhesion, and the cell cycle. In animals, proteins are needed in the diet to provide the essential amino acids that cannot be synthesized. Digestion breaks the proteins down for use in the metabolism.

Proteins may be purified from other cellular components using a variety of techniques such as ultracentrifugation, precipitation, electrophoresis, and chromatography; the advent of genetic engineering has made possible a number of methods to facilitate purification. Methods commonly used to study protein structure and function include immunohistochemistry, site-directed mutagenesis, X-ray crystallography, nuclear magnetic resonance and mass spectrometry.

The building blocks of **proteins** are **amino acids**, which are small organic molecules that consist of an alpha (central) carbon atom linked to an **amino** group, a carboxyl group, a hydrogen atom, and a variable component called a side chain.


R
R group
α-carbon
H
H
N
H
+
Cα
H
C
O
O
–
Amino group
Carboxyl group


(A) Nonpolar R groups
Alanine
Valine
Leucine
Isoleucine
Proline
Phenylalanine
Tryptophan
Methionine
(B) Polar R groups
Glycine
Serine
Threonine
Cysteine
Tyrosine
Asparagine
Glutamine
(C) Negatively charged R groups
Aspartic acid
Glutamic acid
(D) Positively charged R groups
Lysine
Arginine
Histidine

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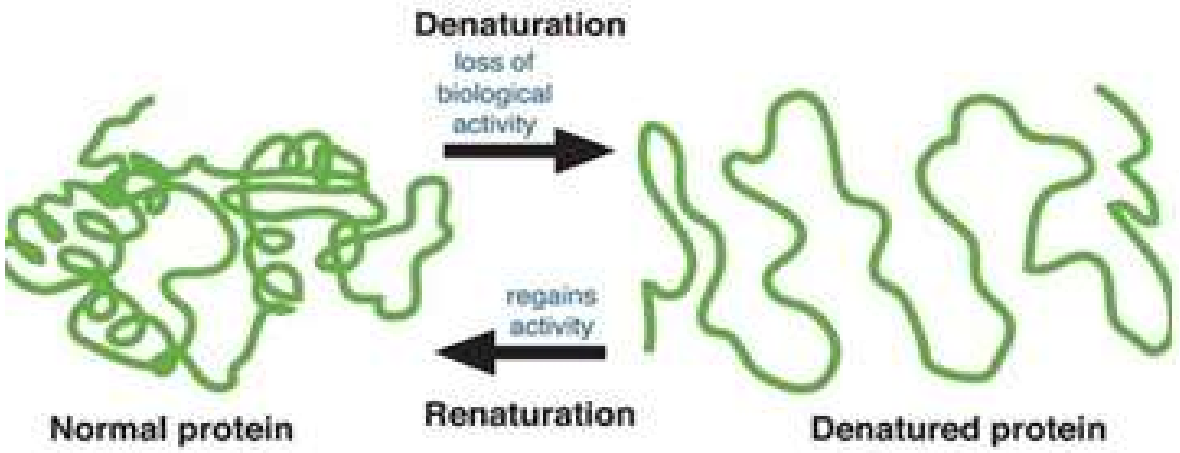
PROTEIN DENATURATION

Denaturation is a process in which proteins or nucleic acids lose the quaternary structure, tertiary structure, and secondary structure which is present in their native state, by application of some external stress or compound such as a strong acid or base, a concentrated inorganic salt, an organic solvent (e.g., alcohol or chloroform), radiation or heat. If proteins in a living cell are denatured, this results in disruption of cell activity and possibly cell death. Protein denaturation is also a consequence of cell death. Denatured proteins can exhibit a wide range of characteristics, from conformational change and loss of solubility to aggregation due to the exposure of hydrophobic groups. Denatured proteins lose their 3D structure and therefore cannot function.



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ROLE OF PROTEINS IN OUR BODY

There are many different types of proteins in our bodies. They all serve important roles in our growth, development and everyday functioning. Here are some examples:

- Enzymes are proteins that facilitate biochemical reactions, for example, pepsin is a digestive enzyme in your stomach that helps to break down proteins in food.
- Antibodies are proteins produced by the immune system to help remove foreign substances and fight infections.
- DNA-associated proteins regulate chromosome structure during cell division and/or play a role in regulating gene expression, for example, histones and cohesin proteins
- Contractile proteins are involved in muscle contraction and movement, for example, actin and myosin
- Structural proteins provide support in our bodies, for example, the proteins in our connective tissues, such as collagen and elastin.
- Hormone proteins co-ordinate bodily functions, for example, insulin controls our blood sugar concentration by regulating the uptake of glucose into cells.
- Transport proteins move molecules around our bodies, for example, haemoglobin transports oxygen through the blood.

REFERENES:

1.www.sciencelearn.org.nz

2.en.wikipedia.org