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PEPTIDES

Proteins are made by polymerization of amino acids through peptide bonds. Alpha carbonyl group of one amino acid reacts with alpha amino group of another amino acid to form a peptide bond or CO-NH bridge.
Two amino acids combine to form a dipeptide. Three amino acids combine to form a tripeptide. A few amino acids together will make oligopeptide. Combination of 10-50 amino acids is called polypeptide. Long polypeptide chains having 750 amino acids are called proteins.

STRUCTURE

- The peptide bond is a partial double bond.
- The C-N bond is trans in nature and there is no freedom of rotation because of the partial double bond character.
- The distance is 1.32 Å which is

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midway between single bond (1.49Å) and double bond (1.27Å)

- The side chains are free to rotate on either side of the peptide bond.
- The angles of rotation determine the spatial orientation of the peptide chain.

TYPES

There are five types of peptides:

(1.) MILK PEPTIDES: Formed when the digestive system breaks down a milk protein called caesin. they are also formed during fermentation of milk.

(2.) PEPTONES: Peptones are produced during the proteolysis of animal milk/meat.

(3.) RIBOSOMAL PEPTIDES: These are produced by translation of mRNA.

(4.) NON-RIBOSOMAL PEPTIDES: they are comprised of enzymes that are unique to each peptide, instead of the ribosome.

(5.) PEPTIDE FRAGMENTS: these are the fragments of proteins used to identify the source of protein.

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FUNCTIONS

Peptides are used for:

- Anti-aging creams: Many anti-aging creams contain different types of peptides. Most commonly used are those which are obtained from sea plants.
- Anti-microbial treatments: Antimicrobial peptides play a key role in treating the skin that is affected by injury, sun damage or acne lesions.
- Body Imaging: Body scans work by sending dyes through the bloodstream that fluoresce when they come in contact with certain tissues. These imaging techniques can help doctors to detect life-threatening cancer at early stages.
- Aspartame: The artificial sweetner with zero calories is found in many diet foods is a synthesized peptide. Aspartame is produced in labs which are 200 times sweeter than sugar.

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PROTEINS

Proteins have different levels of structural organization:

* Primary
* Secondary
* Tertiary
* Quartenary

STRUCTURE

(1.) PRIMARY STRUCTURE: Primary structure denotes the number and sequence of amino acids in the protein. Each polypeptide has a unique amino acid sequence decided by the genes. The primary structure is maintained by the covalent bonds of the peptide linkages. The polypeptide chains are linear however, branching points may be produced by disulfide bonds.

(2.) SECONDARY STRUCTURE: It denotes the configurational relationship between residues which are 3-4 amino acids apart in the linear sequence. Secondary protein structure is

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preserved by —

- Hydrogen bonds
- Electrostatic bonds (ionic)
- Hydrophobic bonds
- van der waals forces

The various secondary structures of polypeptide chains are

(i) Alpha Helix: It is a spiral structure and is stabilized by hydrogen bonds between NH and C=O.

(ii) Beta pleated sheet: The structure is stabilized by hydrogen bonds between NH and C=O groups of neighbouring polypeptide segments.

(iii) collagen Helix: It is a triple helical structure found in collagen.

(3.) TERTIARY STRUCTURE: It denotes the 3D structure of the whole protein. It defines the steric relationship of amino acids which are far apart from each other in the linear sequence, but are close in the 3D (three dimensional) aspect of their structure.

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(4°) QUATERNARY STRUCTURE: The forces which keep this structure are hydrogen bonds, electrostatic bond, hydrophobic and van der Waals forces. Depending on the number of polypeptide chain, the protein may be termed as monomer (1 chain), dimer (2 chains) or tetramer (4 chains).

Homodimers: Contain 2 copies of the same polypeptide chains.

Heterodimers: Contain 2 different types of polypeptide chains.

Eg – 2 α chains and 2 β chains from the Haemoglobin (Hb) molecule.

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TYPES

Proteins can be classified by two ways:

(1.) Based on shape

(2.) Based on nutritional value.

(1.) BASED ON SHAPE:

* Globular: Eg- Albumin, Globulin
* Fibrous: Eg - Collagen, Keratin

(2.) BASED ON NUTRITIONAL VALUE:

* Nutritionally rich: Contain all essential amino acids in required proportion. Eg- Caesin
* Incomplete: They lack one essential amino acid and thus cannot promote body growth. Eg - Pulses are deficit of methionine.
* Poor: They lack many essential amino acids. Eg - zein (corn) lacks lysine and tryptophan.