

Highlights Protein Structure 3

1. Another type of fibrous protein is collagen, the most abundant protein in your body. It contains three intertwined helices comprised of abundant repeating units of glycine, proline, and hydroxyproline
2. Hydroxylation of proline is a post-translational modification (occurs after the protein is made) and the hydroxyls are placed there in a reaction that uses vitamin C.
3. The hydroxyls of hydroxyproline can react with other, forming covalent cross-links that make the collagen fibers more sturdy.
4. Tertiary structure relates to interactions between amino acids in a protein that are not close in primary sequence. These interactions are made possible by folding to the protein chain to bring the distant amino acids closer together.
5. Tertiary structure is stabilized by disulfide bonds, ionic interactions, hydrogen bonds, hydrophilic, and hydrophobic interactions. Disulfide bonds are the strongest forces holding tertiary structure together, as they are covalent bonds.
6. Most proteins that are in cells are globular in nature.
7. Myoglobin is protein that acts as an oxygen 'battery', storing oxygen in muscles for when it is needed. Myoglobin contains a heme group that contains iron. Heme is a 'prosthetic group', which refers to a non-amino acid containing group that binds to a protein and augments its function.
8. Amino acid residues in myoglobin are arranged such that hydrophilic (and what your book calls ionic) amino acids are arranged on the outside and hydrophobic amino acids are largely arranged on the inside.
9. Porin is a membrane protein. Proteins embedded in membranes often have external amino acids that are hydrophobic so they can interact with the non-polar portions of membranes. Porin, in addition, has a hole in the center that allows water to pass through it. The amino acids in porin are arranged with non-polars outside and polars inside.
10. Quaternary structure of proteins relates to the interactions between separate polypeptide chains within the protein. The word polypeptide refers to a polymer of amino acids. A protein may contain one or more polypeptides and is folded and may be covalently modified.
11. Hemoglobin (and many other proteins) have multiple polypeptide subunits. Interactions between the subunits include disulfide bonds, ionic interactions, hydrogen bonds, hydrophilic, and hydrophobic interactions. Modification of the quaternary structure of a protein may have the same effects as modification of its tertiary structure - alteration of its function/activity.
12. Folding is necessary for proteins to assume their proper shape and function. The instructions for folding are all contained in the sequence of amino acids, but we do not yet understand how those instructions are carried out rapidly and efficiently. Levinthal's paradox illustrates the fact that folding is not a random event, but rather based on an ordered sequence of events arising from the chemistry of each group.
13. Proper folding of a protein is essential. Cells have complexes called Chaperonins that help some proteins to fold properly. Misfolding of proteins is implicated in diseases such as mad cow disease and

Creutzfeldt-Jacob disease in humans. The causative agent in these diseases is a "contagious" protein that is coded by the genome of each organism. When it doesn't fold properly, it helps induce other copies of the same protein to misfold as well, resulting in plaque-like structures that destroy nerve cells.