

1. Define primary structure

Linear sequence of amino acids in a polypeptide chain

2. Define secondary structure

Folding of polypeptide backbone into regular structures (alpha helix, beta sheet, turns, loops)

Stabilised by hydrogen bonds between atoms of the polypeptide backbone

3. Define tertiary structure

Assembly of secondary structural elements into a native protein structure

Elements of secondary structure are connected with remaining sections of amino acid sequence, forming connecting loops

4. Define quaternary structure

Assembly of multiple tertiary structure proteins into a multi-subunit structure

Subunits usually associate non-covalently

Interface constructed from hydrogen bonds, buried hydrophobic residues, and occasionally disulfides

Binding of ligand(s) can alter affinity of ligand to subunit (allosteric interactions)

5. What are protein domains?

Structurally independent units, with characteristics of small globular proteins

2+ layers of structure required to bury hydrophobic residues

Each domain has a specific function

Binding site occupies a cleft, between domains

6. Describe the structure of alpha helices

Coiled

Carries a macrodipole

All side chains point in the same direction (out from the helix)

C=O, N-H, all have H-bonds to  $i$ ,  $i+4$

1.5 Angstrom rise per residue;  $100^\circ$  rotation per residue

3.6 residues per turn

Often amphipathic

7. What are beta sheets constructed from?

2+ polypeptide strands (beta strands)

Parallel or anti-parallel

8. Which way do side chains face on beta sheets?

Opposite faces ( $\downarrow\uparrow\downarrow\uparrow\downarrow\uparrow\dots$ )

9. How could an amphipathic beta sheet be formed?

Hydrophobic residue, hydrophilic residue, hydrophobic residue, ...

10. What shape do beta sheets form

Relatively flat

Can adopt a twisted shape due to steric repulsion of the backbone and side chains

11. Where are individual strands in beta sheets located in, in the polypeptide chain?

Can be far apart in primary polypeptide chain; can be nearby

12. What is a beta turn?

Rapid reversal of direction of a polypeptide chain

13. Define super secondary structure:

Commonly seen secondary structural elements

Can be combined with other structural elements to form tertiary structure

14. What are some super secondary structural elements?

Beta-alpha-beta unit

Beta-hairpin

Alpha-alpha motif

Helix-turn-helix (usually to recognise a specific DNA sequence)

beta-barrels

15. What type of protein usually contains amphipathic helices?

Globular proteins

16. Define multimeric proteins:

Quaternary structure

Made up of multiple subunits

17. Where is a binding site typically found on a protein?

In a cleft

Between domains


18. In what way are different domains in IgG proteins structurally similar?

Antiparallel beta-sheets surrounding a hydrophobic core

19. Which direction do side chains always point on alpha helices?

Out, away from the helix

20. Draw all 20 side chains

 amino acid structures.pdf