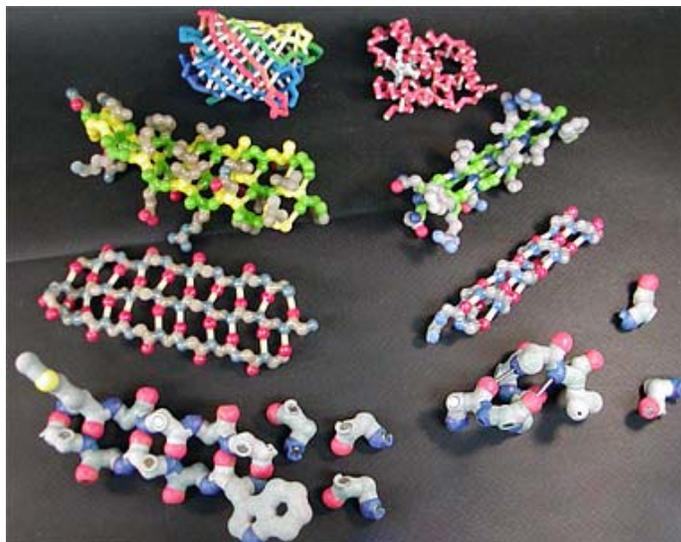


Alpha-Helix and Beta-Sheet Collection (AH1)



TEACHING POINTS

The linear amino acid sequence defines the primary structure of a protein. Regions of the linear polypeptide chain fold into the stable alpha-helix and beta-sheet structures to form the protein secondary structure. The tertiary protein structure is the overall three-dimensional shape of the protein. With this model collection, students can assemble an alpha-helix or anti-parallel beta-sheet, compare the phi-psi angles of the two secondary structures, and explore the contribution of hydrogen bonding to the stability of the structure. Models of the alpha-helix and beta-sheet, with and without side chains, allow comparison of the features of the two secondary structures. Two protein models display tertiary protein structure. The beta-globin protein consists predominantly of alpha-helices while the green fluorescent protein (GFP) consists predominantly of a beta-sheet.

MODELS IN THIS COLLECTION

- Alpha-helix without sidechains
- Alpha-helix with sidechains
- Beta-sheet without sidechains
- Beta-sheet with sidechains
- Alpha-helix building kit
- Beta-sheet building kit
- Beta-globin protein
- Green fluorescent protein (GFP)

MODEL DETAILS

- Alpha-helix without side chains
 - 17 amino acids without side chains
 - Ball and stick format
 - Derived from Helix E of beta-globin (amino acids 58-74)
 - Pitch is 3.6 amino acids per turn of helix
 - Hydrogen bonds (white) between nitrogen and carbonyl oxygen
 - CPK colors (carbon is gray, nitrogen is blue, oxygen is red)
 - Identical helix to the model Alpha-helix with sidechains
 - Model made of plaster with ZCorp printer
- Alpha-helix with side chains
 - 17 amino acids with side chains
 - Ball and stick format
 - Derived from Helix E of beta-globin (amino acids 58-74)
 - Pitch is 3.6 amino acids per turn of helix
 - Hydrogen bonds (white) between nitrogen and carbonyl oxygen
 - The amino acid side chains are CPK colors (carbon is gray, nitrogen is blue, oxygen is red, sulfur is orange)
 - The amino acid backbone atoms are colored green with the nitrogen colored blue (facilitates counting amino acids in the helix)
 - Amino acid sequence: NH_2 -Pro-Lys-Val-Lys-Ala-His-Gly-Lys-Lys-Val-Leu-Gly-Ala-Phe-Ser-Asp-Gly - CO_2H
 - Model made of plaster
- Beta-sheet without side chains
 - 30 amino acids without side chains
 - Ball and stick format
 - Made from amino acids 14-32, 120-127 of GFP (the pattern of hydrogen bonds can be used to identify the location in the GFP model)
 - Hydrogen bonds (white) between nitrogen and carbonyl oxygen
 - Two strands are parallel
 - Two strands are anti-parallel
 - CPK colors (carbon is gray, nitrogen is blue, oxygen is red)
 - Identical to beta-sheet with sidechains
 - Model made of plaster
- Beta-sheet with sidechains
 - 30 amino acids with side chains
 - Ball and stick format
 - Amino acid sequence:
 - NH_2 (120)-Val-Gln-Arg-Ile-Glu-Leu-Gly- CO_2H (127),
 - NH_2 -(14)-Ile-Leu-Val-Glu-Leu-Asp-Gly-Asp-Val-Gln-Gly-His-Lys-Phe-Ser-Val-Ser-Gly-Glu- CO_2H (32)
 - Hydrogen bonds (white) between nitrogen and carbonyl oxygen
 - Two strands are parallel
 - Two strands are anti-parallel

- o Side chains are CPK colors (carbon is gray, nitrogen is blue, oxygen is red)
 - o Backbone atoms of each amino acid are colored alternating yellow and green
 - o Made from amino acids 14-32, 120-127 of GFP (the pattern of hydrogen bonds can be used to identify the location in the GFP model)
 - o Model made of plaster with the ZCorp printer
- Green fluorescent protein, GFP
 - o 1EMB pdb file
 - o 236 amino acids
 - o Alpha carbon backbone format
 - o Chromophore, Ser 65, Tyr 66, Gly 67 green
 - o Amino acid contacts with the chromophore, His 148, Gln 94, Arg 96, Glu 222, Thr 203, Ile 167
 - o Model made of plaster with the ZCorp printer
 - Beta-globin
 - o 1AN3 pdb file
 - o Chain B
 - o Alpha-carbon backbone format
 - o Protoporphorin IX ring containing iron (Fe)
 - o His 63 and His 92 bind the protoporphorin ring
 - o Glu 6 is the sidechain that is mutated to valine in sickle cell anemia
 - o Model made of plaster with the ZCorp printer
 - Alpha-helix Construction kit
 - o Ball and stick format made as individual pieces that attach with magnets
 - o Peptide backbone pieces (8)
 - o Side chain pieces (13—shared with beta-sheet building kit)
 - o Metal hydrogen bonds
 - Beta-sheet Construction kit
 - o Ball and stick format made as individual pieces that attach with magnets
 - o Anti-parallel beta sheet
 - o Peptide backbone pieces (12)
 - o Side chain pieces (13—shared with the alpha-helix building kit)
 - o Metal hydrogen bonds

RESOURCES