Lending Library: Zinc Finger Collection (ZF)

Teaching Points

When proteins fold into their tertiary structures, there are often subdivisions within the protein, designated as domains, which are characterized by shape (motif) and/or function. One such motif is the zinc finger, in which a specific domain of the protein is arranged into a “finger-like” structure where two β-sheet strands and one α-helix are positioned around a zinc ion. The zinc ion is coordinated, or held in place, by histidine and/or cysteine sidechains. The zinc finger motif is commonly found in eukaryotic transcription factors, which are proteins that bind to specific sequences of DNA in order to regulate transcription.

One common class of zinc finger is the C$_2$H$_2$ class which is modeled in this collection. In this class of zinc fingers, the zinc ion is coordinated by two cysteine residues and two histidine residues. With this collection, students can visualize the folding of the polypeptide chain into the α-helix and β-sheet to produce the “finger-like” structure and to see the interaction of the sidechains of histidine and cysteine with the zinc ion. In addition to the backbone models, this collection also includes a model representing the electrostatic potential of the surface of the zinc finger, allowing students to examine the surface of the protein.

The models in this collection allow students to explore multiple models of the same structure to identify the features emphasized in each model.

Models in this Collection

- 7 Zinc Finger Models in various formats

Documentation Included

- How do the models fit back in the suitcase?
General Model Information

- All models, except zinc surface model, are made of nylon on the SLS machine.
- All models are based on PDB 1zaa.
- Residues 4-31 are displayed in all models.
- Zinc is displayed in spacefill format and is colored green.
- Amino acid sidechains are displayed in wireframe format and colored CPK.
- CPK coloring of amino acids:
  - Carbon
  - Oxygen
  - Nitrogen
- Hydrogen atoms are not displayed.

Model Details

- 3 Zinc finger α-carbon backbone models in white
  - Model without sidechains displayed
  - Model with zinc atom (in green) coordinated with histidine and cysteine sidechains displayed in wireframe and colored in CPK
  - Model with all sidechains displayed in wireframe and colored in CPK, and zinc atom in green
- 3 Zinc finger wireframe models in CPK
  - Model without sidechains displayed
  - Model with zinc atom (in green) coordinated with histidine and cysteine sidechains displayed in wireframe and colored in CPK
  - Model with all sidechains displayed in wireframe and colored in CPK, and zinc atom in green
- Zinc finger surface model
  - Uncharged regions in white
  - Positively charged regions in blue
  - Negatively charged regions in red
  - Model made of plaster on the ZCorp 3D printer, then coated with lacquer