**Exploring a Protein Structure in the RCSB PDB: Insulin**

**Learning Goals:**

1. Visualize the structure of a given molecule using RCSB PDB resources.
2. Explore the structure to understand its structure function relationships

**Exercise:**

Review the Molecule of the Month feature on Insulin for background information (<http://pdb101.rcsb.org/motm/14> ). Discuss main ideas of this feature with the students.

Note that there are a few PDB entries listed throughout the feature. For example, PDB entry 4ins can be linked from



Click on this to open the summary page for the PDB entry 4ins (<http://www.rcsb.org/pdb/explore/explore.do?structureId=4ins>).

Read/review the page and answer the following questions based on the descriptions provided:

1. What is the source (organism) of the insulin molecule in this structure?
2. Name the authors who solved the structure of this protein?
3. Explore the 3-D structure of this protein by clicking on JSmol (hyperlink) next to 3D View as seen below:



View the polymer chains shown to contain helical ribbons (in magenta), arrows (in golden yellow) and coil-like regions (white/grey).



Mouse-over the small grey atom (highlighted by a red arrow, in the above figure). What is it and why do you see this atom in the insulin structure (Hint: read the title and abstract of the structure for clues)

1. Change the viewer to PV using the pull-down menu.



The default view is colored by chain (i.e. each protein (polymer) chain in the structure is colored in a different color).

Based on the 3-D model that you see here describe the overall composition of insulin – how many and what chains are present in the structure. Also describe the structure of each insulin molecule in terms of the helical, arrow-like or coiled regions in each chain.

1. Go back to the JSmol view of the PDB entry.



This will re-open the JSmol view of the PDB entry. In the various options click on the box next to S-S bonds to show the disulfide bonds in the structure.



Note yellow SS bond lines appear in the model. These bonds are formed by oxidation of two specific sulfur-containing amino acids. How many such bonds do you see?

1. Are these S-S bonds within the same polymer chain or between different chains of insulin? (Hint: Color the ribbons by sequence to see if the S-S bonding is between the same or different polymer chains).
2. What do you think is the role of these S-S bonds? Describe in 1-2 sentences.