Crime Scene Investigators-Zoo Crime Unit

A panda was found dead at a zoo. DNA samples were taken from a knife and other evidence gathered at the crime scene. Use the DNA sequences from the evidence and the National Center for Biotechnology Information (NCBI) database to determine which sample most likely came from the suspect.

Part 1-BLAST

- 1. Go to http://blast.ncbi.nlm.nih.gov/Blast.cgi
- 2. Click on 'nucleotide blast' option
- 3. Open the **unknown_DNA_sequences.fa** text file found on your desktop. Open the file with WordPad on a PC and TextEdit on a Mac.
- 4. One at a time, copy your sequences from the text editor in to the text box on the BLAST website
- 5. Click BLAST button
- 6. If needed, Google search the specie of the top BLAST hit to help determine the organism.



What organism does the sequence belong to?

Which sequence from your group is most likely the suspect?

Part 2-Align DNA

Now that you have determined which sample from the scene of the crime came from the perpetrator, align the DNA sequences from people suspected of the crime to see who is a match.

- 1. Go to http://www.ebi.ac.uk/Tools/msa/muscle/
- 2. Open the suspects_DNA_sequences.fa text file found on your desktop
- 3. Copy all sequences, including headers, and paste in the multiple sequence alignment box on muscle website
- 4. Select 'HTML' format from the output format dropdown box
- 5. Click submit
- 6. Scroll through the alignments and determine who most likely is the perpetrator.



Who is most likely the perpetrator?

Protein Modeling Exploration

Objective

The chromosomal translocation mutation resulting in the fusion gene BCR-ABL causes Chronic Myelogenous Leukemia (CML). This gene causes cells to grow and reproduce out of control. The drug, Gleevec has been developed to fight CML by blocking the ATP binding site in BCR-ABL thus shutting down the signaling for uncontrollable cell growth. Students will explore the field of structural bioinformatics by looking at the protein model of BCR-ABL and its kinase domain on the Protein Data Bank in Europe website.

Materials

Computers

Directions

- 1. Go to http://www.ebi.ac.uk/pdbe/
- 2. Type 2HYY in the search box.
- 3. Click on 2hyy.
- 4. From the Quick links pane on the right, click on "3d-visualization".
- 5. In the right side pane under "Polymer Visual" select the "Type" to be "Surface" from the pulldown menu.
- 6. You will see four BCR-ABL protein molecule. Rotate and try to locate the drug Gleevec.
- Left click and drag with your computer mouse to rotate the structure. Single right and left clicks will show the structure of the drug Gleevec. Right click and drag to zoom in and out.
- You can change the "HET Groups Visual" Type to "VDW Balls" from the pulldown menu to see the drug better.
- 9. Play with other Type display options from "Polymer Visual" pulldown menu.
- 10. Change the Type of "Water



Visual" to VDW Balls to see the Oxygen atoms of the Water molecules around the protein molecule.