Teaching Notes for Molecular Forensics

This document is a supplement to:
Donovan, S. (2003). Molecular forensics. In J. R. Jungck, M. F. Fass, & E. D. Stanley (Eds.), *Microbes count!: Problem posing, problem solving and peer persuasion in microbiology* (pp. 129-136). American Society for Microbiology Press.

I have had some success using this activity both as a quick stand alone orientation to interpreting distance trees and as an introduction to working with sequence data before students get on the computer to do their own analyses. Breaking the problem down into several steps of orientation and analysis allows everyone to engage with the nature of the data, and the representations used for outputs, while keeping the biological interpretation in mind.

The activity is written in a way that assumes small groups of students will have some time to work with each figure and think about the questions at the end of each section. I often ask them to keep a list of other questions that come to mind during their discussion. I generally follow these small group discussions with a brief whole group discussion so we can address any questions that have arisen and I can interject additional details where appropriate. Their questions often run the gamut from basic biology (What do the letters stand for?) and experimental design (What is the role of the local control?) to the truly interesting (How do we know how much similarity is enough to say they are related?). I am always surprised how many misconceptions and other important issues arise in these discussions.

This is clearly a relatively low tech approach to discussing bioinformatics. This strategy does provide a few important benefits such as making it possible to focus on the biology, interpretation, and decision making without becoming bogged down with a bunch of technical issues. The activity places the emphasis on making sense of results more than the mechanics of getting them. Too often students see computational methods, be they hand calculations or computer generated results, as answers. This approach treats them as evidence to be worked with and placed into a biological context as part of an argument.

Important Information: The possibility of transmitting HIV from a health care providers to patients caused a strong public response including some calls for mandatory testing and registration of all HIV+ health care professionals. Many health care procedures were revised and universal precautions became much more universally practiced. To date there have been no known accidental transmissions of HIV infection from a care provider to a patient. The mechanism of infection in the this case is still unknown. Health care providers are still at a much higher risk of contracting HIV from their patients than passing HIV to their patients.

Suggested extensions to this activity:

- Have students look up some of the data in GenBank to see what kinds of information a complete sequence record contains.

- Do a computer based analysis with the included small sequence dataset, "Exercise_data.txt", or a larger dataset from the literature.

- Relate what you have learned about virus evolution to the efforts involved in creating influenza vaccines.