DNA: From Lab to Courtroom

Catherine A. Teare Ketter

Division of Biological Sciences
University of Georgia
Athens, Georgia 30602–2601

The laboratory exercise on DNA fingerprinting was specifically developed for inclusion in a two part laboratory sequence for nonscience majors. This exercise is placed in the lab sequence to correspond with the end of the lecture discussions on molecular genetics. The data used in this exercise are derived from actual FBI crime cases which occurred in Georgia between 1989 and 1993. Dr. Wyatt Anderson, Department of Genetics at the University of Georgia, assisted in the development of this exercise. As a technical consultant to the State of Georgia crime laboratory, and a frequent expert witness on forensic use of DNA fingerprinting, Dr. Anderson felt that the inclusion of this exercise in the nonscience major sequence would provide the students with a basic understanding of the DNA fingerprinting process and create technically literate potential jurors.

Four objectives are outlined for students at the beginning of the exercise:

- Observe chromatin bands corresponding to "genes" in *Drosphila* giant salivary chromsomes.
- Recognize types of DNA: **unique DNA** and **repetitive DNA**.
- Learn how DNA is chemically cleaved and how the resultant fragments are separated by electrophoresis.
- Understand how DNA technology is used to identify individuals.

Students observe prepared slides of *Drosophila* salivary polytene chromosomes. A chromosome map is provided for visual reference to assist the students in locating specific chromosome regions corresponding to known *Drosophila* mutations. A discussion of restriction endonucleases, RFLP analysis, and the Southern Blot technique follows. Students view a 10 minute video clip on electrophoresis and observe a gel loaded with multiple tracking dyes of differing colors and watch molecular weights separating.

Three sets of autoradiograms are provided to the students. Each case is of increasing complexity paralleling the development of forensic DNA technology from 1989 through 1993. Each set of films is associated with a crime case description. The first case is worked by the teaching assistants with the class as an example. Three different probes are used and the band shitfing phenomenon is demonstrated and discussed.

The second and third cases are assigned to different student groups. The students divide themselves into prosecution and defense teams and evaluate each set of films from their legal position. The students summarize their results in a "mock" trail. Students must calculate the total probability of a match for the suspect and the evidence. Students are required to discuss the technical problems associated with the forensic application of DNA technology including: the small numbers of certain ethnic groups in the FBI data base used to generate the probabilities, problems associated with the use of the DXY probes, the effects of poor sample preservation, and forensic laboratory quality control.

NOTE: 30 mm negatives of the autoradiograms were distributed at the Boston University meeting for cases 2 and 3. Additional copies of the crime films are available upon request from the author. Please allow sufficient time for the author to obtain the original films from the FBI lab and have the autoradiograms copied (4-6 weeks).