



Marine Biotechnology and Bioinformatics

for Teachers

DNA Fingerprinting Simulation



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Introduction/Background/Context

DNA Fingerprinting is a very useful tool in solving crimes. Many classrooms do not have the equipment to do a restriction digest and electrophoresis experiment. This activity will allow the students a chance to simulate the process of analyzing the results of DNA Fingerprinting.

The students will be given a crime scenario that contains DNA results from blood collected at the crime scene. They will analyze the electrophoresis results from three suspects and crime scene DNA to determine who committed the crime.

This biotechnology activity fulfills the California Science Standard 4 on DNA and Standard 5d on DNA technology.

This biotechnology activity fulfills the National Science Standard C on molecular genetics.

STEM Connection. This activity will help students learn more about the following careers: Forensic science, lab technician, and molecular biologist.

Instructional Goal

The goal of this lesson is to:

- Understand the process of DNA Fingerprinting.
- Know how DNA Fingerprinting is used in solving crimes.

Instructional Objectives

Upon completion of this lesson, students will be able to:

- Analyze electrophoresis results from DNA Fingerprinting.
- List three applications for DNA Fingerprinting.

Method

- Students will read the crime scenario.
- They will then visit the following website to get background on DNA Fingerprinting: www.biotech.lanl.gov.edu/biotech_info/select/bnf.html
- Students will analyze the electrophoresis results from three suspects and the crime scene.
- Using the electrophoresis analysis, students will determine who committed the crime by comparing the crime scene DNA Fingerprinting results to their analysis of the three suspects.
- This activity can be used as a precursor to a real electrophoresis lab if the proper equipment is available. EDVOTEK offers an easy to use DNA Fingerprinting kit.



Alexis Higgins at North Salinas High School preparing for the electrophoresis of DNA samples.



Abraham Garcia at North Salinas High School loading DNA samples for DNA Fingerprinting.

Results/Learning Outcomes

- Students measured the distance that each DNA fragment moved from the starting position for each of the three suspects.
- Students successfully determined which suspect committed the crime by comparing the three suspect measurements to the crime scene measurements.
- The DNA Fingerprinting simulation activity was followed by a DNA Fingerprinting lab. The students applied their knowledge of the process of DNA Fingerprinting and were able to solve the crime by analyzing their electrophoresis results.

This image shows the electrophoresis results from the DNA Fingerprinting lab offered by EDVOTEK. The first lane shows crime scene DNA cut with the first restriction enzyme. It is compared to lane three (suspect 1) and lane five (suspect 2) which contain DNA cut with the same enzyme. The crime scene DNA in lane two is compared to lane four (suspect 1) and lane six (suspect 2). Suspect two committed the crime because the results from both enzyme match the crime scene DNA.



This picture shows about the equipment that is needed to do the DNA Fingerprinting lab kit. Items you require from the kit are: the power supply, an electrophoresis chamber, a power supply box, a micropipette, a test tube rack, and a microcentrifuge.

Conclusion/Lessons Learned

There is a lot of interest among students in forensic science currently because of television shows like CSI. I decided to introduce students to the process of using micropipettes and doing electrophoresis with a DNA Fingerprinting simulation and follow up lab to capitalize on their interest. The student worksheet shows the number of DNA pieces and the distance that they migrated during a simulated electrophoresis process. I separated the results for each suspect on a different page of the worksheet so that the students had to use their measuring skills to determine which suspect matched the crime scene. Students were very focused during the lab, and excited to be able to successfully complete the lab techniques involved in DNA Fingerprinting. Doing the simulation activity prior to the lab greatly increased student understanding of the process and application of DNA Fingerprinting.

The summer Marine Biotechnology and Bioinformatics workshop allowed me to learn the laboratory techniques that I needed to teach to my students, as well as give me a chance to learn more advanced lab techniques such as Polymerase Chain Reaction and DNA Sequencing.

A sample page from the student worksheet for the DNA Fingerprinting Simulation.



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