Tested Studies for Laboratory Teaching
Proceedings of the Association for Biology Laboratory Education
Vol. 36, Article 53, 2015

Modeling DNA Fingerprinting with Crayola™ markers

Lisa Bartee

Biology Department, Mt Hood Community College, 26000 SE Stark St., Gresham OR 97030 USA
(**lisa.bartee@mhcc.edu**)

Extended Abstract

DNA fingerprinting is a technique that many students are familiar with from CSI and other crime dramas. Creating and analyzing DNA fingerprints in a lab setting teaches students valuable lab techniques, critical thinking and analysis skills, and is something that they typically find very engaging. We have tried using real DNA-based kits as well as purchased dye-based kits. We found that using gave unreliable results in non-majors classrooms and was very expensive. Purchased dye-based kits were too simplistic. For these reasons, we developed a DNA fingerprinting simulation that uses specific combinations of dyes, such as those found in Crayola™ markers.

The scenario given in class is as follows: A couple is going through a divorce. Brad claims that his wife Angelina has been unfaithful to him. He believes that she has been having an affair with another man (Leonardo). You have been provided with DNA samples from Brad, Angelina, Leonardo, his wife Jennifer, and four children. These samples have already been digested with restriction enzymes and are ready to be run on your agarose gel.

Three of the children are Angelina's and (supposedly) Brad's biological children. The fourth sample is from Leonardo and Jennifer's child. However, the original labels rubbed off the tubes of children's DNA, so you aren't sure whose is whose. Your job is to determine who the parents are of each of the four children and whether Angelina did in fact cheat on Brad.

To prepare the dye samples, the back end cap of each required color of marker is removed with pliers and the marker ink is squeezed out onto a piece of parafilm. A 90 µL quantity of marker dye is added to a tube, along with 900 µL of water and 350 µL of 60% sucrose. Deep Pink Spectrum food coloring (available from Amazon.com or grocery stores) is prepared by adding approximately 1 drop of food coloring to 1000 µL of water.

From these preparations, dyes are combined in the following combinations to create DNA fingerprints for each individual in the scenario:

Brad: Deep Pink Food Coloring (FC), Pink Crayola Marker (CM), Red CM
Angelina: Blue CM, Orange CM, yellow hi-lighter
Leonardo: Purple CM, Pink CM
Jennifer: Black CM
Baby 1 (Brad and Angelina's): Deep Pink FC, Orange CM, Red CM
Baby 2 (Brad and Angelina's): Pink CM, Orange CM, Red CM, yellow hi-lighter
Baby 3 (Leonardo and Angelina's): Purple CM, Orange CM, yellow hi-lighter
Baby 4 (Leonardo and Jennifer's): Black CM, Pink CM

Keywords: DNA Fingerprinting

Link to Original Poster
http://www.ableweb.org/volumes/vol-36/poster?art=53

Mission, Review Process & Disclaimer

The Association for Biology Laboratory Education (ABLE) was founded in 1979 to promote information exchange among university and college educators actively concerned with teaching biology in a laboratory setting. The focus of ABLE is to improve the undergraduate biology laboratory experience by promoting the development and dissemination of interesting, innovative, and reliable laboratory exercises. For more information about ABLE, please visit **http://www.ableweb.org/**

Papers published in *Tested Studies for Laboratory Teaching: Peer-Reviewed Proceedings of the Conference of the Association for Biology Laboratory Education* are evaluated and selected by a committee prior to presentation at the conference, peer-reviewed by participants at the conference, and edited by members of the ABLE Editorial Board.

Citing This Article

Bartee, L. 2015. Modeling DNA Fingerprinting with Crayola™ markers. Article 53 in *Tested Studies for Laboratory Teaching,* Volume 36 (K. McMahon, Editor). Proceedings of the 36th Conference of the Association for Biology Laboratory Education (ABLE), http://www. ableweb.org/volumes/vol-36/?art=53