



Genetic Study Aids DNA Forensics

Researchers are going beyond traditional forensics to try and predict the physical appearance of an unidentified person whose DNA is found at a crime scene.

When DNA is taken from a crime scene, the DNA profile can be searched in the Combined DNA Index System (CODIS), which is the central nationwide database of DNA profiles, or other local DNA data banks to search for a match. In traditional uses of DNA, in the absence of a match, investigators have little or no information on a person.

Through the study of genes and pigmentation, researchers at the University of Arizona in Tucson wanted to determine, with a high degree of accuracy, hair, eye and skin color from a forensic DNA sample.

“There are instances where there are no witnesses and no matches in the DNA database,” says Murray Brilliant, Lindholm professor of genetics in the Department of Pediatrics and the Steele Children’s Research Center at the university. “I wanted to come up with a way to predict a person’s appearance, a simple DNA test to predict what a person might look like using a DNA sample.”

A goal of the study was to correlate polymorphism, or variations, in genes that are known to affect pigmentation, with variations in eye, hair and skin color. The research was supported by a grant from the Office of Justice Programs’ National Institute of Justice.

The Study

A research team led by Brilliant used 1,000 ethnically diverse student volunteers to conduct the study, paying each student \$20 for their participation. Researchers measured the students’ skin tone using a skin reflectometer on the lower portion of the upper arm, where people are not likely to tan. Skin pigmentation is measured by skin reflectance. A reflectometer shines wavelengths onto the

skin; what doesn’t get reflected gets absorbed. Darker skin absorbs more light.

Researchers also took hair samples from volunteers who had not dyed their hair in the past three months and determined pigment through chemical analysis. They determined eye color by comparison with an eye chart available from companies that make artificial eyes. Eye color is difficult to measure because eyes are not a uniform color.

The team then obtained DNA samples by swabbing the inside of the volunteers’ mouths along the cheeks. Information was entered into a database and the samples coded by pigmentation number and DNA number so participants’ identities were unknown. Using the DNA samples, researchers were able to predict the amount of pigment in the hair with about 76 percent accuracy. For eye color, accuracy was about 76 percent and for skin color, which is more complex, accuracy was about 50 percent.

The technology is not sophisticated enough yet to use as evidence, but has the potential to assist investigators.

“This can be used as an investigative tool the same way an eyewitness account could be used as an investigative tool,” Brilliant says.

The study included collaborators from the University of Arizona Department of Ecology and Evolutionary Biology, Pennsylvania State University College of Medicine, Fujita Health University School of Health Sciences and DNA Print Genomics, Inc.

For more information, contact Murray Brilliant at (520) 626-3305, e-mail mhb@peds.arizona.edu. For a copy of the final grant report on the study, Gene Polymorphisms and Human Pigmentation, visit <http://www.ncjrs.gov/pdffiles1/nij/grants/223980.pdf>.

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