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Familial DNA could become a valuable investigative tool for the law enforcement community – providing decisive leads in cases which would otherwise go unsolved.

In December 2003, Darryl Hunt was released from prison in North Carolina after serving nearly 20 years. Through DNA testing, investigators determined that Hunt could not have committed the 1984 rape

and murder for which he was convicted. An innovative new forensic tool, familial DNA analysis, led them to another man, Willard Brown. Brown confessed to the crime, thereby exonerating Hunt of any wrongdoing. This case is only one example of how law enforcement may utilize familial DNA.

The purpose of this article is to examine familial DNA and its impact on law enforcement and criminal investigations. Potential benefits and limitations of

familial DNA will be described and practical concerns about implementing familial DNA analysis will also be noted.

A Brief History of DNA

In 1985, English geneticist Alec Jeffreys discovered that certain sections of DNA continually repeat themselves and that the length of these sections differs from person to person. Jeffreys devised a technique known as Restriction Fragment Length Polymorphism (RFLP) whereby DNA fragments are cut and the lengths of

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the repeating sections are determined. The value of RFLP to forensic science was historic.

In 1987, a Florida man became the first person in the United States to be convicted of a crime (rape) based on DNA evidence. In 1989, Virginia became the first state to begin a DNA database to link crime scene samples to the DNA profiles of offenders. DNA databases have since been established in all 50 states. Some require all convicted felons to submit a DNA sample; others obtain profiles from some misdemeanor offenders; and six states permit samples to be obtained from persons merely arrested for certain crimes.

Background of Familial DNA

Many new methods of DNA analysis have emerged since Jeffreys' pioneering work. One technique, mitochondrial DNA (mtDNA), tests DNA from the mitochondria of a human cell. Humans inherit mtDNA solely from their mother; thus, siblings with the same mother will have identical mtDNA to each other and to their mother (assuming no mutation is present). Mitochondrial DNA aids law enforcement because it is present in a significant quantity within cells, therefore allowing scientists to extract mtDNA from very minute DNA samples.

One prominent case involving mtDNA was that of Albert DeSalvo, the so-called Boston Strangler. DeSalvo confessed to killing Mary Sullivan, a crime attributed to the Boston Strangler. In 2000, Sullivan's body was exhumed for analysis; both her family and the DeSalvo family never believed Albert DeSalvo murdered her. Through mtDNA testing, it was determined that Richard DeSalvo, Albert's brother, did not have the same mtDNA as samples still present on Sullivan's body. This indicates that Mary Sullivan's killer may not have been Albert DeSalvo, since mtDNA would be identical for both Richard and Albert, raising questions about whether DeSalvo actually was the Boston Strangler.

Like mtDNA, familial DNA analysis is based on the similar genetic makeup shared by relatives. However, familial DNA is based on profiles found in databases (such as in the Combined DNA Index System); these DNA profiles are from nuclear DNA, not mtDNA. The familial testing process begins when a DNA sample from a crime scene is found to partially match an individual's profile in a DNA database. Investigators can then deduce that the sample may have come from a close relative of that person, because "First degree relatives (parent, sibling, or child) on average will share at least half" of their DNA makeup (Henry T. Greely, Daniel P. Riordan, Nanibaa' A. Garrison & Joanna L. Mountain, "Family Ties: The Use of DNA Offender Databases to Catch Offenders' Kin," p. 250, *Journal of Law, Medicine & Ethics*, 2006). Investigators may then be able to "identify, as potential suspects, not just those in the database, but their close relatives as well" (Frederick R. Bieber, Charles H. Brenner, & David Lazer, "Finding Criminals Through DNA of Their Relatives," p. 1316, *Science* 312, June 3, 2006).

used to identify victims of natural disasters and missing persons. For purposes of criminal investigations, familial DNA can exonerate the innocent (as occurred with Darryl Hunt); it can also allow investigators to widen their range of suspects if a partial match is located. While a potentially valuable technique, some concerns remain.

Legal Concerns

Several legal questions may arise regarding familial DNA. To date, these issues have not been fully examined or resolved.

Will the use of familial DNA violate individuals' Fourth Amendment privacy rights? Assuming that familial DNA becomes a legally accepted tool used by law enforcement, lifetime "genetic surveillance" could possibly extend to family members of those with genetic profiles in DNA databases. This refers to the argument that the relatives of individuals with database profiles will constantly be at risk for investigation, thereby placing them under indirect surveillance and weakening their privacy rights. Proponents count on this concern by noting that relatives of offenders would simply be aiding in the investigation; not unlike assisting investigators to determine the motive of a family member accused of criminal activity.

When a crime scene DNA sample partially matches that of a person in a database, can investigators legally obtain DNA samples from that person's family members, or would doing so be viewed as an invasion that "shocks the conscience"? If so, by what means may the samples be acquired? For example, would investigators acting on a partial match need a court order to take a sample, or could they obtain DNA surreptitiously, from abandoned property?

Rulings

In *California v. Greenwood*, the Supreme Court held that evidence acquired from discarded property is not protected by the Fourth Amendment. Various courts have subsequently considered the admissibility of DNA evidence obtained from abandoned property. For instance, the Florida Fourth District Court of Appeal ruled in 2002 that using "police trickery to acquire a DNA sample violates individual rights. However, in 2006, the Iowa Court of Appeals ruled that a suspect's DNA acquired from a discarded water bottle and fork was legally obtained. These inconsistencies complicate procedures to obtain DNA samples based on a relative's partial match.

If not through abandoned property (what justification (probable cause or reasonable suspicion) would be necessary to obtain or compel DNA samples pursuant to a partial match? In *Schmerber v. California*, a defendant convicted of driving

under the influence argued that police violated his rights by extracting blood samples without first obtaining a warrant. The Court ruled that the defendant's rights were not violated because the police officers had probable cause to obtain the blood samples. This precedent (see also *United States v. Berry*, decided by the Sixth Circuit Court

of Appeals) suggests that probable cause might also be the standard required for the acquisition of a DNA sample. However, in *Skinner v. Railway Labor Executives' Association*, the Supreme Court upheld mandatory blood and urine testing of railway employees based on a compelling interest in transportation safety, with no requirement for reasonable suspicion. It is unclear whether partial DNA matches triggering familial analysis would provide probable cause, reasonable suspicion, or neither; thus, the legal justification required for obtaining or compelling a sample in familial DNA cases remains uncertain.

Another legal issue which remains unclear is whether familial DNA would meet the legal standards for admission as scientific evidence. According to *Daubert v. Merrell Dow Pharmaceuticals*, scientific evidence is only admissible if it is generally accepted in its respective field. This begs the question of whether or not familial DNA will be accepted by the scientific community, allowing its admissibility as evidence.

Benefits and Limitations

The benefits of familial DNA are well established: It could help revive cold cases; exonerate the innocent; broaden suspect lists; and increase the number of crimes solved, to name a few. The rate of cold hits, database matches found for investigations which have exhausted all leads, could increase by as much as 40 percent through the use of familial DNA. However, familial DNA is not foolproof.

There is currently no standard for what constitutes a partial match. "Thirteen pairs of numbers, one pair for each of the thirteen [short tandem repeats]" are used by investigators in the United States to locate full DNA matches (Greely et al, *supra* note 11, at p. 250; Owen & Burke, *supra* note 4, at p. 619). But, how many pairs result in a partial match worthy of investigating relatives? Or is familial DNA analogous to fingerprint matching, for which there is no set number of points legally necessary to determine a match? The lack of a standard is problematic if familial DNA analysis is to become an accepted forensic tool and potentially confounds familial DNA's admissibility as scientific evidence.

Familial DNA could increase profiling and racial disparities in the criminal justice system. Certain groups of people are more likely to be involved with the criminal justice system based on ethnicity, social class, and other factors; these individuals are thus more likely to submit a DNA profile for storage in a database. Because of this, they may be more likely to be partially matched to a DNA sample left at a crime scene because of overrepresentation in the databases and, consequently, their relatives may be more vulnerable to be investigated pursuant to the finding of a partial match.

Familial DNA also has ethical implications. Suppose, for instance, a DNA sample left at a crime scene is partially matched to two people. It would be likely that they were related. If one of the individuals involved was adopted, would investigators be responsible for informing each that they might be from the same biological family? Although these are not criminal justice-related concerns, ethical questions such as these should be addressed before the use of familial DNA becomes widespread.

Potential misuse is another concern of familial DNA. For instance, consider a situation in which investigators link a suspect whose samples are not in a DNA database – without clear probable cause – to a crime in which DNA evidence was recovered. Investigators could then obtain, perhaps through abandoned property, a DNA sample from a known relative of the suspect. A partial match between the known relative and the crime scene sample could lead investigators to affirm their suspect identification. However, this is contrary to how familial DNA should be used, as the samples were not obtained based on investigative leads.

Implementation Concerns

Some states are examining the investigative possibilities of familial DNA. For example, in early 2007, officials in both

Massachusetts and Virginia discussed its use. As of this writing, it was unclear whether a decision had been reached in either state.

It is necessary to have agreed upon standards between states regarding familial DNA, as cooperation is critical for an investigation's successful outcome. This was recently illustrated in Colorado when authorities requested a DNA profile from California's database based on a partial match. California currently does not permit investigations based on partial matches; as such, they refused to release the profile. By contrast, Arizona and Oregon have helped Colorado investigators pursue leads based on partial matches to profiles in their respective state databases.

Agencies seeking to use familial DNA should conduct thorough cost-benefit analyses. If suspect lists dramatically increase through the use of familial DNA, personnel would be needed to investigate those leads. Furthermore, additional lab technicians would be needed to analyze the samples. Since 2006, \$214 million has been spent improving crime labs and collecting and analyzing DNA samples. If familial DNA was included in the formula, costs would likely increase.

Conclusion

Law enforcement officials and policy makers need to carefully examine familial DNA and implement effective guidelines addressing the legal and other concerns noted throughout this article. The United Kingdom already has established guidelines regarding familial DNA, and authorities in New South Wales, Australia, are considering its implementation. Further investigation of familial DNA is necessary in the United States if law enforcement is to employ this potentially invaluable forensic ally. Indeed, familial DNA could be the next historic contribution to forensic investigations.

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