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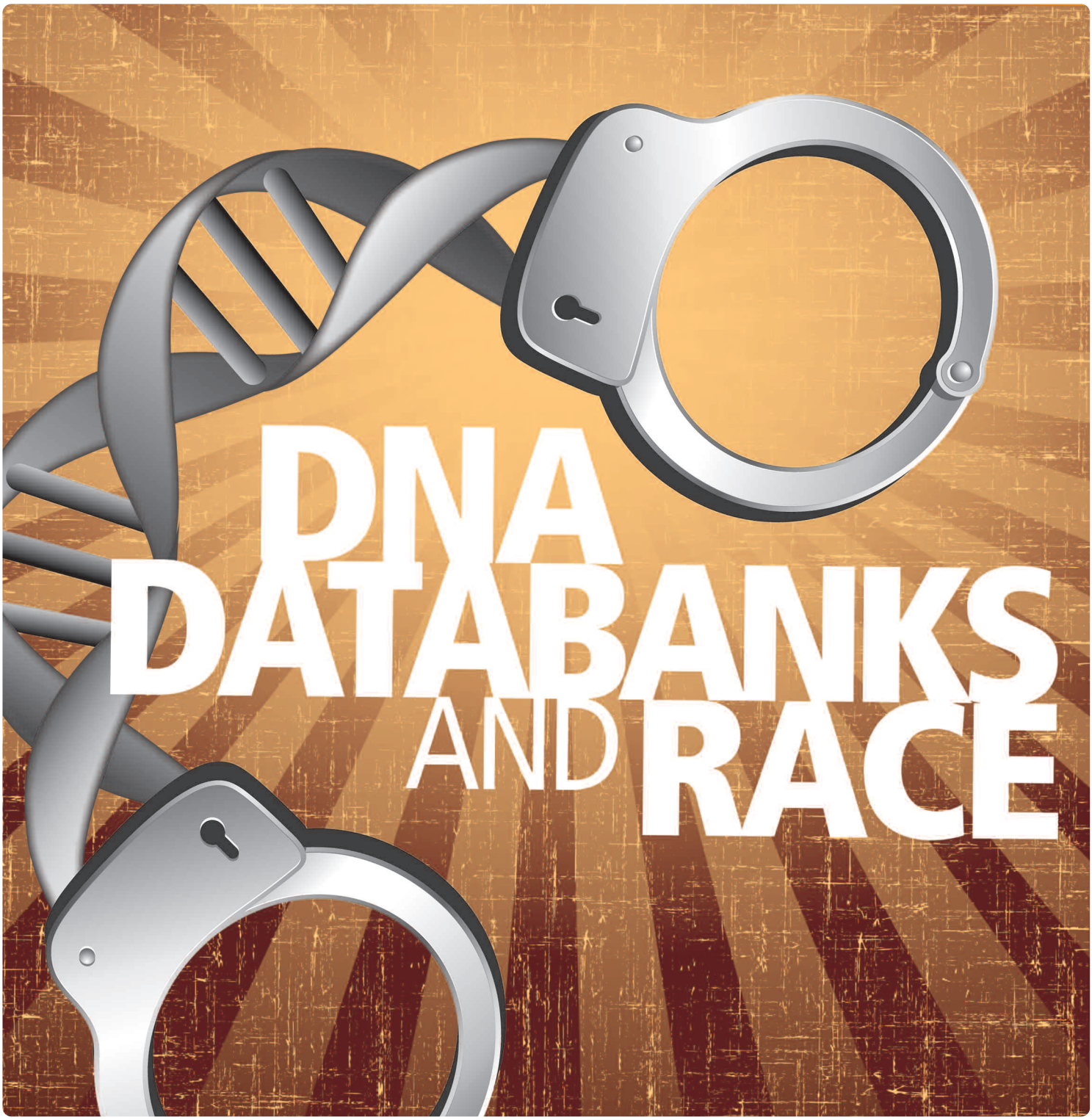

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Editorial

Sam Anderson

Well, we've done it. *GeneWatch* has successfully transitioned from a print magazine to a completely electronic journal—and, as you most likely noticed, it's free. Printed issues will still be available if you don't mind paying, but each issue will be available in print-friendly PDF format so you can still hold the complete magazine in your hands.

This special double-issue has been in the works for some time; even on election night it was in the back of my mind. I was buying a bottle of celebratory champagne that evening and the man behind the counter asked for my ID.

"Do you have another photo ID?" he asked after looking at my driver's license. I did.

"Do you have a credit card?" I handed it over.

"Now I'm just going to need your blood type and a DNA sample," he joked. I didn't ask how privy he was to the existence and extent of forensic DNA databanks, but I did spend a few moments trying to picture how kids might use fake genome samples to get into R-rated movies.

Of course we're a long way from flashing our genetic information at checkout counters, but in the realm of government and law enforcement, DNA profiles are being collected and used more than most people probably realize. In this issue of *GeneWatch*, Troy Duster writes that each month states are uploading around 3,000 DNA profiles into the FBI's national DNA databank, known as CODIS. The databank began with profiles of convicted violent felons but now includes many profiles from those convicted of drug offenses, misdemeanors, or even some people who were merely arrested. Similarly, the United Kingdom's database contains over 4 million profiles—nearly 1 million of which were obtained from people who have never been convicted of any crime.

As a result, the racial disparity in arrests and convictions—especially felony drug offenses— is echoed and potentially exaggerated in DNA databases. The racial and civil liberties issues associated with these databases were the topics of a conference sponsored by CRG in June of 2008. The event, titled *Forensic DNA Databanks and Race: Issues, Abuses and Actions,* brought together scientists, scholars, and racial justice activists.

Several keynote speakers also submitted full-length papers, and thanks to a great deal of help from event organizer Kathleen Sloan, this issue of *GeneWatch* features extracts from those landmark papers. On page 3, Troy Duster puts the creation and application of DNA dragnets into a larger social context and brings to question the infallibility of "cold hits." William Thompson expands on the "rhetoric of infallibility" of DNA tests and reveals the potential for error (page 5). On page 9, Harry G. Levine, Jon B. Gettman, Craig Reinarman and Deborah Peterson Small assert that expanded DNA collection is resulting in the creation of what they call "Jim Crow's Database." As Duana Fullwiley writes (page 12), the racial implications of genetic databanks are made explicit when forensic DNA tests are used for racial profiling - yet this technology is also far from watertight. Finally, Helen Wallace of GeneWatch UK discusses the development of the world's first forensic DNA database in Britain on page 14 and proposes changes that would protect civil liberties without compromising the usefulness of DNA databanks.

In addition to these extracts, Sue Friedman, founder of Facing Our Risk of Cancer Empowered, relates her perspective as a women's health advocate on direct-to-consumer genetic tests (page 17), and you can read the CRG citizen's guide to your rights concerning the collection and use of forensic DNA (page 19).

Continued on page 9

DNA Dragnets and Race: Larger Social Context, History and Future

By Troy Duster

An extract from the full paper

There is abundant evidence to support the claim that there is a systematic racial bias within the criminal justice system. This begins with decisions by police at the point of stop, search, and arrest, extending through the sentencing guidelines and practices and incarceration.[1] There is now also a developing forensic science literature that claims to be able to predict "ethnic-affiliation" from population-specific allele frequencies.

In 1997, Mark Shriver published a paper in which he trumpeted the possibility of using DNA markers to predict race.[2] From the very beginning, the forensic science interest in "ethnic estimation" was to permit the police to focus in more narrowly on a specific population of possible suspects.

The states are the primary venues for the prosecution of violations of the criminal law, and their autonomy has generated considerable variation in the use of DNA databanks and storage. Even as late as the mid 1980s, most states were only collecting DNA samples from sexual offenders. The times have changed quite rapidly. All fifty states now contribute to the FBI's Combined DNA Index System (CODIS). Moreover, there has been rapid change in the inter-linking of state databases. In just two years, the database went from a total of nine states cross-linking "a little over 100,000 offender profiles and 5,000 forensic profiles" to 32 states, the FBI, and the US Army now linking "nearly 400,000 offender profiles, and close to 20,000 forensic profiles".[3] States are now uploading an average of 3,000 offender profiles every month. This may sound daunting, but computer technology is increasingly efficient and extraordinarily fast. It takes only 500 microseconds to search a database of 100,000 profiles.

A DNA dragnet involves law enforcement officers searching for individuals who match the profile of a criminal suspect, then asking those people to submit a sample of their DNA for analysis. This approach originated in Britain, and DNA dragnets are still most advanced in Europe and the United Kingdom. The first DNA dragnet was conducted in Leicester, England in 1987.

While the United States has only conducted about a dozen DNA dragnets, most notable about them is their focus on specific racial groups. San Diego was among the first jurisdictions to conduct the practice when a serial killer stabbed six persons to death in their homes in the early 1990s. The suspect was African-American, and more than 750 African-Americans were tested. In 1994, police in Ann Arbor, Michigan, obtained nearly 200 samples from African-Americans in the hunt for another serial rapist and murderer. In both the San Diego and Ann Arbor cases, the suspect was apprehended and convicted for committing another crime, not as a result of the success of the dragnet. Then in 2004, Charlottesville, Virginia's racially-driven dragnet generated a controversial response from civil liberties groups, ultimately convincing the police to temporarily abandon the dragnet strategy.[4]

"Much more is at stake than the scientific reputation of some principal investigator; an error in forensic analysis could result in wrongful imprisonment or the death sentence for an innocent person."

Miami, Florida was the scene of the most notorious and widespread racial DNA dragnet. Between September 1994 and January 1995, six women were killed and their bodies were left just outside the Miami city limits on a street known as the Tamiami Trail. More than 2,300 men were stopped by the police as they drove down streets in the area, each asked to provide saliva samples to determine a possible DNA match.[5] While the so-called "Tamiami Strangler" was identified through other means, this dragnet is of particular relevance to the issues raised here because (1) almost all of the men who were asked for DNA samples were African-Americans, and (2) their DNA samples were stored.

Several states in the US have embarked upon data collection of arrestees. The most aggressive programs are in Louisiana and California, but the trendline is clear, so some states are debating whether to include *all* arrestees. This development carries dramatic implications for the prospect of heavily racialized databases.

First, consider that incarceration rates for blacks and Latinos are now more than six times higher than for whites;

60% of America's prison population is either African-American or Latino. Just over 20% of black males between the ages of 25 and 44 have served a sentence at some point in their lives, and 8% of black men of working age are now behind bars.[6] At current rates, a third of all black males and one-sixth of Latino males will go to prison at some point during their lives, while the figure for whites is one in 17. These are national figures, but depending upon the urban area, things can look even more heavily racialized.

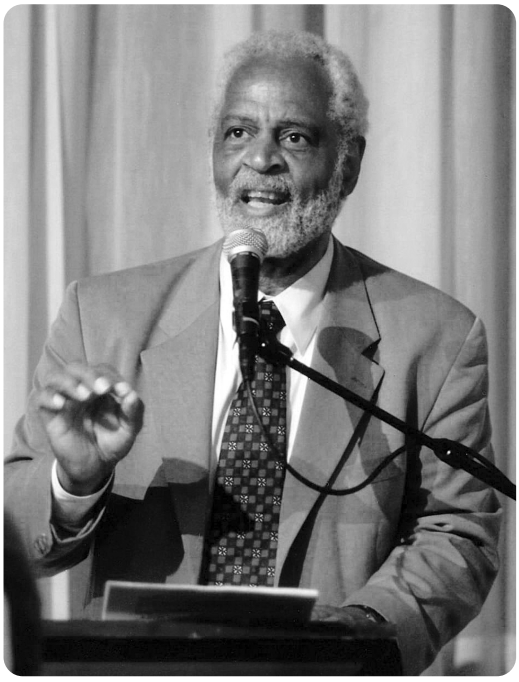
We know African-Americans are being arrested at a rate of at least five times greater than whites for minor violations such as marijuana possession, even though the best available evidence suggests that whites are more likely than blacks to use (and thus possess) marijuana at every age level. The DNA of arrestees is being collected more and more routinely (12 states now collect DNA from those merely arrested); we are witnessing a new kind of convergence with portents for even greater racial disparities in convictions and rates of incarceration.

We have data showing that defendants confronted with the "information" that there is DNA evidence against them are far more likely to see this as "definitive evidence" – and thus more likely to accept a less advantageous plea bargain.[7] Murphy (2007) and others have noted the successful "creep" of the CSI Effect on the general public.[8] But Prainsack and Kitzberger (2008) have discovered that defendants are perhaps even more susceptible to the CSI Effect, i.e., the tendency to believe that DNA evidence is sufficient to secure a conviction.[9] Their work with prosecutors and interviews with defendants in the United Kingdom document just how much the technology of the *DNA Mystique*[10] has become a part of the taken-for-granted features of the *zeitgeist*. Since prosecutors have become increasingly aware of this, they can and do tell those arrested and accused of a crime that "they have the DNA fit" – whether or not they do! This is legally permitted, and there are also documented cases in the United States where this has been a practice.[11]

Second, more and more cases will be brought before prosecutors using "cold hits" (that match "known offenders" – which will increasingly include those merely arrested). We know that those "merely arrested" will be heavily distorted by race.

Which brings us to a crucial distinction between science and forensic science. One of the most essential elements of science is replication of findings by an independent investigator. If a researcher claims to have discovered some empirically derived finding (think of cold fusion), s/he must make available the method of investigation and open up for scrutiny the procedures so that other scientists can determine whether the finding was spurious, unique, doctored, a fluke, etc. Not so with empirical evidence on DNA matches in a court of law. The crime labs are routinely held proprietarily, where the government agency *refuses* to permit independent laboratory work by "outsiders" who could use the same "scientific methods" to either corroborate or refute a finding of a DNA match.[12] This barrier to comparative laboratory analysis is not science – but it is the current state of forensic science. Much more is at stake than the scientific reputation of some principal investigator; an error in forensic analysis could result in wrongful imprisonment or the death sentence for an innocent person.

Thus we can begin to get a glimpse into the future to see how these various forces (racialized dragnets, expanding offender databases to include arrestees, and the CSI effect – on both prosecutors and defendants) can and will further distort the racial bias in the criminal justice system. The vast majority of young persons of African-American and Latino descent who are brought into the criminal justice apparatus cannot afford representation by private attorneys, and are thus doubly victimized by a system that dramatically over-selects them at point-of-arrest by ratios from 5 to sometimes even 8 to 1.[13] The seemingly inexorable move now gaining momentum to include those merely arrested in the national DNA database will only increase the current disparities, for the full range of reasons chronicled above. What is to be done? The two initial tasks are to a) start to rollback the "function creep" of adding those merely arrested into a database that now totals nearly six million, and b) use this as an opportunity to explain to an unsuspecting public that "cold hits" are not nearly what they seem to be on their favorite crime television programs. ■■■



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REFERENCES

1. Mauer, Marc. *Race to Incarcerate*, New York: New Press, distributed by W.W. Norton. (2006)
2. Shriver, Mark D., Michael W. Smith, Li Jin, Amy Marcini, Joshua M. Akey, Ranjan Deka, and Robert E. Ferrell. "Ethnic-Affiliation Estimation by Use of Population-Specific DNA Markers, *American Journal of Human Genetics*, 60:957-964. (1997)
3. Gavel, Doug. "Fight Crime Through Science," *Harvard Gazette*, November 30. (2000)
4. Glod, Maria. "Police in Charlottesville Suspend 'DNA Dragnet.'" *Washington Post*. April 15, B01. (2004)
5. Pan, Philip P. "Prince George's Chief has used Serial Testing Before" *Washington Post*, January 31, B1. (1998)
6. Austin, J., T. Clear, T. Duster, D.F. Greenberg, J. Irwin, C. McCoy, A. Mobley, B. Owen, J. Page . *Unlocking America: Where and How to Reduce America's Prison Population*, Washington, DC: The JFA Institute. (2007)
7. Prainsack, Barbara and Martin Kitzberger. "DNA behind bars – 'other' ways of knowing forensic DNA technologies," *Social Studies of Science (in press)* (2008)
8. Murphy, Erin. "The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence," *California Law Review*, 95, June, 1-81. (2007)
9. Prainsack and Kitzberger (2008).
10. Nelkin, Dorothy and M. Susan Lindee. *The DNA Mystique: The Gene as a Cultural Icon*, Ann Arbor: University of Michigan Press. (2004)
11. LaDuca, Rocco. "Fake Report puts Focus on Police Tactics," Observer-Dispatch, (November 3, 2007) http://www.uticaod.com/news/x1375674847. Accessed 26 July 2008.
12. Murphy (2007)
13. Austin, et al (2007)

The Potential for Error in Forensic DNA Testing

By William C. Thompson

An extract from the full paper

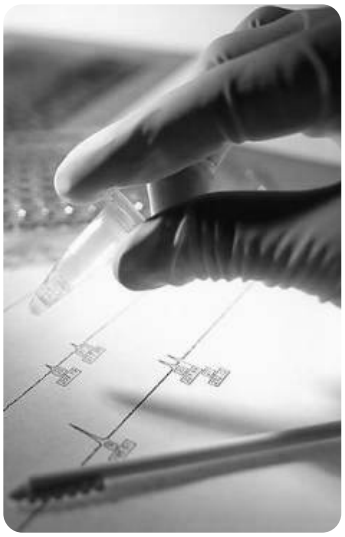
Promoters of forensic DNA testing have, from the beginning, claimed that DNA tests are virtually infallible.[1,2] In advertising materials, publications and courtroom testimony, the claim has been made that DNA tests produce either the right result or no result.[3] This rhetoric of infallibility took hold early in appellate court opinions, which often parroted promotional hyperbole.[4] It was supported when the National Research Council, in the second of two reports on forensic DNA testing, declared "the reliability and validity of properly collected and analyzed DNA data should not be in doubt."[5] It was further reinforced in the public imagination by news accounts of post-conviction DNA exonerations. Wrongfully convicted people were shown being released from prison, while guilty people were brought to justice, by this marvelous new technology. With both prosecutors and advocates for the wrongfully convicted using it successfully in court, who could doubt that DNA evidence was in fact what its promoters claimed: the gold standard, a truth machine?[6]

The rhetoric of infallibility proved helpful in establishing the admissibility of forensic DNA tests and persuading judges and jurors of its epistemic authority.[7] It has also played an important role in the promotion of government DNA databases. Innocent people have nothing to fear from databases, promoters claim. Because the tests are infallible, the risk of a false incrimination must necessarily be nil. One indication of the success and influence of the rhetoric of infallibility is that, until quite recently, concerns about false incriminations played almost no role in debates about database expansion. The infallibility of DNA tests has, for most purposes, become an accepted fact—one of the shared assumptions underlying the policy debate.

In this article, I will argue that this shared assumption is wrong. Although generally quite reliable (particularly in comparison with other forms of evidence often used in criminal trials), DNA tests are not now and have never been infallible. Errors in DNA testing occur regularly. DNA evidence has caused false incriminations and false convictions, and will continue to do so. Although DNA tests incriminate the correct

person in the great majority of cases, the risk of false incrimination is high enough to deserve serious consideration in debates about expansion of DNA databases. The risk of false incrimination is borne primarily by individuals whose profiles are included in government databases (and perhaps by their relatives). Because there are racial, ethnic and class disparities in the composition of databases, the risk of false incrimination will fall disproportionately on members of the included groups.[8,9]

This article will discuss major ways in which false incriminations can occur in forensic DNA testing, including coincidental DNA profile matches between different people, inadvertent or accidental transfer of cellular material or DNA from one item to another, errors in identification or labeling of samples, misinterpretation of test results, and intentional planting of biological evidence. It will also discuss ways in which the secrecy that currently surrounds the content and operation of government databases makes these issues difficult to study and assess. It will conclude by calling for greater openness and transparency of governmental operations in this domain and a public program of research that will allow the risks discussed here to be better understood.



A coincidental match between different people who happen to share the same DNA profile is one way a false incrimination can occur. To understand the likelihood of a coincidental match, it is important to understand what a DNA profile is and how DNA profiles are compared. Forensic laboratories typically "type" samples using commercial test kits that can detect genetic characteristics (called *alleles*) at various loci (locations) on the human genome. The test kits used in the United States generally examine the 13 STR loci selected by the FBI for CODIS, the national DNA database.[10] Some of the newer test kits also examine two additional STR loci.

At each STR locus, there are a number of different alleles (generally between 6 and 18) that a person might have. Each person inherits two of these alleles, one from each parent. Numbers are used to identify the alleles and the pair of alleles at a particular locus constitutes a genotype. Hence, one person can have a genotype (for a locus called D3S1358) of "14, 15;" while another person has the genotype "16, 17." The complete set of alleles detected at all loci for a given sample is called a DNA profile. When describing DNA profiles, people sometimes mention the number of loci they encompass.

In cases I have reviewed over the past few years, evidentiary samples from crime scenes often produce incomplete or partial DNA profiles. Limited quantities of DNA, degradation of the sample, or the presence of inhibitors (contaminants) can make it impossible to determine the genotype at every locus. In some instances the test yields no information about the genotype at a particular locus; in some instances one of the two alleles at a locus will "drop out" (become undetectable). Because partial profiles contain fewer genetic markers (alleles) than complete profiles, they are more likely to match someone by chance (see endnote 1). The probability of a coincidental match is higher for a partial profile than for a full profile.

A further complication is that evidentiary samples are often mixtures. Because it can be difficult to tell which alleles are associated with which contributor in a mixed sample, there often are many different profiles (not just one) that could be consistent with a mixed sample. Because so many different profiles may be consistent with a mixture, the probability that a non-contributor might, by coincidence, be "included" as a possible contributor to the mixture is far higher in a mixture case than a case with a single-source evidentiary sample.

The risk of obtaining a match by coincidence is far higher when authorities search through thousands or millions of profiles looking for a match than when they compare the evidentiary profile to the profile of a single individual who has been identified as a suspect for other reasons. As an illustration, suppose that a partial DNA profile from a crime scene occurs with a frequency of 1 in 10 million in the general population. If this profile is compared to a single innocent suspect, the probability of a coincidental match is only 1 in 10 million. Consequently, if one finds such a match in a single-suspect case it seems safe to assume the match was no coincidence. By contrast, when searching through a database as large as the FBI's National DNA Index System, which reportedly contains nearly 6 million profiles, there are literally millions of opportunities to find a match by coincidence. Even if everyone in the database is innocent, there is a substantial probability that one (or more) will have the 1-in-10 million profile. Hence, a match obtained in a database search might very well be coincidental. Consider that among the 6 billion or so people on planet earth we would expect about 600 to have the one-in-10-million DNA profile; among the 300 million or so in the United States we would expect to find about 30 people with the profile. How certain can we be that the one matching profile identified in a database search is really that of the person who committed the crime?

A number of states have recently begun conducting what is known as familial searches.[11]

In cases where a database search finds no exact match to an evidentiary profile but finds a near match—that is, a profile that shares a large number of alleles but is not identical—authorities seek DNA samples from relatives of the person

who nearly matches in the hope that one of the relatives will be an exact match to the evidentiary sample. In several high-profile cases familial searches have identified suspects who were successfully prosecuted.[12] The key questions raised by familial searches, from a civil liberties perspective, are how often they lead to testing of innocent people—i.e., people who do not have the matching profile—and how often they might falsely incriminate innocent people through coincidental matches. Familial searching may increase the number of people falsely incriminated by coincidental matches because it increases the effective size of the population subject to genetic monitoring. The larger the effective size of the database, the greater will be the likelihood that one of those innocent people will be identified.

People have been prosecuted based on cold hits to partial profiles. Defendants in cold-hit cases often face a difficult dilemma. In order to explain to the jury that the incriminating DNA match arose from a database search (in which the government had thousands or millions of opportunities to find a matching profile), the defendant must admit that his profile was in the database, which in many states entails admitting to being a felon, a fact that might otherwise be inadmissible. Courts in some cold-hit cases have, at the urging of defense counsel, opted to leave the jury in the dark about the database search in order to avoid the implication of a criminal record. Jurors are told about the DNA match, but are not told how the match was discovered. The danger of this strategy is that jurors may underestimate the probability of a false incrimination because they assume the authorities must have had good reason to test the defendant's DNA in the first place. In other words, jurors may mistakenly assume the DNA test compared the crime scene sample to the DNA of a single individual who was already the focus of suspicion (a circumstance under which the risk of a coincidental false incrimination is extremely low) and not realize that the defendant was identified through a cold hit (a circumstance under which the risk of a coincidental false incrimination is much higher).

"Among the first 200 people exonerated by post-conviction DNA testing were two men who were convicted in the first place due partly to DNA testing errors."

My argument is that jurors'evaluations of *the case as a whole* may be inaccurate if they are not told the match was found through a database search. I am suggesting that jurors will assume (incorrectly) that the DNA evidence confirms other evidence that made the defendant the subject of police suspicions and hence will underestimate the likelihood that the defendant could have been incriminated by coincidence. This is a process that, in my view, puts innocent people who happen to be included in a database at risk of false conviction.

When DNA evidence was first introduced, a number of experts testified that false positives are impossible in forensic DNA testing. Whether such claims are sinister or not, they are misleading because humans are necessarily involved in conducting DNA tests. Among the first 200 people exonerated by post-conviction DNA testing were two men (Timothy Durham and Josiah Sutton) who were convicted in the first place due partly to DNA testing errors. In both cases a combination of technical problems in the laboratory and careless or mistaken interpretation of the test results produced misleading DNA evidence that helped send innocent men to prison for many years.[13] False DNA matches have come to light in a number of other cases as well.[14,15]

One cause of false DNA matches is cross-contamination of samples. Accidental transfer of cellular material or DNA from one sample to another is a common problem in laboratories and it can lead to false reports of a DNA match between samples that originated from different people. In addition, accidental cross-contamination of DNA samples has caused a number of false "cold hits."

A second potential cause of false DNA matches is mislabeling of samples. The best way to detect labeling errors is to obtain new samples from the original sources and retest them, but this safeguard is not always available. Evidence at crime scenes is typically cleaned up (and thereby destroyed) once samples are taken, and the original samples are sometimes exhausted during the initial round of testing. Retesting is rarely done, even when samples are available. Routine duplicate testing by forensic laboratories is another possible safeguard, but it too is rarely done.

A third potential cause of false DNA matches is misinterpretation of test results. Laboratories sometimes mistype (i.e., assign an incorrect STR profile to) evidentiary samples. If the incorrect evidentiary profile happens to match the profile of an innocent person, then a false incrimination may result. Mistyping is unlikely to produce a false match in cases where the evidentiary profile is compared with a single suspect, but the chance of finding a matching person is magnified (or, more accurately, multiplied) when the evidentiary profile is searched against a database.

The ability of criminals to neutralize or evade crime control technologies has been a persistent theme in the history of crime.[16,17] There are anecdotal reports of criminals trying to throw investigators off the track by planting biological evidence. When such planting occurs, will the police be able to figure it out? Will a jury believe the defendant could be innocent once a damning DNA match is found? I have strong doubts on both counts and, consequently, believe that intentional planting of DNA evidence may create a significant risk of false

incriminations.

Do innocent people really have *nothing to fear* from inclusion in government DNA databases? It should now be clear to readers that this claim is overstated. If your profile is in a DNA database you face higher risk than other citizens of being falsely linked to a crime. You are at higher risk of false incriminations by coincidental DNA matches, by laboratory error, and by intentional planting of DNA. There can be no doubt that database inclusion increases these risks, the only real question is how much. In order to assess these risks, and weigh them against the benefits of database expansion, we need more information.

Some of the most important information for risk assessment is hidden from public view under a shroud of governmental secrecy. For example, the government's refusal to allow independent experts to examine the (de-identified) DNA profiles in offender databases is a substantial factor in continuing uncertainty about the accuracy of frequency estimates (and hence the probability of coincidental matches). I believe there is no persuasive justification for the government's insistence on maintaining the secrecy of database profiles, so long as the identity of the contributors is not disclosed. The government's refusal to open those profiles to independent scientific study is a significant civil liberties issue. ■■■

William C. Thompson *is Professor and Chair of the Department of Criminology, Law & Society at the University of California, Irvine. He co-chairs the Forensic Evidence Committee of the National Association of Criminal Defense Lawyers and is a member of the California Crime Laboratory Task Force, a body created by the state legislature to recommend ways of improving forensic science in California. He studies the way people interpret (and sometimes misinterpret) scientific and statistical data and has also written extensively about the use and misuse of DNA evidence.*

ENDNOTES

1. In general, as the number of alleles in a DNA profile decreases, the probability that a randomly chosen person will, by coincidence, happen to match that profile increases. Because the alleles vary greatly in their rarity, however, it is possible for a profile containing a few rare alleles to be rarer overall that a profile containing a larger number of more common alleles. Consequently, when discussing the likelihood of a coincidental match it is more helpful to focus on the estimated frequency of the profile than the number of loci or alleles encompassed in the profile.

REFERENCES

1. J.J. Koehler, "Error and exaggeration in the presentation of DNA evidence," Jurimetrics, 34: 21-39, 1993.
2. W.C. Thompson, "Forensic DNA Evidence," In B. Black & P. Lee (Eds.), ExpertEvidence: A Practitioner's Guide to Law, Science and the FJC Manual. St. Paul, Minn.: West Group, 1997 pp. 195-266.
3. Jay D. Aronson, Genetic Witness: Science, Law and Controversy in the Making of DNA Profiling. New Brunswick, N.J.: Rutgers University Press, 2007.
4. Ibid.
5. National Research Council, The Evaluation of Forensic DNA Evidence. Washington, D.C.: National Academy Press, 1996, p. 2.
6. Michael Lynch, Simon Cole, Ruth McNally & Kathleen Jordan, Truth Machine: The Contentious History of DNA Fingerprinting. Chicago: University of Chicago Press (2008).
7. Ibid.
8. Simon A. Cole, "How much justice can technology afford? The impact of DNA technology on equal criminal justice." Science and Public Policy, 34(2) 95-107, March 2007; Simon A. Cole, "Double Helix Jeopardy," IEEE Spectrum, 44-49, August 2007
9. Harry G. Levine, Jon Gettman, craig Reinarman & Deborah P. Small, "Drug arrests and DNA: Building Jim Crow's Database." Paper produced for the Council forResponsible Genetics (CRG) and its national conference, *Forensic DNA Databases and Race: Issues, Abuses and Actions* held June 19 20,2008, at New York University. Available at www.genewatch.org.
10. John M. Butler, *Forensic DNA Typing: Biology, Technology and Genetics of STR Markers* (2nd Ed.). Elsevier/Academic Press, 2005.24
11. Richard Willing, "Suspects get snared by a relative's DNA," USA Today, June 8, 2005, at 1A; David R. Paoletti, Travis E. Doom, Michael L. Raymer & Dan Krane, "Assessing the implications for close relatives in the event of similar but no matching DNA profiles," Jurimetrics Journal 46: 161-175 (2006).
12. Willing 2005.
13. W.C. Thompson, "Beyond bad apples: Analyzing the role of forensic science in wrongful convictions." Southwestern Law Review 37:101-124 (forthcoming).
14. W.C. Thompson, F. Taroni & C.G.G. Atiken, "How the probability of a false positive affects the value of DNA evidence." Journal of Forensic Sciences, 48(1): 47-54 (2003).
15. W.C. Thompson, "Tarnish on the 'gold standard:' Understanding recent problems in forensic DNA testing." The Champion, 30(1): 10-16 (January 2006).
16. Paul Ekblom, "Can we make crime prevention adaptive by learning from other ecological struggles?" Studies on Crime and Crime Prevention. 8: 27-51, 1998.
17. Paul Ekblom, "How to police the future: Scanning for scientific and technological innovations which generate potential threats and opportunities in crime, policing and crime reduction," In. M. Smith and N. Tilley (Eds.) Crime Science: New Approaches to Preventing and Detecting Crime. Cullompton: Willan, 2005.

Drug Arrests and DNA: Building Jim Crow's Database

By Harry G. Levine, Jon B. Gettman, Craig Reinarman and Deborah Peterson Small

An extract from the full paper

Methodically collecting and storing evidence from crime scenes, especially for violent crimes like murder and rape, has long been part of good policing. In recent years scientific and laboratory techniques have increased investigators' ability to obtain DNA information from that evidence. Over two hundred people convicted of serious crimes have been found innocent, and useful leads for many other crimes have been developed, through the use of DNA contained in evidence collected at crime scenes. Scrupulous, professional collection of DNA and other forensic evidence at crime scenes is a wise and sensible policy.

Building huge and ever-growing criminal justice DNA databases of potential suspects – with DNA collected from people convicted of misdemeanors and non-violent felonies, or even just arrested for them – is another matter entirely.

As the collection of DNA at crime scenes has increased, collection of DNA from individuals has increased much more. In 2007 the *Washington Post* reported that "the nation's databank of DNA 'fingerprints' is growing by more than 80,000 people every month."[1] CODIS (Combined DNA Index System), the U.S. government's national DNA database, is the largest DNA databank in the world. As of January 2008, there were two hundred thousand *forensic* (crime scene) DNA profiles, but five and half million DNA profiles of *individuals*. This dramatic growth in DNA collected from individuals is the result of the federal government, states, and local jurisdictions making increasing numbers of crimes of decreasing severity DNA "swipeable."

In recent years, growing numbers of geneticists, criminologists, civil libertarians, journalists, academic researchers and others have voiced profound questions about the DNA "offender" databases, and especially about the collection of DNA for misdemeanors, non-violent felonies, and from people *merely arrested for petty misdemeanors.*

Contrary to what many believe, DNA evidence is not infallible (see endnote 1). Knowledgeable observers and insiders have pointed out that errors occasionally appear even in the best laboratories and quite often in others. Problems include: mixing up and cross-contamination of DNA samples; the considerable judgment and misjudgment involved in DNA analysis; and biases in interpretation, which tend to favor the prosecution. As the size and number of DNA databases expand, so too does the potential for error and abuse.[2]

For understandable reasons, police departments and prosecutors have played key roles in pushing for expansion of DNA databases; expected to solve crimes, law enforcement wants to use any tool that holds promise of making their jobs easier and their work more effective. Police departments, especially in big cities, are large organizations with considerable resources to devote to promoting legislation and policy that they believe serve their interests and needs, and they have been very successful in pushing for DNA collection.

However, there is no equivalent public or private organization to effectively question police proposals and claims. The skeptics or critics of the expansion of DNA databases are generally individual academics, staff at small non-profit groups, or journalists who sometimes can briefly investigate a case or story – none of whom have even a small fraction of the public relations resources or political influence of law enforcement. As a result, there is at present little to stop or even slow down the drive to expand the DNA databases by including more crimes of decreasing severity and to require collection of DNA not just from individuals convicted of crimes but also from the far larger number of people arrested just for misdemeanors (see endote 2).

Independent of the problems of error and the other ethical and civil liberties issues posed by the DNA databases, there is a separate, important question: who are the people most affected by rapid expansion of the DNA criminal justice databases? The answer – much more than has been discussed or even understood – is Blacks and Latinos, especially teenagers and young men. The great engine of these arrests is drug possession offenses, especially the large number of arrests for possession of small amounts (often just a few grams) of marijuana and other drugs, overwhelmingly for personal consumption (see Table 1).

Editorial (continued from page 2)

I would like to mention as a final note that as of the time this publication went to 'print' (electronically), close to a million DNA profiles of those suspected but not convicted of a crime may be facing removal from the U.K.'s national database. This is thanks to a decision by the European Court of Human Rights deciding that Britain's government "overstepped any acceptable margin of appreciation" in the expansion of its DNA database. Considering that Helen Wallace calls for limiting the U.K. database to convicted criminals in her extract in this very issue, forgive me if I take the news as a friendly omen for our other contributors and the new electronic era of *GeneWatch.*

This paper presents data from New York City and elsewhere in the U.S. showing that young Blacks and Latinos are arrested at much higher rates than Whites simply for possessing small amounts of marijuana and other drugs, *even though Whites use all drugs at higher rates than Blacks or Latinos* (See endnote 3). In New York City, Latinos are arrested for marijuana possession at over twice the rate of Whites, and Blacks are arrested at five times the rate of Whites. Misdemeanor marijuana possession arrests constitute over ten percent of all arrests in New York City. Most other large U.S. cities also arrest a great many people for marijuana possession and arrest Blacks at much higher rates than Whites.[4]

Why is this happening? Since Whites use and possess all drugs at higher rates than Blacks or Latinos, why are these drug arrests throughout the U.S., especially the misdemeanor possession arrests, so racially skewed? And why are there so many of them?

Patrol and narcotics police and their supervisors benefit from their departments' focus on misdemeanor offenses. Arrest statistics are the metric by which police departments everywhere increasingly judge officer productivity and often supervisor productivity; when arrest numbers are high, many within the police department benefit. Misdemeanor arrests, especially drug possession misdemeanor arrests, are easy to make and, compared to other police work, they are relatively safe. Patrol and narcotics police in New York and some other cities can make overtime pay booking and processing the people they arrest for petty misdemeanors; in New York this is so common that among themselves officers call such overtime pay "collars for dollars." For patrol and narcotics police, these arrests also count toward promotions and choice assignments.

	Total Estimated All Arrests*	White %**	Total Estimated White Arrests	Black %**	Total Estimated Black Arrests
Property Crimes	1,540,297	68.20%	1,050,483	29.40%	452,847
Violent Crimes	611,523	58.50%	357,741	39.30%	240,329
All Drug Violations	1,889,810	63.60%	1,201,919	35.10%	663,323

Table 1 - White, Black and Total U.S. Arrests for Property, Violent, and Drug Crimes, 2006
Blacks make up about 13% of the U.S. population. Whites (including most Hispanics) are about 74% of the U.S. population.
Source: FBI Crime in the United States. *Table 29, Estimated Number of Arrests, http://www.fbi.gov/ucr/cius2006/data/table_29.html. ** Table 43, Arrests by Race, 2006. http://www.fbi.gov/ucr/cius2006/data/table_43.html

Most arrests of all kinds throughout the U.S. are for misdemeanors. For misdemeanor arrests – as for the much larger number of non-criminal offenses such as parking tickets – there is almost never a formal "victim" or a complainant other than the police. For misdemeanors as for parking tickets, officers are directed by their commanders to go looking for them, often to meet arrest quotas.

Urban police departments heavily deploy their patrol forces to "high crime" and low income neighborhoods, which in most large U.S. cities are disproportionately Black and Latino. Because patrol officers and narcotics police are heavily concentrated in only certain neighborhoods, they make most stops, frisks, searches and misdemeanor arrests in those neighborhoods. The low-income Black and Latino young people who are arrested for misdemeanors tend not to know important people who can make trouble for the arresting officers or their supervisors. As a result of this policing strategy of making many arrests for petty offenses in only certain neighborhoods, the misdemeanor arrests for drug possession and other minor offenses are racially skewed throughout the U.S.

Police departments tend not to call public attention to their misdemeanor arrests and prefer that the media do not either – and police departments have considerable influence over what is reported in the local media about their routine activities. And partly because almost nobody knows about the great many misdemeanor arrests and their racial bias, there is very little political pressure to reduce them.

When CODIS, the U.S. criminal justice DNA database, was created in 1994, it was based on serious violent crimes such as murder and rape. As the DNA databases have expanded to include more and more crimes of decreasing severity, they include more of what have conventionally been called victimless crimes, especially misdemeanor drug possession.

As the graphs and tables presented in this paper show, expanding the databases to allow DNA to be collected for more drug offenses, and especially to the large number of drug possession misdemeanors, has already added ever greater numbers of Blacks and Latinos to the databases, far out of proportion to their percentage of the population or their percentage of drug users. This produces DNA databases that are increasingly and unfairly racially biased.

Some have argued that innocent people should not care that their DNA is in the criminal justice databases. If they are not guilty, it is said, they will have no problems. We recommend that legislators who claim the DNA databases are free from error – and who advocate including DNA from misdemeanor arrests, neighborhood sweeps, or familial searches – should be encouraged to put their own DNA and that of their immediate family members into the databases. Most are unlikely to do so because being in the DNA databases does indeed put one at risk of being falsely accused and even convicted of serious crimes. It is also revealing that police departments and police unions fiercely oppose putting police officers' DNA in the databases.

Despite the technical errors and errors of interpretation, DNA databases are now being used, and will be used ever more in the future, to identify suspects and to convict people. As a result, Black and Latino teenagers and young people who are disproportionately and unjustly arrested for marijuana possession and other misdemeanors are also disproportionally at

higher risk of being falsely suspected, accused and even convicted of more serious crimes – and so are their genetically similar relatives.

The racial segregation laws in the United States that ran for 89 years – from 1876 to 1965 – were commonly called Jim Crow laws. We suggest that continual expansion of CODIS and other racially-skewed DNA file and storage systems should be thought of as building Jim Crow's database. ■■■

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ENDNOTES

1. For a state of the art discussion of the problems with the newest DNA evidence from a forensic perspective see: Erin Murphy, "The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence," *California Law Review*, 95, June, 2007.
   At: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=89612. Also see: William C. Thompson, "The Potential for Error in Forensic DNA Testing (and How That Complicates The Use of DNA Databases for Criminal Identification)." Paper produced for the Council forResponsible Genetics (CRG) and its national conference, *Forensic DNA Databases and Race: Issues, Abuses and Actions* held June 19 20,2008, at New York University. Available at www.gene-watch.org.
2. As is often the case with highly-touted, expensive, large-scale, anti-crime measures advocated by law enforcement, the DNA databases also have a questionable track record compared to other uses of funds and resources. Simoncelli and Krimsky (2007) make this point very well: "While the prevailing notion with respect to these databanks is "the bigger the better," it is worth noting that the ability to use DNA in crime solving is limited by the ability to collect uncontaminated and un-degraded DNA at a crime scene, not by the number of people in the databank. As the databanks expand to people convicted of minor offenses or merely arrested, the chances that any given profile in the database will help resolve a future crime apparently diminish. In the United Kingdom, the enactment of arrestee testing in 2004, which has corresponded with a ballooning of the UK database from 2 million to 3 million profiles (including those of more than 125,000 people never charged with any crime), has actually corresponded with a slight decrease in matches with crime scene evidence.

   Likewise, DNA dragnets have proven to be highly ineffective. In a study conducted by the University of Nebraska, only one of eighteen dragnets conducted in the United States was found to have led to the actual perpetrator, and this was a dragnet that only involved 25 people who were all staff at a nursing home where repeated sexual offenses were taking place. In other words, the obvious small pool of suspects already existed. Worse still, some dragnets have even been found to interfere with crime-solving....

   In the case of familial searching, it is perhaps too soon to tell how helpful this technique could be for law enforcement. But with this and surreptitious DNA sampling it is likely that only the successes will be made public. Law enforcement officials are unlikely to publicize failures or the dead ends or the number of people who are investigated without their consent or knowledge....

   An over-reliance on these practices could well undermine law enforcement. Some law enforcement officials have expressed concern that the tremendous resources funneled into building and expanding forensic DNA banks are channeling money away that should be put into following up on investigational leads or placing police officers on the streets. In addition, crime laboratories all over the country are plagued by extraodinary backlogs resulting from the heedless expansion of the databanks."[3]
3. The New York State Division of Criminal Justice Services has on the web tables showing the arrests for four broad categories of felonies (Drug, Violent, DWI, Other) and four broad categories of misdemeanors (Drug, DWI, Property, Other). It shows this for all counties in NY State, as well as totals for the five counties of New York City, and for all counties other than New York City. It has tables showing the arrests for every year from 1997 through 2007. For 2007 see: "Adult Arrests: New York State by County and Region – 2007" At: http://criminaljustice.state.ny.us/crimnet/ojsa/arrests/year2007.htm. The racial breakdown in New York City misdemeanor marijuana arrests is shown in Graphs 3, 4, 5, and 7. The racial breakdown in all other New York City misdemeanor drug arrests is shown in Graph 11.

REFERENCES

1. Rick Weiss, "Vast DNA Bank Pits Policing Vs. Privacy," *Washington Post*, June 3, 2006
2. See: Robert Perry, Testimony on "Legislation Addressing New York State's DNA Database" May 31, 2007, http://www.nyclu.org/node/1028. William C. Thompson et al., "How the probability of a false positive affects the value of DNA evidence," *Journal of Forensic Science*, Vol. 48, No. 1, January 2003.
3. Tania Simoncelli and Sheldon Krimsky, "A New Era of DNA Collections: At What Cost to Civil Liberties? *American Constitution Society for Law and Policy, August 2007.* http://www.acslaw.org/node/5338
4. U.S. Dept. of Justice, Federal Bureau of Investigation. Uniform Crime Reporting Program Data [United States]: Arrests By Age, Sex, And Race, 2000 - 2004 [Computer files]. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor].

Can DNA 'Witness' Race? Forensic Uses of an Imperfect Ancestry Testing Technology

By Duana Fullwiley

An extract from the full paper

On August 11, 2004, an African-American man named Derrick Todd Lee was convicted for the first of a series of murder and rape cases in south Louisiana. In the early 2000's, seven women in the Baton Rouge area had been violently murdered by a serial killer. [1] Lee's eventual convictions were largely based on his Y-chromosome STR DNA profile that matched DNA from samples found on the serial victim's bodies. Before this, however, Lee's DNA underwent a specific genetic analysis that attempted to place him within one of four continental racial groups. Thus, Lee was the first person in the United States to be identified as a possible suspect by an unconventional DNA test that racially profiled his DNA left at a crime scene.

The technology that purported to read Lee's race in his DNA is trademarked as "DNAWitness." The name is not accidental. Its inventors at DNA Print Genomics Inc. want to convey the idea that this technology itself embodies the power of the 'expert witness' through literal genotypes, or "base-calls," of the perpetrator's specific DNA nucleotide pairs. Forensic analysis with "DNAWitness" is, quite simply, a comparison of a sample of unknown origin with a panel of genetic markers called *Ancestry Informative Markers*, or AIMs. The basic process of an AIMs analysis consists of a comparative exhibition of varying autosomal coding markers and their relative frequencies in four world populations. The goal of this specific iteration of the AIMs test, packaged only for forensics as DNAWitness, is to *infer* the aggregate of phenotypes associated with any one racial category in the United States. Such an inference is based on the extent to which the anonymous sample expresses allelic variations of markers comprised in a panel that is thought to differ in people from the continents of Africa, Asia, Europe, and (pre-Columbian) America (see endnote 1). In the case of the south Louisiana serial killer, DNAWitness yielded 'ancestry estimates' that the perpetrator's genetic makeup was 85% sub-Saharan African and 15% Native American. The Louisiana task force's previous search for a 'Caucasian' male was thereafter deemed to be potentially off the mark. The suspect, as deduced by DNAWitness, was most likely a 'lighter skinned black man' as inferred from probabilistic ancestry percentages revealed in the perpetrator's DNA.

In this article I examine the use of DNAWitness to determine the *prospective* race of a suspect in order to provide evidence to law enforcement for narrowing a suspect pool. I argue that DNAWitness falls short of legal and scientific standards for trial admissibility and eludes certain legal logic concerning the use of racial categories in interpreting DNA. DNAWitness can offer vague profiles in many cases, and has a wide margin of error that too often absorbs what might be understood to be important aspects (i.e. substantial percentages) of ancestral heritage and of a forensic 'racial profile.' Moreover, this technology's individual ancestry estimates are highly vulnerable to social and political interpretations of phenotype, and may be impossible to accurately interpret with a sufficient degree of objectivity, required of both science and law. It is possible, however, that this test may help to predict a range of skin color phenotypes, as was the case for Lee, since many of the AIMs are skin and hair pigmentation alleles.

The AIMs technology, (again, packaged with different names depending on the market and client) as manufactured by *DNAPrint Genomics*, is specifically designed to assess allelic frequency differences of coding DNA, or Single Nucleotide Polymorphisms. This is important, since markers that the test makers interpret as 'African' or 'European', for example, are *also* found in other world populations that differ from the prior continental referent populations (African, European, Native American and Asian) used by the company in both name and geographic location. This is to say that differences in ancestry profiles may be due to evolution, gene flow, genetic convergence, or genetic drift. *The presentation of DNAWitness test results demonstrates no attempt to distinguish between these different mechanisms of locus possession in individuals or in groups.* Direct and unique ancestry (gene flow) is but one among several mechanisms that might explain shared sequence variation among and between racialized individuals. The simple description of a certain frequency, or set of frequencies, as 'African' ancestry may constitute a false designation of 'racial type,' while, conversely, it *might not.* The fact that there is no gold standard for this technology (a specific proprietary test) should make the legal community pause before lauding its potential success and eventual adoption on a broad basis.

From the outset, before evaluating scientific criteria for admissibility in a trial setting, it must be clarified that DNAWitness has not been used at the trial stage, but rather at the pre-trial stage as *prospective* information for investigating

officers. Nonetheless, it is critical to consider the scientific standards for legal admissibility to shed light on the ways in which this technology may actually do harm in the courtroom, since its scientific shortcomings can be easily identified with regard to admissibility rules. Furthermore, holding this technology to accepted legal standards with regard to 'expert' use of science and technology will also allow us to better understand DNAWitness' problematic role in the legal setting at *any* stage.

Legal precedent would have us focus on three federal cases to determine how scientific merit constitutes the rules for admissibility in a court of law: *Daubert v. Merrell Dow Pharmaceuticals, General Electric & Co. v. Joiner,* and *Kumho Tire Co., Ltd v. Carmichael.* Issues of a)"reliability," b)"scientific validity," and c) whether techniques "can be tested" and "falsified" are of critical concern. As stated in *Daubert v. Merrell Dow,* "scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry."[2] More specifically, a "non-exclusive checklist for trial courts to use in assessing the reliability of scientific expert testimony," provided in *Notes to 702, Federal Rules of Evidence*, includes:

> (1) "whether the expert's technique or theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot be reasonably assessed for reliability;
> (2) whether the technique or theory has been subject to peer review and publication;
> (3) the known potential rate of error of the technique or theory when applied;
> (4) the existence and maintenance of standards and controls; and
> (5) whether the technique or theory has been generally accepted in the scientific community."[3]

DNAWitness fails to meet this basic checklist on four out of the five items. (It has been subjected to peer review, as AIMS, in several research studies for means other than inferences of racial phenotype.) Notwithstanding that these *Federal Rules* were established for the use of scientific evidence in a court of law independent of DNA testing, they nonetheless hold for all scientific evidence.[4] Effective December 1, 2000, several amendments to the rules, namely with regard to procedure and methods of reliability, made it clear to both the bench and bar "that an attack on the procedure used to test DNA for evidentiary purposes can be an effective challenge to the weight of any DNA evidence admitted."[5] Thus, presenting genetic results in less than exact and recognized ways could prove detrimental to case arguments.

The rise of new genetic technologies in the past two decades has yielded a range of scientific possibilities for the courts. Not all genetic tests perform the same kinds of tasks, and none were instituted without prolonged discussion, debate, and research consensus with regard to their reliability and consistency among scientists and law enforcement.[6] As this brief discussion makes clear, DNAWitness is based on Ancestry Informative Marker technology, or coding SNPs, that are largely shared among individuals and groups for varying reasons—reasons that are neither described nor acknowledged explicitly in the test results offered by DNAPrint. AIMs-based technologies, like DNAWitness, are attempts to model human history from a specifically American perspective to *infer* present-day humans' continental origins.[7] Such inferences are based on the extent to which any subject or sample shares a panel of alleles (or variants of alleles) that code for genomic function, such as malaria resistance, UV protection, lactose digestion, skin pigmentation, etc. There is a range of such traits that are conserved in, and shared between, different peoples and populations around the globe for evolutionary, adaptive, migratory, and cultural reasons. To assume that people who share, or rather *co-possess*, these traits can necessarily be 'diagnosed' with a specific source ancestry is misleading. Not only will siblings often share the same profile—or not—but individuals from all four 'parental' continental groups offered up by the model could feasibly share similar profiles—or not. As a forensics market version of the AIMs technology, DNAWitness may offer precise mathematical ancestry percentages, but the accuracy of that precision remains debatable.

At best, this technology is an experimental modeling tool that hopes to mimic recent American human history as it reconstructs four racial types through an artificial homogenizing of markers found with relatively higher frequencies on some continents and lower frequencies on others. As compelling a tool as DNAWitness may seem, investigators should require that DNA analyses used in the serious proceedings of law be falsifiable, reliable, and thoroughly vetted. Anything less would prove irresponsible if incorporated into criminal investigations. □□□

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ENDNOTES

1. The same technology, produced by *DNAPrint Genomics*, is also packaged as *AncestrybyDNA* for recreational genealogical ancestry testing. It is also used in biomedical research settings for purposes of admixture mapping for disease traits and to prevent confounding in 'mixed' populations in case-control studies for complex disease traits. See www.dnaprint.com/welcome/productsandservices/index2.php (Accessed March 28, 2008).

REFERENCES

1. P. Roberts, *Sunday Advocate*, 1 June 2003, p. 1A.
2. Daubert v. Merrell Dow Pharmaceuticals, 509 US 579 (1993).
3. Notes to Fed. R. Evid. 702, http://www.law.cornell.edu/rules/fre/ACRule702.htm.
4. E. Imwinkleried, in *DNA and the Criminal Justice System: The Technology of Justice*, D. Lazer, Ed. (Cambridge: MIT Press, 2004), chap. 5, p. 98-99.
5. E. Imwinkleried, in *DNA and the Criminal Justice System: The Technology of Justice*, D. Lazer, Ed. (Cambridge: MIT Press, 2004), chap. 5, p. 99.
6. National Research Council, *The Evaluation of Forensic DNA Evidence, Committee on DNA Forensic Science: An Update* (Washington DC: National Academy Press, 1996)
7. T. Frudakis, Molecular Photofitting: Predicting Ancestry and Phenotype Using DNA (Burlington, MA: Academic Press, 2007), p. 429.

Prejudice, Stigma and DNA Databases

By Helen Wallace

An extract from the full paper

The collection, use and storage of DNA for forensic purposes have increased rapidly since 1995, when the world's first DNA database was set up in Britain. The use of DNA in criminal investigations can undoubtedly be highly beneficial, providing evidence that can help to convict the guilty and exonerate the innocent. However, the retention of individuals' DNA profiles and other information on computer databases, combined in some countries with the storage of linked biological samples, raises many privacy and individual rights issues. These include potential misuse of the information by governments or others and the prospect that false DNA matches may lead to intrusive investigations of innocent people by law enforcement agencies.

This paper discusses the evidence and reasons that innocent people whose DNA profiles are contained in DNA databases may be vulnerable to stigmatization or prejudicial treatment. It draws on experiences from the development and operation of the National DNA Database in Britain, which contains the largest proportion of the population of any DNA database in the world.

Both DNA and fingerprints may be left wherever a person goes. The retention of an individual's DNA profiles and fingerprints in a database therefore allows a form of biological tagging or 'biosurveillance' which can be used to establish whether a person has been present at a particular location.[1] This purpose goes beyond mere 'identification' to mapping an individual's movements, including (but not limited to) using biological evidence to establish their likely presence at a crime scene.

Unlike fingerprints, DNA can also be used to investigate biological relationships between individuals (including paternity and non-paternity), and thus trace other individuals who may be related to a person whose DNA profile has been obtained from a crime scene or elsewhere. Biological relationships can be statistically inferred from computerised DNA profiles by searching for partial matches between profiles (an indication of relatedness), a process known as 'familial searching'.

The computerized DNA profiles held in DNA databases are a string of numbers based on specific areas of each individual's DNA, known as short tandem repeats. However, some countries also retain the biological samples collected from individuals, linked to their record on the computer database by a reference number. A person's DNA sample contains additional private information about their health and other physical characteristics. Some of this information (such as carrier status for a genetic disorder) may be highly sensitive and/or unknown to the individual.

The National DNA Database (NDNAD) in Britain was the first to be established and contains a much larger proportion of the population than any other country in the world. An estimated 576,250 individuals had records added to the Database in 2006/07: one person every minute.[2] About 4.2 million people – nearly 7% of the population - had their DNA profiles retained on the Database by the end of October 2007.[3] Approximately 1 million of these individuals have never been convicted or cautioned for any crime. Many countries are considering establishing or expanding their databases in line with the changes made in Britain, and examination of the NDNAD therefore provides an opportunity to consider the potential for stigmatization or prejudicial treatment of individuals with records on the Database.

Uses of the NDNAD may include any purpose "*related to the prevention or detection of crime*." Uses now include familial searching (using partial DNA matches to try to identify the relatives of a suspect), searching by name, and undertaking various types of genetic research (including controversial attempts to predict ethnic appearance from DNA).[4]

GeneWatch UK recognizes the extremely important role that DNA can play in some criminal investigations. We are not opposed to the existence of the National DNA Database, but are deeply concerned that its rapid expansion is spiraling out of control. The law in England, Wales and Northern Ireland allows the capture and use of genetic information without consent from a defined section of the community (those who have been arrested for a recordable offense), often referred to as the 'active criminal population,' despite the fact that many of these individuals will not have committed any crime.

There is a strong bias in the system towards the inclusion of DNA profiles from young black men and vulnerable people, including children and the mentally ill.

The rapid expansion of the Database has enormous implications for the balance between the power of the state to implement 'biosurveillance' on an individual and the individual's right to privacy. There is also significant potential for others – including organised criminals – to infiltrate the system and abuse it, for example by using it to reveal changed identities and breach witness protection schemes.

The permanent retention of all DNA profiles, samples and police records significantly changes the relationship between the individual and the state. Individuals with records on the DNA Database lose their presumed legitimacy to go about their daily life, their right to refuse to take part in genetic research and their right to keep their family relationships and other genetic information private. Even if they have never been charged or convicted of any offence, they may be refused employment or a visa as a result of the retention of a permanent record of their arrest on the Police National Computer. The retention of an individual's DNA profile also allows their movements to be tracked or their relatives to be identified. The potential implications for the right to protest are particularly serious.

	Original PQ*	Recalculated**
Unconvicted persons with a PNC record	605,069	605,069
Persons who have received non-custodial sentences or cautions, recorded on the PNC	1,681, 284	1,681, 284
Persons who have had a custodial sentence, recorded on the PNC	636,271	636,271
Estimated total no. individuals on NDNAD with a PNC record	2,922,624	2,922,624
Estimated total no. of individuals on NDNAD with no PNC record (includes 18,056 volunteers).***	534,376*	429,501**
Estimated number of individuals with profiles on the NDNAD	3,457,000*	3,352,125**
Estimated number of replicate profiles	427,270*	532,145**
Total number of individuals' DNA profiles on the NDNAD	3,884,270	3,884,270

Table 1: Estimated numbers of individuals on the NDNAD at end June 2006.

* Assuming the 11% replication rate then in use.

**Assuming the 13.7% replication rate now in use.

There are many circumstances in which the retention of an individual's DNA profile and linked data will give rise to potential identification, but in the majority of cases this does not involve the identification of the individual as the perpetrator of a crime. Many individuals identified through matches on the Database will be subject to investigation by the police but are subsequently acquitted of any crime. The purpose of data retention is quite different from the purpose of collection; retention of DNA data is a form of surveillance based on the idea that the individual, or a relative of theirs, may commit a future crime. Records and samples can also be used without consent for a much broader range of purposes than those for which they were originally collected, such as inclusion in genetic research.

It is difficult to reconcile the current situation with the principle of equal application of the law (the concept that everyone is equal before the law).

People on the Database are treated as members of a 'risky population' whose DNA requires permanent retention by the state.[5] Youths, people suffering from mental illness, and people from black and minority ethnic groups are particularly likely to be

members of this 'risky population.' Approximately 27% of the entire black population, 42% of the male black population, 77% of young black men, and 9% of all Asians have records on the National DNA Database, compared with just 6% of the white population.[6] The rate of arrest of 10-17-year-olds has also risen disproportionately as the result of new arrest targets set for the police: between 2002-06 arrests of children and young people rose by 16.4%.[7] Retention of an individual's DNA profiles on a Database is likely to be of most benefit when he or she has a record as a 'career criminal' and is considered likely to re-offend. However, the population on the Database now includes anyone who is arrested for a recordable offence. Ministers have accepted that: "*As far as we are aware, there is no definitive data available on whether persons arrested but not proceeded against are more likely to offend than the population at large.*"[8]

The lesson from the rapid expansion of the National DNA Database is that there is significant potential for stigma and prejudicial treatment of people who have their DNA profiles retained. Although putting everyone on the Database is sometimes proposed as a solution to discrimination, it would not prevent the Database from being used in a discriminatory way and would considerably exacerbate concerns about potential misuse and false matches. Such proposals are also widely regarded as extremely costly and impractical.

The rapid expansion of the National DNA Database has not improved the crime detection rate. Since 2002/03, the number of individuals with DNA profiles on the Database has more than doubled from 2 million to 4.5 million, but there has been no corresponding increase in the number of crimes detected using DNA.[9] An earlier increase in DNA detections was due to the decision to take more DNA from volume crime scenes (particularly thefts and burglaries), not to putting more individuals on the Database.[10]

GeneWatch UK believes that there are important changes that could be made to improve safeguards for human rights and privacy without compromising the role of the DNA Database in tackling crime. A better balance would be struck by:

1. Reintroducing a system of time limits on how long people are kept on the Database – so that only DNA profiles from people convicted of serious violent or sexual offenses are kept permanently.
2. Destroying all individuals' DNA samples once an investigation is complete, after the DNA profiles used for identification have been obtained.
3. Ending the practice of allowing genetic research using the Database or samples, limiting permissible research to performance management and database improvements.
4. Better governance of the Database, including an independent regulator.
5. Public and parliamentary debate before new uses of the Database are introduced.
6. A return to taking DNA on charge rather than arrest, except where it is needed to investigate a specific offense. □□□

Helen Wallace *is Director of GeneWatch UK, a not-for-profit science policy research group which aims to ensure that genetics is used in the public interest. She has been Director since January 2007, and was Deputy Director from September 2001, with overall responsibility for GeneWatch UK's work on human genetics. The focus of her work at GeneWatch has been on the assessment and regulation of genetic tests and genetic databases, including the genetic research project UK Biobank and the police National DNA Database.*

Year	2004	2005	2006	2007	2008	2009
No. on database (millions)	2.77	3.27	3.77	4.27	4.77	5.27
No. of case stains (thousands)	584	634	684	734	784	834
Expected mean no. of adventitious matches	2	2	3	4	4	5

Table 2: Predicted adventitious DNA matches using full profiles on the NDNAD
Source: Gill, P. "National DNA Databases and some other deliberations." *Presentation to the Foundation for Science and Technology.* February 6, 2008.
http://www.foundation.org.uk/events/pdf/20080206_Gill.pdf

REFERENCES

1. Williams R, Johnson P (2004) Circuits of surveillance. *Surveill Soc*, **2**(1), 1-14.
2. Parliamentary Question. House of Commons Hansard. 30 Oct 2007 : Column 1254W.
3. Parliamentary Question. House of Commons Hansard. 7 Jan 2007: Column 274W.
4. GeneWatch UK(2006) Using the police National DNA Database – under adequate control? GeneWatch Briefing. June 2006. Available on: www.genewatch.org
5. McCartney C (2004) Forensic DNA sampling and the England and Wales National DNA Database: a sceptical approach. *Critical Criminology*, **12**, 157-178.
6. National DNA Database. Adjournment Debate. House of Commons Hansard 29 Feb 2008 : Column 1427.
7. Home Office Statistical Bulletins: 'Arrests for Recorded Crime etc.' 02/03-05/06
8. House of Commons Hansard 9 Oct 2006: Column 491W
9. Crimes solved by DNA evidence fall despite millions being added to database. The Telegraph. Available on: http://www.telegraph.co.uk/news/newstopics/politics/lawandorder/3418649/Crimes-solved-by-DNA-evidence-fall-despite-millions-being-added-to-database.html .
10. Home Office (2006) DNA Expansion Programme 2000-2005: Reporting achievement. Forensic Science and Pathology Unit. http://police.homeoffice.gov.uk/news-and-publications/publication/operational-policing/DNAExpansion.pdf.

Direct-to-Consumer Genetic Tests

By Sue Friedman

Risks and responsibilities - a breast cancer advocacy perspective.

In 1996, I entered the world of breast cancer advocacy through my own diagnosis at age 33. As a veterinarian, I had some medical background, but limited information about my diagnosis or how best to navigate the system. At the time, there were few resources focused on hereditary cancer and genetics. After my initial treatment of a unilateral mastectomy with TRAM flap reconstruction, I learned from a magazine article that I fit the criteria for a hereditary syndrome. I was angry that my health care providers hadn't given me basic information that could have saved me from unnecessary surgeries. But they, too, were in the dark about hereditary breast cancer. Although it cost me another two surgeries, fortunately it didn't cost me my life. I was grateful to learn about genetic testing and preempt a second diagnosis of cancer. (Pathology from my prophylactic mastectomy found DCIS in my "healthy breast.") The lack of adequate information and resources motivated me to found FORCE: Facing Our Risk of Cancer Empowered, the only nonprofit organization devoted to helping individuals and families affected by hereditary breast and ovarian cancer.

I am neither in favor of nor against the marketing of genetic tests directly to consumers. Many of our members have reported first learning about genetic testing for the genes associated with hereditary breast and ovarian cancer, or BRCA testing, through direct-to-consumer marketing. Marketing efforts can raise patient awareness of available technologies. However, improperly handled information can also cause problems. When biotech companies control the bulk of information reaching consumers either directly or through their health care providers; when health care providers and consumers perceive the information coming from these companies as complete and balanced; when clear and uniform regulations about marketing of tests is lacking; and when tests are being promoted absent of the direct input of field specialists, there is greater opportunity for unbalanced and misleading information, inconclusive or incorrectly interpreted test results, and the grave likelihood of consumer harm.

"I have watched meetings of professional societies where speakers held up educational pieces prepared by a test manufacturer and stated, "This is all you need to begin genetic testing in your practice.""

Ten years ago, the prevailing information about breast cancer risk was based on the Gail model, which predicts the risk of developing breast cancer based on limited personal and family medical information. The drug Tamoxifen had recently been approved by the FDA for breast cancer prevention in women with a high-risk for breast cancer as indicated by their Gail model score. The pharmaceutical company provided a large number of primary care physicians with calculators that helped them quickly determine a patient's Gail model score, their breast cancer risk, and whether or not they would benefit from Tamoxifen. Very few of these physicians had any formal training in cancer genetics or risk assessment and sometimes used the calculator as the only index for measuring breast cancer risk. Unfortunately, the Gail model misses many hereditary cancer risk factors such as paternal family history, family history of ovarian cancer, and second and third degree relatives. Many high-risk women were mistakenly told that their risk for cancer was not elevated.

In this landscape, the biopharmaceutical company Myriad launched a marketing campaign offering physicians and consumers more information about hereditary breast and ovarian cancer syndrome. Suddenly, the medical community was paying more attention to family history of ovarian cancer, multiple cases of breast cancer within a family, premenopausal breast cancer, male breast cancer, and the paternal family history. In general, this was an improvement over risk assessment based purely on the Gail model. However, once again health care providers with little or no training in cancer genetics—and little time to provide a formal risk assessment—began offering genetic testing in their offices. In recent years, advertisements for BRCA testing have been accompanied by aggressive marketing to physicians. Some of this messaging to physicians has promoted the notion that referral to a genetics expert prior to genetic testing is unnecessary. Patients tested in such a setting, without the option of referral to a genetics expert prior to genetic testing, are being denied standard-of-care informed consent. The importance of such consent is laid out by the National Comprehensive Cancer Network and other professional societies and consumer organizations.

At FORCE we have begun to document cases of people who received incomplete or incorrect information about genetic testing. Anecdotally these cases appear to be rising in fre-

quency. Unlike with pharmaceutical products, the adverse events associated with marketing of genetic tests may be less obvious, and documentation may be more difficult. Because many of the tests in question fall under the Clinical Laboratory Improvement Amendments (CLIA), there is no "labeled indication" for the test. "Off label use" and adverse events are difficult to quantify. Unfortunately, once a test is offered to the public, the average consumer assumes that the test has been validated, has gone through an FDA approval process, has clinical utility, and any marketing claims must be true.

Also at issue is the lack of one trusted central source to provide credible information about available tests. Information provided by a corporation is not necessarily comprehensive; missing information may be as problematic as the information that is included. I have watched meetings of professional societies where speakers held up educational pieces prepared by a test manufacturer and stated, "This is all you need to begin genetic testing in your practice." At a recent panel discussion on direct-to-consumer testing, one genetics expert likened this scenario to the proverbial "fox guarding the henhouse." The creation of the Evaluation of Genomic Applications in Practice and Prevention initiative in 2004 is a step in the right direction, but it lacks the capacity to evaluate in a timely way the burgeoning number of tests offered to consumers.

The lack of uniform oversight is another concern with marketing of genetic tests. Tests and laboratories fall under several possible jurisdictions, and some commercial tests fall through regulatory gaps. Tests offered through CLIA-approved laboratories do not fall under FDA jurisdiction and as such have no requirements for test validation and demonstrated clinical utility. Although many states have laws regarding the marketing of genetic tests to consumers, the laws are patchwork and often lay out only the minimum requirements regarding direct-to-consumer testing. Recently two states, New York and California, issued "cease and desist orders" to certain companies that were offering genetic tests to consumers without physician involvement. Some of the companies were able to resolve the issues cited by hiring staff physicians to meet state guidelines. However the involvement of a physician in the ordering of a genetic test may not be enough to improve patient care. Government interest in the concerns raised by direct marketing of tests is another positive step, but without a central federal agency to lead the oversight, current efforts fall short of what is needed to protect consumers.

It is critical for health care providers, government regulators, and companies offering direct consumer access to genetic tests to remember that people are making real-life, real-moment decisions based on test results and information that they are receiving from their health care providers about the meaning of these results. Along the way there are many areas for the introduction of misinformation and misinterpretation of tests. Recently I participated in a panel and listened in shock as one panel member recounted several stories of how her company gave patients access to genetic tests that were not recommended by their physician and which they provided outside of standard of care and/or FDA recommendations. It is unclear how a physician could interpret the off-label use of a test they didn't think was medically necessary and how the patient might use such results to make medical decisions absent of any clear guidelines or supportive research.

The responsibility for improving patient experience of genetic testing is a shared one requiring input, resources, and action from many parties. We need the passage of effective federal legislation to tighten loopholes around marketing of consumer tests and remove the confusion associated with a patchwork of state laws. Not all genetic testing requires the same level of pre- and post-test counseling or education. However, it is important that the appropriate experts are involved from the beginning in determining what information is needed to help people make informed decisions. It should not be up to the test developers to determine the appropriate amount of information, nor to designate the minimal competency for conveying this information. A panel of health care providers, consumers, platform developers, and government officials should determine requirements for expert involvement and a minimum standard competency. Tightening up the regulatory loopholes and enacting effective laws takes time. In the interim, health care providers need to understand the tests being marketed to their patients. In the absence of the time or expertise to understand the tests, physicians must be willing to refer patients to the genetics experts who can understand and help interpret the tests. Professional societies need to develop clear guidelines that outline standard-of-care, including the appropriate point to refer people to other specialists. Consumer organizations need to be vigilant and educate their constituents about receiving appropriate input from medical experts prior to ordering genetic tests. Finally, the test manufacturers themselves need to demonstrate responsibility and restraint in their marketing practices by involving consumer and professional society representatives in the development of their marketing materials. By working together we can improve patient experiences of genetic testing and help people fully realize the promise of personalized medicine that these technologies bring. ■■■

Sue Friedman *founded the national nonprofit organization Facing Our Risk of Cancer Empowered in 1999 after learning she carried a mutation that led to her breast cancer at age 33. In 2003, Sue retired from veterinary medicine to direct FORCE full-time. Sue also works at the H. Lee Moffitt Cancer Center and Research Institute in Tampa, FL as an outreach coordinator for their Cancer Genetics Program. . She participates as an advocate on the National Comprehensive Cancer Network panel that develops standard-of-care guidelines in oncology and volunteers for the National Cancer Institute's CARRA program (consumer advocates in research and related activities).*

Forensic DNA Collection: A Citizen's Guide to Your Rights

1. DNA DRAGNETS

SCENARIO

You are between the ages of 18 and 35 and live in a city, town or neighborhood where a homicide has occurred. A police officer comes to your home and requests a cheek swab of your saliva so that a DNA profile can be obtained. You are told that the purpose of obtaining your DNA is to exclude you as a suspect. This is what is known as a DNA dragnet to find the perpetrator of a crime. You are told that you have the right to refuse but if you do, the police will treat you as a potential suspect. You are not told anything about what will happen to your DNA profile and the biological sample from which it is drawn after the case is closed.

LEGAL RIGHTS AND RESPONSES

You have the right to refuse to allow police to conduct a cheek swab. It is legal for police to ask for a voluntary DNA sample but they must be careful about how they phrase the request. A Fourth Amendment violation can occur if police mislead an individual; for example, by saying he or she has a duty to provide a sample or saying that the person will be treated as a suspect for refusing. The courts have repeatedly determined that the taking of DNA constitutes a "search" under the Fourth Amendment. It is also improper for police to threaten to report names to the press of those refusing to provide a sample.

DNA dragnets are not always truly "voluntary" and may feel extremely coercive. People are often afraid to say no to police out of fear that their refusal may cast suspicion on them. But you have the right to say no and you should exercise that right. If you agree to provide a DNA sample, you should assume the police will keep it forever and will include your profile in the offender database. Because you have given the sample voluntarily, you may not be eligible for your state's procedure to have the sample expunged. If you have any concerns about giving a sample voluntarily, you should tell the police that you wish to talk with a lawyer about the consequences of providing a sample before you decide whether to give one. Although the police may be suspicious of your refusal, they cannot obtain a warrant based only on that refusal.

While law enforcement officials may promise to destroy samples after testing, there is no way to determine if the evidence has in fact been destroyed. After a DNA dragnet of over 1,000 men in Louisiana failed to find a match to the suspect's genetic profile, law enforcement officers entered the local men's DNA profiles into the state's criminal database. Some individuals have sued, usually without success, to have their DNA profiles removed and biological samples destroyed.

2. ARRESTEE DNA COLLECTION

SCENARIO

You are arrested and detained but not charged or convicted of any crime. Can the police obtain a profile of your DNA? Can they upload the profile to the national forensic DNA database, CODIS (Combined DNA Index System), operated by the FBI? Are you obligated to give the police a biological sample (blood or saliva)?

LEGAL RIGHTS AND RESPONSES

If federal agents detain and arrest you, they have the authority to take DNA from you and to immediately upload it to CODIS. If local authorities arrest you, depending on the laws in your state, you may be obligated to give a DNA sample. The DNA Fingerprint Act of 2005 allows states to upload profiles to CODIS. Eleven states (Alaska, Arizona, California, Kansas, Louisiana, Minnesota, New Mexico, North Dakota, Tennessee, Texas and Virginia) currently allow for involuntary DNA collection from individuals merely arrested or suspected of a crime. You should familiarize yourself with the laws in your state and if they do not provide for involuntary collection, you should consult with an attorney before submitting to a DNA test.

Usually the police need a search warrant to collect your DNA unless you have been convicted of a crime. Under federal law, the government requires people arrested for certain crimes to provide DNA samples. These laws probably violate the Fourth Amendment to the U.S. Constitution which guarantees "the right of the people to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures." The conduct of a "search" generally requires probable cause and a judicial warrant, or at least individualized suspicion. However, the courts have yet to decide this question. If the police want to take a sample of your DNA, you should make it clear that you are not voluntarily providing a sample, recognizing that they may take it anyway.

In April 2008, the U.S. Department of Justice proposed a rule for compelled DNA sample collection from arrestees and detainees under the DNA Fingerprint Act of 2005 and the Adam Walsh Child Protection and Safety Act of 2006. The rule directs federal agencies that arrest or detain individuals to obtain DNA samples if the agency also takes fingerprints from such persons and specifies procedures for collection. The rule does not indicate whether an arrestee/detainee will be advised of their right to legal counsel before a DNA sample is taken, nor does it provide for an appropriate period of delay to accommodate judicial review if counsel for the arrestee wishes to seek a determination by a court of the legality of the DNA sample collection before it occurs. Substantial questions surround the constitutionality of

compelled DNA seizures from people who have not been convicted of crimes and the issue has yet to be definitively determined by the courts. In addition, the rule proposes to sanction the use of physical force and compulsion against unconvicted and presumably innocent individuals. Finally, the rule allows federal agencies to contract with private entities to carry out the collection of DNA samples.

3. FAMILIAL SEARCHING OF DNA

SCENARIO

A detective visits your home and explains that the DNA profile of a second cousin of yours was a close, but not identical, match with the DNA profile obtained from biological evidence left at a crime scene. The detective explains that the perpetrator of the crime is very likely a member of your family and s/he would like to ask you questions about your family. In addition, the detective requests a cheek saliva swab from you so that you can be eliminated as a suspect in this crime.

LEGAL RIGHTS AND RESPONSES

You do not have to talk to the police or let them into your home. You can tell them that you want to consult with an attorney before deciding whether to speak with them (and then do so). You can also tell them that you simply do not wish to talk to the police at all, as is your right under the Fifth Amendment against self-incrimination. You do not need to provide a DNA sample unless they have a search warrant that requires it.

In 2006, laws that limited familial searching were loosened and police are increasingly engaging in familial or "low stringency" DNA searches. DNA profiles in government forensic DNA databases are used to identify parents, children, siblings and relatives whose profiles are not in the databases, thus the term familial searching. Because DNA is inherited, family members share a common gene pool and are likely to have similar profiles. Fully cognizant of this, governments permit DNA databases to be searched for near matches between DNA profiles contained in databases and profiles collected at crime scenes. In this way, governments are expanding genetic surveillance beyond those individuals whose DNA is contained in databases to wholly innocent family members. This means that if you share genes with someone convicted or merely arrested for a crime, your genetic information is also in the government's database, even if your relative is never convicted of a crime.

The realities of the criminal justice system ensure that communities of color will be disproportionately affected by familial searching. From 1994 to 2004, African-Americans were five times more likely than whites to be incarcerated, and in 2000, African-Americans and Latinos comprised 63% of incarcerated adults even though collectively they represented only 25% of the U.S. population. This reality is perpetuated by racial profiling, discriminatory sentencing and general racial bias in the criminal justice system. Consequently, many racial and ethnic minorities who have never committed or even been accused of committing crimes are increasingly being trapped in a genetic surveillance web of "guilt" by familial association.

4. NON-VIOLENT CRIME CONVICTIONS AND DNA SAMPLING

SCENARIO

You have been convicted of a non-violent crime and placed on probation. You have never served jail time. The police department requests a blood sample so they can file a profile of your DNA.

LEGAL RIGHTS AND RESPONSES

Most courts have held that if a statute authorizes the government to collect DNA from a person convicted of a felony then the police may do so, although almost all of these cases involve people convicted of violent felonies. You should talk to a lawyer about whether the law authorizes them to take a sample based on your specific conviction and whether that law is constitutional.

There may be an issue regarding the terms of probation - a boiler plate condition might be to comply with this sort of request. Most states collect DNA samples from all felons. Many states also collect DNA samples from individuals who have committed certain kinds of misdemeanors.

5. RETROACTIVE DNA PROFILING

SCENARIO

You have served two years in jail for failure to comply with a court order to pay child support. Before your release, the police want to place your DNA profile on CODIS, the national forensic DNA database. What are your rights with regard to retroactive DNA profiling?

LEGAL RIGHTS AND RESPONSES

The U.S. Constitution most likely does not prohibit applying DNA laws retroactively. Some state constitutions may prohibit it and some DNA collection laws do not apply retroactively to people convicted before the laws went into effect. The expectation of privacy is greatly lessened while in confinement, so while you do not have to voluntarily comply, your DNA sample will likely be taken from you involuntarily.

6. SURREPTITIOUS DNA SAMPLING

SCENARIO

You have refused to give police a DNA sample in their familial search. The police subsequently go through your curbed garbage during the night to obtain samples of your DNA from discarded items such as plastic cups or cigarette butts. Can the police forage through your garbage to obtain samples of your DNA?

LEGAL RIGHTS AND RESPONSES

This practice, known as "surreptitious sampling," is currently legal. There is no expectation of privacy in garbage once it is out on the curb. Courts have found that there is no expecta-

tion of privacy in discarded genetic material and that the practice of surreptitious sampling does not violate the Fourth Amendment. The U.S. Constitution does not prohibit the police from searching your garbage because you are deemed to have abandoned it. State constitutions or laws may prohibit the police from doing this.

7. GENETIC PRIVACY

SCENARIO

Your DNA profile has been uploaded onto the national forensic DNA database because of a previous arrest. The police give another agency of government that is studying behavioral genetics access to the DNA database, which includes your profile. The police also allow the genetic investigators to examine the original biological sample of anyone in the database. What are your rights? What laws, if any, protect the privacy of your genetic information?

LEGAL RIGHTS AND RESPONSES

Such use, without individual informed consent, is improper. The Fourth Amendment to the Constitution protects the privacy of genetic information collected for law enforcement purposes from being used in unrelated research projects. Personal data should be used for the purpose for which it was collected. Individuals convicted of a crime have fewer civil rights and may not be successful in challenging the sharing of their profiles. Those who were arrested and not convicted do not lose their rights, however, and may have a legitimate claim in a court of law. The reality, however, is that you will probably never know if other governmental agencies have access to your DNA profile. This could be extended to an array of potential research such as the possibility of the government licensing your DNA sample to a private company to help it develop some sort of commercial product.

8. REMOVAL OF DNA FROM DATABASES

SCENARIO

You have been charged with criminal trespass in a political demonstration. Your DNA was taken during the booking procedure. You were never convicted of a crime. Do you have the right to have your DNA profile removed from the database and the biological sample destroyed?

LEGAL RIGHTS AND RESPONSES

Under the DNA Fingerprint Act of 2005, it is more difficult to have your DNA profile removed and the sample destroyed. In the past, if an individual was acquitted or if charges were dismissed, the state had the burden of removing an arrestee's sample from CODIS, the national DNA database. Under the new legislation, the arrestee is required to file a certified copy of a final court order establishing that all charges have been dismissed, the case resulted in an acquittal or that no charges were filed.

Laws in 29 states specifically require that DNA evidence be retained. Wisconsin law mandates that the biological sample be destroyed after a DNA profile is created. Laws in Connecticut, Georgia, Nebraska and Virginia require permanent retention; Arizona retains them for 35 years.

NOTE: In all of the above instances, it is imperative that individuals exercise their due process right to legal counsel.

A Note to Our Readers

Season's Greetings *GeneWatch* Readers!

As a new year approaches, CRG has been experiencing a renaissance over the past year. Following the convening of an extremely successful national conference on forensic DNA, race and the criminal justice system, CRG has launched several initiatives to expand its programming, staffing, outreach and infrastructure.

So just what are these new developments?

An international search has commenced for a new Executive Director to take the reins at this exciting time in CRG's history. We are creating an entirely new website to serve the global community and provide the most up-to-date information on developments in genetics and biotechnology and their implications for public policy.

This issue of *GeneWatch* marks the electronic publication of our award-winning twenty-five year-old magazine and features the remarkable papers presented at our national conference. Continuing our focus on forensic DNA databases, we will be offering presentations around the country to grassroots organizations on how these databanks affect their constituents.

As society continues to grapple with the issue of race, CRG is concentrating its energies on a comprehensive program devoted to genetics and race. Replacing fiction with fact, we will explore race and ancestry, medicine, intelligence and forensic DNA.

The dangers to consumers and public health perpetrated by gene myths are also under the watchful eye of CRG and are the center of another initiative. As a thought leader in the field of science and the public interest, CRG is establishing an international advisory group to bring you the most informed opinion and research on all the topics that touch your life and concern the global citizen.

Everyone at CRG is infused with the spirit of dynamic development, evolutionary change and global reach. We invite you to join in our spirit of enthusiasm as you contemplate the issues addressed in this new edition of *GeneWatch* and participate in our continuing growth.

A happy new year to all!

- Kathleen Sloan, Outreach Coordinator

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Support from people like you makes CRG's work possible.

Much of our income comes from individuals. Your support helps keep our programs free of the restrictions that come with funding from pharmaceutical and health care companies or government sources. We are the watchdogs for accurate and unbiased information about biotechnology, even when the truth doesn't suit current political or commercial agendas. And we depend on you to be able to do what we do.

There are many ways you can help CRG. You can become a donor: an annual gift in quarterly installments of $25, $50 or $100 gives us a wonderful and predictable support with a minimal shock to your budget. You may also be able to designate CRG through your workplace giving program, including the Combined Federal Campaign. Many companies will actually match or even double-match your donation. Check with your employer about its matching gift program. You might also consider making an investment in a future where biotechnology is properly used by remembering CRG in your will with a bequest or charitable trust gift.

To learn more about helping CRG, please call us at 617.868.0870. You may also write the Council for Responsible Genetics at 5 Upland Road, Suite 3, Cambridge MA 02140, or send an email to crg@gene-watch.org.

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