

BIOLOGY

When DNA Implicates the Innocent

The criminal justice system's reliance on DNA evidence, often treated as infallible, carries significant risks

By Peter Andrey Smith on June 1, 2016



Credit: RAFF SWAN Alamy

In December 2012 a homeless man named Lukis Anderson was charged with the murder of Raveesh Kumra, a Silicon Valley multimillionaire, based on DNA evidence. The charge carried a possible death sentence. But Anderson was not guilty. He had a rock-solid alibi: drunk and nearly comatose, Anderson had been hospitalized—and under constant medical supervision—the night of the murder in November. Later his legal team learned his DNA made its way to the crime scene by way of the paramedics who had arrived at Kumra's residence. They had treated Anderson earlier on the same

day—inadvertently “planting” the evidence at the crime scene more than three hours later. The case, presented in February at the annual American Academy of Forensic Sciences meeting in Las Vegas, provides one of the few definitive examples of a DNA transfer implicating an innocent person and illustrates a growing opinion that the criminal justice system's reliance on DNA evidence, often treated as infallible, actually carries significant risks.

As virtually every field in forensics has come under increased scientific scrutiny in recent years, especially those relying on comparisons such as bite-mark and microscopic hair analysis, the power of DNA evidence has grown—and for good reason. DNA analysis is more definitive and less subjective than other forensic techniques because it is predicated on statistical models. By examining specific regions, or loci, on the human genome, analysts can determine the likelihood that a given piece of evidence does or does not match a known genetic profile, from a victim, suspect or alleged perpetrator; moreover, analysts can predict how powerful or probative the match is by checking a pattern's frequency against population databases. Since the mid-1990s the Innocence Project, a nonprofit legal organization based in New York City, has analyzed or reanalyzed available DNA to examine convictions, winning nearly 200 exonerations and spurring calls for reform of the criminal justice system.

Like any piece of evidence, however, DNA is just one part of a larger picture. “We're desperately hoping that DNA will come in to save the day, but it's still fitting into a flawed system,” says Erin E. Murphy, a professor of law at New York University and author of the 2015 book *Inside the Cell: The Dark Side of Forensic DNA*. “If you don't bring in the appropriate amount of skepticism and restraint in using the method, there are going to be miscarriages of justice.” For example, biological samples can degrade or be contaminated; judges and juries can misinterpret statistical probabilities. And as the Anderson case brought to light, skin cells can move.

Since 1997, when researchers first showed that it was possible to gather genetic information about a person based on skin cells they had left on an object, this type of trace evidence, also known as touch DNA, has been increasingly collected from surfaces such as door and gun handles. (In some jurisdictions, such as Harris County, Texas, the number of touch DNA cases submitted for laboratory analysis increased

more than threefold between 2009 and 2013, often as a means of identifying possible perpetrators for burglaries and thefts.) Commercial companies now sell kits to law-enforcement agencies that can generate a full genetic profile of an individual from as few as three to five cells. Independent labs and scientists working on such projects as identifying long-deceased individuals also employ the kits.

Until recently, this type of DNA has been regarded as incontrovertible proof of direct contact. But a growing number of studies show that DNA does not always stay put. For example, a person who merely carried a cloth that had been wiped across someone else's neck could then transfer that person's DNA onto an object he or she never touched, according to a study published earlier this year in the *International Journal of Legal Medicine*. Similarly, Cynthia M. Cale, a master's candidate in human biology at the University of Indianapolis, recently reported in the *Journal of Forensic Sciences* that a person who uses a steak knife after shaking hands with another person transfers that person's DNA onto the handle. In fact, in a fifth of the samples she collected, the person identified as the main contributor of DNA never touched the knife. Cale and her colleagues are among several groups now working to establish how easily and how quickly cells can be transferred—and how long they persist. “What we get is what we get,” Cale says, “but it's how that profile is used and presented that we need to be cautious about.”

At the forensics meeting in Las Vegas, Kelley Kulick, a public defender for the County of Santa Clara, presented the idea that Anderson's DNA hitched a ride on the medics' uniforms. Just how often transferred DNA ends in a wrongful accusation is unknown. “Although clear cases appear to be quite uncommon, I think it's probably more prevalent than we think,” says Jennifer Friedman, a public defender in Los Angeles and DNA specialist. “The problem is that what we don't see frequently is the ability to definitely prove that transfer occurred.”

The erroneous interpretation of touch DNA for Anderson has now also become a contentious issue for two co-defendants on trial for the Kumra murder, Kulick says. No doubt DNA evidence remains an invaluable investigative tool, but forensic scientists and legal scholars alike emphasize that additional corroborating facts should be required to determine guilt or innocence. Like all forms of evidence, DNA is only

one circumstantial clue. As such, Anderson's case serves as a warning that a handful of wayward skin cells should not come to mean too much.



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