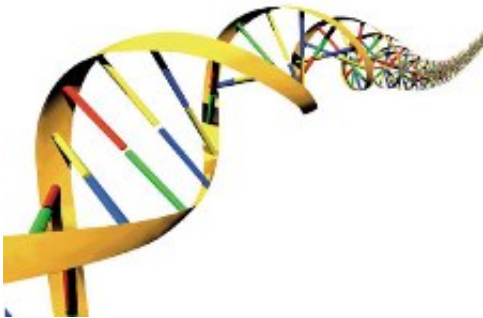


DNA tests, technology and justice: A brave and uncertain new world

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The power of DNA evidence to put someone behind bars or keep an individual free is a staple of television shows like "Law & Order" and "CSI." But not all DNA evidence is so straightforward.

As justice races to keep pace with technology, new questions about how [evidence](#) is obtained are coming into play.

Trace DNA - tiny amounts of genetic material - is saddled with complications, creating confusion in and out of courtrooms and prompting a new realization: Forensic science can't always lead to clear-cut results.

These samples, known as low template or low copy number DNA, often

degrade in quality once they're replicated for testing. Mixed sample DNA presents similar problems because it contains genetic material from two or more people, and each must be isolated before being matched.

Then there's touch DNA, the sort of infinitesimal residue that's left on the trigger of a gun, for example, or a ballpoint pen. It may be as small as three human cells. This DNA can be replicated and tested, but a conclusive match can be tough to find.

Frederick Rench, a defense attorney in Clifton Park, N.Y., spent 18 months learning the ins and outs of DNA testing and its complications while defending a client.

"That's just how complex this stuff is," he said.

Sensational cases like the Amanda Knox trials highlight the "yo-yo effect" that can result when trace or mixed sample DNA is offered as primary evidence.

In 2009, low template number DNA on a knife and brassiere helped convict Knox, an American college student studying in Italy, and her former boyfriend, Raffaele Sollecito, in the 2007 murder of Knox's roommate, Meredith Kercher.

But disagreement over the quality of the DNA profile provided as evidence led to their exoneration in 2011. They were retried and convicted for the second time in 2014, only to be exonerated again a year later.

How and when to use this evidence is controversial.

"This is something we are trying to figure out ourselves," said Paul

Cates, communications director for the Innocence Project, a nonprofit legal group that relies on DNA evidence to exonerate wrongfully convicted people. "We realize that there's a lot of discussion about (low template number DNA) in the scientific community and we are doing our own research to figure out where we are on this."

More easily tested is a single strand of hair, a mouth swab or blood from a single source. They are the sorts of high template number DNA samples that are often the stuff of popular courtroom dramas. Reliable, definitive results are routinely expected; there's plenty to test and normally only one set of DNA. And the testing procedures are pretty standard.

"Any qualified lab analyst could follow these procedures and give results that wouldn't be challenged," said Brian Meehan, a professor of forensic biology at Ohio Northern University and the director of forensics at IntelliGenetics, a DNA testing lab.

It's the low template and mixed sample DNA evidence that has prompted debate as defense attorneys and prosecutors quarrel over evidence admissibility, generating appeals and overturned convictions.

Rench's client, John Wakefield, was accused in the 2010 strangling of Schenectady, N.Y., resident Brent Wentworth after prosecutors linked DNA residue found on an amplifier cord - believed to be the murder weapon - with Wakefield. Describing the DNA as trace evidence, Rench argued to have it thrown out.

Wakefield already had admitted to attending a party at the victim's residence in the days before the slaying, which Rench said explained the possible DNA match. Wakefield was found guilty in March and will be sentenced this month.

Former Indiana state trooper David Camm was twice convicted for killing his wife and children in 2000. Five years later, trace DNA on a sweatshirt found at the scene was tested, pointing to someone else. But because of the low template nature of that DNA evidence, prosecutors tried to have the evidence ruled out. In 2013, Camm was exonerated after serving 13 years in prison.

With low template DNA, analysts are forced to make what Meehan termed an "educated analysis," based on samples that are less conclusive.

"How can we be assured that we're making the right call?" he said. "Procedures for analysis and interpretation are not black and white."

There are high peaks and low points associated with how closely a sample matches an individual's genetic markers in a traditional test. It's up to an analyst to establish an "analytical threshold" by drawing a line across those peaks and valleys to isolate what's known as "good data" from "bad data," Rensch said.

Testing situations also arise where analysts are forced to make judgment calls, he said. New technology could help standardize DNA analysis and create more reliable results, Rensch said, "which means we'll have better data to go with that evidence."

But that doesn't mean it will be any less open to controversy.

The findings of TrueAllele Casework, a "computerized DNA interpretation system," have been contested in New York and Pennsylvania courts, although Frye hearings, which determine whether scientific evidence is admissible, have declared them to be so.

While not totally reliable, the computerized DNA testing is gaining acceptance. The repercussions could be significant. How, one might ask,

can a defense attorney cross-examine a software system?

Rench said it's a marked difference, and he's wrestling with it himself. He only hopes that better evidence will lead to more justice.

"And who can argue with that?" he said.

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