

AMERICAN CHEMICAL SOCIETY

ARE DNA FINGERPRINTS ADMISSIBLE IN COURT?

LOS ANGELES—DNA identification techniques have been described as the law enforcement tools of the future, according to Rodney P. Harmon, Alameda County, CA's senior deputy district attorney. DNA fingerprints—a term first coined by Alec Jeffreys (University of Leicester, U.K.) for the unique banding patterns of human genomic DNA produced by restriction fragment length polymorphism (RFLP) analysis—are extremely powerful tools, indeed: they can positively identify the DNA from a forensic sample as belonging to one individual out of about 10 billion, twice today's global population. As such, DNA fingerprints potentially offer criminal courts an infallible way to convict perpetrators of violent crimes.

Do the courts see it this way? Speaking at the 196th American Chemical Society meeting here in September, Harmon explained that, as convinced as scientists may be about the forensic applications of DNA tests—including multi- and single-locus RFLP analysis as well as polymerase chain reaction (PCR) amplification techniques—their legal counterparts remain bound to establish whether the tests are valid. To the courts, this means the following: "The technique must be sufficiently established to have gained general acceptance in the particular field in which it belongs." That ruling—the so-called Frye ruling resulting from proceedings in 1923 involving the admissibility of an early form of lie detector test that measured systolic blood pressure—has become the legal standard for the admissibility of new scientific techniques.

According to Harmon, in the years since Frye was decided, this one simple concept has been the basis of litigation on the admissibility as evidence of lie detector tests, hypnosis, voice prints, and electrophoretically analyzed serum proteins.

Frye hearings determine whether the jury ever gets to hear certain test results—results that a large proportion of the scientific community might feel are valid, explains Harmon. If a judge finds that certain evidence is not relevant, the jury never gets to hear it. But relevance is not the only consideration for admissibility: legally or factually prejudicial evidence is also inadmissible. What does this have to do with scientific tests such as DNA analysis? Explains Alan Hymer, senior trial attorney for the Alameda County public defender's office: "The science may mislead the

jurors, who tend to ascribe an inordinately high degree of certainty to proof derived from an apparently scientific mechanism, instrument, or procedure." And as far as the courts are concerned, DNA tests are new and unproven scientific techniques. Moreover, he queries, if the tech-

throwing up roadblocks against the admissibility of DNA evidence," says Hymer. "In reality, that depends on whether the evidence is going to be used for or against my client." For example, a DNA test report prepared for the prosecution in one criminal case concluded that "The DNA pat-

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DNA typing by RFLP analysis of forensic samples such as semen stains and blood provides corroborating evidence in rape and incest cases.

nique turns out to be invalid, "How are non-scientific lawyers going to demonstrate that fact to a non-scientific jury?"

Thus, Frye hearings ask the expert witness to assess the technique's validity. For DNA tests using multi-locus RFLP typing, says Hymer, the expert would have to assess among other things that there is general agreement that the banding pattern exhibited by the lower-molecular-weight DNA is actually a genetically inherited sequence of base pairs rather than adventitious banding. Similar questions apply to single-locus typing, direct sequencing, or the PCR reaction. In the end, the banding pattern results should neither include a person who should be excluded, nor exclude one who should be included.

Frye hearings also question the test's statistical basis. The prosecution that opens with DNA test evidence, explains Hymer, will want this evidence to demonstrate that there's only one chance in a million that anyone other than the defendant or the victim could have left the sample from which the DNA was isolated—be it hair, blood, semen, saliva, bone, or tissue. Estimating these probabilities initially, he says, involves a Frye question: although the statistical procedure used to make the determinations may be well recognized, the scientific assumptions that go along with them must be examined.

"As a criminal defense attorney, I'm perceived as the one who will be

terns from the vaginal swab and the suspect were indistinguishable. The occurrence of this pattern has an approximate frequency of one in 45,419,940 in the North American Black population, and one in 6,134,960 in the North American Caucasian population." To this Hymer quips: "So what, I'm supposed to hope my client is Caucasian?" He concludes: "It's safe to say that in the face of this genetic fingerprint every defense attorney will feel obligated to call for a Frye hearing."

Today, most states routinely admit and allow DNA typing evidence. In several cases, says Hymer, the defense has presented exonerating DNA evidence and the prosecution has dismissed the case without Frye hearings. "At least from the law-enforcement perspective, this indicates there is substantial agreement that DNA testing is valid," he says. One case, however, resulted in a hung jury because the defense challenged the admissibility of the statistical evidence needed to support the identity of the suspect by DNA typing. The judge refused to allow those statistical arguments.

The forensic death knell has already tolled for certain kinds of scientific evidence, including voice prints and polygraphs. For DNA tests, "There are likely to be Frye hearings in every case until there's a binding appellate opinion stating there is no Frye issue," concludes Hymer.

—Jennifer Van Brunt

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