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Human Error in Forensic DNA Typing

To the Editor:

Although I agree with the point that Hagerman (1990) made in his letter "DNA Typing in the Forensic Arena," I have some concerns about its implications. As I understood the point being made, in the process of DNA "fingerprinting," human error (e.g., mixing up samples) is much more likely to produce a fortuitous "match" between suspect and evidence than is genetic coincidence. The probability of a false match is the sum of the probabilities of all such possible errors as well as the frequency of a given band pattern in the population. When the frequency of human error is orders of magnitudes greater than the frequency of a given phenotype, the frequency of human error *is* essentially the chance of false inclusion, and the phenotype frequency—and arguments over whether it is one in a thousand or one in a billion—become irrelevant. Hagerman recommends steps such as regular, published proficiency studies to monitor and help control laboratory errors.

Although anything that reduces the frequency of such error is desirable, I am rather concerned that this belated recognition of the existence of human error will result in a blacklash against DNA typing and that some would say that it should not be used at all (i.e., admitted into evidence) until more measures are taken to prevent such errors. This restriction would be unfortunate. As far as can be inferred by the proficiency tests cited by Hagerman, the current rate of laboratory error of DNA typing compares favorably with that of forensic serology tests (Sensabaugh 1987), and both are almost certainly much less prone to error than is, for example, eyewitness testimony. Eyewitness testimony has been demonstrated to be notoriously unreliable—in some circumstances more often wrong than right (Loftus 1979)—yet no one would dream of not allowing it into evidence. The point is, *all* forms of evidence, not just DNA evidence, are of course subject to human error. It seems absurd to have defendants face incriminating, possibly unreliable eyewitness testimony but not have exonerating DNA evidence admitted that is in general more reliable. If DNA evidence is admitted, then the strengths and weaknesses of that evidence can be freely debated by each side's advocates in front of the jury, just as is done for any other evidence.

Determining just how "reliable" is a given piece of evidence is unfortunately fraught with uncertainty, and, although knowing laboratory error rates in proficiency tests could be useful, because of particular circumstances it may not be a good estimate of the reliability of DNA evidence in a given case. The laboratory cannot simulate all aspects of real life, and there are perhaps too many unforeseen circumstances that can befall any piece of evidence—again, not just DNA evidence—to "reliably" make such estimates. Yet, for justice to be served, legal decisions have to be made, and one cannot wait for numerical estimates—even if such estimates were possible—of the probability of error for every piece of evidence. Perhaps the best that can ever be done in presenting DNA evidence—or, for that matter, any expert testimony—is to acknowledge the possibility of error and to let juries weigh that possibility in the context of all evidence in a case.

If the possibility of error is acknowledged, is it prejudicial to say that there is a one-in-an-extremely-large-number probability of false match due to genetic coincidence? A conditional statement such as "If there has been no other error, then the chance of false inclusion is the frequency of the DNA phenotype in the population" begs the question of what is the chance of other error, but it is still a truthful statement. It would seem to be still up to the legal advocate to make clear to the jury that they should be more concerned with the chance of human error than with the chance of coincidental genetic identity.

Finally, I also agree with Hagerman that the possibility of a false "no-match" due to human error is of equal concern as a false match. However, I would note that a false no-match is the more likely outcome, since undetected sample switching is the most likely human error. This is because, if there is truly a match, the evidence and suspect samples are often the only samples, among the many tested, that are of the same type. Thus an undetected switch results in a false no-match. On the other hand, if there is truly a no-match, then the evidence and suspect have different types; only if there are multiple samples of the same type can an undetected switch result in a false match—and then only if the switch occurs in a few of many possible ways.

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