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Author's Response

Sir:

While we appreciate the effort of Dr. Brenner and Mr. Inman to advance discussion of this important issue, we feel compelled to point out some limitations of their analysis and conclusions. The key problem is their unrealistic assumption that false positive errors are distributed randomly and uniformly across potential suspects. This assumption is crucial to their analysis although it is not required by the analysis offered in our article (1).

Our article focused on the probability that an innocent suspect could be incriminated under the facts of a particular case (which we called the "false positive probability"). Brenner and Inman focus on a somewhat different question—the proportion of innocent suspects who are falsely incriminated, which they call the "false positive rate." If there is a uniform, random distribution of false positive errors across potential suspects, as Brenner and Inman assume, then the false positive probability will equal the false positive rate. We believe, however, that the false positive probability may be far higher in some cases than others. As we explained in (1), the false positive probability is affected by a variety of case-specific factors and hence is a question that must be considered carefully in each case. Accordingly, a low overall rate of false positives does not preclude the possibility that some subset of all suspects face a substantial risk of false incrimination.

We agree with Brenner and Inman that the particular circumstances of databank searches can rule out or greatly reduce the probability of many types of errors and therefore are likely to assure a low overall rate of false positives. To our knowledge, no one (other than Brenner and Inman) has suggested that the arguments we set forth in (1) "would spell the doom for catching criminals through DNA databanks or dragnets." Hence, we think Brenner and Inman are attacking a strawman when they say that our reasoning implies that a substantial percentage of cold hits should be false. While we believe that the false positive probability in particular cases could easily be in the range discussed in (1), e.g., 10^{-4}, we do not think (and did not argue) that the false positive probability for every person in the databank on every search could be that high.

Our article was not about the overall rate of error in DNA testing. It was about the way in which the potential for error *in a given case* affects the probative value of the DNA evidence *in that case*. Although we assume the overall rate of error in databank searches is low, we believe the false positive probability could be high enough in some cases to be a serious concern. Brenner and Inman suggest that the probability a false positive due to a sample mix-up or cross-contamination is non-existent in *most* cold-hit cases because "convicted offender samples are catalogued by a contracting laboratory *normally* unrelated to the lab where the crime scene is analyzed." (emphasis added) We agree, but we note that safeguards that exist in *most* cases do not rule out the existence of a subset of cases in which the probability of error is higher than normal. It would be a serious mistake to disregard the potential for error in those cases based on arguments about the low overall rate of error.

The false positive probability may also be higher than normal in cases in which the perpetrator's profile is inferred from a sample that is mixed, degraded or marginal in terms of the quantity of DNA available. Mixture studies have shown significant rates of error in inferring the correct profile of minor contributors (2,3). Typically, the laboratory will get most of the profile right, but be wrong on one or two alleles. Allelic drop-out due to degradation or stochastic effects might also contribute to mistyping a few alleles in a profile. The probability of a false incrimination in such cases will not be randomly distributed across the databank. Because the erroneous profiles in these cases will be similar to those of the true perpetrator, close relatives of the perpetrator who happen to have profiles in the databank will be far more likely to match (falsely) than others in the databank. Whether the false positive probability in such cases is high enough to be of concern is an issue that deserves careful consideration. Again, it would be a mistake to dismiss this concern based on arguments about the low overall rate of error.

Brenner and Inman infer that the overall rate of false positives in suspectless databank searches must be extremely low because they are aware of no instances in which an individual identified by a "cold hit" was able to be proven innocent by records placing him in prison at the time of the offense (except one case where the suspect allegedly had an identical twin). As already discussed, this argument does not prove that the false positive probability is extremely low in all cases. Hence, it does not and cannot refute the claim of a particular suspect that a false positive is likely to have occurred in his case. We also believe Brenner and Inman have made a minor error in their formula for computing the expected number of errors under their assumption of uniform, random distribution of error. We believe the correct formula, using their nomenclature, is $CF/(F + P)$, rather than CF/P, and hence that the expected number of errors is not quite as high as they suggest.

Despite these differences in our perspectives, we agree with Brenner and Inman that the overall rate of false positives is an important issue. We also agree that the number of "cold hits" that are disconfirmed by other evidence is likely to be highly probative of the overall rate of false positives. We commend Brenner and Inman for raising this important point.

We believe, however, that it is unsatisfactory and potentially misleading to address this issue on the basis of anecdotal evidence. The issue is sufficiently important to warrant a systematic and public program of research on the results of databank searches. To assess the overall false positive rate in a rigorous manner it will be necessary to know how many searches are conducted, how discriminating the searches are, and how many produce "cold hits" as well as the number of "cold hits" that are "confirmed" and "disconfirmed" by subsequent evidence. In light of the argument advanced by Brenner and Inman, it is now clear that this information is highly relevant to an issue of significant public importance—the overall rate of error in suspectless databank searches. Indeed, we believe criminal suspects who are incriminated by "cold hits" will be able to use the Brenner and Inman argument to make a strong case that they should be entitled to review the type of data described here due to its relevance to the overall reliability of the system that incriminated them. Accordingly, we urge that systematic collection and reporting of the relevant data begin immediately, and we thank Brenner and Inman for illustrating the importance of doing so.

Finally, we think Brenner and Inman are mistaken when they imply that the concerns raised in our article (1) apply only to dragnet and databank search cases. The primary message of our article is that even a seemingly low false positive probability, on the order of 10^{-3}, 10^{-4}, or even lower, can substantially undermine the value of DNA evidence, and create a significant risk of false incrimination, *when the other evidence against the suspect is weak*. The *other evidence* is often weak in cold hit cases, but it can also be weak in conventional cases when, for example, the suspect produces a strong alibi. One of the cases in which a DNA false positive caused a false conviction, for example, was that of Timothy Durham, who produced eleven alibi witnesses to testify that he was in another state at the time of the crime. Any reasonable assessment of the evidence in the case, ignoring the DNA, should have indicated a low (prior) probability that Durham was guilty. In such cases, the false positive probability looms large in determining the probative value of the DNA evidence and therefore the possibility of an error should always be an important consideration.

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