DNA MIXTURE EVIDENCE AND THE NEED FOR ACCURATE MATCH STATISTICS

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Criminal justice relies on DNA evidence to convict or acquit the accused, and to protect the public from crime. In forensic science, DNA enjoys an unparalleled reputation for infallibility. But when DNA data is incorrectly interpreted, the resulting match statistics can be inaccurate.

DNA evidence is usually a mixture of two or more people. The molecules can be degraded or present in small amounts. Resulting laboratory data may require modern statistical analysis for accurate interpretation. Unvalidated statistical methods need not be reliable. And unreliable DNA reporting of forensic data can lead to unjust outcomes.

Forensic guidelines do not require crime laboratories to validate their DNA mixture interpretation. Laboratory analysts often apply "thresholds" that discard data, but the accuracy of threshold procedures has not been scientifically proven. Altering signals before entry into statistical software can lead to inaccurate results. By omitting informative DNA data, an "inconclusive" report can deny courts evidence that could implicate the guilty or exonerate the innocent.

Adjusting laboratory data can introduce human subjectivity. There is a danger that contextual bias (such as inadvertently assuming guilt) can yield a DNA analysis that is not impartial. Some mixture interpretation protocols do not use all the DNA data. Data selection can overstate the probative value of a match, which can mislead juries.

Simplifying complex data can cause DNA interpretation errors. Simple methods are appropriate for simple DNA data. But their application to more challenging samples must be empirically justified before they can relied upon. Without supporting validation data, an unsubstantiated interpretation method can taint DNA evidence in criminal cases.

Ten years ago NIST and others warned forensic practitioners about mixture interpretation issues. Since then, a decade of unsophisticated data analysis has led to hundreds of thousands of mixtures with inaccurate match statistics. This realization has recently shut down crime laboratories (e.g., Washington, DC) and necessitated extensive DNA evidence review (e.g., 24 thousand cases in Texas).

The CPI workhorse is a subjective one-sided match statistic, unrelated to identification information, raising doubt about DNA infallibility.

Victims and defendants need DNA justice. Mixture evidence, past and present, must be reviewed in an unbiased and scientifically valid way. Accurate DNA match statistics ensure conviction integrity, and maintain public trust in criminal justice.