STRmix v. Buckleton

Misinterpretation of DNA evidence in:
People of New York v. Oral (Nick) Hillary

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Background

A mixture contains DNA from two (or more) people. A mixture ratio of 1:1 indicates equal amounts of DNA from both people. A ratio of 10:1 indicates a larger amount of DNA from a major contributor, and a smaller amount from a minor contributor.

DNA data is a signal comprised of peaks. Peak height is measured in relative fluorescent units (rfu). A threshold discards data peaks below a certain height.

STRmix is a New Zealand computer program that analyzes DNA mixtures. John Buckleton is a developer of the commercial STRmix program.

Fingernail DNA evidence was obtained from homicide victim Garrett Phillips. Laboratory analysis showed a possible DNA mixture containing Phillips, and perhaps a second person. Software developer John Buckleton used his STRmix program to compare this possible mixture with suspect Nick Hillary.

Reliability

There are Federal Rules of Evidence (FRE) on the admissibility of expert testimony. Reliability Rule 702 requires sufficient data, a reliable method, and that the method be reliably applied to the data.

Sufficient data

The fingernail data contains potentially exculpatory DNA peaks between 30 and 50 rfu that do not come from Hillary. According to STRmix, the mixture ratio is around 250:1.

Reliable method

STRmix validation studies have been published using a data threshold of 30 rfu. None of these studies used a 50 rfu threshold that discards more DNA peaks.

STRmix validation studies have gone down to a mixture ratio of 25:1. No published studies have examined ratios as low as 250:1, the level of a few cells.

At a ratio of 250:1, the minor contributor may be too low to detect. Studies by the developer show that STRmix is unreliable at this level. The program cannot accurately

distinguish between true and false matches. It can give a positive association, whether or not a person's DNA is actually present in the mixture.

Reliably applied method to data

Buckleton found a 250:1 mixture ratio. Such a tiny purported minor component may not even be real. STRmix is only validated for 25:1 mixtures, not for a 250:1 ratio. Applying an unreliable method to insufficient data is not reliable.

Buckleton chose a threshold of 50 rfu. But the fingernail evidence contains potentially exculpatory evidence between 30 and 50 rfu. And STRmix is validated for using more peaks at 30 rfu, not fewer at the higher 50 rfu level. Applying an unreliable method to insufficient data is not reliable.

In fact, running STRmix at a validated 30 rfu threshold would exclude Hillary. The fingernail evidence is exculpatory. STRmix proves that Hillary's DNA is not present. Does the prosecution possess this crucial Brady material needed by the defense?

A STRmix operator can subjectively choose their data to get the answer they want. Running the validated STRmix program on all the relevant data excludes Hillary, and helps prove his innocence. Buckleton's invalid data choices give a scientifically baseless answer that could help prosecutors secure a wrongful conviction.

Relevance

Relevance Rule 403 balances the probative value of evidence against its prejudicial nature.

Probative

Ignoring crucial exculpatory evidence (i.e., data peaks between 30 and 50 rfu) does not prove anything. Running an unreliable computer program (i.e., unvalidated at 50 rfu, or for 250:1 mixture ratios) does not prove anything. The prosecution ran an unreliable method on insufficient data to report a nonscientific result. When there is no science behind an expert's opinion, it has no probative value.

Prejudicial

DNA is highly prejudicial evidence. Telling a juror that DNA connects important evidence to a defendant strongly conveys guilt. If that DNA connection is wrong, no amount of good science to the contrary can unring the bell. The jury should not hear flawed DNA evidence that can unfairly harm a defendant and irreversibly taint a trial.