

B138 DNA Mixture Interpretation: Bias Versus the Scientific Method

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Learning Overview: The goal of this presentation is to highlight the detrimental effect on justice when forensic experts do not follow the scientific method during analysis and interpretation of results.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by making attendees aware that it is only via the use of the scientific method that forensic science can serve justice.

The challenges related to the interpretation of DNA mixtures are real and multiple. However, there are cases in which the DNA expert can interpret a DNA mixture with relative ease and convey the information to the court in as unbiased a manner as possible. It is the onus of the DNA expert to present the court with all the scientific evidence. When only one side of the evidence is presented in court, thus contrary to the scientific method, the evidence presented by the DNA expert should be placed into question. This is evident of cognitive bias and flawed interpretation standards implemented by that institution.

In 2017, a case was heard in the Cape Town High Court of South Africa, where three members (both parents and one son) of a family were murdered in 2015. The second son in the family was the accused. DNA evidence was processed (Profiler Plus® kit) with only nine Short Tandem Repeat (STR) markers. In this family, there were only five informative STR loci between the mother and her sons. This called for careful examination of all available data when interpreting these three DNA profiles, as the scientific method dictates.

During the case of the State, Expert A testified that the DNA profiles of the mother and two sons: “... can be read into this mixture.” This mixture was on a swab from the shower of the bedroom shared by the sons. This opened the door to speculation by the prosecution that the accused showered after allegedly committing the murders, thus depositing his mother’s DNA in the shower. Expert A testified that she used a Sample Status Report (SSR) containing information related to this DNA mixture to write her affidavit.

However, it is evident from a qualitative comparison of the DNA profiles that the mixture could have resulted from the DNA profiles of the two sons alone. It is by chance that the two brothers inherited different alleles from their mother at each of the five informative loci. During cross-examination, Expert A conceded that an alternative interpretation could have been that the DNA mixture consisted only of the DNA profiles of the two brothers. She testified that it is for “... the quality office to decide” whether alternative interpretations should also be mentioned in her affidavit.

The SSR used by the DNA Expert A contained qualitative data, but also quantitative information based on quantitative Polymerase Chain Reaction (qPCR) analysis (Quantifiler® Duo DNA Quantification kit). When calculating the male-to-female DNA ratio, it is evident from the data that no female DNA was present in the DNA mixture.

Independent Expert B, when analyzing the mixture and reference profiles, took both the qualitative and quantitative data into consideration and concluded that only the DNA profiles of the two sons were present in the mixture.

Intentionally or not, Expert A omitted to use the quantitative data in her interpretation. This case was not the first time that Expert A omitted using all the data. In 2013, the judge stated in his judgment that “This quantitative [sic] element of the interpretation of the electropherograms was not taken into account ...,” referring to Expert A, ultimately favoring the evidence of another expert who took all data into account.¹

The interpretation of DNA mixtures is often a challenge and susceptible to cognitive bias. However, in this case, the evidence was clear but the scientific method was ignored. If an expert continues to ignore part of the evidence, after this bias has been highlighted in a previous case, it is possible that the danger of cognitive bias is not fully comprehended or is deliberately embraced to support a specific view in court. Whatever the case may have been, it is evident that quality standards from the expert’s institution do not address the management of cognitive bias, nor are they in line with the scientific method.

It is only by embracing the scientific method and managing cognitive bias that DNA experts will enable the pursuit of justice through truth in DNA evidence.

Reference(s):

¹ *Bokolo v State* (483/12) [2013] ZASCA 115 (18 September 2013).

DNA Mixtures, Interpretation, Bias