



B172 An Overview of Different Approaches to Expressing Significance in Associative Forensic Reports

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After attending this presentation, attendees will better understand the varying methods used to convey significance in forensic reports involving comparison of trace evidence.

This presentation will impact the forensic science community by providing an overview of the importance of expressing significance in forensic comparisons, the different methods currently employed to express significance, and the advantages and disadvantages of each method.

In February 2009, the National Academy of Sciences (NAS) Report, *Strengthening Forensic Science in the United States: A Path Forward* was released.¹ The Report expressed the need for the forensic community to “raise the standards for reporting and testifying” and identify in reports “the sources of uncertainty in the procedures and conclusions along with estimates of their scale (to indicate the level of confidence in the results)”. This has increased the urgency among standard-setting organizations, such as the Scientific Working Group for Materials Analysis (SWGMA), the European Network of Forensic Science Institutes (ENFSI), and the Organization of **Scientific Area Committees** (OSAC) to create standards by which analysts express significance in their reports.

Ideally, significance would be expressed with a frequency, as is done in DNA analysis. In most cases with manufactured materials, this is not possible due to both lack of information and the changing nature of the population of manufactured materials. Given these limitations inherent in expressing significance, several approaches have evolved to express significance. Many analysts have not changed their reporting from historical “could have originated from the same source” conclusions or have added statements to the conclusion to outline limitations of any associations made. While expressing limitations is an improvement over a simple “could have” conclusion, this approach does not offer context regarding the relative significance of the association.

There are longtime proponents of the use of an associative evidence scale to express various possible conclusions, strengths, and limitation to an association. This approach has been adopted by many forensic laboratories in the United States and abroad and has been the basis of attempts by some standard-setting organizations to form a consensus document on expressing significance in associative trace evidence. The evolution and practice of this approach will be outlined in this presentation. The associative scale has received criticism for being subjective and inherently unscientific.

A method that has gained support, primarily outside the United States is a Bayesian approach using likelihood ratios to express the significance of an association. The ENFSI has written a comprehensive standard supporting the use of likelihood ratios in trace evidence reports as well as examples on how such reporting should be utilized.² One concern over the use of likelihood ratios is that, while considered a valid statistical method, many of the frequency assumptions utilized are simple estimates and therefore also subjective. Labor-intensive frequency studies have been utilized in the calculation of likelihood ratios, but consensus has not been reached as to which frequencies to employ. Complicating matters is the necessity for these frequency studies to be repeated from geographical area to geographical area.³ In addition, a recent study has shown that it is difficult for juries to understand the verbal conclusions assigned to describe likelihood ratios.⁴

In conclusion, this presentation will offer an overview of the current trends in expressing significance in associative trace evidence and demonstrate the benefits and limitations of each approach.

Reference(s):

1. National Research Council, National Academy of Sciences, *Strengthening Forensic Science in the United States: A Path Forward* (2009)
2. ENFSI Guideline for Evaluative Reporting in Forensic Science: <http://www.enfsi.eu/documents>
3. Ryland S.G., Jergovich T.A., Kirkbride K.P. Current trends in forensic paint examination. *Forensic Sci Rev* 18:97–117; 2006
4. Mullen C., Spence D., Moxey L., Jamieson A. Perception problems of the verbal scale. *Sci. Justice*. 2014;54:154–158

Associative Scale, Significance, Likelihood Ratios