



B34 An Evaluation of DNA Results With Propositions at the Activity Level: How to Identify the Features That Influence the Bayes Factor — An Example With a Stabbing Scenario

Lydie Samie, School of Criminal Justice of Lausanne, Ecole des Sciences Criminelles-UNIL-Batochim, Lausanne, Vaud 1015, SWITZERLAND; Franco Taroni, PhD, Batochine Quartier UNIL-Sorge, Lausanne 1015, SWITZERLAND; and Christophe Champod, PhD, ESC / University of Lausanne, Batochine, Quartier Sorge, Lausanne-Dorigny, Vaud 1015, SWITZERLAND*

The goal of this presentation is to demonstrate how to identify the features that influence the Bayes factor using a Bayesian Network, allowing the evaluation of DNA cases at the activity level. This allows the identification of the type of experimental studies that are needed in a specific case and will help the scientist focus on a limited number of variables of interest. This presentation illustrates the variable of interest for a specific stabbing scenario.

This presentation will impact the forensic science community by assisting attendees in evaluating DNA cases at the activity level.

Traces with low levels of DNA can be the result of a secondary transfer or even a tertiary transfer. Consequently, factors such as transfer, persistence, recovery, and background need to be considered. Scientists should consider their biological results given activity-level propositions. The issue here is that many experts do not feel they can do so. One of the reasons is that each case has its own features. Can numerical values from experimental studies performed under controlled conditions be used for evaluation in real-life cases? Experiments allowing a wide variety of options for any unknown specific feature should be conducted, but it is difficult to design an experiment that takes into account all possible variations of all factors; however, the most significant fact is not that the feature varies but whether the variation of the feature has an impact on the value of the results (i.e., Bayes factor).

The goal of this review is to illustrate how to identify the features that influence the Bayes factor using a Bayesian Network. This permits identification of the type of experimental studies needed in the case at hand. It helps scientists focus on a limited number of variables of interest, helping them to evaluate DNA results at the activity level. Cases presented as demonstrations are cases in which the main proposition is that the person of interest stabbed the victim and the alternative propositions are either that the person of interest shook the hand of the real offender or that the person of interest has nothing to do with the stabbing or the offender (i.e., an unknown person stabbed the victim).

Results demonstrate that in both situations the greatest impact on the value of the results were extraction efficiency, sampling efficiency, proportion of contact between hand and target surface, transfer proportion, type of surface, and type of contact. The background, the environmental conditions, the quantity of DNA on the person of interest's hand and on the alternative offender's hand have the least impact.

Considering the alternative proposition, "The person of interest has nothing to do with the stabbing, an unknown person stabbed the victim," the most impactful feature is the conditional match probability. This feature has no impact on the value of the results under the other alternative proposition (i.e., the person of interest shook hands with the actual offender).

For a case, once extraction efficiency and sampling efficiency have been established and the type of surface and of contact are known and instantiated, the features of interest remain proportion to contact and transfer proportion.

Activity, Bayesian Network, DNA