



F37 Why DNA Interpretation Has Become More Challenging in Recent Years

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After attending this presentation, attendees will better appreciate interpretation challenges being faced by forensic DNA laboratories.

This presentation will impact the forensic science community by providing a better understanding of how improved sensitivity has brought new challenges to forensic DNA interpretation.

DNA interpretation with Short Tandem Repeat (STR) markers involves utilizing genotyping software and laboratory Standard Operating Procedures (SOPs) to evaluate Capillary Electrophoresis (CE) data. Peaks in multi-colored CE electropherograms generated as CE mobility time points are translated into DNA size information and then to allele repeat number for each STR locus. In both evidentiary and reference samples, decisions are made for each peak above an analytical threshold regarding whether or not the peak is an allele or an artifact, whether or not alleles at an STR locus can be paired to form a genotype, whether it is possible for some alleles to be missing from the data, and whether or not the sample originated from a single-source or a mixture of multiple contributors. Validation studies are essential for setting parameters used in a laboratory's SOPs to make these decisions. Guidance on validation studies and data interpretation has been provided from organizations such as the Scientific Working Group on DNA Analysis Methods and the European Network of Forensic Science Institutes.

There are two areas of forensic DNA interpretations which are particularly challenging: (1) low-level DNA samples where sensitivity is an issue; and, (2) complex mixtures where specificity is an issue. The number of contributors to a sample and the amount of DNA available for testing can impact the uncertainty or ambiguity in the conclusions drawn. In many situations involving complex results where uncertainty in the interpretation is large, the only scientifically responsible conclusion is "inconclusive" to avoid the chance of inappropriately including or excluding a potential contributor from an evidentiary result.

It is important to keep in mind that some measurements and interpretations are more reliable than others. Thus, uncertainty in measurements and interpretation should be reflected in the reports generated in a forensic case investigation. Assumptions made during the interpretation process should be documented and conveyed as clearly as possible. This documentation will aid those individuals reviewing the lab report to appropriately assess the results obtained and the conclusions drawn.

This presentation will discuss principles behind why DNA interpretation has become more challenging in recent years with an increase in sensitivity being applied by modern polymerase chain reaction amplification techniques. Approaches taken for interpretation may be subjective in some cases and therefore can become the weakest part of the overall DNA typing process. This presentation will also provide some historical perspective on the impact of improved sensitivity with DNA analysis and the desire to extend the reach of forensic DNA testing.

Forensic DNA, DNA Mixtures, DNA Sensitivity