B213 A Survey on Serological and DNA Typing Methods in United States Forensic Laboratories

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After attending this presentation, attendees will better understand the most common serological tests and DNA typing kits in use in a representative sample of forensic DNA laboratories in the United States. This presentation will discuss the amount of variation that exists with the laboratories' chosen methodologies, the trends toward new methodology and instruments, and the knowledge that forensic professionals want new employees or recent graduates of forensic programs to possess prior to entering the field.

This presentation will impact the forensic science community by informing United States forensic practitioners about their community's trends and the methods in use. This will help determine the variation present among laboratories. The results will also act as guidelines for educators in developing course content in their forensic science programs to maximize students' pertinent knowledge prior to entering the workplace.

There are approximately 400 public forensic laboratories in the United States, of which 59% perform serological and DNA typing analysis on evidence. Each laboratory selects the methodologies and kits, then validates corresponding Standard Operating Procedures (SOPs) based upon their needs and expertise. The differences among laboratories lead to variation and a lack of SOP standardization within the community, which is a major concern, particularly with DNA mixture interpretations. A 2013 study by the National Institute of Standards and Technology (NIST) found discrepancies in how laboratories were interpreting artificially generated mixture profiles. The results highlighted significant variation among the conclusions reached, not only by different laboratories, but also within a single laboratory between different analysts. Understanding and characterizing the basis of this variation will benefit the community.

The variation in public forensic laboratories is also reflected considerably among forensic biology educational programs in the United States, whose purpose is to develop and effectively prepare pertinent content to maximize employment opportunities for their students.

To address the aforementioned concerns, a survey was developed to receive feedback from laboratories on various areas of testing. Topics ranged from collection methods and presumptive and confirmatory tests for different body fluids to the type of kits laboratories use for extraction, quantitation, and amplification. For example, laboratories were asked to select which tests are used for the presumptive and confirmatory testing of blood and to describe their workflow process for blood evidence screening. In addition, there was a section for comments and advice for educators. The survey was distributed to 198 National DNA Index System (NDIS) laboratories through Qualtrics, an on-line survey-making platform. One hundred seventeen responses were collected, but 17 responses were incomplete and therefore excluded from the analysis. With 100 complete responses, the response rate of the survey was 50.5%.

Results from the survey not only highlight the most popular serological methods and DNA kits, but also provided insight to the forensic DNA community. For example, results revealed that phenolphthalein (the Kastle-Meyer test) was the most common presumptive test (71%) and the ABAcard® HemaTrace® was the most common confirmatory test (64%) for blood. Variation was observed more frequently with the laboratories' serological methods and

workflow processes, especially for sexual assault evidence. Several laboratories process blood evidence with a visual examination, followed by a presumptive test; if the presumptive test is positive, the evidence is processed for DNA. Sexual assault workflow, on the other hand, is dependent on the type of evidence given the different items present in a sexual assault kit, such as swabs, slides, and clothing. Consequently, the evidence may be processed differently. One possible workflow is to process the evidence first with a microscopic sperm search and, if the search is negative, with a confirmatory test for p30, indicating the presence of seminal fluid. Another approach is to perform a differential extraction to isolate the male DNA, then a microscopic sperm search on the evidence from which the male profile was obtained. Furthermore, laboratories were surveyed on additional analysis capabilities, such as mitochondrial DNA (mtDNA) analysis and Massively Parallel Sequencing (MPS) capabilities.

The survey provided a significant amount of information from several laboratories. This allows for the identification of commonly used methods and an understanding of how these vary across laboratories. This information will inform laboratories on the most popular current, and potentially future, methods used by forensic practitioners, allow laboratory directors to be better prepared for the future, and help educators develop their programs to produce knowledgeable graduates.

Survey, Serological Tests, DNA Typing