A35 An Efficient, Systematic Approach to Serology Screening of Sexual Assault Evidence

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After attending this presentation, attendees will understand the pros and cons of a new processing regime for sexual assault evidence. Elimination of semen confirmation on swabs prior to extraction along with full AP mapping of clothing and bedding will be compared to conventional kit screening and the use of an alternate light source to identify potential semen stains. Laboratories will be able to assess which approach will allow them to increase throughput and reduce the backlog of sexual assault cases without sacrificing effectiveness.

This presentation will impact the forensic science community by comparing different strategies for sexual assault evidence screening to help laboratories evaluate which will result in increased throughput and reduced costs for a laboratory without sacrificing effectiveness.

Forensic serology is a term used to describe the process of identifying biological fluids on items of evidence collected from crime scenes. Most crime laboratories use a combination of presumptive and confirmatory testing methods on sexual assault cases to test for body fluid stains such as semen, blood, and saliva in order to isolate stains for DNA testing. Examining evidence using conventional testing methods is time consuming and costly due to the labor intensive nature of the work and the fact that it cannot be automated.

Common practice for sexual assault kit testing is to first test kits swab for the presence of acid phosphatase and then to confirm the presence of semen either by microscopic identification of spermatozoa or by detection of prostate specific antigen (PSA). If kit swabs are negative, both microscopic and PSA testing must be performed to ensure the sample is truly negative. When there are no semen positive sexual assault kit samples, an alternate light source is used to aid in identifying potential semen stains on other evidence items that are invisible in ambient light. Screening evidence in such a manner enables analysts to isolate stains on clothing and bedding items and determine the nature of a stain prior to DNA testing.

One goal of the Harris County Medical Examiner's Office Forensic Biology Laboratory is to streamline this process to be more efficient without sacrificing effectiveness. Two processes have been identified where procedural modifications may streamline case processing of sexual assault cases. The first focuses on sexual assault kit processing while the second focuses on screening non-sexual assault kit evidence such as clothing and bedding.

The first improvement is to perform differential DNA extraction on all sexual assault kit swabs instead of using conventional presumptive and confirmatory testing to determine which swabs to send for DNA testing. Following extraction, all swabs are quantified using the Quantifiler Duo system, in which both the total amount of human and male DNA is determined. Swabs with a minimum male quant value of 0.003 ng/uL continue to DNA testing while those that have less than 0.003 ng/uL terminate processing at this point. The confirmation of semen can be done by either visualizing spermatozoa from the slide made from the sperm fraction pellet during differential extraction or by performing PSA testing. Eliminating the acid phosphatase step increases efficiency because in current processing, semen is routinely confirmed twice, once during serology screening by PSA or slides and again during differential extraction by microscopic confirmation of spermatozoa. The added

benefits of this modified process are that DNA extraction can be automated and this approach has the ability to detect male DNA from any cells instead of only from sperm cells.

The second potential process improvement for increasing efficiency is full AP mapping. Currently, analysts examine sexual assault evidence in visible light and a second time under alternate light. Afterward, the areas identified as possibly containing semen are then tested for acid phosphatase. By systematically AP mapping an entire object, the need for visual examination under two different types of light is removed. The fact that the testing is systematic has the additional benefit of detecting semen positive stains that cannot be visualized with AP or visible light. Using this approach, clothing and bedding of dark color or with a fluorescent background will be as easy to examine as lighter fabrics. This approach has the added benefit of saving laboratory space because the need for dark rooms is diminished.

The purpose of this study is to describe the validation of both modified serology procedures. A comparison will be made to show the traditional versus modified procedure and which: (1) is most efficient; (2) performs better; and, (3) is most cost effective.

Serology, Sexual Assault, Efficiency

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