A50 Application of a Handheld Vacuum Filter Device for Differential Sperm Separation

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After attending this presentation, attendees will understand the practical application of a handheld vacuum filter device, as well as, its use for specific separation of the male fraction in mixed sample evidence.

This presentation will impact the forensic science community by providing a methodology to obtain a cleaner suspect DNA profile. This profile is obtained with reduced contamination and increased speed and specificity. Data interpretation is more accurate upon the cleaner DNA profile obtained using the handheld vacuum filter device.

A critical aspect of the crime laboratory is the processing and analysis of evidence related to sexual assaults. Usually this evidence is a mixture of sperm and female epithelial cells. When mixtures of different sources of DNA are present, the analyst must separate the contributors into fractions. This separation, when different cell types prevent clean fractions, can produce significant problems upon DNA profile presentation in court. To improve this separation of sperm and female epithelial cells, a handheld vacuum-filter device was used during collection, sampling, and fraction separation. The resultant, male fraction produced a cleaner DNA profile for the perpetrator. Upon presentation in court, the information and correlation with the suspect's DNA could be made with more clarity and a decreased possibility of re-trial and re- testing.

The handheld vacuum-filter device can be adjusted to various degrees of porosity, depending on the type of evidence to be evaluated. The adjustment can be made at either initial collection or during sample analysis. Selecting a smaller pore size filter during differential mixture analysis more specifically and accurately targeted the male fraction of the body fluid mixtures, producing a cleaner male DNA profile. The use of the handheld vacuum-filter device during evidence collection would permit for minimal contamination, further improving the quality of the fractions obtained during DNA analysis.

The mixtures evaluated included liquid and dried samples, mimicking the type of evidence collected at crime scenes. This was done to determine scope and limitations of the handheld vacuum-filter device. Performance was also compared when using different filter porosities with the different sample types to identify the limitations of the instrument during collection, sampling, and DNA extraction. DNA was extracted using the organic extraction method coupled with concentration by filtration. The DNA recovered was verified by qPCR prior to amplification and genotyping. The use of the handheld vacuum-filter device was also applied to samples with various male to female ratios. The same procedures were followed to determine the applicability to degraded or limited quantity/quality samples. The filters permitted concentration of the DNA, resulting in the quantification of DNA with these challenging samples. The results of quantification and STR profiling were compared to traditional differential extraction procedures on both sample types.

The resultant cleaner suspect DNA profile, obtained with reduced opportunity for contamination and increased speed and specificity, will significantly impact the forensic science community. Data interpretation would be more accurate upon the cleaner DNA profile obtained using the handheld vacuum-filter device. However, of even greater significance will be the impact upon the DNA case backlog and efficiency of analysis. Cleaner samples at collection and more efficient and specific separation

of fractions during DNA extraction will enable cases to be processed more efficiently.

Sperm, DNA, Differential Extraction

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