A56 Separation of Semen From Superabsorbent Polymers for Forensic Analysis

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After attending this presentation, attendees will gain an understanding of the challenges in separating cellular material from the superabsorbent polymer (SAP) materials and the fibrous matrices found in evidence such as diapers, sanitary napkins, absorbent medical pads, and other related forensic evidence, and will learn a protocol that can successfully separate the cellular material from the substrate will be presented.

This presentation will impact the forensic community by describing best practices for isolating semen from evidence containing absorbent and superabsorbent materials, and the impact that SAPS have on downstream DNA analysis.

The presence of super absorbent polymers in forensic evidence has been found to complicate spermatozoa isolation for body fluid identification and inhibit organic DNA extractions. In certain cases, primarily involving women, small children, and infants, the successful isolation of cellular materials, and subsequently DNA, from SAP-containing materials such as feminine pads, diapers, and absorbent medical pads, is a difficult task, and failures of body fluid identification tests and DNA isolation have been observed. These super absorbent polymers are designed to absorb and retain large volumes of water or organic liquids, but when they are submitted as forensic evidence, they impede testing by sequestering the cellular material in the process. The purpose of this research was to develop a method to separate semen from SAPs found in materials such as diapers and feminine pads, with the ultimate goal of maximum yield from the evidence, and minimal inhibition of downstream forensic molecular testing.

Multiple centrifugal methods using size filtration were investigated to separate the SAP gel and fibrous material from the rest of the liquid sample containing the desired spermatozoa and other cellular material. Factors for a successful separation required determination of an optimal filter pore size, centrifugal speed and time that would allow cellular materials and liquid to flow through the filter, while preventing the polymers and cellulose fiber from flowing through. After a successful separation protocol was developed, sperm counts were used to compare percent yield and success of the protocol. Percent yield between isolation from just the top fabric layer of the item and a "core" of all layers of the item were also compared. DNA isolations and STR analysis were conducted on filtered SAP samples to determine levels of inhibition.

Finally, direct DNA isolation of the biological fluids on evidence with SAPs was evaluated using two silica-based DNA isolation methods. Since the silica methods have a direct affinity for DNA, samples were isolated using silica-based differential extraction methods to determine if direct DNA isolation is possible in the presence of SAPs, and if so, how those isolations are impacted. If the isolation methods are not affected by SAPs, laboratories may have the option to directly isolate DNA and determine presence of seminal fluid using molecular biology methods.

In conclusion, difficult samples such as evidence containing superabsorbent polymers can impact both body fluid identification and DNA analysis, and a modified approach was developed that can directly impact casework. This method uses standard materials and reagents found in most laboratories, and thus could be implemented quickly for significant impact.

Seminal Fluid, Semen, Diapers

 ** Presenting Author*