B168 Detection and Quantitation of Polydimethyl Siloxane Using Liquid Chromatography/Mass Spectrometry

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After attending this presentation, attendees will understand and be able to implement a method for the detection and quantitation of Polydimethyl Siloxane (PDMS), a common condom lubricant.

This presentation will impact the forensic science community by providing a successful validation that can result in a more robust and comprehensive analysis of chemical extracts which contain PDMS.

This presentation will cover a validation study for the use of a new methodology in the analysis of forensic samples related to sexual assault investigations. This successful validation will result in a more robust and comprehensive analysis of chemical extracts which contain PDMS.

Examination of items of evidence from sexual assault crimes may in some instances require the detection and comparison of materials from condoms and sexual lubricants used in the commission of the crime. Improvements in the ability to detect and discriminate these types of materials can lead to more effective processing of sexual assault casework. A common condom lubricant, PDMS, is a very stable polymer with several potential sources including, but not limited to, lotions, cosmetics, machining greases, and lubricants. As such, trace amounts of PDMS may be present on items of evidence from environmental contamination. Typical analyses targeting PDMS are qualitative in nature and do not allow for the discrimination of trace background levels from more concentrated lubricant stains.

The quantitative analysis of PDMS was conducted by normal phase Liquid Chromatography/Atmospheric Pressure Chemical Ionization-Mass Spectrometry (LC/APCI-MS) with Multiple Reaction Monitoring (MRM). LC/APCI-MS (MRM) analysis (limit of detection 1.7ng μL^{-1}; limit of quantitation 3.5ng μL^{-1}).

Cuttings from a collection of new and well-worn underwear were analyzed by this method to establish the expected background levels of PDMS in garments. The global average background concentration of PDMS in new and freshly washed but unworn undergarments was determined to be 6±5µg cm^{-2}. A sampling of well-worn and washed men's and women's undergarments yielded a global average PDMS concentration of 4±2µg cm^{-2}.

PDMS concentrations in a variety of lotions, condoms, and personal lubricants were determined to assess the contribution of each product to a potential stain or background. All lotions studied here were found to contain less than 1.0% PDMS by mass. Condom residue varied in composition based on lubricant type; spermicidal and unlubricated condoms did not typically contain PDMS. Condoms labeled as lightly lubricated were nearly 100% PDMS by mass. The average for other lubricated condoms was 29% PDMS by mass, but ranged from 10% to 50% PDMS by mass. Only one personal lubricant studied here was found to contain PDMS (41% by mass).

The findings from this study show that underwear background PDMS levels are not significant when compared to the PDMS content of condom lubricants.

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Condoms, Siloxanes, Mass Spectrometry