B118 Application of a Standardized Gas Chromatography Tandem Mass Spectrometry Method for the Improved Detection of Ignitable Liquid Residues

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The goal of this presentation is to decribe an approach to improve the detection and identification of ignitable liquid residues (ILR) through development of a standardized gas chromatography ion trap tandem mass spectrometry (GC/IT/MS/MS) method that is simple to implement and interpret.

This presentation will impact the forensic community and/or humanity by describing an approach to improve the detection and identification of ignitable liquid residues through development of a standard GC/IT/MS/MS method that is simple to implement and interpret. Data in support of the method will be provided and the advantages of the method will be shown through examples where GC/MS analysis alone does not provide conclusive results. This method allows for improved analysis of ILR evidence by overcoming previous disadvantages of MS/MS methods without increased examiner labor or time or the need for complicated interpretation software.

The detection and identification of small quantities of ignitable liquid residues in fire debris evidence can be difficult due to: significant alteration of these mixtures during the fire, recovery methods that afford poor selectivity and/or sensitivity, and co-extraction of interfering products (IP). The objective of this project was the development of a standardized GC/IT/MS/MS method that can be employed on an ion trap mass spectrometer, independent of manufacturer. Flexible chromatographic parameters and uniform ionization parameters were incorporated in the creation of a standardized GC/MS/MS method for ILR analysis.

Regions of uniform ionization, termed ***bins***, were created using the standard n-alkanes, C_8 through C_{23}, as markers. The general approach described in this presentation can be used in any GC/IT/MS/MS instrument and the spectra generated can be shared as a guide between instruments. An examiner can generate his/her library for use in their laboratory or use a previously created IT/MS/MS library due to the uniform ionization. Changes in chromatographic parameters would require minor adjustments of the bins. A searchable mass spectral database produced from this method would facilitate identification of components found in ignitable liquids (ILs) and interfering products (IPs). Chromatograms obtained using the standard IT/MS/MS method will be presented and compared to data generated by typical MS methods for different ILs and their corresponding weathered fractions in the presence of interfering products. Data in support of the advantages of the method will be shown through examples where GC/MS analysis alone does not provide conclusive results.

These experiments will improve current analysis of fire debris without significantly changing the workload of the examiner or the time required for analysis. It is anticipated that the results using GC/IT/MS/MS will not require sophisticated training or data analysis programs. This method is expected to allow for the identification of ILRs that might currently go undetected.

Ignitable Liquid Residues, Interfering Products, GC/IT/MS/MS

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