Y13 The Effects of Storage Conditions and Time on Extracted Ignitable Liquids Using Gas Chromatography/ Mass Spectrometry (GC/MS)

Sierra Strnisa, Canonsburg, PA 15317; Stephanie J. Wetzel, PhD, Duquesne University, Pittsburgh, PA 15282*

Learning Overview: After attending this presentation, attendees will understand how variables such as temperature and storage containers affect the ability to identify petroleum distillates through GC/MS analysis over several months.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by aiding in the establishment of optimal storage procedures, designed for ignitable liquid extracts, for the preservation of accurate analytical results.

In arson investigations, recovery of an ignitable liquid can be the determining factor in whether a fire is ruled accidental or intentional. In some cases, fire debris recovered from the scene must be archived in the event that a sample must be analyzed at a later time, though little is known about how to properly store extracted samples in order to maintain the integrity of analytical results over time. Up to this point, there has been research conducted comparing analytical results using different storage containers, extraction techniques, and analysis methods over longer periods of time; however, temperature has not yet been considered in conjunction with these other factors. To address this gap in research, the conjoined effect that storage temperature and container have on analytical results over time were tested by storing in two different containers at two different temperatures across a nine-month period.

Ignitable liquids can be classified into eight basic categories and three sub-categories; this study focused on petroleum distillates, just one of these eight classifications, due to their accessibility and low cost. Three petroleum distillates (Crown® White Gas Camp Fuel, Crown® Paint Thinner, and Crown® 1-K Kerosene) classified into different sub-categories (light, medium, and heavy) were selected as samples. Samples were extracted onto activated charcoal strips using a passive headspace method. The charcoal strips were then transferred to a Sirchie® Nylon Fire Debris Bag or PTFE-lined glass vial. Once contained, samples were stored under room temperature conditions or refrigerated at 4°C. After storing for intervals of three months, six months, and nine months, extracted samples were subsequently analyzed using GC/MS to visualize peak profiles. The protocol mentioned previously was followed for preparation of "time 0" samples (samples that were extracted and immediately run on the GC/MS with no storage) in order to provide a baseline for comparison purposes. Analysis of sample data was performed through identification of target compounds according to the American Society for Testing and Materials protocol by utilizing the National Institute of Standards and Technology Mass Spectral database.[1] Comparisons were made between all variables (storage time, container, temperature, and among the distillates chosen), noting any loss of target compounds or signal strength. This research may indicate a modification to standard protocol for the storage of extracted ignitable liquids in the future, ensuring accurate results.

Reference(s):

1. *ASTM Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography/Mass Spectrometry.* 2014, E1618-14, 1-15.

Ignitable Liquid, Arson, Storage Conditions

*Presenting Author