B164 Using Solid-Phase Microextraction-Gas Chromatography/Mass Spectrometry (SPME-GC/MS) to Detect Volatile Compounds Remaining From the Storage of Dead Mice

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After attending this presentation, attendees will understand the principles of how Volatile Organic Compounds (VOCs) from decomposition can be used as evidence and how the volatile profile is affected once the decomposed body is removed.

This presentation will impact the forensic science community by demonstrating that the VOCs released by decomposition can be collected, analyzed, and differentiated, allowing for detection of a decomposing body, even after removal. This is important as it can aid investigators in the discovery of the body or in determining that a body was present, but moved to a secondary crime scene.

One of the main objectives in forensic science is to analyze evidence so a linkage can be made. The linkage can be between a number of different elements, such as the victim(s), suspect(s) and crime scene(s). These linkages help law enforcement officers reconstruct the events that took place during a crime, which aids their investigation. One possibility is linking a body to a certain area based on the VOCs detected in the surrounding area (soil, air, etc.). Body odors are emitted from both living and decaying bodies. Each occur due to different taphonomic processes; therefore, the VOCs released from the body could be different. There are five stages of decomposition: (1) fresh; (2) bloated; (3) active decay; (4) advanced decay; and, (5) dry remains. The two main processes that are involved in the stages of decomposition are autolysis and putrefaction. As these processes occur, different VOCs are released from the body.

In this study, four mice were placed into four separate quart-sized arson cans. Three of the cans were used for data collection, while the fourth can was utilized for photographing the decomposition process. The headspace above the decaying mice was analyzed by utilizing three different SPME) fibers (one fiber per can): (1) Polydimethylsiloxane (PDMS); (2) Polydimethylsiloxane/Divinylbenzene (PDMS/DVB); and, (3) Polydimethylsiloxane/Divinylbenzene/Carboxen (PDMS/DVB/CAR). The VOCs collected using these fibers were analyzed and compared using a splitless method for GC/MS. Cleaning and storage conditions in addition to instrument parameters were assessed to determine the optimal procedure. This allows for a fast and simple sample collection methodology without any sample preparation prior to analysis. The run time for each sample was 25.67 minutes. A diluted standard mixture, of similar compounds to those observed in previous literature, was prepared and run using a split method to confirm that the method was working properly.

VOCs associated with decomposition stages of the mice were collected once a week for each can using a different fiber. The most abundant VOCs present within the first week of decomposition consisted of dimethyldisulfide, dimethyl trisulfide, dimethyl tetrasulfide, phenol, and indole for all three cans and all fibers. These results support previous studies that indicate sulfide compounds are among the first to be released during decomposition. By day 13 of decomposition, the PDMS fiber only detected five compounds (abundances of $2x10^5$ or greater). By day 16 of decomposition, the PDMS/DVB fiber detected more than ten compounds and the PDMS/DVB/CAR fiber detected more than 13 compounds (both with abundances of $2x10^6$ or greater). I n addition to the compounds listed

above, additional compounds included: hydrocarbons, esters, amines, alcohols, ketones, and furans. Based on these results, the PDMS/DVB/CAR fiber was chosen as the optimal fiber. This fiber was then utilized to determine the VOC signature that remained after the mice were removed from the three cans.

Decomposition, Volatile Organic Compounds, SPME-GC/MS