A137 Evaluation of the Volatiles Organic Compounds Released From an Illicit Substance for the Development of Improved Field Calibrants for Instrumental and Canine Detection

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After attending this presentation, attendees will have an enhanced understanding on the importance of identifying the active odor signature of illicit substances and its use to aid in the development of field calibrants for detection by instruments and detection canines.

This presentation will impact the forensic science community by providing a detailed overview of the most abundant Volatile Organic Compounds (VOCs) that constitute the dominant odor profile of a frequently smuggled illicit substance and its potential in the development of instrument calibrants and canine training aids that are safer, easier to use, and provide a more reliable odor source.

Despite tough anti-drug laws enforced within the United States, the trafficking and use of illicit substances continues to be a national problem. The Office of National Drug Control Policy estimates that Americans spend approximately $65 billion per year on illegal drugs from which only approximately $1 billion (1.5%) is seized per year, domestically, by all Federal agencies combined.[1] Therefore, the detection of these substances, especially during transportation and storage, is of great importance and an emphasis is needed on improving current detection capabilities. Currently, canines are the most commonly used form of detection for concealed contraband. To maintain the operational readiness and reliability of these canines, routine training must be performed. Most often, detection canines are trained using gram quantities of illicit drugs, but there are challenges associated with this approach including needing to follow strict Drug Enforcement Administration (DEA) regulations, potential toxicities, and the variation in the amount of VOCs in drugs from different sources. As a substitute for real narcotics, odor mimics have been used for canine training purposes as they provide more consistent amounts of VOCs, are non-hazardous, and not subject to DEA restrictions.

Ongoing research has identified dominant active odor signatures of the major drugs such as cocaine, methamphetamine, and MDMA to include methyl benzoate, piperonal, and benzaldehyde, respectively, and effective odor mimics have been created using the identified active odor chemicals.[2-4] Current research is focused on identifying the active odor signature of other popular illicit drugs, such as heroin. This study presents the VOCs released from heroin using Headspace Solid-Phase Microextraction Coupled with Gas Chromatography/Mass Spectrometry (HS/SPME/GC/MS) to identify the active odor signature. Depending upon the manner in which heroin is manufactured and sold, the constituents present may differ; therefore, headspace analysis was performed on different batches of seized heroin and the VOCs detected were assessed for similarities and dissimilarities. Overall, over five different compounds were discovered and ranked by chemical functionality. A pilot study using narcotic detection canines was performed with odor mimics that were created using each individual compound, as well as mixtures, and the canines' response to each type of mimic will be presented. In general, the results demonstrate that HS-SPME-GC/MS of illicit substances combined with field testing with law enforcement-certified detection canines can be combined to develop reliable odor mimics for field calibration of detection canines which will result in an overall improvement in seizure rates of these substances.

References:

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Illicit Substances, Volatile Organic Compounds, Detector Canines