B3 The Quantification of Drug Residues and Drug Odorants Under Variable Conditions Evaluated by SPME-GC/MS and With Detection Canines

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This goal of this presentation is to describe ongoing research involving the quantification of signature odor chemicals of narcotics and the relative abundances of odorants based on the sample size, length of exposure and degree of containment.

This presentation will impact the forensic community and/or humanity by presenting the differences in odor recognition used by detector dogs to locate controlled substances under varying conditions.

Narcotic odor is a result of odorant(s), which is/are characteristic of a drug and detected by the olfactory receptors. Previous research has established that certified law enforcement detector canines often do not alert to the parent drug itself, rather they alert to by-products or decomposition products. These products have been shown to be volatile organic compounds (VOCs) used by detection canines to locate controlled substances. For example, research into the odorants of cocaine and MDMA has shown methyl benzoate and piperanol, respectively to be responsible for detected odors by the majority of law enforcement canines tested. This present study focused on evaluating the relative abundance of the odorants emanating from specific narcotics under varying conditions. The study also examined differences in odor perception of canines based on sample size, degree of containment and length of exposure.

The methodology involved included headspace solid phase micro extraction (SPME) combined with gas chromatography/mass spectrometry. Headspace SPME sampling makes it possible to obtain consistent samples of VOCs above very small quantities of drugs as well as very large samples. Headspace sampling was carried out using variable sample sizes and variable containment scenarios ranging from completely closed to completely open. The SPME GC/MS method utilized a 70µm Stable Flex™ Carbowax Divinylbenzene (CW/DVB) SPME fiber (Supelco). This fiber has been previously determined, experimentally, to meet optimum standards for narcotic laboratory testing. Carbowax Divinylbenzene has proven effective in removing volatiles from the headspace of illicit drugs. This research includes the identification of the volatile headspace chemicals above a variety of drug samples. The potentially variable levels of these volatile organic compounds will be presented and examined.

The illicit drugs involved in this study included marijuana, cocaine, and heroin. The active odor signature chemical of cocaine has been confirmed to be methyl benzoate with threshold levels of 1-10 mg spiked methyl benzoate or 0.1-1 ng/sec-odor diffusion. The level of signature odor chemicals needed to initiate consistent alerts from law enforcement detector dogs further enhances the significance of dog alerts to possible controlled substances, because these levels are only present if significant contamination occurs. The specific amounts and the variable levels of the odor chemicals will be investigated to further justify this statement.

Current research has determined the highest composition of volatile organic chemicals present in the headspace of marijuana to include á- pinene, limonene, β-pinene, carene, and camphene. However based on the individual samples of marijuana analyzed, the relative concentration of á-pinene was seven times higher than the limonene with a ratio of 58:8. It was therefore necessary to determine the exact composition of this odor in addition to its relative abundances, based on sample size. Quantification of parent drug residues and drug odorants has also been evaluated for different paper currencies (U.S. and Jamaican).

The results demonstrate that the sampling time, sample size, containment vessel, and degree of containment can have an influence on the ratio of VOCs observed. The significance of these results to drug odor detection by law enforcement canines will be discussed. These studies have not shown drug odorants to be present above paper currency in general circulation supporting the theory that there is insufficient drug contamination on paper currency in circulation to initiate an alert by a properly trained law enforcement detector dog.

Odorants, Canine, Illicit Drugs

 ** Presenting Author*