B76 Headspace Sampling and Detection of Cocaine, MDMA, and Marijuana via Volatile Chemical Markers; Solid Phase Microextraction-Ion Mobility Spectrometry

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The goal of this presentation is to describe headspace sampling and detection of low vapor pressure drugs using SPME-IMS via related volatile chemical markers.

This study will impact the forensic science community by demonstrating the detection of volatile components in the headspace of cocaine, MDMA, and marijuana samples using SPME as sampling and pre-concentration device. IMS operating conditions are set at optimal configurations previously reported for these volatile markers.

This presentation shows evidence of successful headspace sampling and detection of cocaine, 3,4-methylenedioxy- methylamphetamine (MDMA), and marijuana under new optimized IMS instrumental conditions for methyl benzoate, piperonal, and limonene, and α/β-pinene respectively.

The parent compounds of drugs like cocaine, MDMA, and marijuana have very low vapor pressure and are consequently not readily available in the headspace for vapor sampling. Canines are trained to detect and alert to the volatile components present in high enough concentration in air rather than the parent compounds with low vapor pressures. However, current IMS instruments are configured to detect primarily particles of the parent compounds, thus making headspace sampling and detection ineffective for low vapor pressure drugs, and detection is limited to sampling by surface swipe.

The current research presents the progress in headspace detection of these drugs via the previously identified volatile markers. This is a significant step forward in trace detection of drugs, especially useful in confined spaces such as cargo containers where these volatile markers compounds can be found in high enough concentration. This study reports the minimum mass required in order to detect these drugs in the headspace at equilibrium inside a container of a given volume. In addition, this study reports the analysis of several potential interference compounds at these new IMS settings, and the associated percentages of false positive peaks.

The analytical instrument used in this research is a commercially available IMS fitted with a novel solid phase micro-extraction (SPME) interface previously designed in the Almirall research group. This interface enhances sampling and pre-concentration of volatile compounds of drugs and explosives. The IMS operating conditions were programmed at settings previously reported by our group for successful detection of the volatile chemical markers of the above compounds of interest.

Headspace Detection, SPME-IMS, Drugs

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