B139 Evaluation of a New Technology for the Collection and Analysis of Breath Components for Marijuana Detection Using Capillary Microextraction of Volatiles (CMV)

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After attending this presentation, attendees will be more familiar with the new CMV technology.

This presentation will impact the forensic science community by providing insight into a hopeful new technology for the non-invasive collection and detection of drugs (i.e., marijuana) in the breath of potentially intoxicated motorists.

Increased legalization of medical and recreational marijuana usage in the United States has led to an urgent need for forensic field tests for the detection and confirmation of drugged driving. Marijuana use has been found to have a detrimental effect on an individual's driving abilities, causing an increase in public concerns for road safety. The non-invasive approach of breath collection has made exhaled breath an attractive sample to collect for field detection of drugs. Breath analysis for marijuana detection, although potentially advantageous, has been limited by the available breath collection devices and analysis techniques. The endogenous compounds of breath, which naturally form in the body, make up the complex background of normal breath, which may interfere with analyses developed for the determination of compounds in the breath associated with the smoking of marijuana. Previous studies characterizing the breath of individuals who have smoked marijuana used filters as sample collection devices resulting in low collection efficiencies.

This study proposes the evaluation of a new technology, CMV, for its suitability for the collection of breath aerosols and volatiles in exhaled breath analysis. The CMV preconcentrates breath components using a mini capillary tube filled with Polydimethylsiloxane (PDMS) -coated glass filter strips. The CMV offers dynamic sampling of Volatile Organic Compounds (VOCs) with a simple coupling to the inlet of a Gas Chromatograph (GC) for analysis, avoiding expensive thermal desorption instrumentation needed for bulk sorbent-type collection devices. CMV offers a 5,000-fold increase in surface area and an improved collection capacity over the static, single Solid-Phase Microextraction (SPME) fiber based on the same preconcentration fundamentals. The collection efficiency and analysis of commonly known volatiles associated with normal breath and marijuana smoking were studied using a simulation of synthetic breath composed of vapors generated by permeation into a flow of humidified nitrogen. After collection of the synthetic breath onto the CMV, two extraction methods were tested for efficacy in releasing analytes for analysis. The comparison of the direct thermal desorption and online supercritical Carbon dioxide (CO_2) extraction of a CMV into a GC/Mass Spectrometer (GC/MS) inlet was used to determine the recovery profiles of the two recovery approaches. The chemical characterization of these breath components would provide a foundation and better understanding of breath collection with CMV. This understanding permits the differentiation between normal breath constituents and the exogenous compounds resulting from the smoking of marijuana. Reliable demonstration of the CMV for breath collection would serve as a proof of concept for future applications of the CMV for detection of marijuana smokers' breath for drug-impaired driver management. The

portability and sensitivity of the CMV could aid law enforcement agencies in the future during traffic patrols of drug-impaired drivers.

Breath Analysis, Breath Collection Device, Drug Detection