## B71 Quantitation of Major Cannabinoids Found in Seized Marijuana Using Automated Headspace/Solid-Phase Microextraction Coupled With Gas Chromatography/Mass Spectrometry (HS/SPME-GC/MS)

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After attending this presentation, attendees will better understand using automated HS/SPME for the quantitation of Δ9-trahydrocannabinol, cannabidiol, and cannabinol from marijuana plant material.

This presentation will impact the forensic science community by providing an automated method for the quantitation of major cannabinoids through the direct headspace sampling of suspected marijuana samples. This presentation will enhance the applicability of HS/SPME-GC/MS to controlled substance analysis.

The term marijuana refers to the plant material of *Cannabis sativa* L. There are more than 60 natural cannabinoids found in marijuana. The primary psychoactive component is Δ9-Tetrahydrocannabinol (Δ9-THC). Other important components for forensic purposes in states with legalized marijuana include Cannabinol (CBN) and Cannabidiol (CBD). Current analytical methods for the detection of cannabinoids include solvent extractions followed by gas or liquid chromatography. Such methods have several limitations, including the use of hazardous solvents, the expense of said solvents, disposal of the waste generated from solvent use, and the time needed to perform such extractions. A solution that may eliminate such limitations is the use of an HS/SPME-GC/MS method to detect the cannabinoids found in marijuana samples.

In this research, an optimal automated HS/SPME-GC/MS method has been developed using cannabinoid standard reference materials and actual marijuana material samples. An internal standard of deuterated Δ9-THC (D3-Δ9-THC) and any standard reference samples used were placed in a vial and the solvent evaporated under a gentle air stream before analysis. The plant material was ground and sieved before being weighed out into sample vials. Unlike previous methods that would require the sample to be extracted with solvents before analysis, the HS/SPME-GC/MS method required the sample to be sealed in the sample vial and placed on a GC/MS autosampler that would carry out the HS/SPME extraction using a 23 gauge 100µm Poly(DiMethyl)Siloxane (PDMS) fiber and inject the extracted cannabinoids into the GC/MS. The optimized extraction temperature for cannabinoids was found to be 150°C for quantitative analysis, and the optimal extraction temperature was found to be five minutes. Regeneration of the PDMS fiber was achieved by heating the fiber to 250°C in the autosampler conditioning chamber during the run after the fiber was exposed to the inlet of the GC/MS.

Results from the optimized HS/SPME-GC/MS method show that quantitation of Δ9-THC, CBN, and CBD could be completed with an $r^2$ of 0.99 and combined accuracy of more than 95% when using an internal standard of D3-Δ9-THC. The quantitative ions used for Δ9-THC, CBN, and CBD were 310m/z, 295m/z, and 238m/z; 314m/z, 299m/z, and 231m/z; and 231m/z, 174m/z, and 121m/z, respectively. The same major cannabinoids can be seen with both traditional liquid extraction and HS/SPME methods; however, in some cases the HS/SPME-GC/MS method shows more cannabinoids than the liquid extraction. With a better sensitivity, faster sampling preparation, smaller sample quantity required, and cheaper supplies cost, HS/SPME-GC/MS quantitation can provide major advantages over traditional liquid extraction. Future research will include statistical analysis of the data collected from marijuana plant samples using an already optimized qualitative method and this quantitative method with the goal of being able to differentiate marijuana from different growers.

**Marijuana, Quantitation, Solid-Phase Microextraction**

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