B122   Adulteration of Psychoactive Herbal Supplements Revealed by Direct Analysis in Real-Time Mass Spectrometry (DART®-MS)

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After attending this presentation, attendees will understand the value of Direct Analysis in Real-Time Mass Spectrometry High Resolution Mass Spectrometry (DART®-HRMS) for rapid confirmation of the identity of psychotropic plant material and for screening psychoactive herbal supplements for banned substances.

This presentation will impact the forensic science community by demonstrating the benefit of DART®-HRMS in drug chemical analysis, especially in terms of the speed and simplicity of analysis of samples in complex matrices. Definitive identification of psychoactive compounds can be accomplished using in-source Collision-Induced Dissociation (CID) and screening for adulterants can be rapidly performed. The ability to characterize and identify not only unscheduled plant-based psychotropics but also controlled substances could assist in reducing casework backlogs in forensic drug laboratories.

Sceletium tortuosum, commonly known as Kanna, is a psychotropic plant that has been identified by the United Nations Office on Drugs and Crime as a drug of concern.[1,2] Historically used for medicinal purposes, Kanna is marketed as an antidepressant, stimulant, and a natural alternative to traditional drugs of abuse.[2,3] Kanna is often sold as an herbal supplement and is found in multiple incarnations (seeds, powders, resin, etc.), which makes it challenging to identify. Because of its classification as a dietary or herbal supplement, Kanna is exempted from mandatory regulation and testing by the United States Food and Drug Administration (FDA). Consequently there is little oversight regarding the ingredient profile of Kanna products.

There have been many reported cases of herbal supplements being laced with toxic or banned substances.[4-6] The sample matrices are often complex, which makes analysis and definitive identification of these substances using conventional methods quite challenging. Hyphenated methods such as Gas Chromatography/Mass Spectrometry (GC/MS) and Liquid Chromatography/Mass Spectrometry (LC/MS) can be used to determine supplement identity and reveal the presence of adulterants; however, these approaches often require tailored method development that targets specific analytes of interest. With the increasing numbers of psychoactive herbal supplements on the market, it is impractical to develop standard operating protocols for each of these unscheduled substances.

DART®-HRMS is an ambient ionization method that can circumvent some of the aforementioned challenges in plant-based sample analysis. DART®-HRMS screening of Kanna samples revealed that these herbal products exhibit characteristic chemical fingerprints that are consistent with the presence of psychoactive and chemotaxonomic markers previously detected in the *S. tortuosum* species. These include mesembrine, mesembrenol, mesembrenone, and hordenine. Comparison of the in-source CID spectra of available authentic standards to in-source CID spectra of the Kanna products confirmed the presence and identity of the biomarker hordenine. Furthermore, the results of the in-source CID analysis revealed the presence of ephedrine in one of the herbal supplements. This finding was independently confirmed by GC/HRMS analysis.

The identification of ephedrine as an adulterant in Kanna products demonstrates the benefit of using DART®-HRMS for screening of psychoactive plant material and herbal supplements, as many traditional analysis methods would have been unlikely to have revealed its presence. DART®-HRMS was shown to be a powerful tool to not only screen plant-based drugs of abuse for psychotropic alkaloids, but also to reveal the presence of banned substances and adulterants.

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Legal Psychoactives, Ephedrine, Adulterated Supplements

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