



A179 The Characterization of a Series of Synthetic Cannabinoid Reference Standards Followed by the Analysis and Comparison of Various Herbal Incenses and Unknown Powders

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After attending this presentation, attendees will have a firm grasp on the properties and characteristics of synthetic cannabinoids, understand their relationship to herbal incenses or “legal marijuana,” understand how to effectively analyze such samples, and finally, understand why such information is becoming increasingly important to forensic drug chemists.

This presentation will impact the forensic science community by informing attendees on the emerging synthetic cannabinoid or “legal marijuana” phenomenon among drug users and educating drug chemists on the proper analysis of such compounds.

Recently, herbal blends marketed as “legal marijuana” have become increasingly popular on the streets due to their ability to produce a marijuana-like high.^{1,2} Although declared as an incense and not for human consumption, these blends are consumed as herbal drugs via inhalation, much like cannabis.³ In the United States, these products are largely an internet phenomenon,² but are also readily available at smoke shops across the country.

One particular brand of herbal incense that has emerged from Europe within recent years is *Spice*. The list of ingredients on the packaging of *Spice* indicates a mixture of plant components, such as *Indian Warrior*, *Lion's Tail*, and *Blue Lotus*.^{3,4} The overall blend of these herbs was claimed to be responsible for the cannabis-like intoxication produced upon consumption.^{3,4} However, there was strong suspicion that synthetic cannabinoids not reported on the label were added to *Spice* in order to produce the described pharmacological effects.^{3,4,5} Upon scientific analysis by various laboratories, *Spice* and other herbal blends were found to contain several synthetic cannabinoid compounds, which supported prior suspicions.^{1,5} These compounds include the following: HU-210; HU-211; CP 47,497; JWH-018; JWH-073; JWH-398; JW-250; and the

fatty acid oleamide.^{1,2,3,4,5} Of these, only HU-210 is controlled federally in the U.S. (schedule I), but states such as Kansas, Missouri, and Illinois have already or are in the process of enacting laws to outlaw one or more of the above mentioned compounds.

There is no evidence that JWH, CP, and/or HU compounds are present in all herbal incense products or even batches of the same product.⁴ Various concentrations and diverse combinations of these substances have been used in different herbal products to produce cannabis-like effects.⁴ This poses an obvious danger to consumers. It also expresses the need to identify precisely what is contained within the herbal blends, which can be difficult. According to Elizabeth Williamson, professor of pharmacy at the University of Reading and a specialist in herbal medicines, “Unless researchers know precisely what they are looking for - and have the “fingerprint” of the compound that they are trying to find with which to compare their results - it can prove almost

impossible to produce the necessary breakdown.”⁶

Currently, there are more than 100 known compounds with cannabinoid receptor activity, and it is plausible that additional substances from different chemical groups will soon be discovered.⁴ Any of these compounds could one day be added to any of the existing herbal blends, which poses a challenge for future identification, monitoring, and risk assessment of this “legal marijuana” phenomenon.

As word publicly spread that herbal blends were found to contain synthetic cannabinoids capable of producing effects comparable to or more potent than those of Δ^9 -Tetrahydrocannabinol, the popularity of smoking herbal incenses has risen significantly. Now, online websites have begun selling what they claim to be pure synthetic cannabinoid powders to anyone willing to purchase them, no questions asked. Since concentrations and identities of synthetic cannabinoids vary greatly between brands of herbal incenses and even within batches of the same brand, purchasing pure powders is more beneficial for users because they can be sure of what they are receiving and one gram of powder can be purchased for approximately the same price as one package of herbal incense. With the powder in their possession, users have a wide range of options. For example, comments on online drug and toxicology forums such as *Toxicology Synchronium* indicate that users have begun to make their own herbal blends by preparing a solution of one or more synthetic cannabinoids and spraying it onto a mixture of plant material.^{7, 8} Users have also indicated that they have begun experimenting with various routes of administration, such as insufflation.^{7,8} With new trends such as



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these, it is highly plausible that synthetic cannabinoid powders will soon end up in forensic science labs. Therefore, to be able to conclusively determine the identity of these substances, it is essential that scientists know how to analyze such compounds.

In order to build a synthetic cannabinoid library to aid in the future analysis and characterization of various brands of “legal marijuana,” various synthetic cannabinoids already found to be present in herbal blends, as well as those that could possibly be found in future blends, were obtained from *Cayman Chemical* of Ann Arbor, Michigan, and subsequently analyzed by gas chromatography/mass spectrometry (GC/MS) and fourier transform infrared (FTIR) spectroscopy. The reference standards analyzed include the following: JWH-018; JWH- 019; JWH-073; JWH-200; JWH-250; HU-210; HU-211; HU-308; HU-

331; (\pm)-CP 47,497; and 9-octadecenamide. The data gathered from the reference standards were applied to the analysis of various brands of herbal incenses obtained from laboratory submissions and smoke shops as well as synthetic cannabinoid powders obtained via the Internet. The powders and herbal incenses were quantitated using gas chromatography/flame photometric detection (GD/FPD) to (1) determine the purity of the JWH powder samples relative to the reference standards; and, (2) determine the percentage of drug present in each of the herbal incense extracts relative to the corresponding powder samples. GC/MS, FTIR, and GC/FPD data are presented for all reference standards and samples analyzed.

Synthetic Cannabinoids, JWH-018, Herbal Incense