K14 Analytical Methods Development for Identifying and Quantifying Synthetic Cannabinoid Substances

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After attending this presentation, attendees will learn about the details of analytical methods including gas chromatography-mass spectrometry (GC-MS), liquid chromatography-mass spectrometry (LC- MS), and infrared spectrometry (IR) for analyzing synthetic cannabinoid products containing the JWH-018 ingredient. The chemical characteristics of the K2 and K3 products along with the metabolic breakdown of the active compounds in the urine matrix will be discussed. The findings and methodologies will contribute to future development of a protocol for analyzing banned synthetic cannabinoid substances.

This presentation will be impact the forensic science community, as well as, the drug enforcement community by providing important information on the development of laboratory methods for analyzing synthetic cannabinoid substances that are different from natural marihuana products. The new laws banning these substances will require robust methods based on GC-MS, LC-MS, and IR spectrometry for characterizing products seized in police raids and assessing the levels of the metabolites in the urine samples of suspected users.

Recently, several states have outlawed the sale, use, and possession of synthetic cannabinoids. For instance, Tennessee has banned the sale of synthetic cannabinoids (more specifically JWH-018, JWH-073, HU-210, and HU-211) as of July 1, 2010. The popularity of these drugs is largely due to the lack of an analytical protocol for analyzing the synthetic cannabinoid substances for enforcement purposes. The use of these illegal drugs is often associated with trying to get "high" or intoxicated while avoiding the detection of the metabolites of these synthetic cannabinoids in order to pass the standard drug test for natural cannabinoids. The development of an analytical method for determining the characteristic metabolites of synthetic cannabinoids will provide a reliable means of identifying individuals using synthetic cannabinoids and studying the detection periods of these metabolites in urine samples. These drugs are commonly available under the name K2 or K3, each of which have the active ingredient of JWH-018.

Since the emergence of synthetic cannabinoids and their "herbal blends" in the markets, little research has been published on the urine metabolites of these products. Some synthetic cannabinoids are extremely potent and regulated by the U.S. Drug Enforcement Agency

(DEA). For example, HU-210 is 100 times more potent than the active ingredient in marijuana, Δ9-tetrahydrocannabinol (THC), and is subsequently considered a Schedule I controlled substance.[1] Analysis of the current commercially available synthetic cannabinoids has shown the presence of JWH-018 and CP 47,497-C8, as well as the derivatives of these two compounds.[2] The allure of these compounds is that they act on the same receptors (CB1 and CB2) resulting in a "high" without triggering a positive drug test for marijuana use.[3] The most recent publication related to the metabolites of synthetic cannabinoids focused on the analysis of urine samples following the administration of "Tropical Synergy" obtained from Russian law enforcement. The study confirmed the presence of two synthetic cannabinoids, JWH-018 and CP47,497-C8. Following urinalysis via gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS), several hydroxylated derivatives of JWH-018 and CP47,497- C8 were found.[4]

In this study, the techniques of GC-MS, LC-MS, and infrared spectrometry (IR) are used to analyze synthetic cannabinoid compounds present in the herbal products, smokes, and urine samples of test subjects. Attenuated total reflectance and long path-length gas cells are used with IR spectrometry for both herbal product and smoke analysis. Solid phase extraction as well as gas sampling bags and sorbent tubes are used for the mass spectrometric analysis of cannabinoid constituents. Herbal mixtures with synthetic cannabinoids differ from manufacturer to manufacturer and the components of their mixtures are rarely given in the package labels. The combined GC-MS, LC-MS, and IR analysis provide unambiguous identification of constituents in the K2 and K3 products. The development of methods for characterizing the commercially available herbal products, the constituents in the smoke and smoke residues, and their metabolites in the urine matrix would be a significant step for the enforcement of laws regarding these illegal synthetic cannabinoid substances.

References:

1. Microgram Bulletin. Mar. 2009. 42(3): 23 – 24. U.S. Dept. of Justice Drug Enforcement Administration. http://www.justice.gov/dea/programs/forensicsci/microgram/ mg0309/mg0309.pdf
2. Uchiyama, N., et. al. Chemical analysis of synthetic cannabinoids as designer drugs in herbal products. For. Sci. Intl. 198, 2010, 31 – 38.
3. Huffman, J.W., et.al. 3-indolyl-1-naphthylmethanes: new cannabimimetic indoles provide evidence for

 ** Presenting Author*

aromatic stacking interaction with the CB1 cannabinoid receptor. Bioorg. Med. Chem. 11, 2003, 539 – 549.

4. Sobolevsky, T. et. al. Detection of JWH-018 metabolites in smoking mixture post-administration urine. For. Sci. Intl., 2010. In press.

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