A178 Identification of Synthetic Cannabinoids in K2 Herbal Incense and Drug Paraphernalia by TLC, GC/MS, LCMS/MS, and LCTOF

Barry K. Logan, PhD, NMS Labs, 3701 Welsh Road, Willow Grove, PA 19090; Lindsay E. Reinhold, MFS, 1150 Woods Road, Southampton, PA 18966; and Francis X. Diamond, BS, and Allan Xu, PhD, NMS Labs, 3701 Welsh Road, Willow Grove, PA 18901*

After attending this presentation, attendees will be able to discuss the rise in popularity of a number of synthetic cannabinoid agonists currently subject to abuse in the United States, and the products that contain them. Attendees will be able to select appropriate analytical techniques for their forensic identification and confirmation.

This presentation will impact the forensic science community by preparing forensic laboratories to identify these drugs which are increasingly being outlawed and scheduled on a state by state basis throughout the United States.

A variety of therapeutic drug candidates have been developed since the 1970's, with activity at the cannabinoid CB1 receptor, responsible for the psychoactive effects of tetrahydrocannabinol (THC), the active component of marijuana. These compounds include a series developed at Hebrew University, the HU–series, drugs developed by Pfizer, the CP Series, and drugs developed at Clemson University, the JWH Series. As investigational compounds never developed for therapeutic trials, they were never scheduled or prohibited in the United States. Beginning in 2007, these drugs began to appear in a smokeable form in Europe, doped onto benign herbal material and sold as "Spice," a herbal incense containing HU-210, a potent CB1 agonist. Subsequently a variety of products appeared on the recreational drug market in Europe and the United States, including a variety of "K2" blends – Strawberry, Citron, Blueberry, Blonde, Summit, etc - other brands include Yucatan Fire, Space, and K3. A variety of these products have been characterized through the use of various chemical color tests, thin layer chromatography (TLC), gas chromatography mass spectrometry (GC/MS), liquid chromatography tandem mass spectrometry (LCMS/MS), and liquid chromatography time of flight mass spectrometry (LCTOF). Quantitative analysis was performed by high performance liquid chromatography (HPLC) and GC/MS.

The primary identification technique was GC/MS, identifying compounds by library matching. Compounds not identified through library matching were identified by molecular formula through analysis by accurate mass LCTOF. Reference standards for JWH133, CP47,497 (C=7), CP47,497 (C=8), JWH-250, CP55,940, JWH-015, HU-210, HU- 211, JWH-073, JWH-018, JWH-018, JWH-019, JWH-200, and

WIN55,212 were obtained for confirmation of drugs identified in the herbal material and they have been characterized using a selection of the techniques described above.

Quantitative analysis by GC/MS and HPLC showed significant variability in concentration of the active drugs within a single sachet and also between different sachets with the same name, purchased from different suppliers.

The most frequently identified synthetic cannabinoids were JWH- 018 and JWH-073, either together or alone, which had concentrations in the range of 7 to 20mcg/g of herbal material. Less frequently occurring were JWH-200, JWH-250, JWH-175, CP47,497 (C=7), and WIN55,212,

but generally in the same concentration range, with the exception of WIN55,212 which was present in trace amounts and identified only by LCMS/MS.

Water pipes used for smoking K2 blends were also tested and the drugs and degradation products were identified in the bowl, screen, and stem of the smoking apparatus.

Routine color tests (Dille-Koppanyi, Scott, Duqenois-Levine) were not found to be useful for screening herbal material. TLC has some value, but has limited ability to resolve closely related compounds in the same

mixtures and inadequate sensitivity for low levels of drugs present in some blends.

As more states adjust their scheduling for these emerging recreational drugs, criminalistics laboratories will need to adapt to use non-traditional analytical methods to identify new analogs and add these to their analytical menus.

Synthetic Cannabinoids, K2, LCMSMS

 ** Presenting Author*