B189 The Detection and Identification of Synthetic Cannabinoids by Portable Nanoflow Liquid Chromatography-Ultraviolet (LC-UV) Detection

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Learning Overview: After attending this presentation, attendees will understand how synthetic cannabinoids can be screened for and/or positively identified using portable nanoflow LC-UV detection instrumentation.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting the first truly portable method of nanoflow LC with UV detection as a method for reliable detection and identification of synthetic cannabinoids. This methodology is not only applicable for field testing of these emerging drugs but presents a relatively low-cost alternative (Category A tests not available) to meeting the Scientific Working Group for Seized Drugs (SWGDRUG) requirements for drug identification.

Within the United States, drug abuse has been at an all-time high and has no indication of slowing down. In fact, cases involving drug overdose deaths have more than tripled since 1990. Many different factors have contributed to this rise in drug abuse, one of these being a sharp and steady increase of "emerging" drugs. These emerging drugs are defined as the variances of controlled substance analogs that are synthesized to circumvent existing drug laws. For this study, the type of emerging drug being investigated is synthetic cannabinoids. Synthetic cannabinoids are defined by being able to affect the same receptors in the brain as Δ-9 Tetrahydrocannabinol (Δ9-THC). Commonly known as "Spice" or "K2," synthetic cannabinoids are used as an alternative to marijuana because of their similar psychoactive effects. General drug screening techniques struggle to identify synthetic cannabinoids, compounded by the multitude of analogs that are continuing to be made every day.

As a complementary separation technique to Gas Chromatography (GC), various forms of LC have emerged for drug analysis. These forms of LC not only can be applicable to most if not all drugs, without the need for liquid-liquid extraction and/or derivatization, but also they can increase the reliability of retention time measurements to assist in compound identification. Ultraviolet (UV) detection, a complementary technique to electron ionization mass spectrometric detection for GC, is commonly employed for LC.

For field test purposes, the most common methods for synthetic cannabinoids include color and spectroscopic techniques. Color tests are highly susceptible to false positives. Other techniques, such as portable Raman and Fourier Transform Infrared (FTIR) spectroscopy, have proven to be effective in screening for drugs at remote sites, but struggle when trying to perform the analysis of mixtures. Not only is a portable nanoflow LC able to be used at remote sites, but it has also proven to be a reliable method for screening and/or identification of drugs in a mixture.

This presentation describes the use of a portable nanoflow LC instrument, which provides for specificity in detection of synthetic cannabinoids, applicable to mixtures. Drug detection is accomplished by employing tandem capillary columns in series with dual UV wavelength on-column detection, resulting in very low solvent usage, all in an instrument that weighs only about 16 pounds. The instrument generates dual uncorrelated retention times and peak area or peak height ratios, which are proportional to a compound's extinction coefficient at both wavelengths. Two capillary columns in series (e.g., C8 and biphenyl) and dual UV LED detectors (e.g., 255nm and 275nm) are employed. Specificity in analysis arises from the unique ratios of dual relative retention times and peak area or peak height ratios from dual UV wavelength detection. The applicability for the screening and/or identification of these emerging drugs in various plant material matrices is presented. In regard to drug identification, the proposed instrumentation has the capability of adhering to the SWGDRUG guidelines by providing laboratories for which a Category A test is not available with two Category B tests (dual complementary retention times) and at least one Category C test (dual UV wavelength detection).

Portable Nanoflow LC, Emerging Drugs, Synthetic Cannabinoids

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