B13 The Detection and Identification of Synthetic Cathinones by Portable Nano-Liquid Chromatography (Nano-LC) With Dual Wavelength Ultraviolet (UV) Detection

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Learning Overview: After attending this presentation, attendees will understand how different synthetic cathinones can be screened for and identified by portable nano-LC with dual wavelength UV detection.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting the first portable nano-LC with UV detection that can be used in the field or laboratory for the screening or identification of emerging drugs, specifically synthetic cathinones. This is a valuable technique because, unlike other portable devices, it is both lightweight and highly amenable to mixtures. In terms of identification, the proposed technology presents a low-cost option to meeting the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) guidelines.

Emerging drugs have been created to avoid controlled substances laws. These drugs, also known as "designer drugs," are created by slightly altering the chemical structure of a current controlled substance. Since these drugs are not regulated by controlled substances laws, they can be purchased over the internet and in local smoke shops. Synthetic cathinones are an example of designer drugs. They are a group of amphetamine compounds derived from the active stimulant (cathinone) of the khat plant. These drugs imitate the effects of controlled stimulant drugs, such as methamphetamine, Methylenedioxymethamphetamine (MDMA), and cocaine. The desirable effects of synthetic cathinones felt by users include increased alertness, euphoria, increased sociability, and improved attention span.

The most commonly used field test for the preliminary identification of seized drugs are color tests, which lack specificity. Portable instruments employed, including Raman, Infrared (IR) spectroscopy, Ion Mobility Spectrometry (IMS), and Gas Chromatography/Mass Spectrometry (GC/MS), can be used for the on-site identification of seized drugs but have limitations in the identification of synthetic cathinones. Portable Raman and IR spectroscopy are problematic for the identification of mixtures. Portable IMS, which can separate mixtures based on their mobility in a buffer gas, lacks specificity. GC/MS can both separate and identify mixtures of seized drugs, but is limited for the identification of synthetic cathinones due to indistinguishable mass spectra and retention times of certain positional isomers.

SWGDRUG guidelines specify for drug identification that when a category A test is unavailable, alternatively acceptable are two procedures from category B and a third from category C. The category B tests include two retention times using uncorrelated separation systems, while the category C is of lower specificity.

The portable nano-LC instrument employed in this investigation is the first of its kind; weighing only 16 pounds, it can easily be transported between the laboratory and the field. The instrument's software can be run on a laptop or tablet connected through built-in Wi-Fi and has a rechargeable battery that can be used for 10+ hours. Because of its size, the instrument uses a fraction of the solvents and produces a fraction of the waste of conventional laboratory LC systems. The nano-LC can be equipped with different tandem columns in series with on-column LED UV detection at two wavelengths. This instrument is ideal for the screening of seized drugs because it can give two uncorrelated retention times and peak area or peak height ratios (dependent on absorbance ratios) that are proportional to the drug's extinction coefficient at both wavelengths. In addition, based on the multitude of identification points, it could meet SWGDRUG guidelines for drug identification. The present study employs two capillary columns in series (C8 and biphenyl) and dual UV detectors (255nm and 275nm) for the screening and/or identification of different synthetic cathinones, including in the presence of adulterants. These drugs are identified by the ratios of the relative retention times for both capillaries and by their peak height or peak area ratios determined by dual wavelength detection.

Portable Nano-LC, Emerging Drugs, Synthetic Cathinones