B143 Investigating the Utility of Automated Flash Chromatography in Forensic Drug Analysis

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After attending this presentation, attendees will understand how automated flash chromatography systems can be utilized in forensic drug analysis. Such systems are capable of isolating and purifying components of a liquid mixture, much like a modern High-Performance Liquid Chromatograph (HPLC); however, unlike HPLC, flash chromatography systems are capable of collecting the isolated components for further analysis.

This presentation will impact the forensic science community by demonstrating a means to isolate and collect components of a liquid mixture that require additional analysis in order to attain an identification. This becomes especially important when encountering emerging synthetic drugs before reference material is available.

Gas chromatography/mass spectrometry is the gold standard for analyte identification in most forensic drug analysis laboratories; however, when new synthetic drugs are detected, more information may be needed to make an identification. Ideally, Nuclear Magnetic Resonance (NMR) spectroscopy would be used to gain insight into the molecular structure of the unknown compound. Unfortunately, NMR analysis requires fairly pure samples to avoid complicating the spectra with signals from multiple compounds. Therefore, the compound of interest must be isolated and purified before it can be analyzed via NMR spectroscopy. Several isolation and purification techniques, such as liquid-liquid extraction, could be attempted to meet this requirement; however, automated flash chromatography was explored as it provides a means to isolate compounds of interest when little-to-no chemical information is known.

Because synthetic drug standards are expensive and are only sold in small quantities, known mixtures of common controlled and non-controlled substances were used for this study as a proof of concept. Various method parameters, including different columns and mobile phases, were tested. Polar silica columns and non-polar C18 columns were both tested. Water, methanol, acetonitrile, hexane, ethyl acetate, and isopropanol were tested to determine the optimal mobile phase for the separation. Utilizing automated flash chromatography equipped with an Ultraviolet (UV) detector, cocaine was successfully isolated and collected from a mixture containing equal parts lidocaine and benzocaine. For this specific mixture, a silica column with a methanol mobile phase was found to provide the best separation when the cocaine was in freebase form. To successfully isolate the cocaine, a liquid-liquid extraction containing a 1:1 ratio of sodium bicarbonate and chloroform was first performed to convert any salts to freebase. The sample mixture was then run on the automated flash chromatography system. Results showed clear separation of cocaine from lidocaine and benzocaine. Further analysis of the purified cocaine was successfully performed via NMR spectroscopy.

The same process used to develop the method used for this study could be employed for unknown compounds, such as synthetic cannabinoids. Because so many parameters can be altered which affect the separation, it is suggested that quick tests using Thin-Layer Chromatography (TLC) be used prior to attempting a full-scale separation on an automated system. Once optimal method parameters are determined, automated flash chromatography systems

provide a simple technique for the successful isolation and collection of analytes requiring further analysis for identification, making it a useful tool in forensic drug analysis.

Drug Analysis, Flash Chromatography, Synthetic Drugs