



### **K20 Method Development for the Analysis of Non-Traditional Drugs Used to Facilitate Sexual Assaults**

*Jennifer L. Greaux, BS\*, and Bruce R. McCord, PhD, Department of Chemistry, Florida International University, University Park, Miami, FL 33199*

After attending this presentation, attendees will become aware of a wide array of “non-traditional” drugs which have the potential to be used to facilitate sexual assaults. In addition, attendees will gain insight into the use of capillary electrophoresis (CE) for drug analysis and the advantages and disadvantages of using such a technique when coupled to a UV detector and an electro spray ionization time-of-flight mass spectrometer (ESI-TOF-MS).

This presentation will impact the forensic community by providing a more efficient technique for drug analysis and introducing new methodology for analyzing “non-traditional” drugs which have the potential to be used to facilitate sexual assaults.

The term drug-facilitated sexual assault (DFSA) has been assigned to cases where a drug(s) has been used to incapacitate an individual so that he/she is unable to consent to sexual activity.

The overall purpose of this project was to develop and optimize methods for the analysis of drugs which may be found in blood and urine specimens from sexual assault cases. It was desirable that these methods also provide accurate identification and confirmation when compared to standards. Drug standards have been prepared at various concentrations in buffer and deionized water and separated using CE-UV and CE-MS. These mixtures were comprised mainly of drugs belonging to the following classes: anticholinergic, anticonvulsant, antidepressants, antihistamines, antihypertensive, cough suppressants, and muscle relaxants. The compounds selected have been identified as candidates for DFSA because they may cause sedation, amnesia, and lower an individual’s ability to resist a sexual assault.

Some of the problems surrounding sexual assault samples are that there is a limited time window for detection and that the drugs may have widely varying chemical properties and may be present in very low concentrations. Therefore, a technique is required that is fast, efficient, and very sensitive for DFSA samples. It is proposed that CE coupled to MS may be a useful technique to analyze these compounds due to its high resolution and wide range of sample detection capabilities. In addition, the application of time of flight mass spectrometry greatly improves the ability to detect and identify unknown analytes. Due to its high (3ppm) resolution, the time of flight system permits infusion of samples prior to separation as a quick and efficient prescreening tool.

Optimization of developed methods was performed by altering parameters such as buffer pH and concentration, voltage, and sample injection. Additionally, the effects of adding organic modifiers and a water plug were examined. Phosphate buffer at low pH was used as the run buffer as it will cause the drugs to remain charged and suppress the electroosmotic flow to allow sufficient time for separation. The limits of detection and reproducibility of results were also evaluated to determine the relevance of this study to “real-life” samples.

The analysis of various drug mixtures will be detailed to show that capillary electrophoresis is an efficient and reliable technique for drug detection of sexual assault samples. Such a technique can then be used to aid authorities in prosecuting criminals accused of sexual assault in a quick but efficient manner.

#### **Capillary Electrophoresis, DFSA, Method Development**