K39 Determination of Trace Levels of Benzodiazepine in Urine Using Capillary Electrochromatography – Time-of-Flight Mass Spectrometry

Maximilien Blas, PhD, 10491 Southwest 15 LN, Apartment 211, Miami, FL 33174 ;and Bruce R. McCord, PhD, Department of Chemistry, Florida International University, University Park, Miami, FL 33199*

The goal of this presentation is to present the benefit of using a monolith as a stationary phase in separation science and its hyphenation with a mass spectrometry detection.

This presentation will impact the forensic science community by providing information regarding the detection of trace level of benzodiazepines which are common drugs used as tools in drug facilitated sexual assault (DFSA).

Benzodiazepines are substances with a wide range of therapeutic uses; suitable for the treatment of sleeplessness, anxiety, increased muscle tone or epilepsy.

Mainly because they can produce anterograde amnesia, benzodi- azepines are common drugs used as tools in drug facilitated sexual assault (DFSA). These drugs are comprised of a 1,4– diazepine ring with a benzene ring fused to carbons 6 and 7 and typically a phenyl group attached to carbon 5. Following an incident of DFSA, benzodiazepines may be present in very low concentrations. A successful analytical method for the analysis of these compounds may require detection limits below 10 ng/mL. Thus a highly sensitive analytical method is required.

This work details a method for the separation and determination of ten benzodiazepines in urine using capillary electrochromatography–time of flight mass spectrometry (CEC–MS(TOF)) and an hexyl acrylate-based porous monolith. The time of flight mass spectrometer proves to be able to determine exact mass of protonated benzodiazepines to three decimal places. This high selectivity along with the CEC separation, provides an effective method for the identification of benzodiazepines. Linearity is satisfactory for all compounds in the concentration range of 25–500 ng/mL for lorazepam and 12.5–500 ng/mL for the others. The relative standard deviations are between 1.4–2.3% for retention times and 1.1–9.2% for relative areas. Using the monolithic stationary phase, a pre-concentration step is achievable and permits a 75–140 fold improvement in sensitivity. This strategy allows the quantification of these drugs down to 1 ng/mL in urine. This method was used for the analysis of benzodiazepines in spiked urine samples.

Benzodiazepine, Electrochromatography, Mass Spectrometry

 ** Presenting Author*