Analysis of Cathinones in Plasma Using LC-MS/MS

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Introduction
Cathinones better known as bath salts have been listed as illicit drugs since 2011 and are the structural analog of Drug Enforcement Agency (DEA) Schedule I and II substances. They have been banned in numerous countries. Newly synthesized cathinones which mimic the effects of illegal drugs of abuse and to bypass the provisions of drug regulations are still available. These products have caught concern among law enforcement agencies. Acute toxicity and numerous fatalities have been linked with the abuse of designer cathinones. Despite the increased availability of designer drugs, few studies have focused on the analytical extraction techniques and the matrix effect for their detection and quantification in biological samples. Accurately quantifying the concentration of cathinones in biological samples is important for the regulation of cathinones.

LC-MS/MS is commonly used for detecting cathinones. However, Concheiro et al. (2013) showed the matrix suppression was observed in urine sample of cathinones by LC-MS/MS analysis. Endogenous interferences in urine have suppressed cathinone, mephedrone, and 3,4-methylenedioxypyrovalerone (MDPV) detections by LC-MS/MS up to 27%, 11%, and 9%, respectively. This study was aimed to elucidate the plasma matrix effect on the quantification of these three cathinones by LC-MS/MS. We developed LC-MS/MS methods that utilize standard addition without internal standard. A mixture of cathinone and mephedrone in plasma was analyzed.

Method
A UHPLC system with Phenomenex Kinetex™ C18, 2.1x100 mm, 1.7 μm column at 30 °C with a isocratic of eluent A water/0.05% formic acid and eluent B methanol/0.05% formic acid was used at a flow rate of 500 μL/min. The injection volume was set to 10 μL, and the auto-sampler temperature was set to 15 °C.

Results
Representative standard addition curves for cathinone and mephedrone

Discussion
SPE is the most commonly used technique for forensic sample preparation. Several types of SPE sorbents have been developed for chemical extraction. On-going researches at John Jay College are using many SPE techniques, such as polymeric sorbents have a broader pH stability range and higher analyte retention for polar compounds than traditional bonded silica sorbents. Chemically modified resins with different functional groups have also been developed to include the ion exchange mechanism. In this study, however, we developed the standard addition method for quantification without using internal standards. The most attractive aspect of this method is the simplicity of the sample prep; it is a dilute and shoot method.

The mechanism for standard addition is illustrated below.

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