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Rapid Identification of Abused Drugs and New Psychoactive Substances in Urine of Adolescents and Young Adult by Ambient Mass Spectrometry

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Editorial

Traditionally, abused drugs and new psychoactive substances present in urine or blood are identified and quantified by Gas Chromatography-Mass Spectrometry (GC-MS) and Liquid Chromatography tandem Mass Spectrometry (LC-MS/MS) [1-3]. Although both techniques are sensitive and reliable, tedious and time-consuming sample pretreatment such as solvent extraction, filtration, concentration, fractionation, and derivatization are needed. Thermo Desorption Electro Spray Ionization Mass Spectrometry (TD-ESI-MS) is an emerging analytic technique that enables in situ mass spectrometric analysis of specimens under ambient conditions. The minimal specimen preparation required for analysis and the sensitivity of detection achieved offer great advantages, especially in the field of forensic science [4]. Here we will present three cases of drug abuse and new psychoactive substances in urine samples of adolescents and young adult. On Jan 5th, 2016, a 25-year-old man was sent by his friends and presented to the emergency department with slurred speech and drowsiness. His blood pressure and respiratory rate were normal, and body temperature was 40.1 degree Celsius. Physical examination revealed bilateral pupils dilatation and ataxia. He had normal blood data of sodium, potassium, glucose and bicarbonate levels. Brain CT scan revealed no definite evidence of intracranial lesion. TD-ESI-MS revealed the presence of 3,4-Methylene Dioxy Meth Amphetamine (MDMA), 3,4-Methylene Dioxy Amphetamine (MDA), mephedrone and ketamine. LC-MS/MS data: MDMA: 204 ng/mL, ketamine: 3985 ng/mL, mephedrine: 3040 ng/mL matched the above TD-ESI-MS results [5]. The second case was a 17 years old male adolescent who was sent to our Pediatric Intensive Care Unit due to strange behavior of hitting his head and back in the morning of Feb. 13th, 2017. He snorted amphetamine and then took half a cup of coffee free by his friend in that morning. On the arrival of our Emergency Room (ER), he had leukocytosis of 30,100 and rhabdomyolysis with blood CPK levels of 41,875 IU/L (reference range <200 IU/L). At our ER, he had general soreness and hallucination of traveling to hell. Urine toxicology immuno assay screen revealed positive for combined amphetamine and MDMA, ketamine and benzodiazepines. LC-MS/MS revealed urine drug levels of amphetamine (>15,000 ng/mL), amphetamaine (2416 ng/mL), nimetazepam metabolite 7-amino-nimetazepam levels of 107 ng/mL), ketamine and mephedrone. TD-ESI-MS also matched the above data. The third case was a 15 years old boy was sent to our Pediatric intensive care unit due to consciousness disturbance. He had suicide attempt of burning charcoal and drank a cup of coffee containing drugs due to accusing his steeling from his friends. At the ER, his blood carboxy hemoglobin levels data was 35% (reference range <1.5%) and the data was returned to 0.1 % after hyperbaric oxygen therapy. His urine screen was positive for ketamine. The data of LC-MSMS and TD-ESI-MS also revealed positive for ketamine.

TD-ESI-MS has the characteristics of easy and simple and fast. But the limitation of ambient mass spectrometry are (1) the maximum of identifying drug items each run is 30 kinds of drugs (2) only for qualification of drugs.

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