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## Ambient mass spectrometry for rapid diagnosis of psychoactive drugs overdose in an unstable patient

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### ABSTRACT

A 25-year-old man suffered from consciousness change was sent to our emergency department by friends who reported that they were not sure what had happened to him. Physical examination revealed bilateral pupils dilatation, lethargy, slurred speech, and ataxia. Computer-aided tomographic scan of the brain revealed no definite evidence of intracranial lesions. Routine laboratory tests revealed total physiological turmoil. Despite immediate commencement of aggressive treatment, the patient's condition deteriorated long before the traditional drug screen provided an answer for the identities of the multiple drugs overdose. It ended up with the need for cardiopulmonary resuscitation, but in vain. At the end of the tragic event, under the suggestion of a colleague, a portion of the patient's urine specimen was sent to our university esoteric laboratory for rapid analysis by means of a newly-developed thermal desorption-electrospray ionization-mass spectrometry. Ketamine, 3,4-methylenedioxyamphetamine, and 3,4-methylenedioxyamphetamine were identified in the urine sample within 30 s. Conventional toxicological testing techniques like gas chromatography-mass spectrometry or liquid chromatography-mass spectrometry are currently used for identifying abused drugs. One concern is their time-consuming sample pretreatment which leads to relatively low efficiency in terms of turnaround time for revealing the identity of the consumed drugs particularly when the patients are severely overdosed. We learned a lesson from this case that a more efficient toxicological identification technique is essential to expedite the process of emergency care when the patients are so heavily overdosed that they are under critical life-threatening conditions.

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### 1. Introduction

Psychoactive drugs cause intoxication through various mechanisms that require different therapeutic strategies [1,2]. Identification of abused drugs is currently based on the history of exposure, clinical signs and symptoms, and laboratory tests. Unfortunately, it is difficult to identify rapidly drugs taken by severely overdosed patients at the early stages of emergency care, because such patients usually suffer

from mentality changes and fail to report precisely the type of intoxicants consumed. Not all signs and symptoms of psychoactive drug overdoses are present in every patient; the drugs have multiple pharmacologic functions and affect the brain in different ways [3]. Severely intoxication mandates rapid identification of the offending agents that guides the emergency physician to appropriate management and prescription of antidotes. Traditionally, abused drugs present in urine or blood are identified and quantified by gas chromatography-mass spectrometry (GC-MS) and/or liquid chromatography tandem mass spectrometry (LC-MS/MS) [4,5]. Although both techniques are sensitive and reliable, tedious and time-consuming sample pretreatment like solvent extraction, filtration, concentration, fractionation, and derivatization are needed. These conventional methods require hours for drug identification rendering delay in data-reporting. Although immunoassay techniques have also been introduced to identify

*Abbreviations:* GC-MS, Gas chromatography-mass spectrometry; LC-MS/MS, Liquid chromatography tandem mass spectrometry; TD-ESI-MS, Thermal desorption-electrospray ionization-mass spectrometry; MDMA, 3,4-methylenedioxyamphetamine; MDA, 3,4-methylenedioxyamphetamine; TD-ESI, Thermal desorption-electrospray ionization.

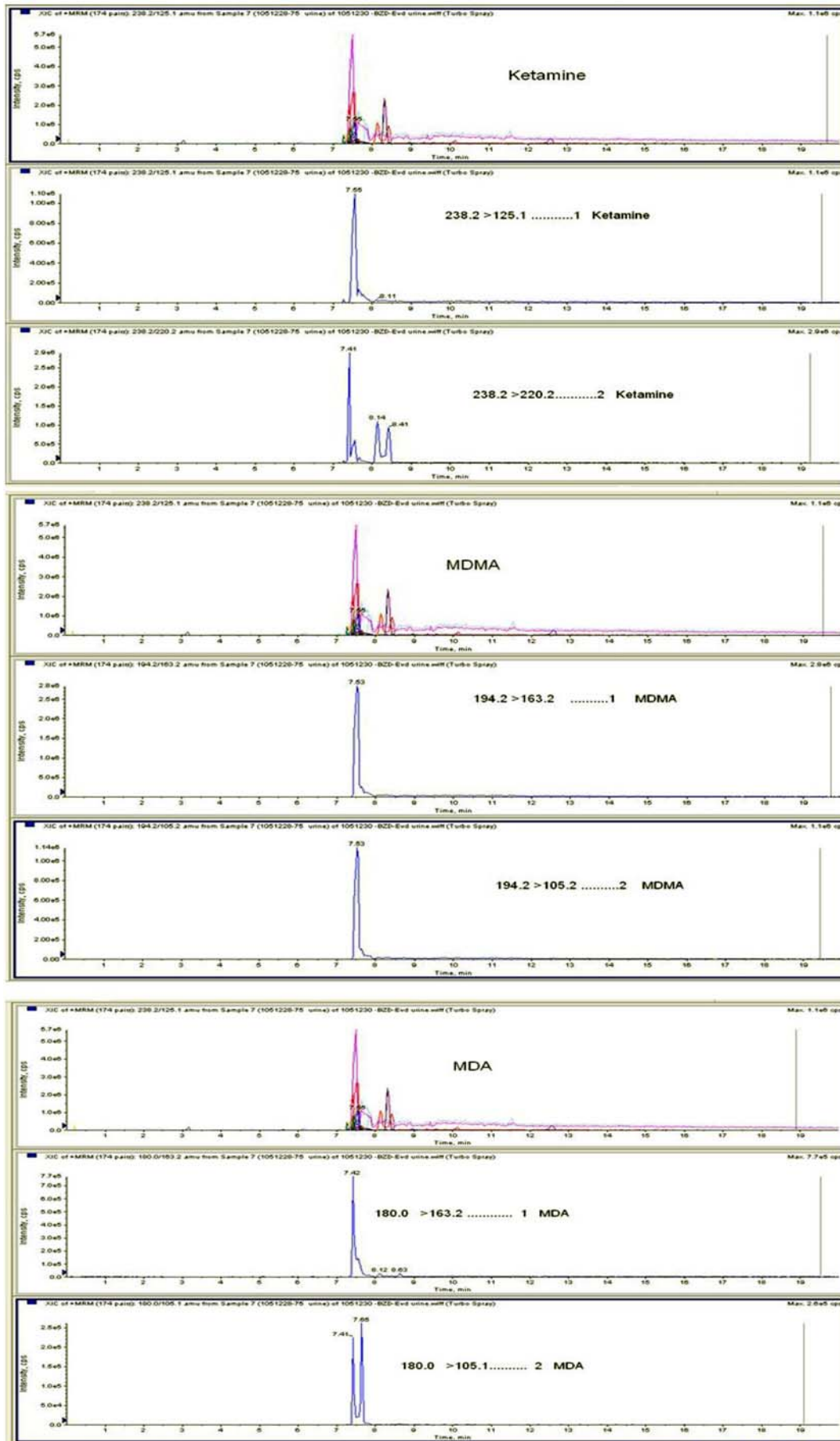
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