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CASE REPORT

Presence of mephedrone and methylone in an attempted suicide: A surprising result where toxicological analyses have changed the initial conclusions

Frédéric Aknouche[a,*], **Emilie Guibert**[a], **Alison Tessier**[a], **Pascal Kintz**[b]

[a] *Laboratoire Barla, 22, avenue Robert-Soleau, 06600 Antibes, France*
[b] *X-Pertise Consulting, 84, route de Saverne, 67205 Oberhausbergen, France*

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Summary Mr. D., aged 31, was found lying unconscious on his back on the grounds of his residence with bed sheets wrapped around his neck and attached to a tree branch for the purposes of suicide by hanging. Emergency services arrived at his residence where a Glasgow Coma Scale score of 6 led to tracheal intubation. The cardiovascular examination showed tachycardia. Blood tests performed on admission revealed hyperglycemia (3.80 g/L), metabolic acidosis, alcohol concentration at 0.16 g/L, CRP at 110 mg/L and transaminases (AST) at 84 IU/L. A bag of white powder and an empty vodka bottle were found at the patient's residence, suggesting simultaneous use of alcohol and cocaine. Therefore, a charge of illegal drug possession was filed by the police and a blood specimen was collected to test for alcohol, drugs of abuse and medications. The forensic tests on Mr. D.'s blood, performed by liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS), revealed the presence midazolam (not quantified), methylone (936 ng/mL), and mephedrone (116 ng/mL). Other tests were negative, including cocaine. Concomitant consumption of alcohol and cathinone may induce coma, associated to hyperglycemia. This case, with detection of illegal drugs by an expert laboratory using standard techniques is shown here to be critical to understanding the clinical effects of suspected drugs; this type of analysis must be prescribed rapidly once the patient is hospitalized (short half-lives and stability problems of mephedrone).

* Corresponding author.
Adresse e-mail : aknouche.frederic@wanadoo.fr (F. Aknouche).

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Introduction

Since 2000, all new synthetic recreational drugs have been referred to as new psychoactive substances or NPS, which include cathinones. The cathinone category includes the synthetic derivatives of a natural substance known as S-cathinone. Cathinone is found in khat, or *qat* (*Catha endulis*), a plant native to the Horn of Africa.

Substitution of one or more functional groups results in the synthesis of cathinones, such as methylone and mephedrone. Structurally similar to amphetamines, they are phenylethylamines, with a ketone in the beta position [1].

New designer drugs are synthesized by clandestine laboratories (mainly in continental Asia) due to an increasing request of the black market. Consumers may order these substances via the Internet since there are no specific administrative formalities with regard to exportation.

Legislation in European countries concerning classification of these substances as illegal drugs to prohibit use is highly variable from country to country. In France, methylone and mephedrone are classified as illegal drugs since 2010.

The effects of these two cathinones are poorly described in the literature and are difficult to distinguish from the effects of amphetamines or cocaine. Pharmacological activity is apparent after 15 minutes and may last up to 3 hours [2,3]. Users may prolong effects by taking multiple doses over several hours [4].

The mechanism of action is the same for all S-cathinone derivatives: inhibition of monoamine transporters for dopamine, serotonin and adrenaline in the central nervous system. In addition, there is increased presynaptic release of catecholamines such as noradrenaline [3,5]. In a recent review [6], Karila et al. have discussed the effects and risks associated to mephedrone and methylone and have pointed important health-related issues in relation to the somatic, psychiatric and addictive consequences of their use.

Mephedrone intoxication, already described in the literature [7], is characterized by sympathomimetic toxicity: agitation, mydriasis, tachycardia, hypertension and more rarely arrhythmia and convulsions. Patients treated by emergency services/departments following mephedrone use often present the following symptoms: agitation, sweating, headache, palpitations and nausea [8]. Regan et al. [9] reported 89 emergency admissions following mephedrone consumption, for the period from 2009 to April 2010, with the following symptoms: agitation, chest pain, paresthesia, palpitations and shortness of breath.

Psychological complications and the risk factors for dependence are still poorly understood. The comedown syndrome after mephedrone consumption is similar to withdrawal, involving shaking, shivering, lowered body temperature and paranoia. Very little information has been published on methylone.

In this report, we present a case of combined mephedrone and methylone intoxication related to a suicide attempt.

Case description

This laboratory was requested by a police officer to perform a blood screening for alcohol, pharmaceuticals and drugs of abuse collected from a subject who wanted to commit suicide while under the influence of psychoactive substance(s). Although the laboratory did not receive the medical history of the subject, some informations were available, including the initial report of his hospitalization.

Mr. D., aged 31, was found lying unconscious on his back on the grounds of his residence with bed sheets wrapped around his neck and attached to a tree branch for the purposes of suicide by hanging. Emergency services were called and they arrived at his residence at 10:20 am. The subject was then hospitalized in intensive care unit. Due to a Glasgow Coma Scale score of 6, a tracheal intubation was achieved. Cardiovascular examination revealed tachycardia.

Blood tests performed on admission by the laboratory of the hospital revealed a hyperglycemia (3.80 g/L), metabolic acidosis, an alcohol concentration at 0.16 g/L, CRP at 110 mg/L and AST at 84 IU/L. Rhabdomyolysis (CPK = 2278 IU/L) was observed during hospitalization.

During the early hours of hospitalization, police went at his home where a bag of white powder and an empty vodka bottle were found. As a consequence, a charge of illegal drug possession was filed. It was the opinion of the police that the subject has simultaneously used alcohol and cocaine. The Prosecutor of the city ordered blood collection for forensic purposes. This specimen was obtained the same day around 4:00 pm. This is the specimen that was analyzed by the laboratory.

The patient's medical history revealed that he had consumed alcohol at around 4:00 am to have the courage to hang himself. The patient's discharge documents refer to a suicide attempt involving cocaine and alcohol intoxication and a failed hanging (absence of marks).

The patient's neurological status improved, with recovery of normal waking consciousness a few hours after admission. He was calm and cooperative. Psychiatric treatment was recommended. Three days later, the patient succeeded in hanging himself. However, the laboratory was not informed about possible new toxicological analyses. In particular, it was not possible to obtain a hair specimen, which would have been suitable to establish whether consumption of cathinones was repetitive.

Materials and methods

Tests to detect pharmaceuticals and illegal drugs (excluding cannabis) were performed with an ultra-high performance liquid chromatography system coupled with a quadrupole mass spectrometer (UPLC-Quattro micro, Waters). The chromatographic column was an Acquity HSS C18 1.8 μm (2.1 × 150 mm). The mobile phase consisted of an ammonium formate buffer (5 mM, pH 3.0) and an acetonitrile solution acidified with 1 % formic acid.

Methylone and mephedrone were extracted from 1 mL of whole blood with MDEA-d_5 used as the internal standard, under alkaline conditions, with