



Case report

Fatal intoxication with synthetic cannabinoid MDMB-CHMICA



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ABSTRACT

MDMB-CHMICA is a synthetic cannabinoid that appeared on the European drug market in September 2014. This substance was found in Poland in the herbal mixture “Mocarz” (“Strongman”), which caused a large outbreak of intoxications at the beginning of July 2015. This paper describes the circumstances of death and toxicological findings in a fatal intoxication with MDMB-CHMICA (in combination with alcohol). Loss of consciousness and asystole occurred a few minutes after smoking the ‘legal high’. The man died after 4 days of hospitalisation. The cause of death accepted by the medical examiner was multiple organ failure. MDMB-CHMICA was detected and quantified in blood (ante- and postmortem) and internal organs tissues. The samples were analysed using liquid chromatography with mass spectrometry (LC-MS/MS). The concentration of MDMB-CHMICA in antemortem blood was 5.6 ng/mL. Although the death occurred after 4 days from administration a relatively high concentration (2.6 ng/g) was estimated in the brain. Traces of this compound were also found in other postmortem materials (blood, stomach, liver, bile, and kidney). The presented case shows the health risks associated with MDMB-CHMICA use. The administration of this substance can lead to the number of organ failures, cardiac arrest and consequently death.

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1. Introduction

The largest group of new psychoactive substances (NPSs) are synthetic cannabinoids (SCs). All of them share the ability to affect the cannabinoid receptors in the body, mimicking the effects of tetrahydrocannabinol (THC), the main active compound of cannabis. The first popular SC – JWH-018 – was identified in 2008 in the smoking mixture ‘Spice’ [1]. In the same year it also appeared in Poland. In the subsequent year, in Poland the other cannabinoids gained more popularity such as JWH-073, JWH-250 and homologues of CP 47,479. In 2010, most popular SCs were JWH-081, JWH-122, JWH-210, RSC-4, and AM-694. Since early 2013, the most commonly used SC in Poland was UR-144 and slightly less popular was XLR-11, which is a fluorinated UR-144 [2]. In 2014, a flood of new SCs had been observed and 101 NPSs were reported to the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), of which 30 were SCs. At the beginning of 2015, 137 SCs in total were monitored by the EU Early Warning System. Currently, it is the largest most diversified and fastest developing group of NPSs [1,3].

The emergence of new SCs is, among others, the result of subjecting them to legal control. Those that become controlled are immediately replaced by new uncontrolled substances. This is like a cat-and-mouse game between the legislators and illicit-drug manufacturers. The recent resurgence of the NPSs market in Poland resulted in a further amendment to the Drug Addiction Counteraction Act. 114 NPSs including dozens of SCs have been controlled in Poland since July 1st, 2015. This resulted in significant changes in the composition of ‘legal high’ preparations. At the beginning of July 2015, the media in Poland reported a large outbreak of intoxications in Poland. Within 2 weeks, several hundred intoxication cases were reported, of which most were related to the use of the herbal mixture “Mocarz” (“Strongman”) [4]. The product “Mocarz” has been present on the Polish market since at least 2010 [5]. Like other ‘legal highs’, it was sold mainly through the Internet. It was one of the most popular herbal mixtures, however its chemical composition has changed over time. According to data from the Institute of Forensic Research in Krakow (IFR) and National Institute of Medicines in Warsaw in recent years JWH-203, JWH-081, JWH-019 (2010), UR-144, 5F-AKB48 (2014), UR-144, XLR-11 and MDMB-CHMICA (2015) were all identified in preparations sold under this name [5]. Nowadays, on the basis of the IFR casework, it has been proved that many of the intoxications observed in Poland in July 2015 were the result of the use of “Mocarz” containing MDMB-CHMICA.

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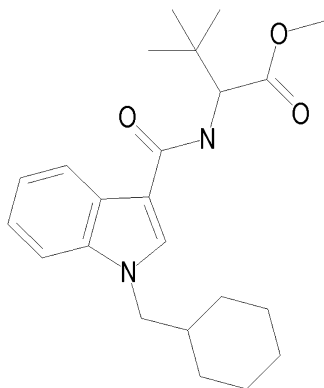


Fig. 1. Chemical structure of MDMB-CHMICA.

MDMB-CHMICA (methyl 2-[[1-(cyclohexylmethyl)-1H-indol-3-yl]formamido]-3,3-dimethylbutanoate) (Fig. 1) is an indole based cannabinoid that shares some structural similarities with AB-CHMINACA. It was initially sold under the wrong name MMB-CHMINACA and sometimes it is mistakenly referred to as this compound. In Europe it was seized (in herbal product) for the first time in Hungary in September 2014. Towards the end of 2014, this substance had also been detected in seizures of powders in Romania, Sweden, and the United Kingdom. In December 2014, one of the largest seizures of SCs (40 kg of MDMB-CHMICA) in Europe was reported in Luxembourg. The following year, it was seized in many other European countries. The main source of MDMB-CHMICA is probably China, from where it is shipped to Europe as a bulk powder [3,6].

MDMB-CHMICA is mostly smoked (e.g. after dissolving in acetone, mixing with herbs and evaporating solvent) in order to get 'high'. It can also be taken orally, sublingually, intranasally or vaporized and inhaled. However, using these methods it is very difficult to measure doses, which in the case of this compound are generally very low. Starting MDMB-CHMICA doses are reported by users as 0.05 mg, and typical doses range between 0.1 and 0.3 mg. Some users repeat doses to prolong the experience (e.g. every 2 h) leading to a few milligrams smoked throughout the day. Users reported that the effects of this cannabinoid are delayed and typically start 0.5–5 min after smoking, and end after approximately 2–4 h (but negative effects may last for up to 15 h). Users claim that the effects of MDMB-CHMICA are stronger than other SCs (data reported on Internet forums) [7–9]. Reported symptoms were stimulation, euphoria, hallucinations, amnesia, aggression, insomnia, anxiety, depression, apathy, delusions, and disturbance of attention [5].

MDMB-CHMICA as well as other 'legal highs' are marketed without any study of their pharmacokinetics and/or toxicity. The unknown action in combination with un-repeatable composition of these products can lead to non-fatal and fatal poisonings. This paper describes the circumstances of death and toxicological findings in a fatal case, in which MDMB-CHMICA was detected and quantified in blood and internal organs tissues collected from a young male.

2. Case history

A 25-year-old man with a history of alcohol and NPSs abuse purchased multiple packages of 'legal highs' from an Internet store. He was previously twice treated psychiatrically (11 and 5 months before the incident) because of 'legal highs' dependence. The man picked up the envelope with 'legal highs' at the post office at approx. 11:00. From the testimony of his colleague it is known that three packages with names: "Mocarz", "Czeszący grzebień"

("Combing comb") and "Baka" were inside the envelope. The man opened the package "Czeszący grzebień", and proceeded to put some of the herbal product in a pipe and smoked it. At the same time, he also drank a beer. After smoking, the man stopped talking. His colleague had seen him last at around 14:00–15:00. At that time the man was drunk and sleepy, had slurred speech, and it was also hard to communicate with him. The man returned home with another friend at about 16:50. He administered the 'legal high' named "Mocarz". Moments later, he fell to the floor (around 17:00). He was wheezing and vomited. The man lost consciousness, but his eyes remained open. His mother called the emergency medical service, which was on-site around 17:30. Doctors upon arrival found the man lying on the floor, unconscious, without a circulation and a pulse. The police arrived at the scene, where police officers secured six packs of 'legal highs' (powders and herbal products); including an empty package of "Mocarz". The resuscitation was successful, but the man did not regain consciousness and was taken to the Intensive Care Unit (ICU) at about 18:00.

On admission to the hospital, the patient was deeply unconscious (Glasgow Coma Scale, GCS 3), limp, circulatory and respiratory inefficient, without deep tendon reflexes, without pharyngeal and tracheal reflexes. There were no any signs of functioning of the central nervous system (CNS). The patient was unresponsive to pain and overall areflexia was observed. The pupils were extremely wide, stiff, with no reaction to light, without corneal and ciliary reflexes. The heart rate was 100 beats per minute (bpm), the blood pressure was 120/40 mm Hg and the temperature was 35.1 °C. Injuries on the body were not disclosed. The antemortem blood sample was collected at 18:50 (approx. 2 h after "Mocarz" use and 8 h after "Czeszący grzebień" use). During the 4 days of hospitalisation, severe redness of the skin of the upper half of the body, which was resolved with time, was observed, along with pathological muscle contraction of the chest, with decreasing intensity with time. Purulent and watery content was expelled from the digestive tract. There was also very strong diarrhoea and features of bleeding diathesis (injection sites bleeding). Body temperature was in the range of from 33.0 to 37.3 °C. Despite an intensive treatment, the patient's condition did not improve. On the fourth day of hospitalisation brady-asystole cardiac arrest occurred, but the patient was resuscitated. Unfortunately, 1 h later the next cardiac arrest occurred and the man was pronounced dead (at 14:30 of the fourth day).

As a result of the autopsy (performed 4 days after the death) the medical examiner concluded respiratory, circulatory, heart, kidney and liver failures as well as hypoxic-ischemic damage of the CNS. The cause of death accepted by the medical examiner was multiple organ failure. Blood and internal organs tissues (brain, lung, stomach, liver, bile, and kidney) were collected during the autopsy and sent, along with antemortem blood sample, to the author's laboratory for toxicological analysis.

3. Experimental

3.1. Reagents and materials

MDMB-CHMICA and JWH-018-D₉ were from Cayman Chemicals (Ann Arbor, Michigan, USA). HPLC-grade acetonitrile (MeCN), methanol, and formic acid (98–100%) were bought from Merck (Warsaw, Poland).

Blank blood samples used for the development and validation of the method and for preparing controls were obtained from a regional blood donation centre. Blank blood screened for common drugs of abuse (including MDMB-CHMICA) was negative. Biological material was stored at –20 °C and at +4 °C prior to the analysis.

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