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The electric Kool-Aid NBOMe test: LC-TOF/MS confirmed 2C-C-NBOMe (25C) intoxication at Burning Man

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Key Words: Phenethylamine, 2C-C-NBOMe, 25C, Burning Man, high resolution mass spectrometry, wilderness medicine

Running Head: 25C Intoxication at Burning Man

Abstract

Introduction: Designer drugs are constantly evolving, with the NBOMe derivatives of the 2C class of phenethylamines recently emerging in the United States market. Cases of 2C-I-NBOMe toxicity have recently been reported in the literature. No reports to date describe the clinical effects 2C-C-NBOMe toxicity. Case Report: A 24 yo female was found to be tachycardic, tachypneic and with agitated delirium after drinking wine, smoking marijuana and ingesting 3 blotter paper doses of what she thought was lysergic acid diethylamide. She thought she was being attacked by invisible assailants. She was transported from her campsite to an on-site field hospital by emergency medical personnel, where she was treated with intravenous normal saline and lorazepam with complete recovery within 10 hours. Leftover blotter paper samples were analyzed using Agilent Liquid Chromatograph-Time-of-Flight Mass Spectrometer (LC1200-TOF/MS 6230). The primary compound detected was 2C-C-NBOMe, with a smaller amount of 2C-I-NBOMe also present. Conclusions: Utilizing LC-TOF/MS, 2C-C-NBOMe was detected in blotter paper samples ingested by a patient with tachycardia and agitated delirium who had complete recovery.

Key Words: Phenethylamine, 2C-C-NBOMe, 25C, Burning Man, high resolution mass spectrometry, wilderness medicine

Introduction

Use of designer drugs is increasing, as evidenced by the well-documented rise of synthetic cannabinoids (herbal incense, spice, K2) and synthetic cathinones (bath salts) in Europe and the United States (1), the pervasiveness of methylenedioxymethamphetamine (MDMA) in pop culture (2), and the constant detection of novel compounds with high resolution mass spectrometry techniques (3-5). The 2C class of psychedelic phenethylamines was first synthesized by Alexander “Sasha” Shulgin in the 1970s and 1980s (6). They are 5HT₂ receptor agonists with variable receptor activity. Although 2C-I and 2C-B are both 5HT_{2A} receptor agonists, 2C-I also has a high affinity to 5HT_{2C} (7,8). Sold as “research chemicals” in the 1990’s and in Dutch “smart shops” in the 2000s, there are few cases in the literature of toxicity from 2C compounds (9). In 2003, N-benzyl derivatives of the 2C-x compounds were synthesized, including 2C-I-NBOMe (25I), 2C-C-NBOMe (25C), and 2C-B-NBOMe (25B), in order to produce strong 5HT_{2A} receptor agonists for psychiatry research (10). 2C-I-NBOMe and 2C-C-NBOMe became available for purchase online in 2010 (11) and there are a few cases in the literature of 25I toxicity (12-14) and one of 25B toxicity (15).

Case Report

A 24-year-old Caucasian female with no significant past medical history was screaming in her tent while camping at Burning Man in the Black Rock Desert in Nevada, USA. She was agitated and confused, under the impression that she was being attacked. On initial evaluation, her HR was 140 bpm with RR 32 per minute. Her pupils were dilated to 5 mm and her skin was moist and hot to the touch. She was not oriented to person, place or time. Per her boyfriend, earlier that evening she drank wine and smoked marijuana. Thirty minutes prior to evaluation, she ingested 3

doses of “acid” on blotter paper. She had taken acid (lysergic acid diethylamide, LSD) many times in the past without adverse effect. After brief assessment, paramedics physically restrained her to a gurney and transported her via ambulance to the on-site field hospital. Overnight, she was treated with intravenous normal saline boluses and 2 mg intravenous lorazepam, making a full recovery within 10 hours. The following day, she had complete amnesia to the events that had transpired and was otherwise asymptomatic. Seven other people had ingested single doses from the same blotter paper that evening, but none had similar adverse effects. No one had taken more than one dose. All users had received the drug for free from one supplier. A leftover drug sample was obtained from the supplying party, who had obtained it directly from the producer and was under the impression that it was “25C,” telling the patient that the drug was not acid, but “like acid.”

The drug specimen was analyzed using Agilent Liquid Chromatograph-Time-of-Flight Mass Spectrometer (LC1200-TOF/MS 6230). Diluted methanolic extracts of the drug were injected in the LC-TOF/MS after which the chromatograms obtained were analyzed using Agilent’s MassHunter Qualitative Analysis software to determine the presence of drug(s). The database includes 723 compounds commonly referred to as designer drugs. Identified mass spectra are presented in Figure 1. The primary compound identified was 2C-C-NBOMe, which was confirmed by cross-referencing to a drug standard and a mass spectral match in the database. A very small amount of 2C-I-NBOMe was also confirmed in the specimen. We obtained a formula match to a dichlorinated version of 2C-C-NBOMe, but were unable to confirm its presence due to lack of reference standards for that compound.

Discussion

This is the first reported case of adverse effects from 2C-C-NBOMe (25C) ingestion, characterized by agitated delirium and tachycardia consistent with a sympathomimetic syndrome. Prior published case reports of 25I toxicity describe tachycardia, hypertension, agitation, aggression, visual and auditory hallucinations, seizures and hyperpyrexia (12-14). It appears that 25C may have similar clinical effects.

On June 10, 2013, the family of NBOMe compounds were placed under a temporary class drug order in the UK (16) and recommendation was set forth by the Advisory Council on the Misuse of Drugs on November 28, 2013 to control these compounds permanently as Class A substances (17). On October 10, 2013, 25I, 25C and 25B were temporarily assigned as Schedule 1 drugs for 2 years under the Controlled Substances Act in the USA (18).

The detection of a novel compound is significant, but this case also brings up other important points. First, the patient and her partner were both under the impression that the drug involved was LSD despite being told that it was “like acid.” This may have led to the decision to take 3 doses instead of one. A problem with the quickly evolving nature of designer drugs is that they can mimic the appearance of older drugs usually distributed in recognized forms, such as LSD on blotter paper, with variable potencies.

Second, it becomes clear that more accurate and timely reporting of analytical data is needed in the medical literature. 2C-C-NBOMe, which was first described in a PhD dissertation in 2003, published in 2004 and on the market in 2010 (10,11), has been described in the analytical setting (19), but has never been described in a patient before. This is not to say that emergency physicians have not treated these patients yet. However, there are no analytical techniques such as high-resolution mass spectrometry (LC-TOF/MS, LC-QTOF/MS) necessary for novel

compound analysis readily available to emergency departments in the United States (3). This makes it so that toxicologists are always playing “catch-up” with drug suppliers and their chemists.

Information gathered by law enforcement is often not made available to treating emergency physicians and clinical toxicologists until the Drug Enforcement Administration (DEA) assigns temporary scheduling to a drug. In the case of 25I, 25C and 25B, the Federal Register document included previously unpublished information from medical examiner and DEA analyses. These 3 compounds, in some combination, were implicated in the deaths of 14 individuals (11 due to acute toxicity and 3 due to violent behavior from 25I toxicity). All 3 compounds have been seized in bulk shipments from Asia and 731 cases have been identified by the local and state forensic laboratories and the DEA since June 2011. The compound most frequently identified in these cases is 25I, followed by 25C and 25B (18).

Finally, incidents like this utilize rural emergency medical services (EMS) staff for hours. In a sparsely populated setting such as the Nevada desert, medical assistance and treatment were only available due to the thorough planning of event coordinators and a fully functioning temporary EMS system. Due to the fact that Burning Man is held 150 miles from definitive medical care, EMS operations include multiple dedicated air and ground units, two first-aid stations and a physician staffed field hospital (20). One patient incident as in this case did not strain the EMS staff, but a mass casualty event would certainly be a challenge to manage.

Conclusions

Utilizing LC-TOF/MS, 2C-C-NBOMe (25C) was detected in blotter paper samples ingested by a patient with tachycardia and agitated delirium who had complete recovery. This is the first

reported case of 25C toxicity in the literature. Timely analysis and reporting are a key component of public health awareness of novel designer drugs.

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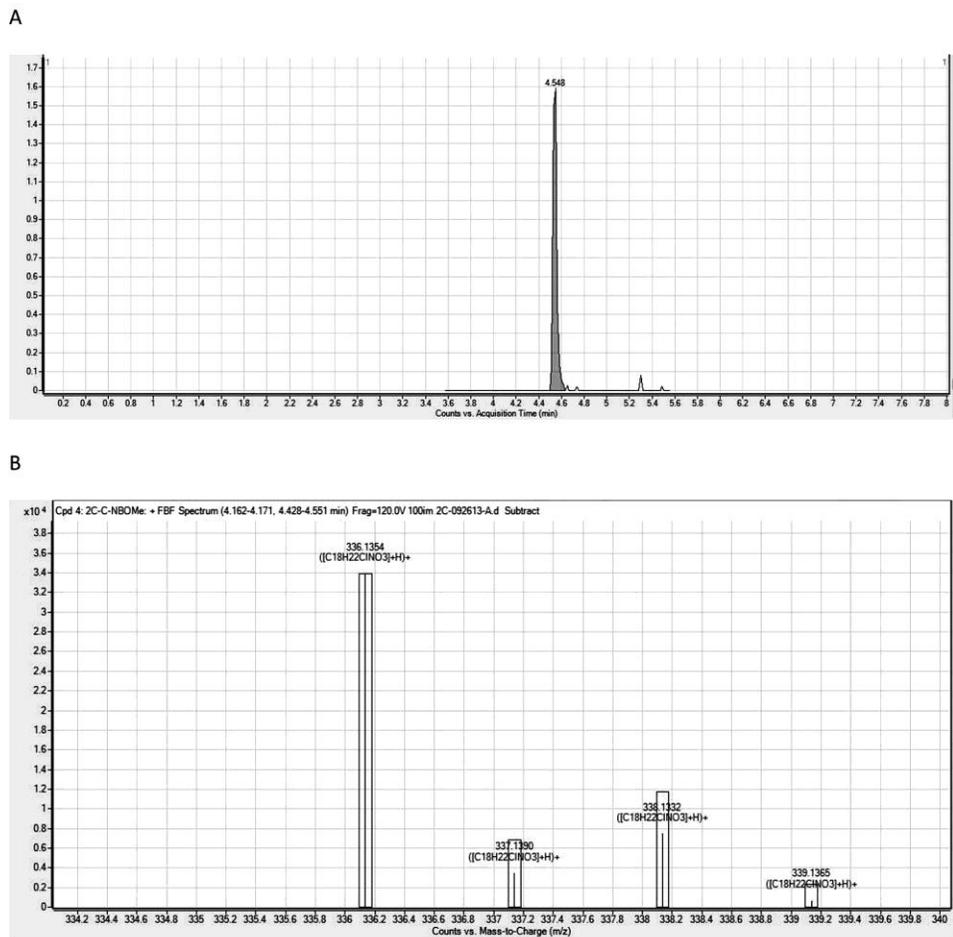


Figure 1: The extracted ion chromatogram (A) and molecular ion peak spectrum (B) of 2C-C-NBOMe detected in the left-over product taken by the patient.