It is illegal to post this copyrighted PDF on any website. Recreational 2-Methyl-2-Butanol Use: An Emerging Wave of Misuse of an Ethanol Substitute on the Horizon?

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There has been an increasing trend to use 2-methyl-2-butanol (also known as *tert*-amyl alcohol), an old, tertiary alcohol product previously used as a sedative/anesthetic agent, as an inexpensive, easily accessible, potent, and nondetectable ethanol substitute.¹ Referred to as 2M2B on internet blogs, eg, Reddit and Erowid, it is touted to promote potent intoxicating effects greater than those of ethanol. We describe a patient whose use of 2M2B led to hospital presentation with protracted intoxication and delirium.

Case Report

A 25-year-old man presented to the emergency department after companions mobilized emergency medical services due to what appeared to be altered mental status related to substance intoxication. In the emergency department, he was noted to be hypertensive (154/89 mm Hg), tachycardic (130 beats/min), and tachypneic (26 breaths/ min). He displayed slurred speech, gross motor incoordination, and impairments in memory, concentration, and judgment suggestive of acute alcohol intoxication.

Complete blood count revealed mild leukocytosis, without an accompanying left-shift. Complete metabolic panel revealed electrolyte levels within normal limits, an elevated anion gap of 26 mEq/L, elevated serum aspartate aminotransferase level of 62 IU/L, and elevated serum osmolality of 311 mOsm/kg. Serum lactic acid levels were not elevated, but serum β -hydroxybuturate was elevated at 4 mmol/L. Serum and urine toxicology screens were positive for cannabis only. His serum ethyl alcohol level was nondetectable. Because of the high anion gap and serum osmolal gap, ethylene glycol, methanol, and isopropanol levels were assessed, but were nondetectable. Computed tomography of the brain without contrast failed to reveal intracranial hemorrhage, masses, or midline shifting.

Psychiatric evaluation revealed an easily engaged patient with slurred speech; he was forthcoming with information,

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although his thought process was digressive and frequently tangential, without delusions or perceptual disturbances. He denied prior psychiatric history; however, he had alcohol use disorder (based on *DSM-5* diagnostic criteria) characterized by high tolerance, use of alcohol for durations and in amounts greater than intended, and persistent use despite impairments in functioning and strained interpersonal relationships. He regularly used cannabis and admitted to experimentation with methamphetamine, cocaine, and 3,4-methylenedioxymethamphetamine (MDMA). He revealed that he used up to 20–25 mL of 2M2B recreationally in the several hours prior to hospital presentation.

Poison Control was consulted; observation and supportive care were recommended. He was treated with intravenous fluids, thiamine 100 mg/d, and folate 1 mg/d. The symptoms of intoxication gradually resolved over the ensuing 3 days. With resolution of his cognitive status and motor functioning, he was discharged on the fourth day of hospitalization. Psychoeducation was furnished regarding the hazards of 2M2B use and the need for chemical dependency–based treatment.

Discussion

2-Methyl-2-butanol is a tertiary alcohol possessing depressant, hypnotic, and anxiolytic effects thought to be related to its ability to bind to, and inhibit, the γ -aminobutyric acid–A (GABA-A) receptor.² It is available in liquid form and has been accessible from online commercial sources, eg, eBay and Amazon.com, accompanied by a disclaimer that the product is not for human consumption. The ingestion of 2M2B is unpleasant: it reportedly has a camphor-like aroma, and it produces a burning sensation in the mouth and throat. Users often dilute it in water or another liquid to mitigate unpleasant effects.

The appeal of 2M2B as an ethanol substitute among recreational users has been based on several of its pharmacokinetic features. First, 2M2B has greater potency and duration of action than ethanol. Ingestion of amounts as little as 7.5 mL have been advocated to achieve "warm feelings," relaxation, talkativeness, and mildly euphoric and anxiolytic effects equal to the effects obtained by considerably larger quantities of ethanol, eg, 150 mL of standard liquor.³ 2M2B has an extended duration of action that is estimated to last up to 12–24 hours after consumption. Second, use of 2M2B is not associated with hangover. 2M2B does not undergo metabolism by alcohol dehydrogenase into aldehydes, which cause hangover; instead, it is oxidized by cytochrome P450–dependent reactions.⁴ Lastly, 2M2B is not detected on routine

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Syed and Leo

It is illegal to post this copyrighted PDF on any website urine toxicology screens, a feature that makes it particularly clinicians when encountering such patients. Clinicians

appealing to individuals wishing to escape detection from mandatory routine toxicology assessments.^{5,6}

The paucity of pharmacodynamic information on 2M2B has made it difficult to determine the safety of doses employed for its intoxicating effects. The safety of the use of 2M2B in large doses or repeated dosing has not been established, although it is anticipated that tolerance develops with repeated use. Certainly, combinations with other sedative-hypnotics, eg, benzodiazepines and opioids, can produce deleterious effects.

Patients presenting with 2M2B intoxication bring significant diagnostic challenges. Had our patient not disclosed 2M2B use, there would have been nothing in his physical or laboratory findings that would have definitively pointed to 2M2B use. Such patients manifest symptoms commensurate with ethanol intoxication against the backdrop of a low or nondetectable ethyl alcohol level. The presence of an elevated anion gap and serum osmolality may point to ingestion of substances other than ethanol. However, ethylene glycol, isopropanol, and methanol will be nondetectable on assessment as well. 2M2B is not detectable in routine toxicologic assessments. However, it is detectable via gas chromatography–mass spectroscopy,⁵ although the use of the latter may not be clinically practical.

This case is the first, to our knowledge, in the psychiatric and primary care literature illustrating the effects of 2M2B intoxication and the diagnostic challenges that confront efficients when encountering such patients. Clinicians need to be aware of the possibility that patients may present with 2M2B intoxication. Its use has been gaining popularity, especially among youth in Eastern Europe,³ and 2M2B may become increasingly popular in the US as information on its use spreads.

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