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“Bath Salts” Intoxication

TO THE EDITOR: The abuse of psychoactive “bath salts” (PABS) has become commonplace, and patients with PABS overdoses are presenting to emergency departments with increasing frequency.¹ The primary ingredient of the synthetic designer drugs in these bath salts, which are not related to any hygiene product, is methylenedioxypyrovalerone (MDPV). MDPV is structurally related to pyrovalerone and α -pyrrolidinophenone compounds that inhibit norepinephrine–dopamine reuptake and thus act as central nervous system stimulants.^{2,3} Despite growing efforts to ban these products through legislation, PABS often skirt substance-control laws and are readily available at low cost. These products are easily obtained over the Internet under such names as Ivory Wave or Vanilla Sky and are marketed as producing a high similar to that obtained with illegal stimulants such as methamphetamine. They are sometimes referred to as “legal cocaine” (but without causing the pronounced euphoria), as alertness enhancers, or as aphrodisiacs. The long-term use of PABS leads to tolerance, and abstinence is characterized by withdrawal and intense craving. When PABS are taken orally, intranasally, intravenously, or rectally, their effects occur with doses as low as 3 to 5 mg, and the average dose ranges from 5 to 20 mg. The risk of overdose is high, since packages contain as much as 500 mg, and some labels suggest escalating the dose to more than 50 mg. PABS are rapidly absorbed when ingested orally, with a rush reaching its peak at 1.5 hours. Their effects last for 3 to 4 hours before the user has a potentially harsh crash. The total experience occurs over 6 to 8 hours.

Patients who have taken PABS can present with extreme sympathetic stimulation and profoundly altered mental status. The sympathetic effects may include tachycardia, hypertension, hyperthermia, and seizures, and deaths have been reported. Altered mental status presents as severe panic attacks, agitation, paranoia, hallucinations, and violent behavior (e.g., self-mutilation, suicide attempts, and homicidal activity). Neither the physical and behavioral effects nor the labora-

tory findings have been well documented, since most case reports are anecdotal or are gleaned from Web-based drug-user forums⁴ (Table 1). Thus, PABS have been described as possessing the worst characteristics of lysergic acid diethylamide (LSD), phencyclidine (PCP, or “angel dust”), methylenedioxymethamphetamine (“ecstasy”), cocaine, and methamphetamine.⁵

Clinicians need to be aware of several issues. First, the severity and potential lethality from overdoses often necessitate care and monitoring in the intensive care unit; second, routine drug screens do not detect PABS; third, PABS can be cut with other psychoactive substances, which can confound the clinical presentation; and finally, patients may need physical restraints and high doses of sedatives to prevent self-harm or harm to others. Treatment is largely supportive, typically with intravenous benzodiazepines (for sedation, to control seizures, or both) and intravenous fluids, particularly if there is suspicion of rhabdomyolysis.

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Table 1. Physical and Behavioral Effects of Psychoactive “Bath Salts.”

Physical Effects	Behavioral and Mental-Status Effects
Tachycardia	Panic attacks
Hypertension	Anxiety
Vasoconstriction	Agitation
Arrhythmias	Paranoia
Hyperthermia	Hallucinations
Sweating	Psychosis
Mydriasis	Aggressive behavior
Muscle tremor and spasms	Violent behavior
Seizures	Self-destructive behavior
Stroke	Self-mutilation
Cerebral edema	Suicidal ideation
Respiratory distress	Insomnia
Cardiovascular collapse	Anorexia
Myocardial infarction	Depression
Death	

Disclosure forms provided by the authors are available with the full text of this letter at NEJM.org.

1. Emergency department visits after use of a drug sold as "bath salts" — Michigan, November 13, 2010–March 31, 2011. *MMWR Morb Mortal Wkly Rep* 2011;60:624-7.
2. United States Drug Enforcement Administration. Methylendioxypropylvalerone, December 2010. (http://www.deadiversion.usdoj.gov/drugs_concern/mdpv.pdf)
3. Westphal F, Junge T, Rösner P, Sönnichsen F, Schuster F. Mass and NMR spectroscopic characterization of 3,4-methylenedioxypropylvalerone: a designer drug with α -pyrrolidinophenone structure. *Forensic Sci Int* 2009;190:1-8.
4. Psychonaut Webmapping Research Group. MDPV report. London: Institute of Psychiatry, King's College London, 2009.
5. Halladay J. States race to ban risky 'bath salts' drug. *USA Today*. February 11, 2011. (http://www.usatoday.com/news/nation/2011-02-11-bathsalts11_ST_N.html.)

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CORRECTION

Oxygen Sensing, Homeostasis, and Disease (August 11, 2011; 365:537-47). In the reference list (pages 545-547), two separate references were run together under 6 and under 81, which resulted in misnumbering of the rest of the list. We regret the error. The article is correct at NEJM.org.

NOTICES

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Contact VA-NMMG, 1700 17th St. NW, Suite 508, Washington, DC 20009; or call (202) 797-0700; or fax (202) 797-0771; or see <http://www.medicalmusical.org>; or e-mail vanmmg@hotmail.com.

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The following courses will be offered in Chapel Hill, NC: "Building Inspection and Management Planning for Asbestos" (Oct. 10–14; refresher course, Dec. 8); "Certified Safety Professional (CSP) Review Course" (Oct. 31–Nov. 4); "Supervising Asbestos Abatement Projects" (Nov. 14–18; refresher course, Dec. 7); "31st Annual Occupational Safety and Health Update" (Dec. 1 and 2); and "Designing Asbestos Abatement Projects" (Dec. 9).

Contact the Occupational Safety and Health Education and Research Center, University of North Carolina, P.O. Box 16248, Chapel Hill, NC 27516-6248; or call (888) 235-3320 or (919) 962-2101; or fax (919) 966-7579; or e-mail osherc@unc.edu; or see <http://www.osherc.sph.unc.edu>.

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