

Bath Salts Abuse Leading to New-Onset Psychosis and Potential for Violence

Michelle E. John¹, Crystal Thomas-Rozea¹, David Hahn²

Abstract

Background: Bath salts have recently emerged as a popular designer drug of abuse causing significant hazardous effects on mental health and physical health, resulting in public health legislation making its usage illegal in the United States. **Objective:** To educate mental health providers on the effects of the new designer drug bath salts, including its potential to cause psychosis and violence in patients. **Method:** This is a case report on a 40-year-old male with no past psychiatric history who presented with new-onset psychosis and increased risk for violence after ingesting bath salts. In addition, a literature review was performed to summarize the documented effects of bath salts abuse and the current U.S. public health legislation on bath salts. **Results:** The presented case illustrates a new-onset, substance-induced psychotic disorder related to bath salts usage. The literature review explains the sympathomimetic reaction and the potential for psychotic symptoms. **Discussion:** To discuss the physical and psychological effects of bath salts, treatment options for bath salts abuse and U.S. legislation by Ohio state law to current U.S. federal law that bans production, sale, and possession of main substances found in bath salts. **Conclusion:** It is important for mental health providers to be aware of bath salts, understand the physical and psychiatric effects of bath salts and be familiar with current legislative policy banning its usage. Lastly, bath salts abuse should be in the differential diagnosis where psychosis is new onset or clinically incongruent with known primary presentation of a psychotic disorder.

Key Words: Bath Salts, MDPV, Mephedrone, Synthetic Cathinones

Introduction

Bath salts first emerged in Europe by 2007 and gained popularity in the United States by 2010 (1). Bath salts were originally marketed as “legal highs” labeled “not for human consumption” to circumvent drug abuse legislation (2). This designer drug appeal stemmed from its euphoric high, being easily accessible, affordable, and undetectable on routine drug screens (3). Bath salts is the commercial marketing term for a group of synthetic derivatives of cathinone (stimulant), a naturally occurring beta-ketone amphetamine analogue found in the Khat plant (*Catha edulis*) (4, 5). 4-methylmethcathinone (mephedrone) and 3,4-methylenedioxypropylvalerone (MDPV) are the two most common synthetic cathinones found in bath salts (6). However, other synthetic cathinones—including methylone—may also be found in bath salts (7).

¹Case Western Reserve University/University Hospitals of Cleveland, Department of Psychiatry

²University Hospitals Case Medical Center and Case Western Reserve University

Address for correspondence: Dr. Michelle John, University Hospitals of Cleveland, Department of Adult Psychiatry, 10524 Euclid Avenue, 8th Floor, Cleveland, OH 44106
Fax: 216-844-4741; E-mail: Michelle.john@uhhospitals.org

Submitted: December 27, 2013; Revised: March 23, 2014;
Accepted: May 30, 2014

Mephedrone is the main active compound detected in bath salts in the majority of European countries. However, Finland reported MDPV has greater prevalence as the primary substance found in bath salts (8). Mephedrone is suspected to function as a monoamine reuptake inhibitor and may induce the presynaptic release of monoamines. Overall, mephedrone produces an effect of increasing dopamine, norepinephrine and serotonin levels (3).

In the United States, MDPV is the most common detected substance in bath salts (9). It is structurally related to stimulants such as cathinone and hallucinogenic substances such as 3,4-methylenedioxymethamphetamine (MDMA or ecstasy). MDPV is less polar, more lipophilic, more potent and can cross the blood brain barrier easier than other synthetic cathinones (10). When entering the central nervous system, MDPV functions as a norepinephrine and dopamine reuptake inhibitor (11).

Bath salts have been labeled under various trade names, including: vanilla sky, ivory wave, cloud nine, plant fertilizer, among others (8, 12-16). Bath salts usually appear as a pure white to light brown powder or crystal form. Bath salt packages were sold in 50–500 mg packages, with cost ranging from \$25–50 per 50-mg packet (6).

This designer drug can be administered via the following routes: oral ingestion, nasal insufflation, injection, smoked, sublingual and rectal. “Bombing” is the term used for bath salts wrapped in cigarette paper and ingested. “Keying” is defined as placing a key into powdered salts, then insufflating off the key (2). Bath salts are most commonly administered via nasal insufflation (17).

Due to the various routes of administration and the chemical heterogeneity of bath salts, the timing and duration of its effects vary in bath salts users. *The New England Journal of Medicine* has reported that bath salts ingested orally rapidly reach a peak high at 1.5 hours, with lasting effects for 3–4 hours followed by a crash; the entire experience lasts 6–8 hours (11). The desirable high effects reported from bath salts usage include: euphoria, sexual stimulation, empathic mood, increased energy, visual hallucinations, time distortion, excessive talking and greater mental focus (18, 19). Additionally, adverse medical and psychological morbidity as well as mortality have been reported with bath salts abuse. We present a case report on a 40-year-old male with no past psychiatric history presenting with new-onset psychosis and increased risk for violence after ingesting bath salts.

Case Presentation

“Mr. B” is a 40-year-old man with no past psychiatric history, brought to the emergency room by police and

admitted to the inpatient psychiatry unit due to his recent paranoid behavior and concerns he would harm others. Mr. B’s wife reported to police that Mr. B had been acting bizarrely and recently purchased a gun with the plan to shoot neighborhood children who he believed were trespassers. He had a one-month history of increased paranoia, decreased sleep, high energy, self-mutilation (pulling out his body hairs), increased sex drive, increased spending, and increased goal directed activity. He reported a thirty-pound weight loss and reflux-like abdominal pain. He confirmed purchasing a 12-gauge shotgun, alleging trespassers on his property were “taunting” him and wanted to kill him. He reported the intruders wore camouflage clothing and clown make-up. He had also recently bought a video camera, attempting to film those he claimed were trying to harm him, created “booby traps,” and called 911 multiple times reporting trespassers.

Hospital Course

The treatment team obtained collateral information from Mr. B’s family, his friends, neighbors and local police. Once Mr. B was admitted to the inpatient adult psychiatry unit, the treatment team continued to observe high energy and paranoid delusions that others were trying to harm him. Other reported symptoms such as decreased sleep, self-mutilation (pulling out his body hairs) and increased goal directed activity were not observed during his inpatient psychiatric hospitalization. Due to continued psychotic symptoms, the treatment team suggested starting Seroquel 50 mg by mouth at bedtime; however, Mr. B declined psychotropic management. Mr. B did not require any “as needed” medications, restraints or seclusion for agitation during his hospitalization, despite continued belief that trespassers had been harassing him prior to his admission.

Significant laboratory findings included urine toxicology screen positive for marijuana and ecstasy. Mr. B admitted to smoking marijuana for fifteen years, with a frequency of approximately three times a week. Mr. B denied a history of developing tolerance or withdrawal symptoms from marijuana usage. Mr. B denied history of other illicit drug usage. Also, he denied history of significant alcohol usage. During the course of Mr. B’s hospitalization, the media announced new legislation that made bath salts illegal in Ohio. After watching news reports, Mr. B’s wife reported Mr. B had used bath salts. Mr. B later admitted to using bath salts on two occasions approximately one month prior to admission. Mr. B reported he obtained bath salts from a coworker and through the Internet.

Over the twelve-day hospital course, his psychotic symptoms improved. By the fifth day of admission, Mr. B demonstrated less persecutory delusional thinking and no

Table 1 Bath Salts Effects

Psychological Effects
Mood: depression, dysphoria, euphoria, anxiety
Thought: suicidal ideation, homicidal ideation, intensification of sensory experiences, paranoid delusions, auditory/visual/tactile hallucinations
Behavior: insomnia, increased energy, agitation, anorexia, catatonia, panic attacks, self-mutilation, self-destructive behavior, violent behavior
Physical Effects
Cardiovascular: chest pain, tachycardia, vasoconstriction, hyperthermia, diaphoresis, hypertension, palpitations, arrhythmias, myocardial infarction, myocarditis, cardiac arrest
Pulmonary: respiratory distress
Central Nervous System: headache, confusion, drowsiness, dizziness, tremors, myoclonus, hyperreflexia, seizures, stroke, cerebral edema, delirium, blurred vision, mydriasis
GI: dehydration, nausea, abdominal pain, liver failure
Musculoskeletal: muscle spasms, arthralgia, rhabdomyolysis
Renal: renal failure
Skin: skin rash, necrotizing fasciitis
Other: fever, dry mouth, epistaxis, tongue disorder, bruxism, tinnitus, increased libido, cold/blue fingers, methemoglobinemia, serotonin toxicity, death (1, 8, 11, 17, 32-34)

longer had homicidal thoughts. The treatment team consulted forensics psychiatry to assist with providing a violence risk assessment and specific recommendations on gun removal. Also, Mr. B received education on bath salts side effects and was encouraged to abstain from illicit drugs. A safety plan was discussed with patient, his family and local law enforcement based on forensic psychiatry recommendations. Mr. B was not discharged on any psychotropic medications. A follow-up appointment was scheduled after discharge to ensure continued resolution of his symptoms.

Results

The case findings revealed that bath salts abuse resulted in a sympathomimetic reaction with physical effects (abdominal pain and increased libido) and psychological symptoms including: potential to harm others, paranoia, visual hallucinations, delusions, psychosis, aggressive behavior, self-mutilation, insomnia, anorexia and increased energy.

Discussion

The dangerous reported psychological and physical effects associated with bath salts usage has increased in the literature (see Table 1). Common symptoms reported from bath salts abuse included: sympathomimetic toxidrome, agitation and psychotic symptoms (8, 23).

Our patient had a fifteen-year history of cannabis usage and no prior history of psychotic symptoms. Cannabis-induced psychotic disorder was initially considered as a diagnosis. However, a different etiology seemed more likely due to the time frame of his psychotic and sympathomimetic symptoms. Our patient's symptoms were more consistent with his recent bath salts usage due to the time frame of presentation and similar cases reported in the literature. However, the literature has reported that chronic usage of cannabis may sensitize individuals to the effects of other substances, which may have occurred in our patient (24).

Psychotic symptoms have been reported in 40% of cases where bath salts users presented to U.S. emergency departments (7). Multiple case reports have documented paranoid psychosis symptoms induced by bath salts usage (1, 3, 5, 14, 18, 19, 25, 26). While most cases reported bath salts induced psychosis to be transient, one case reported on a 26-year-old female with no prior psychiatric history or prior family psychiatric history presenting with persistent psychotic symptoms due to repeat MDPV usage via nasal insufflation (27).

Penders and Gestring reported three cases of bath salts usage that supported the diagnosis of hallucinatory delirium rather than substance-induced psychotic disorder due to the presence of attention deficits and memory disturbances (28). Kasick et al. discussed two cases of bath salts intoxication

Table 2 Medical Management for Bath Salts Intoxication

Sympathomimetic toxidrome	For all patients: vital signs, cardiac monitoring, peripheral intravenous access, fluid management, temperature control, basic metabolic panel, complete blood count and toxicology screen For chest pain, shortness of breath or tachycardia obtain EKG chest radiograph Cardiac markers can be drawn judiciously for chest pain (19)
Agitation	Creatine kinases level, benzodiazepines, antipsychotics, antihistamines
Psychotic symptoms	Antipsychotics (8, 11)

producing toxic delirium with agitated behavior (29). Toxic delirium—also known as hallucinatory delirium due to bath salts usage—has been reported to produce psychosis with visual hallucinations and congruent paranoid delusions. Excited delirium is defined as a more serious form of delirium, comprised of toxic delirium, psychomotor agitation and/or violent behavior as well as serious physical effects that can include: dehydration, rhabdomyolysis, renal failure and death (9, 30, 31).

Along with psychotic symptoms, this case report and the literature revealed an increased potential to harm oneself and others secondary to bath salts abuse. In one case a man killed his wife and himself by gunshot after a police officer attempted to pull him over for speeding. The couple's five-year-old son was discovered deceased at home. The deceased couple's toxicology report was positive for MDPV and lidocaine (7).

Due to the dangerous physical and physiological effects of bath salts usage, U.S. legislation was passed making this "legal high" illegal in many states. In July 2011, Ohio Governor John Kasich signed House Bill 64 declaring it illegal to sell or possess bath salts and this legislation took effect on October 17, 2011. Specifically, possessing or selling MDPV, mephedrone, methylone, 3-FMC, 4-FMC (flephedrone) and BK-PMMA (methedrone) are illegal in Ohio (32, 33).

On October 21, 2011 the U.S. Drug Enforcement Administration placed a one-year ban on three synthetic stimulants used to make bath salts: methylone, mephedrone, and 3,4-methylenedioxypyrovalerone (MDPV).

Possessing and selling these chemicals, or the products that contain them, is illegal in the United States as a Schedule 1 drug (6). The temporary ban on bath salts became permanent on July 9, 2012 when President Barack Obama signed the Synthetic Drug Abuse Prevention Act of 2012 banning production, sale, and possession of MDPV, mephedrone, methylone and other synthetic substances (34, 7).

Bath salts abuse treatment is comprised of supportive care to manage medical sequelae and psychiatric symptoms (see Table 2).

Judicious usage of antipsychotics should be considered due to the potential to lower seizure threshold in patients already at increased risk for seizures (3). Also, one case documented modified bilateral ECT being a beneficial treatment for persistent psychosis secondary to repeat MDPV usage (28).

Bath salts do not show up on routine toxicology screens. In this case report, the positive urine toxicology screen for ecstasy may be attributed to the concurrent usage of ecstasy. However, our patient denied ecstasy usage and admitted to bath salts usage. Another possibility for a positive urine toxicology screen for MDMA is the structural similarities between it and MDPV, although reports in the scientific literature are lacking. MDPV and mephedrone can be tested by gas or liquid chromatography/mass spectrometry. MDPV can also be detected by nuclear magnetic resonance (14, 19).

Conclusion

Similar clinical presentations of bath salts usage have been reported; however, our case report demonstrates the diagnostic challenges when a patient with new-onset psychosis does not initially admit to bath salts usage. Learning points from this case and the literature include: the importance for mental health providers to be aware of the new designer drug called bath salts; to know its physical and psychological effects; and, the legislative policy banning bath salts possession, sale and usage in the United States. Psychiatrists should consider bath salts abuse in the differential diagnosis where psychosis is new onset or clinically incongruent with the known phenomenological presentation of a primary psychotic disorder. A thorough violence risk assessment should be performed on all patients, particularly when psychotic symptoms are present due to impaired reality testing that may present. As evident in our case, inpatient psychiatric hospitalization may be required until the patient is stabilized and psychotic symptoms have improved.

Acknowledgments

This work was supported by Adult Psychiatry Department at Case Western Reserve University/University Hospitals of Cleveland. The authors would like to thank Dr. Cathleen Cerny, MD, for her assistance with editing this report. No funding was associated with this report. The authors have no conflict of interest.

References

1. Winder GS, Stern N, Hosanager A. Are "bath salts" the next generation of stimulant abuse? *J Subst Abuse Treat* 2013;44(1):42-45.
2. Prosser JM, Nelson LS. The toxicology of bath salts: a review of synthetic cathinones. *J Med Toxicol* 2012;8(1):33-42.
3. Jerry J, Collins G, Stroom D. Synthetic legal intoxicating drugs: the emerging 'incense' and 'bath salts' phenomenon. *Cleve Clin J Med* 2012;79(4):258-264.
4. Watterson LR, Kufahl PR, Nemirovsky N, Sewalia K, Grabenauer M, Thomas BF, et al. Potent rewarding and reinforcing effects of synthetic cathinone 3,4-methylenedioxypropylvalerone (MDPV). *Addict Biol* 2013;19(2):165-174.
5. Kyle PB, Iverson RB, Gajagowni RG, Spencer L. Illicit bath salts: not for bathing. *J Miss State Med Assoc* 2011;52(12):375-377.
6. Fass JA, Fass AD, Garcia AS. Synthetic cathinones (bath salts): legal status and patterns of abuse. *Ann Pharmacother* 2012;46(3):436-441.
7. Gershman JA, Fass AD. Synthetic cathinones ("bath salts"): legal and healthcare challenges. *P T* 2012;37(10):571-595.
8. Murphy CM, Dulaney AR, Beuhler MC, Kacinko S. "Bath salts" and "plant food" products: the experience of one regional US poison center. *J Med Toxicol* 2013;9(1):42-48.
9. Murray BL, Murphy CM, Beuhler MC. Death following recreational use of designer drug "bath salts" containing 3,4-methylenedioxypropylvalerone (MDPV). *J Med Toxicol* 2012;8(1):69-75.
10. Coppola M, Mondola R. 3,4-methylenedioxypropylvalerone (MDPV): chemistry, pharmacology and toxicology of a new designer drug of abuse marketed online. *Toxicol Lett* 2012;208(1):12-15.
11. Ross EA, Watson M, Goldberger B. "Bath salts" intoxication. *N Engl J Med* 2011;365(10):967-968.
12. Kadaria D, Sinclair SE. A case of acute agitation with a negative urine drug screen: a new wave of "legal" drugs of abuse. *Tenn Med* 2012;105(9):31-32.
13. Stoica MV, Felthous AR. Acute psychosis induced by bath salts: a case report with clinical and forensic implications. *J Forensic Sci* 2013;58(2):530-533.
14. Antonowicz JL, Metzger AK, Ramanujam SL. Paranoid psychosis induced by consumption of methylenedioxypropylvalerone: two cases. *Gen Hosp Psychiatry* 2011;33(6):640.e5-6.
15. Sharma TR, Iskandar JW, Ali R, Shah UR. Bath salt-induced delirium and brief psychotic episode in an otherwise healthy young man. *Prim Care Companion CNS Disord* 2012;14(2). pii: PCC.11101224.
16. Center for Disease Control and Prevention (CDC). 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(19):624-627.
17. Lajoie TM, Rich A. "Bath salts": a new drug epidemic—a case report. *Am J Addict* 2012;21(6):572-573.
18. Caffery T, Musso M, Manausa R, Everett J, Perret J. Riding high on cloud 9. *J LA State Med Soc* 2012;164(4):186-189.
19. Olives TD, Orozco BS, Stellpflug SJ. Bath salts: the ivory wave of trouble. *West J Emerg Med* 2012;13(1):58-62.
20. Gallucci G, Malik M, Khan S, Agzal N, Trimzi I. Bath salts: an emerging danger. *Del Med J* 2011;83(11):357-359.
21. Russo R, Marks N, Morris K, King H, Gelvin A, Rooney R. Life-threatening necrotizing fasciitis due to 'bath salts' injection. *Orthopedics* 2012;35(1):e124-e127.
22. Joksovic P, Mellos N, van Wattum JV, Chiles C. "Bath salts"-induced psychosis and serotonin toxicity. *J Clin Psychiatry* 2012;73(8):1125.
23. Striebel JM, Pierre JM. Acute psychotic sequelae of "bath salts". *Schizophr Res* 2011;133(1-3):259-260.
24. Gorriti MA, Rodriguez de Fonseca F, Navarro M, Palomo T. Chronic (-)-delta9-tetrahydrocannabinol treatment induces sensitization to the psychomotor effects of amphetamine in rats. *Eur J Pharmacol* 1999;365(2-3):133-142.
25. Mangewala V, Sanwar SR, Shah K, Singh T. Bath salts-induced psychosis: a case report. *Innov Clin Neurosci* 2013;10(2):10-11.
26. Thornton SL, Gerona RR, Tomaszewski CA. Psychosis from a bath salt product containing flephedrone and MDPV with serum, urine and product quantification. *J Med Toxicol* 2013;8(3):310-313.
27. Penders TM, Lang MC, Pagano JJ, Gooding ZS. Electroconvulsive therapy improves persistent psychosis after repeated use of methylenedioxypropylvalerone ("bath salts"). *J ECT* 2013;29(4):e59-60.
28. Penders TM, Gestring R. Hallucinatory delirium following MDPV: "bath salts". *Gen Hosp Psychiatry* 2011;33(5):525-526.
29. Kasick DP, McKnight CA, Klisovic E. "Bath salt" ingestion leading to severe intoxication delirium: two cases and brief review of emergence of mephedrone use. *Am J Drug Alcohol Abuse* 2012;38(2):176-180.
30. Penders TM, Gestring RE, Vilensky DA. Intoxicated delirium following use of synthetic cathinone derivatives. *Am J Drug Alcohol Abuse* 2012;38(6):616-617.
31. Penders TM, Gestring RE, Vilensky DA. Excited delirium following use of synthetic cathinones (bath salts). *Gen Hosp Psychiatry* 2012;34(6):647-650.
32. Dehner N, Rowley S. Sub. House Bill 64 Spice/K2, Bath Salts. Office of Criminal Justice Services. http://www.ocjs.ohio.gov/hb64_bathsaltsspice.pdf
33. New Law Bans Bath Salts in Ohio. <http://blog.criminalattorneycolumbus.com/2011/10/24/new-law-bans-bath-salts-in-ohio/>
34. Leonhart MM. Rule 2013 United States Department of Justice Drug Enforcement Administration Office of Diversion Control, Federal Register 2013;78(3). http://www.deadiversion.usdoj.gov/fed_regs/rules/2013/fr0104.htm