"Bath Salts"

Mephedrone, MDPV, and methylone

Increased use and mention of "Bath Salts" has triggered interest not only in the media but also with healthcare providers faced with its clinical presentation and management. It should be remembered that any drug bought on the street will usually not contain 100% pure active ingredient, and may be adulterated with a variety of active agents that can alter the clinical presentation.

Introduction

"Bath salts" is a generic term used to signify the collective group of agents being sold at local tobacco and smoke shops, truck stops, "mini-marts/convenience stores" and online. Bath salts are sold under a plethora of names which include but are not limited to 'Ivory Wave', 'Dusted', 'White Lightning', 'Charge +', 'Hurricane Charlie', 'Ocean', 'Scarface', 'Red Dove', 'Cloud 9' and 'White Dove'. Chemical analyses indicate that the three most common active ingredients include mephedrone (4-methylmethcathinone), MDVP (3,4-methylenedioxypyrovalerone), and methylone. The active ingredients have been marketed as plant food, plant growth stimulator, and even insect repellent. All three products are currently unscheduled and legal for sale in the United States. As these products are labeled "not for human consumption", they are exempt from FDA regulations as drugs. Despite being currently unscheduled, the chemicals could potentially be considered *analogues* and hence scheduled under the analogue provision of the CSA (Title 21 United States Code 813).

Pharmacology

All three compounds mentioned above are structurally and pharmacologically similar to amphetamines. Mephedrone is sold under names such as 'Meow Meow', 'MCAT', 'Rush', Ronzio', and 'plant food'. Its chemical structure is classified as a phenylethylamine, and it is a synthetic derivative of cathinone, which is the pharmacologically active alkaloid in the *khat* plant. Due to its similar chemical structure to beta-ketoamphetamines, mephedrone and MDVP can be expected to act as a CNS stimulant by increasing release and inhibiting reuptake of monoamine neurotransmitters. Mephedrone can elicit stimulant and empathogenic effects similar to amphetamine, methylamphetamine, cocaine, and MDMA making it an attractive drug of abuse. In vitro studies of mephedrone and methylone demonstrate similar activity to amphetamine. MDVP, like mephedrone, is structurally similar to cathinone. Unique to MDVP is the presence or absence of ring substituents which will alter its receptor affinity and effects. The

presence or absence of substituents will confer MDMA-like activity (euphoria, empathy, awareness of senses) or stimulant-like activity (agitation, tachycardia, seizures, hypertension) respectively. Finally, methylone is a structural analog of MDMA, also known as ecstacy, and has one-third the potency of MDMA on neurotransmitters. It demonstrates a mixed reuptake inhibiting/releasing mechanism for serotonin, norepinephrine, and dopamine. The pharmacologic effect of methylone is more similar to methylphenidate in regards to neurotransmitter reuptake versus release like amphetamine.

Formulations and Routes

These compounds are available as a white to off-white or yellowish powder or fine crystals. Most "bath salts' will be available in a powder formulation. The active ingredients may be sold as ecstacy or cocaine on the street. Chemical analyses of samples demonstrate that they may be adulterated with caffeine, acetaminophen, cocaine, amphetamine, and ketamine. The most common route of administration is insufflation or ingestion, although there are case reports of rectal and IV administration, as these drugs are highly water soluble. When insufflated, there is a rapid onset of effects within minutes, a peak of less than thirty minutes, followed by a rapid decline. Mephedrone doses in excess of 90 mg are considered a high dose, and doses in excess of 5 mg of MDVP are associated with prolonged panic attacks. When ingested, mephedrone's onset of action is around 45 minutes to two hours depending on the absence or presence of food in the gut, respectively. Psychoactive effects with ingestion typically last longer and can persist up to 4 hours. IV use of these compounds is discouraged amongst users as there is an increased addiction potential. This method of use is common in Romania where mephedrone is oftentimes combined with heroin.

Clinical Manifestations

Patients who present to the emergency department after the use of "bath salts" will most often have a sympathomimetic toxidrome. In case series reports published by Wood et al and James et al, patients who abused mephedrone presented with agitation (53.3%), tachycardia (40%), hypertension (20%), seizures (20%), palpitations (13.3%) and hallucinations/delusions. Some users will report suicidal ideation after abusing MDVP, and there is at least one reported death from suicide after MDVP abuse. Patients using mephedrone may also present with skin discoloration or cool/cold extremities. James et al. reported that 45% of patients experienced symptoms beyond 24 hours post ingestion, and 30% reported symptoms greater than 48 hours after ingestion. Due to similar chemical structure and pharmacology, MDVP and methylone can be expected to cause a similar clinical presentation.

Management

Contact with the Poison Control Center (1-800-222-1222) should provide the basis for definitive patient care. As the most common route of administration is insufflation, decontamination is unlikely to be of benefit unless there is visible powder in the nares. In such cases, a non-water soluble jelly (e.g. Vaseline) can used to swab the nares and remove the excess powder. If the product is ingested and the patient presents within an hour of ingestion, gastrointestinal decontamination with activated charcoal can be considered. There is no specific antidote for these agents. Most patients in case reports responded well to supportive care with benzodiazepines for agitation and seizures. There is no evidence to suggest that patients who abuse MDVP or methylone would respond any different to benzodiazepines. Most reports of

death secondary to mephedrone included other multiple substances detected in the patient (alcohol, cannabis, cocaine, amphetamine). Noting their pharmacology, there may be an increased risk for serotonin syndrome alongside the usual toxidrome.

The Upstate New York Poison Control Center is available 24 hours a day (1-800-222-1222) for consultation on the clinical manifestations and management of these agents.

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