

# Acute Rhabdomyolysis Following Synthetic Cannabinoid Ingestion

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## Abstract

**Context:** Novel psychoactive substances, including synthetic cannabinoids, are becoming increasingly popular, with more patients being seen in the emergency room following acute ingestion. These substances have been associated with a wide range of adverse effects. However, identification of complications, clinical toxicity, and management remain challenging. **Case Report:** We present the case of a young African-American male who developed severe agitation and bizarre behavior following acute K2 ingestion. Laboratory studies revealed markedly elevated serum creatine phosphokinase (CPK) with normal renal function. The patient was managed with aggressive intravenous (IV) fluid hydration and treatment of underlying psychiatric illness. **Conclusion:** We recommend the routine evaluation of renal function and CPK levels with early initiation of IV hydration among patients who present to the emergency department following acute ingestion of synthetic cannabinoids to identify potential complications early as well as institute early supportive therapy.

**Keywords:** K2, rhabdomyolysis, stimulant drugs, synthetic cannabinoids

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## Introduction

Novel psychoactive substances and stimulants including synthetic cannabinoids aka “spice” or “K2” and synthetic cathinones aka “bath salts” add a layer of complexity with regards to correctly identifying and managing acute substance ingestion and toxicity in the emergency department (ED). Identification of synthetic cannabinoids in biological specimens continues to be challenging<sup>[1]</sup> given metabolites are not currently included in routine drug screening tests.<sup>[2]</sup> This likely adds to their appeal among those who ingest these substances as they would be difficult or almost impossible to identify. Studies have shown that the use of these new psychoactive substances is prevalent among adolescents and young adults.<sup>[3-6]</sup> Very little is known about the acute adverse effects following the

use of these synthetic compounds or its long-term effects, more so, given the chemical composition of these drugs are constantly being changed by clandestine manufacturers.<sup>[7]</sup> Some reported effects include seizures, chest pain, vomiting, breathing problems, and psychiatric manifestations such as panic, anxiety, paranoia, hallucinations, agitation, violent behavior, psychosis, and possible dependence.<sup>[2,3,8,9]</sup> Case reports have also identified the additional complications of synthetic cannabinoid use including acute renal failure,<sup>[4]</sup> rhabdomyolysis,<sup>[10]</sup> acute delirium,<sup>[11,12]</sup> myocardial infarction,<sup>[13]</sup> QT prolongation,<sup>[14]</sup> stroke,<sup>[13]</sup> acute gastric dilation,<sup>[15]</sup> and leukodystrophy.<sup>[16]</sup> Benzodiazepines and haloperidol have been suggested to be helpful in the management of symptoms. However, there are

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no antidotes for these substances and guidelines for management currently do not exist.

## Case Report

A 27-year-old man was brought to the emergency room on account of agitation and bizarre behavior shortly after ingestion of K2. The patient arrived in the ED 2 h post ingestion. He had received 2 mg of lorazepam and 2 mg of midazolam before arrival in the ED with a resolution of behavioral symptoms. While in the ED, he denied any complaints and was unable to remember the events surrounding the reported episode. He denied syncope, seizures, or trauma to the head but said: "I felt like I was dying at the time." He also denied co-ingestion of any other recreational drug or other medications. He denied suicidal intent, saying, "I was just trying to get high. It is embarrassing." He noted a similar incident 3 months prior, also after ingesting K2 and said eyewitnesses told him that he had a seizure, but he never presented to the hospital. The medical history was significant for bipolar affective disorder (on fluoxetine and risperidone) and exploratory laparotomy 5 years ago for bowel obstruction. He was a current smoker, smoking one to two packs of cigarettes per day for the last 8 years but denied any other illicit drug use.

A review of systems was positive for sore throat, constipation, and headaches. Physical examination revealed a young male, who was calm, comfortable alert and oriented to time, place, and person. He was initially, tachycardic on presentation with a heart rate of 106, which improved to 75 after 30 min. Blood pressure on arrival was 119/84, and oxygen saturation was 98–100% on room air. The rest of his physical examination was unremarkable. Laboratory results revealed markedly elevated serum creatine phosphokinase (CPK): 18,812 (laboratory ref range: 49–397 U/L) and mildly elevated aspartate aminotransferase: 160 (laboratory ref range: 10–42 U/L). The remainder of his metabolic profile, complete blood cell count, urinalysis, serum ethanol, acetaminophen and salicylate levels were essentially normal. A urine toxicology screen was positive only for benzodiazepines. An electrocardiogram (EKG) showed a sinus rhythm with concave ST elevations and J point notch in leads I, V4, V5, V6, a pattern considered a normal variant or commonly described as early repolarization without evidence of the left ventricular hypertrophy and normal QTc = 386.

He was diagnosed with synthetic cannabinoid intoxication and rhabdomyolysis and managed with aggressive intravenous (IV) hydration with normal saline, receiving 5 L of fluid while in the emergency department (ED). He was subsequently admitted to the medicine service for further management of rhabdomyolysis. Intravenous

fluid hydration was continued at 250 ml/h and psychiatric medications were resumed. Over the next 2 days, CPK levels trended down from 18,812 to 8414, and renal function remained within normal limits.

He was discharged from the hospital after 3 days and counseled to avoid illicit drugs and synthetic stimulant ingestion.

## Discussion

We describe a patient with acute ingestion of K2 and resultant severe rhabdomyolysis with normal renal function while remaining clinically and hemodynamically stable. Rhabdomyolysis is a rare complication of synthetic cannabinoid use and requires a high index of suspicion and laboratory evaluation for early identification. Elevated CPK levels, in our patient, may have been potentiated by severe agitation prior to arrival in the ER. Given K2 ingestion has been associated with seizures and agitation these features are likely to be contributing factors for the marked elevation of CPK.

Benzodiazepines, as monotherapy, are the main-stay of therapy for the management of seizures and agitation having a toxicologic cause while phenytoin and levetiracetam are not recommended.<sup>[17]</sup>

K2 and other synthetic stimulants are being marketed under false advertising schemes and often labeled as "not for human consumption" to avoid regulatory agencies. In addition, the chemical compositions of these agents are constantly being changed, taking advantage of a loophole, in order to market them as legal alternatives to marijuana.

Several states have reported an outbreak of life-threatening symptoms and deaths among patients presenting to the emergency room following synthetic cannabinoid exposure.<sup>[11,12]</sup> This re-emphasizes the need for a thorough evaluation of patients presenting to the ED with unknown etiology for behavioral disturbance with suspected ingestion of synthetic cannabinoids.

The pathophysiology of the associated adverse effects of these new drugs is still poorly understood, and a comprehensive list of related complications does not exist at this time. Given, the constantly changing chemical composition of these designer drugs, studies attempting to identify antidotes or treatments face a challenging task. In addition, we were unable to obtain biologic confirmation of exposure to "K2" in the serum although we ordered a serum test for synthetic cannabinoids. This is not surprising, as standard drug tests are limited and cannot easily detect many of the chemicals used in these products<sup>[2]</sup> given the constantly

changing chemical composition of these substances; there is a high likelihood of false negatives.

We recommend a high index of suspicion for synthetic stimulant use among young person's presenting to the ED with behavioral symptoms of unknown etiology and comprehensive testing to identify potential complications early should be performed, i.e., a complete metabolic profile, CPK, lactic acid, toxicology screen to identify co-ingestion of other substances, EKG, and a complete blood count. We also recommend the early institution of IV hydration in patients without contraindications to IV fluids pending the availability of results; given patients with potentially life-threatening complications such as rhabdomyolysis may appear clinically well.

There is paucity of scientific evidence regarding the treatment of synthetic cannabinoid toxicity and supportive care and management of clinical symptoms are the current main-stay of therapy.

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### Conflicts of interest

There are no conflicts of interest.

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