



## Pathology/Biology Section - 2014

### G1 Two Fatalities Due to the Use of Synthetic Cannabinoids Alone

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After attending this presentation, attendees will be aware of the rise in use of synthetic cannabinoids as an alternative drug. Attendees will understand that intoxication with synthetic cannabinoids is sufficient alone to cause death and will also understand the side effects and potential pathophysiology of deaths.

This presentation will impact the forensic science community by alerting the community of the potential for death due to synthetic cannabinoid intoxication in individuals without natural disease or other drugs contributing to their death.

The first case is an 18-year-old male with a past history of depression, bipolar disorder, and possible bath salt use. He had a recent history of telling his grandfather he was buying synthetic cannabinoids because he thought it was a safe, legal drug. He was last known to be alive the prior evening with complaints of not feeling well. He was found unresponsive in bed the following morning. Scene investigation revealed two empty silver packages suggestive of designer drugs, as well as white powder, and a leafy substance.

The second case is a 26-year-old male with a past history of hepatitis C infection and prior methamphetamine use. He reportedly stopped using methamphetamine 48 hours prior. He was last known to be alive when he went to bed. He was found unresponsive in bed two hours later.

The autopsy of case 1 revealed moderate pulmonary congestion and edema. The remaining vital organs, including the heart, did not exhibit significant anatomic or histopathologic change. The autopsy of case 2 revealed marked pulmonary edema. Intravascular birefringent foreign body material was histologically demonstrated in the lungs, consistent with a history of prior intravenous narcotism. Histologically, rare bronchi exhibited changes suggestive of a diagnosis of asthma. The liver had histologically demonstrable mild to moderate chronic inflammation, including eosinophils, but was free of fatty change and fibrosis. The remaining vital organs, including the heart, did not exhibit significant anatomic or histopathologic change.

In each case, femoral blood, heart blood, vitreous, urine, gastric contents, liver, and brain were submitted for toxicological analysis. Using gas chromatography with a flame ionization detector, two separate aliquots of femoral blood from each case tested negative for ethanol, acetone, isopropanol, and methanol. For each case, a 0.5mL aliquot of femoral blood was extracted with methanol and analyzed for nine drugs of abuse using enzyme immunoassay. A 1mL aliquot of femoral blood was extracted using bicarbonate buffer (pH 11.0) and n-butyl acetate. The aliquot was then analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) for more than 150 drugs. All screening and quantitation of femoral blood for synthetic cannabinoids were performed by an external laboratory using high-performance Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). For case 1, analysis by LC/MS/MS revealed UR-144 at a concentration of 3.2ng/mL. No bath salts or other stimulant designer drugs were detected in his femoral blood, as analyzed by liquid chromatography/time-of-flight mass spectrometry. For case 2, analysis by LC/MS/MS revealed the presence of XLR-11 without quantitation. Vitreous electrolytes performed on case 2 were within normal postmortem limits.

The cause of death in each case was synthetic cannabinoid intoxication with the manner of death being accident. Documented side effects of synthetic cannabinoids include tachycardia, vomiting, central nervous system depression, seizure, hyperglycemia/hypoglycemia, hypokalemia, and arrhythmias. On scene, case 1 was found with vomit adjacent to his head. Myocardial infarction in living individuals has also been attributed to synthetic cannabinoid use. The above cases did not show any gross or histologic evidence of myocardial infarction, although this cannot be completely ruled out. Potential mechanisms of death in the above cases include central nervous system depression and arrhythmias.

Scene investigators and forensic pathologists should be aware that use of synthetic cannabinoids is increasing. These drugs are generally considered to be relatively safe and harmless by users. Currently, in many regions of the country, the drugs are also easily obtainable and relatively cheap. However, synthetic cannabinoids may not be detected on drug screens. Case 1 had a negative drug screen and the drug screen of case 2 detected cannabinoids. This case alerts pathologists that a positive cannabinoid on a



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drug screen may not simply mean the standard tetrahydrocannabinol. If synthetic cannabinoid use is suspected, the pathologist should notify the toxicology lab.

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### **Forensic Pathology, Synthetic Cannabinoids, Intoxication**