H175 Fatal Rodenticide Poisoning in Association With Synthetic Cannabinoid Use—Is It Industrial Contamination?

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Learning Overview: The goal of this presentation is to illustrate the clinicopathologic features of vitamin K-dependent antagonist coagulopathy associated with the use of tainted synthetic cannabinoids and explore a hypothesis of how the cannabinoids came to be contaminated with rodenticide.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by alerting investigators and pathologists to the potentially fatal coagulopathy that may occur with the use of synthetic cannabinoids tainted with brodifacoum, exploring a hypothesis of contamination, and discussing prospective testing to evaluate this hypothesis.

Synthetic cannabinoids have been used recreationally to mimic the psychotropic effects of marijuana, and there has been a relatively recent increase in the number of associated fatalities. These compounds are reportedly consumed as an alternative to cannabis because of accessibility, enhanced effects, and relative undetectability, among other reasons. Synthetic cannabinoids are more variable in content, potency, and function when compared to naturally occurring cannabis. Recent outbreaks of life-threatening vitamin K-dependent antagonist coagulopathy in association with synthetic cannabinoid use have been reported, affecting the states of Illinois, Maryland, Indiana, Missouri, and Wisconsin.[1]

This case involves a 33-year-old male synthetic cannabinoid user who presented to emergency medical services with complaints of hematuria and penile bleeding. The patient went into cardiac arrest before reaching a hospital and resuscitative efforts were ultimately unsuccessful. Postmortem examination identified numerous contusions on the extremities and torso, while analysis of hospital blood showed low hemoglobin (4.0g/dL) and hematocrit (13.1%) with elevated Prothrombin Time (PT of 316.3secs) and International Normalized Ratio (INR of 26.6). Internal examination revealed soft tissue hemorrhage around multiple organs, generalized organ pallor, and gastrointestinal hemorrhage. Toxicologic analysis performed on hospital blood revealed the presence of brodifacoum, a second-generation anticoagulant rodenticide. These clinicopathologic findings are similar to those recently reported in fatal and non-fatal incidents occurring across regions of the United States.

Investigations to determine how rodenticide may have been introduced into synthetic cannabinoids in these life-threatening cases are ongoing. Speculative reports of possible intentional lacing exist in the literature; it has been hypothesized that since both rodenticides and synthetic cannabinoids are metabolized in the liver, saturation of liver enzymes with rodenticide may potentiate and prolong the desired psychotropic effects of the drug.[2] A more worrisome concern is that synthetic cannabinoids are being contaminated intentionally with brodifacoum to cause death. However, a more likely hypothesis is that synthetic cannabinoids may be contaminated at the manufacturing level, during production or storage.

Due to its long half-life and consequent ability to kill after a single exposure, brodifacoum has been banned as a readily accessible, small-quantity, consumer product in the United States.[3] Brodifacoum, and others in this class (such as bromadiolone), are only available for commercial use. In contrast, in China, where most synthetic cannabinoids are manufactured, these rodenticides are widely available. In fact, reports have implicated brodifacoum second only to bromadiolone in the incidence of rodenticide poisoning in this region.[4]

The relative prevalence of accidental brodifacoum poisoning and accessibility of brodifacoum in China raise the possibility of industrial contamination of synthetic cannabinoids outside of the United States, which may produce a fatal coagulopathy. Toxicologic evaluation for brodifacoum in all cases of synthetic cannabinoid use may help to determine the extent of contamination, as low levels may be present in non-fatal or non-life-threatening cases, in addition to fatal cases of acute synthetic cannabinoid intoxication. It is recommended that all autopsy cases which test positive for synthetic cannabinoids also be screened for brodifacoum and other second-generation vitamin K-dependent anticoagulants to evaluate the extent of contamination.

Reference(s):

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4. Yan H., Zhu L., Zhuo X., Shen M., Xiang P. (2016.) Anticoagulant Rodenticide Intoxication in East China: A Three-Year Analysis. *Forensic Sciences Research*, 1:1, 22-27

Brodifacoum, Cannabinoids, Coagulopathy