

## Poisoning, Overdoses, Toxic Exposures

*It's More Than POT: The Story of a Regional Poison Center Surveillance, Medical Toxicology, and the Detection of the National Synthetic Cannabinoid Outbreak*

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Packets of synthetic cannabinoids and contents.

### Background

The national poison center movement originated in the Midwest with actions of the American Academy of Pediatrics in Chicago, Illinois, in 1972. The Missouri Poison Center (MPC) was established in 1974. The MPC and other regional poison centers are essential to the public health locally and nationally. Trends in serious poisoning outbreaks such as the release of synthetic cannabinoids have been detected by real-time electronic surveillance by specialists in poison information and medical toxicologists.



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Historically, the poison center movement began in the Midwest, with the American Academy of Pediatrics focusing on reducing deadly ingestions of aspirin in children and the first Poison Center opening in 1972 in Chicago. In the late 1970s the poison center at SSM Health Cardinal Glennon Children's Hospital was already fielding thousands of calls from citizens throughout Missouri. Fernando De Castro, MD, was the first medical director having served since 1974.

Anthony J. Scalzo, MD, (currently Professor of Pediatrics and Internal Medicine at Saint Louis University School of Medicine and lead author of this article), was named the assistant medical director in the mid-1980s while the center was seeking accreditation by the American Association of Poison Control Centers. In 1984 the center received full accreditation status as a regional poison center and congruent with this status legislation was introduced in the State of Missouri (HB 435) to establish a Poison Prevention and Treatment Network. This legislation was enacted into law in 1986 and the Cardinal Glennon Regional Poison Center was designated to serve the entire state of Missouri. Over the years, the poison center sought to stabilize its funding from the state, hospitals, and the federal government and with that diversification in funding resources the center is now known as the Missouri Poison Center which serves over six million residents of Missouri and currently manages over 59,000 calls per year.<sup>1</sup>

### Economic and Public Health Value of the Poison Center

A special report published by the Hospital Industry Data Institute (HIDI) demonstrated how the Missouri Poison Center helped Missouri residents avoid \$56 million in medical charges during 2011 alone.<sup>2</sup> The

poison center is an important element of our current health care system; not only does the MPC accept calls from the public, physicians, and other providers free of charge, but they also educate the public and health care professionals through trainings and awareness campaigns (Figure 1). A medical toxicologist is accessible to every hospital 24 hours per day without the costs of having multiple specialists on staff at each facility throughout the state. Additionally, a study performed at Saint Louis University School of Public Health showed that the center was second only to vaccines in cost-effectiveness. Poison Control Center (PCC) consultations prevented an estimated 3.26 emergency department (ED) visits per 10,000 population. Inferring from the sample to the Medicare population, PCC consultations prevented an estimated 13,741 unnecessary ED visits and costs of \$6.6 million annually.<sup>3</sup>

Poisoning surveillance functions in real-time at the Missouri Poison Center with redacted and confidential case data uploaded every 8 minutes to the American Association of Poison Control Centers (AAPCC) central office and log shipped every 15 minutes to the Missouri Department of Health. The web-based National Poison Data System software facilitates the detection, analysis, and reporting of surveillance anomalies. Over the years, poisoning prevention efforts have been evidence-based and driven by this data, focusing on all ages; not only prevention of poisoning in children with look-alike drugs and chemicals and child-resistant closures on medication bottles, but also adolescent drug abuse and overdoses, as well as medication interactions and miss-dosing of pharmaceuticals by senior citizens. Public education is a mission of the MPC. The service and value to the citizens of Missouri as well as health care providers have been immeasurable.

### Value of the MPC in Educating Health Care Professionals

The value of the MPC to society and medical professionals goes beyond the cost-savings and guidance offered in patient care. As a rotation for Pediatric



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Figure 1. Missouri Poison Center workstations with Certified Specialists in Poison Information handling emergency calls from Missouri citizens and hospitals.

Emergency Medicine (PEM) subspecialty training, Toxicology allows for PEM Fellows to gain familiarity with the assessment and management of toxicologic problems while functioning as part of a toxicology team. This allows for health care professionals in-training to acquire the knowledge required to manage poisoned patients in the emergency department, outpatient clinic or hospital setting; as well as review the basic pharmacology and pathophysiology relevant to medical toxicology. As part of a comprehensive training in toxicology, PEM fellows rotate through the MPC, where they observe Certified Specialists in Poison Information (CSPI) help hospitals and individuals to care for poisoned patients by providing optimal care and serving as a safety net for risk management. The early involvement of CSPIs in poisoning cases has prevented unnecessary emergency department visits and fast-track treatment. This opportunity allows for the health care professional to learn basic clinical toxicology principles and experience the operations of the poison center, whilst also experiencing the dynamic and interactive guidance of a toxicologist and poison information specialist.

## History of Poison Prevention in Missouri and the US

National Poison Prevention Week was started in Missouri by a pharmacist Homer A. George in the 1950s. George was concerned about nonexistent antidotes for some medicines and chemicals sold in his practice and realized that prevention was the best first aid.<sup>4</sup> A Morbidity and Mortality Weekly Report (MMWR) from the Centers for Disease Control (CDC) in March of 1986 reads as follows: “He perceived a need for greater public awareness of means to prevent childhood poisonings. In 1958, he convinced his town’s mayor to proclaim a Poison Prevention Week, then persuaded Missouri’s governor to proclaim a statewide Poison Prevention Week. Eventually, Homer George convinced his congressional representative to introduce national legislation. With assistance from the American College of Apothecaries, the American Pharmaceutical Association, and the Public Health Service (PHS), the enabling legislation was guided through the 86th Congress and signed into law by President John F. Kennedy on September 16, 1961.”<sup>5</sup>

## Results of Poison Center Surveillance Over the Last 5 to 10 Years

Fast forward a little of over 23 years from that MMWR report to November 2009 when on a routine day at the Missouri Poison Center a CSPI brought to Dr. Scalzo’s attention a call to the center from a physician who is caring for a 14-year-old adolescent boy who had ingested a substance called “K2.” There was nothing in the Poisindex® database or any on-line sources regarding “K2.” The teen was about to jump out of a fifth story window when his friends stopped him. He was hallucinating, agitated, tachycardic, paranoid, and clearly intoxicated. So, what is K2? All we knew at the time is that it was something he smoked and it looked like marijuana (Figure 1). When looking up the term “K2,” Dr. Scalzo discovered that it is second highest mountain in the world in the Karakorum Range of the Himalayas and is second to Mount Everest in elevation, but it is more treacherous to climb than Everest. That would prove to be prophetic. It was the “second” high to marijuana but would prove to be more treacherous and deadly.

After fielding several more calls over the next few weeks, the CSPI nurses and pharmacists at the center recorded a dozen cases of K2 exposures in Missouri. A supplemental redacted database of cases was setup for additional surveillance. Dr. Scalzo, as a public

health official member of the CDC Epidemiological X (EpiX) user group, reported these 12 cases of K2 toxicity. There was a common case definition of “Agitation, Hallucinations, Tachycardia, Hypertension, and Paranoia.” This information was shared nationally. He personally surveyed other major medical centers from New York, Boston, Chicago, San Diego and San Francisco, and no one had experienced more than one or two calls, or most commonly none for this substance. Soon the word spread as did the epicenter of what appears to be the release of K2 in the Midwest. Saint Louis University (SLU) Toxicology and the Missouri Poison Center team along with Christopher Long, PhD, Director of the SLU Forensic Toxicology Laboratory, partnered with the toxicology group at University of Massachusetts (UMass) where an assay for JWH018 and related synthetic cannabinoid compounds had been developed by Amanda Jenkins, PhD, and Chris Rosenbaum, MD, Toxicology Fellow. One of Rosenbaum’s mentors, Ed Boyer, MD, Toxicology at UMass and Harvard was also involved and along with Gaylord Lopez, PharmD, Director of the Georgia Poison Center in Atlanta, and one of his physicians, Sean Ragone, MD. A total of 86 patient exposures and their symptoms were cataloged and studied with SLU Institutional Review Board (IRB) and UMass IRB approval.<sup>6</sup>

The word spread around the nation and with the help of the AAPCC various poison alerts were released to educate physicians, hospitals and other health care providers about the dangers of K2, now referred to as a Synthetic Cannabinoid Receptor Agonist (SCRA). The media was also instrumental in spreading the word about the dangers of synthetic cannabinoids. In an effort to help educate the public as well as other health care professionals, Dr. Scalzo was interviewed on CBS, CNN, NBC, and numerous local and Missouri affiliates. The original K2 samples in Missouri as well as patient’s urine were tested at SLU Forensic Toxicology Laboratory, and also confirmed at UMass Toxicology Laboratory as positive by mass spectrometry for a compound called JWH018, a synthetic full-agonist for the cannabinoid receptor (CB1). The JWH series of compounds were named after the initials of their developer, John W. Huffman, PhD, Chemistry Chair at Clemson University. Dr. Scalzo personally met with Huffman in his office at Clemson in February of 2010 while attending a mid-year meeting of poison center managing and medical directors in Charleston, South Carolina. This helped



catapult the national investigation into the synthetic cannabinoid epidemic in the US.

Currently, hundreds of SCRAAs have been detected including AB-CHMINACA, which was responsible for the death on July 16, 2014, of 19-year-old Connor Reid Eckhardt from Roseville, California. Parents of Eckhardt have single-handedly educated hundreds of thousands of youth and young adults in their travels all over the country and the world. They have almost a quarter of a million followers on Facebook and the number is growing. Borne out of his passion for stopping the use of K2 and related products, on his own accord and expense, Dr Scalzo joined the Eckhardts in May 2015 to support them in making a presentation to over 3,000 youth in Alpharetta, Georgia, an affluent suburb of Atlanta. The synthetic drug epidemic affects the rich, the poor, the privileged, and the underprivileged; it's an equal opportunity "destroyer."

### The US Regional Poison Center System and the MPC at Work Today

A more recent phenomenon of synthetic cannabinoids laced with a long-acting warfarin type compound namely brodifacoum is another example of a timely crisis monitored by regional poison centers in the US, including the Illinois Poison Center where most cases have been monitored but also the MPC. Brodifacoum has been commonly used in rat poison products. As of April 2018, there have been over 150 cases nationwide mostly from Illinois, but also from Missouri, Indiana, Wisconsin, and Maryland. Patients who smoked synthetic cannabinoids presented with unexplained bleeding and at least four individuals have died.<sup>7</sup> The common link appears to be smoking synthetic cannabinoid products and many patients have tested positive in their blood for brodifacoum. The index patient who was first identified in Missouri was found to have brodifacoum in his blood and he also tested positive in the Forensic Toxicology Laboratory at Saint Louis University for a metabolite of AB-FUBINACA (another common synthetic cannabinoid). The CDC and state Departments of Health are working in a coordinated effort with toxicologists and regional poison centers to track these cases on a local, state and nationwide basis. This surveillance is yet another reason that our state of Missouri and other states should support the efforts of their poison centers.

### Conclusion

The Missouri Poison Center routinely monitors for the emergence of poisoning hazards in the state by reviewing reported exposures to discern unusual events or frequencies. The poison center can assist with acute or chronic drug exposures, including environmental or occupational cases. Clinicians are encouraged to report all adverse medication reactions, poisoning and overdose cases. Every case is important to help the MPC track and evaluate trends in poisoning and identify public health threats in our communities.

Coupled with bedside medical consultation by the Division of Toxicology at Saint Louis University and toxicologists at other academic medical centers, comprehensive poisoning care is provided to the citizens of Missouri. Thus, both patients and their physicians in medical offices, emergency departments, inpatient units, and those critically ill in Intensive Care Units are served. The MPC is available 24 hours a day by calling 1-800-222-1222 or visit the MPC website at [www.missouripoisoncenter.org](http://www.missouripoisoncenter.org) for educational opportunities.

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### References

1. Missouri Poison Center Annual Report, 2017.
2. Estimated Medical Charges Saved from Services Provided by the Missouri Poison Center. Hospital Industry Data Institute Special Report, February 2013.
3. The Value of Poison Control Centers for Medicare Beneficiaries: Measuring the Impact of Poison Center Intervention. Health Resources and Services Administration (HRSA), July 17, 2017.
4. Internet: <https://www.semissourian.com/story/2285489.html> accessed 4/25/2018
5. CDC. MMWR Morb Mortal Wkly Rep 1986 Mar 14;35(10):149-52. National Poison Prevention Week: 25th anniversary observance. Centers for Disease Control (CDC).
6. Rosenbaum CD, Scalzo AJ, Long C, Weber JA, Jenkins A, Lopez GP, Ragone S: K2 & spice abusers: a case series of clinical and laboratory findings. Clin Toxicol 2011; 49:528.
7. Centers for Disease Control (CDC): Outbreak Alert: Potential Life-Threatening Vitamin K-Dependent Antagonist Coagulopathy Associated With Synthetic Cannabinoids Use. Clinician Outreach and Communication Activity (COCA) bulletin; 4/5/2018. **MM**