K46 The Interplay Between Forensic Analysis of Seized Drug and Medicolegal Death Investigation Toxicology in the Investigation of Clinical Intoxications to Support Public Health Preparedness and Response

Barry K. Logan, PhD, NMS Labs/Center for Forensic Science Research & Education, 3701 Welsh Road, Willow Grove, PA 19090; Alex J. Krotulski, MS, Center for Forensic Science Research & Education, 2300 Stratford Avenue, Willow Grove, PA 19090; Amanda L.A. Mohr, MSFS, Center for Forensic Science Research & Education, 2300 Stratford Avenue, Willow Grove, PA 19090*

Learning Overview: After attending this presentation, attendees will be able to evaluate the benefits of an integrated approach to early identification of toxic Novel Psychoactive Substances (NPS) in forensic toxicology and seized drug casework and the rapid communication of these findings.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by describing the interconnectedness of forensic analysis of seized drug and medicolegal death investigation casework, with investigation of clinical intoxications in support of public health functions.

There are increasing demands from public health and public safety agencies for better data regarding the extent, trends, and impacts of adverse reactions to the current opioids being abused. Comprehensive chemical analysis, market awareness to inform scope of testing, data collection and management, and rapid sharing of information are all key components of ensuring that both clinical and forensic practitioners remain aware of the most current threats from novel opioids. Data from drug identifications made in seized drugs directs the generation and updating of mass spectral libraries for both point of contact screening devices, seized drug laboratories, and toxicology screening protocols. Confirmation of positive findings from toxicological testing in clinical and forensic populations can alert seized drug testing labs of the need to perform additional testing.

This study has envisioned a model of using data from seized drug testing obtained from samples at ports of entry into the United States, with data from the sample-mining and data-mining of toxicological samples from medicolegal death investigation cases, and data from comprehensive toxicological testing of intoxications in the emergency room, to rapidly identify threats to public health and prepare the relevant stakeholder groups to respond.

In July 2018, there was a mass outbreak of apparent opioid overdoses in Philadelphia, PA, on Saturday and Sunday, with more than 1,000 cases being reported. This was associated with an opioid stamp design “Santa Muerte.” Three deaths were attributed to the outbreak by the media. The cases were unusual in that once the subjects were reversed with naloxone, they displayed an uncharacteristic agitation, shaking, and tachycardia, which apparently responded to treatment with physostigmine, an antidote to anticholinergics such as scopolamine or atropine. Consequently, health alerts were sent out through the public health network about this threat from a combined opioid with anticholinergic.

The following Tuesday, a sample of the Santa Muerte product was submitted to the laboratory for testing. Analysis was performed the same day by Liquid Chromatography/quadrupole Time Of Flight/Mass Spectrometry (LC/qTOF/MS), and Gas Chromatography/Mass Spectrometry (GC/MS) using the Automated Mass Spectral Deconvolution and Identification System (AMDIS) developed by the National Institute of Standards and Technology (NIST). The material was found to contain heroin, fentanyl, and 5F-ADB, a potent cannabinoid CB1 receptor agonist. No anticholinergic drug was present. 5F-ADB can co-elute with heroin under some chromatographic conditions and use of AMDIS can be key to identifying these minor components in complex drug mixtures.

On that Wednesday, samples from one of the intoxications was retrieved and was submitted to the laboratory for testing. Those samples were tested the following day and confirmed the presence of 6-monacetylmorphine, fentanyl, and 5F-ADB. Those results were returned to the hospital, and the Philadelphia Public Health Department was notified of the findings. The findings were also communicated to the National Drug Early Warning System (NDEWS), the Drug Enforcement Administration (DEA) SYNTH-OPIOIDS list, and a pre-established list of other key national and international stakeholders.

This early alert enabled public health agencies to share this information about the toxicity of this batch of drugs with the drug-using community to assist in harm reduction and reduce the risk of further adverse events, and it allowed local crime laboratories to re-examine their chromatographic data and identify 5F-ADB in prior cases. It alerted toxicology laboratories to consider including synthetic cannabinoid testing in their investigation of apparent drug injection deaths or intoxications. It also raised awareness among medical toxicologists of the potential for synthetic cannabinoid drugs to manifest as anticholinergic intoxications, improving the potential for future treatments.

This case study showcases the importance of the interplay between toxicology and seized drug analysis, clinical and forensic stakeholders, and public health and public safety organizations in the investigation of NPS intoxications. It also reinforces the critical need for rapid and timely testing in emergent outbreaks to maximize the value of this resource.

Synthetic Cannabinoids, Novel Opioids, Early Warning Systems