**NPS Discovery – Evolution of an Open-Access Drug Early Warning System**

**Alex J. Krotulski**, Barry K. Logan

Center for Forensic Science Research and Education, United States of America

**Introduction:** NPS Discovery launched in 2018 as an avenue for rapid and timely dissemination of vital information regarding the detection of novel psychoactive substances (NPS) in the United States (US), filling the void for a program that did not exist nationally. The genesis of the program involved the development the new drug monographs which included chemical information, a brief description, and analytical data. These documents continue to serve as notification that new NPS are present in the US recreational drug supply, allowing scientists and practitioners to respond accordingly in their respective jurisdictions. Since 2018, NPS Discovery has grown exponentially to become a premier open-access drug early warning system by utilizing an evidence-based approach to lead the development of additional high impact reports for real-time action.

Also in 2018, NPS Discovery began an initiative to track emerging drug trends through the re-analysis of authentic forensic casework samples, including both biological samples and raw drug materials. This effort has continued through 2021 and has allowed for the production of quarterly trend reports for each NPS subclass and public alerts to rapidly notify stakeholders of drug threats based on increasing positivity and prevalence. In 2020, NPS Discovery unveiled two new initiatives with public health and clinical partners, showcasing newly acquired drug checking data and expanded toxicology testing on patients in emergency department settings, respectively. Most recently in 2021, NPS Discovery introduced a nation-wide, multi-jurisdictional effort to develop recommendations for scope of testing involving NPS. Additionally, our program has undertaken various research studies relating to NPS, including monitoring of drug use fora and gray market vendor sites and assessments of pharmacology and toxicity.

**Methods:** Analysis was conducted using a SCIEX TripleTOF® 5600+ quadrupole time-of-flight mass spectrometer (LC-QTOF-MS), a Waters Xevo TQ-S micro tandem mass spectrometer (LC-MS/MS), and an Agilent 5975 gas chromatography mass spectrometer (GC-MS).

**Results:** Since 2018, NPS Discovery has produced 106 new drug monographs to alert the emergence of 31 opioids, 24 cannabinoids, 24 stimulants, 13 hallucinogens, 6 benzodiazepines, 6 opioid precursors, and 2 miscellaneous drugs. Trend analysis in forensic samples has shown the emergence and proliferation of new generations of opioids linked to scheduling of fentanyl-related substances. Beginning in 2020, an exponential increase in benzodiazepine positivity was observed, with high rates of incidence with fentanyl and other opioids. Turnover of cannabinoids had continued, leading up to the recent detection of new generation cannabinoids post Chinese class-wide scheduling. Changes among stimulant and hallucinogen subclasses were observed to be slower and less volatile.

**Conclusion:** Pairing of data from public health and public safety realms has allowed NPS Discovery to triangulate knowledge and information in manners not previously available in US. While our program was initially designed with forensic toxicology workflows in mind, it has suited well for analysis of samples collected among other field of forensic science and other fields outside of the forensic space. Additionally, the NPS Discovery model and its associated reports are now consumed internationally for comparison of global drug markets and over NPS impacts.