W21 A Decade of Designer Drugs: Lessons Learned and Future Directions

Donna M. Papsun, MS, NMS Labs, Willow Grove, PA 19090-2910; Barry K. Logan, PhD*, NMS Labs, Willow Grove, PA 19090; Michael H. Baumann, PhD*, Intramural Research Program, National Institute on Drug Abuse, National Institutes of Health, Baltimore, MD 21224; Michael B. Gatch, PhD*, University of North Texas Health Science Center, Fort Worth, TX 76107; Alex J. Krotulski, MS*, Center for Forensic Science Research & Education, Willow Grove, PA 19090; Christopher Moraff, MS*, Temple University, Philadelphia, PA 19122; Amanda L.A. Mohr, MSFS*, Center for Forensic Science, Willow Grove, PA 19090; Marilyn A. Huestis, PhD*, Huestis & Smith Toxicology, LLC, Severna Park, MD 21146; Jennifer Bonetti, MS*, Virginia Department of Forensic Science, Norfolk, VA 23510; Aaron Urbas, PhD*, National Institute of Standards and Technology, Gaithersburg, MD ; Donna M. Iula, PhD*, Cayman Chemical, Ann Arbor, MI 48108; Robert A. Middleberg, PhD*, NMS Labs, Willow Grove, PA 19090*

Learning Overview: After attending this workshop, attendees will be able to: (1) discuss current and past trends in Novel Psychoactive Substances (NPS); (2) describe and explain the means by which new substances are assessed for their potency and toxicity; (3) identify resources and strategies for the investigation of NPS toxicity outbreaks and impacts on user populations; (4) assess the available analytical techniques for resolving the identity of positional isomers of new drugs; and (5) apply best practices in the use of standard reference materials and proficiency testing for forensic NPS casework.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a ten-year perspective on how forensic and research sciences responded to the phenomenon of designer drugs, later NPS, the tools and workflows that have been developed, current approaches to evaluating drug toxicity, the impact of NPS on drug user behavior, and best practices for the future identification of structural identity and detail of newly emergent substances.

The emergence of novel stimulants mephedrone and methylone in 2007, followed by the first wave of synthetic cannabinoids in 2008, marked the outbreak of the “designer drug” phenomenon. Due to the number of terms used to refer to the different substances, including “legal highs”, K2, Spice, “bath salts,” and others, the scientific community agreed to refer to emergent substances as Novel Psychoactive Substances or NPS.

Attempting to agree on a universal term for emergent substances was the first of many challenges associated with NPS, and the field still struggles with consistent naming. The large number of substances are diverse in terms of their effects and chemistry, and this has created significant analytical challenges resulting from unavailability of standard reference materials and availability of the necessary technology. There have also been significant impacts on drug user practices and behaviors as a result of the changing market.

This workshop will begin with an overview of the challenges, successes, opportunities, and future threats posed by NPS and will introduce the tools and workflows that have developed to more quickly identify new substances and their potential harms, including *in vitro* and *in vivo* studies that help categorize new substances and their potency and toxicity, that are essential to decisions about scheduling these substances. Later presentations will cover examples of how investigators and laboratories have mobilized to respond to the investigation of NPS toxicity outbreaks and how the analytical data are used to support public health measures. Other speakers will provide perspective on how the lack of consistency in the drug supply have led users to change their behavior and take precautionary measures in their drug procurement and how successful or otherwise these strategies have been. While analytical methods are now becoming well established for many types of NPS detection, identifying the absolute configuration of the drug analogs is now receiving more attention, and the latter part of the workshop will assess emerging analytical techniques for resolving the identity of positional isomers of new drugs. The last part of the program will look at how the forensic community and their partners have addressed issues of rapid access to standard reference materials and expanding proficiency testing programs, including NPS detection.

Novel Psychoactive Substances, Designer Drugs, Emergent