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| ***Project Title*:** Real-Time Sample-Mining and Data-Mining Approaches for the Discovery of Novel Psychoactive Substances (NPS) | |
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**Tracking and Disseminating Data on Novel Psychoactive Substances (NPS) through NPS Discovery's Drug Early Warning System**

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Novel psychoactive substances (NPS) continue to increase in prevalence in the United States. Constant turnover of these drugs is a concern due to unknown effects and toxicity. Many laboratories may not have the resources to stay current with NPS trends which means a central authority is needed to provide assistance and guidance. To that end, and with NIJ funding, the Center for Forensic Science Research and Education (CFSRE) developed NPS Discovery – a drug early warning system – in 2018 to streamline the identification of emerging NPS and to disseminate important information to stakeholders.

The CFSRE's NPS Discovery program monitors NPS through sample-mining and data-mining analytical techniques. The sample populations that feed these workflows are facilitated through collaborations with medical examiner and coroner offices, crime laboratories, police departments, hospitals, and other public health and safety agencies, and include raw drug materials and toxicology specimens. Additionally, our program monitors online resources (e.g., gray market sites, drug use forums) for newly emerging NPS.

NPS benzodiazepines, while the smallest subclass in terms of newly discovered drugs, are the most prevalent subclass of NPS observed in toxicology samples, accounting for approximately 50% of positivity. Beginning around early 2022, a sharp increase in positivity for etizolam and flualprazolam were observed, often in combination with opioids. Since 2020, etizolam has remained the most encountered NPS benzodiazepine, while the positivity of flualprazolam has fluctuated. During this time, notable detection increases for clonazolam, flubromazepam, flubromazolam, and bromazolam have been observed, albeit with less frequency.

NPS opioids are the second most prevalent subclass observed, accounting for approximately 20% positivity in toxicology samples. In early 2020, isotonitazene was the most prevalent synthetic opioid encountered, but was quickly replaced by brorphine in mid-to-late 2020 and then by metonitazene in early 2021. This

demonstrates the quite pace of the current NPS opioid market, with drug that have similar to higher potency than fentanyl. The only fentanyl analogue observed during this time with noted prevalence was fluorofentanyl, although its characteristics are atypical for an NPS. Other NPS opioids to emerge more recently include *N*-pyrrolidino etonitazene, protonitazene, and etodesnitazene.

NPS stimulant and hallucinogen positivity has remained static in the last several years with one drug dominating the market at a given time. Eutylone was the primary NPS stimulant between 2020 and 2022, however, it was recently replaced following international control and now the prevalence and positivity of *N*,*N*-dimethylpentylone are skyrocketing.

The synthetic cannabinoid subclass of NPS has changed the most in recent years due to a class-wide ban implemented by China. This ban has caused a significant reduction in positivity in 2022. MDMB-4en-PINACA has been the most prevalent synthetic cannabinoid observed, followed by ADB-BINACA and others. Much uncertainty remains for this NPS subclass.

NPS – the drugs themselves and their subclasses – are not created equal. Emergence, prevalence, and other characteristics vary greatly from drug to drug and among the subclasses themselves. Laboratories and scientists must remain abreast to ever-changing drug trends and impacts (e.g., chemistry, pharmacology). NPS Discovery strives to collect and share this data and information.