K47 A Comparison of Novel Psychoactive Substances (NPS) Positivity in Postmortem Investigations, 2019–2020

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Learning Overview: The goal of this presentation is to provide attendees an overview of the fluctuations and new trends related to NPS in Postmortem (PM) forensic investigations submitted to a large reference laboratory between January 2019 and June 2020, with focus on the most relevant NPS classes: Novel Synthetic Opioids (NSOs), Designer Benzodiazepines (DBZDs), synthetic stimulants, and Synthetic Cannabinoids (SCs).

Impact on the Forensic Science Community: This presentation will impact the forensic science community by helping attendees to be able to identify those NPS emerging in the illicit drug market in the United States during 2019 and the first half of 2020. Additionally, demographic data as well as concentration levels from different PM cases will be provided as a reference for the forensic science community.

NPS have been steadily emerging on the illicit drug scene since 2008. Illicit manufacturing of different classes of NPS and the alarming increase of NPS-related overdoses over the past decade have raised the need of investing efforts to constantly monitor their appearance, elucidate pharmacological aspects, and implement drug-control policies. Changes in trends in NPS are difficult to predict, and they usually are subject to demographic, economic, and social aspects. For instance, it is expected that the international and national restrictions due to the global coronavirus disease pandemic have had an impact on NPS market flows.

Tracking NPS occurrence, mapping their prevalence, and developing methods using advanced mass spectrometry-based techniques have been essential components of the work in the laboratory to understand NPS use. The laboratory has addressed this problem by expanding its screening libraries to include those novel compounds emerging in the drug market and monitoring their prevalence with subsequent development and validation of confirmatory analytical methodologies. In this study, a comparative analysis between a six-month period January–June 2019 and 2020 was performed focused on NPS-related PM cases. A total of 2,293 NPS-positive identifications within the DBZDs, NSOs, SCs, and synthetic stimulants classes were confirmed in 1,931 PM blood samples. In the first half of 2019, 810 NPS were confirmed in 637 PM blood samples against 1,483 NPS in 1,294 PM blood samples analyzed in the same period in 2020. Interestingly, the positivity of DBZDs was higher than that for NSOs (61% vs. 23%), while in 2019, NSOs surpassed DBZD positivity by almost the same difference (62% vs. 21%). In 2020, within the cases associated to DBZDs, flualprazolam accounted for 58%; it surpassed etizolam (33%), which had been the most frequent finding within this class for the past four years. Furthermore, flualprazolam positivity increased near three-fold by May compared to February, where the highest % increase (relative to 2019) was reached by DBZDs (607%).

As with DBZDs, % increase of synthetic stimulants remained positive over the six months in 2020, with the highest % increase in April (430%) and the lowest in January (22%); eutylone accounted for 84% of these cases followed by alpha-PHP/alpha-PiHP (11%). Within the SCs, 4F-MDMB-BINACA and 5F-MDMB-PICA remained the most prevalent within the scope of testing, although a steady decrease was observed from January to June 2020 with a 116% increase and -52% decrease, respectively.

NSOs, which had been the most prevalent NPS class in recent years, has declined in total positivity confirmations in 2020. Also, while NSO confirmations (excluding acetyl fentanyl) doubled between April and May in 2019, the opposite was observed in 2020; the largest difference was observed in May with a % decrease of -69. Carfentanil has had a steady prevalence in the illicit drug market since its emergence in 2016 and, within the NSO class, carfentanil has been the most abundant finding in 2020 (29%). U-47700, 3-methylfentanyl, 2-furanylfentanyl, and para-fluoroisobutyrylfentanyl, first identified between 2016–2017, are still involved at low frequencies in PM cases. Additionally, two new NSOs, differing from the typical 4-anilidopiperidine core of the fentalogs, isotonitazene and brorphine, emerged in 2019 and 2020, respectively. Furthermore, isotonitazene accounted for 30% of positive NSO-involved PM investigations in the first half of 2020.

The factors affecting the observed fluctuations in NPS use in both periods (2019 and 2020) remains unclear, however, the data shown in this study reveal that not only are "old" NPS are still around, but also that this phenomenon keeps evolving toward the use of increasing breadth and variety of substances, with an increase in DBZDs and synthetic stimulant use, and the emergence of non-fentanyl -elated opioids.

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