K49 Fringe Analogs: The Emergence of New Synthetic Drugs in Postmortem Cases in Miami

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Learning Overview: After attending this presentation, attendees will better understand new synthetic compounds that are becoming more prevalent in postmortem casework, specifically in Miami-Dade County, FL. Attendees will also gain an understanding of the difficulty in detecting these compounds, especially if they are not normally targeted in traditional drug screens.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by introducing novel compounds that for the first time have been implicated in the cause of death in decedents in Miami-Dade County and Collier County, FL. Furthermore, this presentation will inform the forensic science community of the potential increase in dissociative hallucinogens and analogs of methylphenidate as drugs of abuse.

Since 2011, the Miami-Dade County Medical Examiner Department (MDME) has been detecting synthetic drugs in postmortem cases, specifically synthetic cathinones, cannabinoids, benzodiazepines, and most importantly, fentanyl/opioids. In recent years, analogs of compounds not frequently abused in Miami, such as arylcyclohexylamines (ketamine, phencyclidine) and methylphenidate, have emerged throughout the United States. To improve the detection of these various fringe analogs, the MDME has implemented a targeted drug screening/confirmation method into routine postmortem casework using an Ultra High-Performance Liquid Chromatograph (UHPLC), coupled to an Ion Trap-Mass Spectrometer (Ion Trap-MS). This data-dependent method utilizes a Scheduled Precursor List (SPL), retention time matching, and an in-house library built with certified reference materials for the purposes of identification. The SPL contains both a targeted molecular ion and daughter ion for each compound for the purposes of MS^2 and MS^3 spectral fragmentation. In addition, all library entries contain a full-scan MS, MS^2, and MS^3 spectral profile for each compound.

Currently, three analytes that can be classified as fringe analogs—3-Methoxy-PCP, 4-Methoxy-PCP, and 4-Fluoromethylphenidate—were added to a previously validated method that targets designer analogs. Limits of detection in extracted whole blood were established for these three analogs, at 0.5ng/mL, 1ng/mL, and 1ng/mL, respectively. All case samples analyzed using this method were postmortem whole blood specimens, extracted using mixed-mode solid phase extraction columns. All case samples were initially screened on a Gas Chromatograph coupled to a Mass Selective Detector (GC-MSD). Since the beginning of 2018, three cases screened positive for at least one of the three fringe analogs added into the targeted method. Further detail of the analog detected, and other case information, is shown in the table below.

Case #	History	Analog(s) detected via LC-Ion Trap-MS	Analog(s) detected via GC-MSD	Cause of Death	Manner of Death
1	Found unresponsive in bed by family members. Had history of illicit drug use.	3-Methoxy-PCP	3-Methoxy-PCP	Multiple Drug Toxicity (3-Methoxy-PCP included)	Accident
2	Unrestrained driver that collided with a bus. Had used illicit drugs in the past.	3-Methoxy-PCP	None	Blunt Injuries of Torso	Accident
3	Found unresponsive. History of illicit drug use.	3-Methoxy-PCP, 4-Fluoro methylphenidate	4-Fluoro methylphenidate	Pending Toxicology	Pending

Because potency and potential toxic concentrations are unknown for these compounds, sensitive and targeted methods are ideal. The increased presence of these new synthetic drugs has led to the development of additional methods at the MDME, both for the purposes of quantifying these compounds, and adding other related analogs to the current UHPLC-Ion Trap-MS targeted screening method. With further studies and testing, more definitive conclusions can be drawn from this handful of unique compounds emerging in the Miami synthetic drug scene.

3-Methoxy-PCP, 4-Fluoromethylphenidate, Postmortem Toxicology