K49 The Detection of Kavain in Powder: Death Scene Evidence and Postmortem Blood Analysis

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Learning Overview: The goal of this presentation is for attendees to accrue insight into the analytical identification of kavain in a non-biological evidence sample recovered from a death scene and in the case-corresponding postmortem blood obtained at autopsy.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by underscoring the importance of strong collaborative working relationships between medical examiners and toxicology laboratories in facilitating death investigations that suspect novel or non-routine chemical compounds.

Case History and Circumstances: A 56-year-old male was found dead in his secure bedroom by his housemate, who also reported a history of alcoholism with recent detoxification program participation. The decedent's former spouse reported his experimentation with kava and kratom. The scene investigation revealed bloodstains in the bathroom leading into a disheveled master bedroom. The decedent was nude and collapsed next to the bed. Multiple envelopes of a yellow powdery substance were discovered on several room surfaces; likewise, numerous similar plastic bags were located in bedroom dresser drawers. Several old prescription medications were found to include: gabapentin, temazepam, clonazepam, lisinopril, mirtazapine, and sildenafil. A ceramic soap holder in the bathtub was broken, noting sharply edged pieces in the wet bathtub with a bloody towel. Non-velocity blood spatters and smears were noted on the bathroom and bedroom floors and walls.

Methods: Autopsy specimens submitted for toxicological analyses included iliac blood, urine, and vitreous humor; a tan-colored powder in a plastic bag recovered from the scene was submitted for non-biological drug identification analysis. The toxicology analyses entailed Headspace/Gas Chromatograph/**Flame Ionization Detector** (HS/GC/FID) for volatile compounds and a comprehensive drug screen in blood following organic extraction and analysis by Liquid Chromatography/quadrupole Time-Of-Flight/Mass Spectrometry (LC/qTOF/MS). A urine drug screen for 28 drugs/drug metabolites was conducted following enzymatic hydrolysis and Supported Liquid Extraction (SLE) by Ultra Performance Liquid Chromatography-Tandem Mass Spectrometry (UPLC-MS/MS). Confirmatory quantitative analyses for gabapentin (gabapentin d_{10} as IS, Lower **Limit of Quantification** [LLOQ] 0.5mcg/mL) and mirtazapine (mirtazapine d_3 as IS, LLOQ 2.5ng/mL) were achieved by UPLC-MS/MS. For the analyses of kava in the non-biological powder and blood, the laboratory adopted a three step strategy: (1) identification and procurement of available certified reference standards for compounds in the kavalactone class, (2) analysis of the non-biological powder for the kavalactone compounds, and (3) analysis of the postmortem blood specimen for the compound(s) detected in the non-biological powder. Kavalactone compounds monitored by UPLC-MS/MS were kavain, methysticin, and yangonin. All kavalactone analyses were completed qualitatively.

Results: The non-biological powder was positive for the presence of kavain. Gabapentin (3.3mcg/mL), mirtazapine (96.9ng/mL), and kavain (qualitative) were detected in iliac blood. Mitragynine was presumptively identified by LC/qTOF/MS and quantitatively confirmed (180ng/mL) by a reference laboratory. Urine revealed the qualitatively positive result of 7-aminoclonazepam. The cause of death was mixed drug toxicity with kavain, mitragynine, gabapentin, and mirtazapine. The manner of death was accident.

Discussion: In the United States, kavain is available without a prescription as a dietary supplement, while in Europe it is prescribed as an antidepressant or muscle relaxant. The psychoactive effects may include mild sedation or stimulation and euphoria. Mitragynine demonstrates stimulant properties at low dose; however, at high dose, psychosis, hallucination, delusion, and confusion may occur.

Conclusion: The decedent's mitragynine blood concentration is consistent with reports of fatal cases wherein it is detected with at least one other drug. Although the concentrations of gabapentin and mirtazapine appear benign, the combination of kavain and mitragynine may potentiate lethal central nervous system toxicities.

Kavain, Toxicology, Blood

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