K22 An Assessment of the Stability and Degradation of Mephedrone in Solvents and Biological Matrices

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After attending this presentation, attendees will better understand the matrices and storage conditions in which mephedrone is most stable. This will be of benefit in the interpretation of toxicological samples suspected of containing this drug.

This presentation will impact the forensic science community by providing stability information resulting from a quantitative 30-day study evaluating how long mephedrone can be detected in its parent form in working solutions, blood, and urine at three storage temperatures. The results of this study will allow toxicologists to more accurately analyze both clinical and postmortem samples containing mephedrone.

Synthetic cathinones are structural analogs of cathinone, the active substance in the *Catha edulis* (Khat) shrub that is indigenous to the Middle East and East Africa. Although once marketed as "legal highs," many countries passed legislation restricting the usage of synthetic cathinones. However, they continue to appear in forensic casework, so their accurate analysis in case samples is critical. Current literature recognizes the instability of some synthetic cathinones and even cathinone itself but offers little information about degradation products and pathways as well as long-term stability in working solutions and biological matrices. This research investigates the stability and degradation of mephedrone (4-methylmethcathinone, 4-MMC) in methanol, acetonitrile, human whole blood, and urine at 21°C (room temperature), 4°C (refrigerator), and -20°C (freezer) temperatures over 30 days.

Solutions of mephedrone in each of the four matrices (1mg/L) were divided into aliquots (100µL, solvents; 1.2mL, biological matrices) and stored in triplicate at each temperature for extraction and full-scan GC/MS analysis on days 0, 3, 7, 14, and 30. At room temperature, mephedrone in samples decreased in concentration by over 30% by day 3 and by 88% by day 30. At 4°C, over 50% of mephedrone experienced degradation from its parent form in methanol. In contrast, samples stored in acetonitrile suffered a 30% loss by day 30 at room temperature, demonstrating significantly higher stability than in methanol. In human whole blood, samples lost over 95% of their original concentration at room temperature and approximately 25% in the refrigerator and freezer. In urine, samples lost over 40% of their concentration by day 30. GC/MS and LC/TOF were used to elucidate the structures of possible degradation products.

This information regarding stability significantly influences the toxicological analysis of forensic case samples in the context of postmortem samples as well as clinical samples involving suspected driving under the influence (DUI) and drug-facilitated sexual assault (DFSA) using mephedrone. Because working solutions and biological samples experience varying rates of degradation, it is crucial to take the stability of mephedrone in both contexts into consideration when reporting concentrations and drawing conclusions from data resulting from analysis of case samples. This stability information also allows more accurate interpretation of samples retroactively tested in cases where mephedrone was not initially a drug of interest.

Mephedrone, Stability, Degradation