## K53 New Trends in Lysergic Acid Diethylamide (LSD) Use and Recommendations for Analysis

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**Learning Overview:** After attending this presentation, attendees will be better informed regarding the prevalence of LSD in postmortem and human performance casework. The expansion of novel LSD analogs will also be discussed.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by raising awareness of increasing LSD trends and the importance of having methods in place for sensitive screening and confirmation analyses.

The 1960s were the time of hippies, tie-dye, and LSD. Arguably, this drug defined mainstream recreational drug use of the era with its hallucinogenic effects. While new legal restrictions diminished its popularity in the 1970s, an apparent comeback appears to be on the horizon with more analogs and higher potencies. Over the past five years, the Armed Forces Medical Examiner System–Division of Forensic Toxicology (AFMES-DFT) has observed an upward trend in the detection of LSD in blood and urine specimens. In 2018, 46 cases were confirmed positive for LSD and/or the primary metabolite 2-oxo-3-hydroxy-LSD, as compared to 32 cases from 2015 to 2017. As of July 2019, 34 have already been reported positive, putting this year on track to set a new high if this trend continues.

For screening large batches of casework, it is efficient to use a sensitive LSD immunoassay kit. An immunoassay kit is used at AFMES-DFT that has a Limit Of Detection (LOD) of 0.5ng/mL. Using a 1ng/mL LSD concentration for 100% activity at the decision point, the primary metabolite 2-oxo-3-hydroxy-LSD was calculated to retain only 9% cross-reactivity at the same concentration. This could lead to false negative screens if only the metabolite is present without parent LSD. However, the metabolite is often ten-fold more concentrated than the parent, so the screen may still be successful even with low concentrations of LSD.

With new analogs coming on the market, immunoassays become even more useful to a toxicology lab. LSD analogs all share a similar structure to LSD, with modifications at the N-1 or N-6 positions or substitutions for diethylamide. These analogs can cross-react on an immunoassay and elicit a positive response if at a high enough concentration. Several commercially available reference standards for these analogs were purchased and characterized with the following cross-reactivities: AL-LAD (12%), ETH-LAD (16%), LSZ (18%), 1B-LSD (57%), 1P-LSD (60%), and ALD-52 (83%). This level of cross-reactivity could lead to a number of unconfirmed positive cases if these analogs are not included in the confirmatory testing panel.

A proposed recommendation to prevent this discrepancy is to have a hallucinogenic screening panel targeting LSD, 2-oxo-3-hydroxy-LSD, and their analogs as an escalated testing option when there are clear signs of intoxication without any positive result from routine panels. This can be implemented by using immunoassays, Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), or LC/Time Of Flight/Mass Spectrometry (LC/TOF/MS) analysis. At minimum, one form of analysis should be used on suspected cases.

Case histories may prove especially useful when indicating which cases should proceed to this testing. Examples of indicative histories from casework include those who were running naked through traffic or jumping off buildings with the belief they had the ability to fly. This makes it extremely important for requesting agencies to provide more detailed descriptions about patient behavior in the histories to aid in targeted laboratory testing. It is even more important for labs to test for not only LSD, but also its analogs as their popularity will only continue to increase. Failure to implement appropriate testing for LSD will result in missing confirmations, reporting numerous cases as falsely negative, and underestimating the prevalence of LSD in the community.

**LSD, NPS, Screening**



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