K54 Simultaneous Analysis of Opiates and Acetaminophen With Noscapine Monitoring

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After attending this presentation, attendees will learn about a novel liquid extraction solvent and acquisition cycle for determining opiates in forensic toxicology specimens. This extract is suitable for analysis by Liquid Chromatography with Tandem Mass Spectrometry (LC/MS/MS) to measure various common opiates, along with acetaminophen as a co-compound and monitoring of noscapine as an alkaloid contaminant from illicit morphine preparations. The procedure is a robust and sensitive method for routinely evaluating blood, stomach, urine, and vitreous humor for evidence of opiate use and abuse. The audience will also learn about the opiate levels commonly found in postmortem death investigations, DUI suspects, and sexual assault victims. In addition, heroin deaths involving related concentrations of 6-monoacetylmorphine, codeine, and morphine will be reconciled with the presence of noscapine.

This presentation impacts the forensic science community by distinguishing a new way to analyze opiates with advantages on enhanced recovery, preparation economy, time savings, and signal stability. Since implementing this procedure over the last year, not one analytical run failed to meet acceptance criteria. Sample volumes have been reduced by half, turnaround times have been decreased, and more information is obtained without a separate extraction for acetaminophen analysis. These benefits raise services for clients in the community and help to achieve goals for laboratory accreditation.

Opiates are an important category in forensic toxicology for their prevalence in impaired drivers and overdose deaths. Another factor often overlooked is that acetaminophen is a toxicologically significant drug frequently compounded with hydrocodone tablet preparations. Although Solid Phase Extraction (SPE) purifications are a useful way of obtaining clean drug extracts for instrumental analysis, acetaminophen recovery suffers greatly. A multiple-targeted analysis of opiates consisting of morphine, hydromorphone, oxymorphone, codeine, oxycodone, 6-monoacetylmorphine, acetaminophen, and hydrocodone combined with noscapine monitoring using a modified Liquid-Liquid Extraction (LLE) has been developed. The simple LLE method utilizes a mixture of organic solvents consisting of isopropyl alcohol, isoamyl alcohol, and 1-chlorobutane for extraction to yield enhanced recovery that saves money and time.

In the LC/MS/MS acquisition method, two separate mass spectroscopy segments were utilized to improve the detection sensitivity, while short dwell times were used for acetaminophen transitions to lower sensitivity in adjusting for its relatively high concentration scale. The opiates follow a linear curve fit from 10ng/mL to 2,000ng/mL with a corresponding curve range of 1mg/L to 200mg/L for acetaminophen. The 15-minute chromatography gradient cycle allows for clean separation of all analytes, especially morphine and hydromorphone as well as codeine and hydrocodone, which are isobaric pairs that can interfere with each other in qualitative and quantitative confirmations.

This method has many benefits for the toxicology laboratory at many levels. Extraction analysts find the process to be faster and easier than SPE protocols. Instrument data processors report stronger responses with sharp peaks, linear curve fits, and quality controls in good agreement with expected outcomes. Laboratory managers realize successful sequential analytical runs decrease turnaround time, which reduces the burden on consumable budget, and provides more data using less specimen. Overall, this method has been validated as a superior process for routine forensic toxicology opiate analysis.

Opiates, LC/MS/MS, Toxicology

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