K35 LC/MS/MS Determinations of Hydrocodone and Hydromorphone in Oral Fluid, Urine, and Hair After Short-Term Therapy

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After attending this presentation, attendees will learn about LC/MS/MS-based opiate confirmation method in specimens from a subject who took hydrocodone over a few days for post-surgical pain.

This presentation will impact the forensic science community by providing a clearer view for interpreting forensic toxicology casework by distinguishing the profile of a therapeutic user versus one who abuses their medication.

This presentation illustrates a controlled system of how therapeutic doses of hydrocodone is distributed and detected in oral fluid, urine, and hair specimens. Attendees will learn about an LC/MS/MS-based opiate confirmation method in specimens from a subject who took hydrocodone over a few days for postsurgical pain. A comparison and contrast of these amounts will be made with those observed in DUI and DFSA casework.

Hydrocodone is a semisynthetic opiate indicated for acute and chronic pain relief. The hepatic enzyme CYP2D6 transforms it into hydromorphone and other metabolites, which follows an average serum half-life of 3.8 hours. Due to its side effects such as euphoria, sedation, and availability, hydrocodone is now one of the most commonly abused prescription drugs. It has become a common analyte in forensic toxicology confirmations, as well as controlled substance submissions from diversion and illicit use.

Most opiates are easily detected by immunoassay screens in blood, oral fluid, or urine. Modern techniques such as LC/MS/MS are very sensitive and selective in distinguishing hydrocodone from other opiates and determining the concentration. Therapeutic hydrocodone concentrations in blood typically range from 0.01-0.03 mg/L, rise to 0.10-0.20 mg/L in abusers, and plateau around 0.30-0.40 mg/L in cases of acute fatal overdose. Urine levels can be more difficult to interpret due to the inherent influences of diet, excretion patterns, and other factors.

Data on a subject who took therapeutic amounts of hydrocodone over a span of a few days will be presented. The times of doses and specimen collections were recorded and reconciled with confirmations by LC/MS/MS without an initial immunoassay screen. The extraction method for urine is a solid-phase extraction, whereas our oral fluid and hair extractions are simply diluted and filtered samples. Each type of curve provides reportable concentrations between 10 and 2,000 ng/mL. The limit of quantitation is 10 ng/mL, while the limit of detection is an administrative cutoff at 5 ng/mL.

For the therapeutic user in this case, the concentrations of hydrocodone in oral fluid remained between 0.001-0.01 mg/L, while hydromorphone levels remained at an undetectable level. In urine, hydrocodone levels were 0.01-0.50 mg/L and hydromorphone levels were within the range of 0.002-0.003 mg/L. When normalized to dosing and time, the hydrocodone and hydromorphone levels displayed a consistent ratio of concentrations between each other. In distinction, a retrospective analysis of hydrocodone in DWI and DFSA urine specimens gave hydrocodone concentrations from 0.02-73 mg/L and hydromorphone levels of 0.005-0.69 mg/L.

Hair was also examined, where the therapeutic user began submitting haircut specimens after three weeks and continued to provide clippings each week thereafter. In a sense, it is a reverse segmental analysis because the most distal ends opposite the root were sampled each week for opiate contents. Results showed an initial 25 pg/mg concentration at 18 days, which gradually peaked at 71 pg/mg after 52 days and rapidly declined in the following weeks.

These results support this methods for analyzing opiates in oral fluid, urine, and hair by LC/MS/MS. The data also provides a clearer view for interpreting forensic toxicology casework by distinguishing the profile of a therapeutic user versus one who abuses their medication. **LC/MS/MS, Hydrocodone, Hydromorphone**

 ** Presenting Author*