K45 6-Acetylmorphine in Hair: Self-Reported Heroin Users Not Considered Positive Using Proposed Federal Guidelines

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After attending this presentation, attendees will learn the metabolic profile of heroin in hair specimens and understand the proposed Federal Guidelines for testing opiates in hair.

Guidelines and proposals are sometimes implemented without adequate regard for the relevant science. This presentation will impact the forensic community and/or humanity by showing that a significant number of admitted heroin users would not be considered positive under workplace testing rules if the proposed requirement for the presence of morphine is implemented.

Methods: Heroin abuse is associated with adverse health conditions, including fatal overdose, collapsed veins, and, when injected, infectious diseases, including HIV/AIDS and hepatitis. The central nervous system is depressed following heroin intake, and mental functions are generally impaired. Long-term effects include heart infections, abscesses and liver disease. Pulmonary complications may result from the poor health condition of the abuser, as well as from heroin's depressing effect on respiration.

This study was designed to determine whether the proposed Federal Rules for one of the "alternative" matrices, hair, would effectively identify heroin users. The proposed Federal guidelines for morphine, codeine and 6-acetylmorphine (6-AM) state that a hair specimen containing at least 200 pg/mg of 6-AM cannot be reported as positive unless it also contains at least 200 pg/mg of morphine.

The study enrolled 203 subjects, approximately half of whom admitted to opiate use, half who did not. Each subject provided a hair specimen taken from the head at the time of interview. Information on drug use, including time of last use, frequency of use, ethnicity, age, sex and hair color were recorded for each subject. The specimens were analyzed for morphine, codeine and 6-acetylmorphine using immunoassay and gas chromatography-mass spectrometry. While the analysis of various opiates in hair has been previously published, this is the first study where the positivity rate was determined according to proposed Federal guidelines.

Results: Mono-acetylmorphine (6-AM) was the major metabolite detected in hair following heroin use, and in all except three samples it was present in higher concentrations than morphine. Only one sample from an admitted heroin user did not contain 6-AM, and there were no samples containing only morphine. Overall, the mean morphine concentration detected in hair was 780 pg/mg; (median 407 pg/mg). The mean codeine level was1174 pg/mg; (median 481 pg/mg) and the mean concentration of 6-AM in the hair samples was 1904 pg/mg; (median 828 pg/mg). Morphine was present in 34 of the 52 positive samples from the self-reported group (65.3%); codeine in 46/52 (88.4%) and 6-AM in 38/52 (73%).

In the self-reported opiate using population, 45 hair samples confirmed positively for opiates under the proposed rules. However the other seven (15.5%) contained 6-AM at concentrations higher than 200 pg/mg, so would not have been considered positive under the regulations.

In the self-reported non-drug using population, 7 specimens (7%) were positive under the guidelines. Five of these contained codeine at levels higher than 200 pg/mg and the other 2 contained codeine, morphine and 6-AM.

Currently, the proposed Federal guidelines require morphine to be present as well as 6-AM in hair specimens in order to be reported as positive. The data shows that this will cause approximately 15% of heroin users to go undetected. Based on this study, and supported by the literature, morphine is not the predominant metabolite detected in hair following heroin use. Therefore, if the detection of heroin users is the focus of the Federal program, the presence of 6-AM alone in hair should be considered a positive result.

Summary: When specimens were analyzed according to the levels proposed in the Federal guidelines for alternative samples, hair failed to identify seven self-reported heroin users. Even though 103 subjects admitted opiate intake, not all were heroin users, some admitting to hydrocodone or oxycodone intake. However, of the seven who admitted frequent heroin use, all hair specimens contained measurable amounts of 6AM, confirming their admission. Under the Federal Guidelines, these individuals would not have been reported as positive. It has been suggested that hair is a superior matrix to urine for the detection of drug users, however for this to be true, appropriate detection levels must be mandated, and the stand-alone presence of 6-AM must be considered a positive result.

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