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Graduate Masters Theses

Correlation Between Blood And Skeletal Muscle Cocaine And Opiate Concentrations. Andrea Barrentine. MS, May 2005.

ABSTRACT:
Cocaine and heroin are popular drugs of abuse and are therefore routinely investigated in the Forensic Toxicology Laboratory. Due to the nature of illicit drug abuse and subsequent overdose, decedents are not always found immediately. In such cases, the cadaver may be in an advanced state of decomposition with no blood available for analysis. Therefore it is extremely important to be able to correctly quantitate the amount of these drugs and their metabolites in an alternate matrix that is slower to decompose such as skeletal muscle. Finding a correlation between concentrations of drugs in blood and other tissues would assist the Medical Examiner's Office in determining the cause and manner of death in their investigations. Accurate determination of cause and manner of death greatly impact not only the legal system and law enforcement, but also the families of the decedents and society in general. In order to find this correlative relationship, forty cases were analyzed using the Bexar County Medical Examiner's Office Forensic Toxicology Laboratory Cocaine/Opiate Extraction Procedure. Using solid phase extraction, elution, and derivatization, and separation by gas chromatography/mass spectrometry (GC/MS), the concentrations of cocaine, benzoylecgonine (the major metabolite of cocaine metabolism), and morphine, the end product of heroin metabolism, were measured. While cocaine ranged in concentrations of 0.01-4.1 mg/L in the blood, in the tissues kidney, liver, brain, and muscle, the concentrations of cocaine ranged from 0.01-3.87 mg/kg. Blood benzoylecgonine concentrations were from 0.03-5.1 mg/L and 0.01-9.57 mg/kg in the various tissue matrices. Morphine ranged from 0.07-1.3 mg/L in blood and 0.01-1.70 mg/mg in the tissues. Multivariate statistical analysis found significant correlation (measured by Pearson's correlation coefficient, r) between blood and the tissue matrices forcocaine, benzoylecgonine, and morphine. Correlation of cocaine concentrations: kidney (r =0.994), liver (r = 0.976), brain (r = 0.965), and muscle (r = 0.978). Correlation of benzoylecgonine concentrations: kidney (r = 0.8836), liver (r = 0.4448), brain (r = 0.4025), and muscle (r = 0.8237). Correlation of morphine concentrations: kidney (r = 0.740), liver (r =0.712), brain (r = 0.913), and muscle (r = 0.860). These correlations and the further analysis using linear regression have shown that skeletal muscle, and the other tissues such as the kidney, liver, and brain, are useful samples for postmortem investigation. While there is a correlation, the concentrations of cocaine, benzoylecgonine, and morphine in muscle may not be accurately used to determine the approximate level of these drugs in the blood at time of death when the preferred matrix for analysis, blood, is not available for analysis. The data collected in this study is an important finding that should be noted in the Forensic Toxicology Laboratory and other Medical Examiner Laboratories.