H37 Preliminary Studies of the Isolation of Drugs From Bone and Bone Marrow: A Broadened Role for the Forensic Anthropologist

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The goal of this presentation is to introduce attendees to a new analytical technique, Accelerated Solvent Extraction (ASE), and its potential to provide evidence of drugs and drug metabolites in bone and/or bone marrow.

This presentation will impact the forensic community by detailing a new analytical technique which provides a presumptive line-of-evidence towards determining the identity of a decedent based on drug or medication history by detecting certain classes of lipophilic drugs in decomposed or skeletonized remains.

Toxicologists continue to develop methods for the detection of drugs and drug metabolites in various biological matrices other than blood and urine, including oral fluid, hair, and more recently, bone. The use of bone specimens for toxicological examination provides forensic anthropologists with an opportunity to collaborate with toxicologists in further developing techniques for detection of drugs and drug metabolites. A limited number of studies have been conducted; the majority utilize solvent extraction of analytes from bone specimens. However, these studies typically examine the whole bone and do not isolate the lipid portion of the bone only. This issue may be significant since many drugs are lipophilic and are more likely to be distributed to the lipid portion of bone and bone marrow. The typical method of soaking cut bone in methanol has not been thoroughly evaluated with regards to reproducibility or recovery. The current pilot study employs Accelerated Solvent Extraction (ASE) to separate the lipid portion from the non-lipid portion of the specimen, which reduces the potential for contamination and the volume of solvent required to perform the test. ASE is a reproducible, easily calibrated, and robust method, allowing for increased accuracy and reliability. ASE also requires only a few minutes, rather than twenty four hours, to complete the isolation process.

This is a preliminary study of the isolation of drugs and drug metabolites from the lipid fraction of bone specimens obtained from rats administered drugs for various durations. The non-lipid portion of the bone remaining after ASE was also tested to determine the completeness of the extraction. The extractions performed by ASE were compared to extractions performed following a twenty four hour methanol soak.

Amitriptyline, a tricyclic antidepressant, was detected in the lipid fraction of whole bone specimens following single-dose administration; however, single-dose methylenedioxymethamphetamine (MDMA, Ecstasy) and repeated-dose cocaine were not detected. The lipophilicity of the drugs and/or experimental design may account for the lack of detection of these analytes. No drugs were detected in the non-lipid portion of the ASE extract, suggesting that ASE performed a thorough extraction of the lipids, and therefore, the drugs.

Both methods resulted in the detection of amitriptyline, and the ASE technique yielded evidence that the extraction was complete. Additionally, ASE can allow for calibration and potential correlation of drug administered and concentrations found. Overall, the results of the study are promising, lending support to ASE as an analytical technique for the isolation of drugs and drug metabolites in bone. Future work must be conducted to elucidate the effectiveness of this method.

The assessment of drug use through the analysis of bone for drugs and drug metabolites is an important tool in the investigation of skeletonized and decomposed cases, providing presumptive evidence of the decedent's identity by correlation of the analytical findings with purported drug history. The results may also provide evidence supporting the cause and manner of death, particularly in cases involving drug use and misuse.

Forensic Anthroplogy, Accelerated Solvent Extraction, Bone Toxicology

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