D8 Histomorphology and Age Estimation of the Human Rib Cortex in Methamphetamine Users

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After attending this presentation attendees will have an understanding of observed histomorphological changes in the bone microstructure of methamphetamine users. In addition, this presentation will demonstrate how methamphetamine use may result in less accurate histological age estimations

This presentation will impact the forensic science community by demonstrating that methamphetamine abuse can be associated with changes to the bone microstructure. This has important implications for those doing histological age estimations using osteon population densities.

Histological age estimation using bone microstructure is an accepted and accurate tool when trying to determine age at death in unknown skeletonized human remains. Studies have demonstrated lifestyle choices such as poor diet, insufficient exercise, and substance abuse can negatively affect bone health. Of these lifestyle choices, the advanced decay of the dentition and pathologies associated with the oral cavity seen in chronic methamphetamine users is often noted. The purpose of this analysis is to determine if the tissue pathology associated with long-term methamphetamine use is a localized response to poor dental hygiene or an indication of a more systemic response that is discernible in the bone microstructure. Studies have associated chronic methamphetamine abuse with lower bone densities in both the axial and appendicular skeleton but to date no studies examine what methamphetamine's role may be on impacting the microscopic structure of bone.

A comparison of the fourth rib cortical bone microstructure between males that were known to be methamphetamine abusers (N=18) and individuals who did not abuse the drug was undertaken (N=19). Histomorphometric variables calculated in this analysis included mean osteon size, Osteon Population Density (OPD), and cortical area measurement. OPD and mean osteon size were found to vary significantly between study and control populations. Users of the drug had a mean OPD of 15.19. Non-users were shown to have an OPD of 21.68. Osteon population densities were found to be significantly less in methamphetamine users ($p<.01$). Users had an average mean osteon size of .041mm^2 compared to non-users at .039mm^2. Mean osteon size was found to be significantly larger in methamphetamine users at a 90% confidence interval ($p<.10$).

When histological age estimations were attempted using Stout and Paine 1992 formula, it was found that individuals who abused methamphetamine, as well as the control group, tended to have age estimations that underestimated actual age. When calculated, the methamphetamine group underaged individuals by an average of 11.6 years. This differed from the control population which on average underestimated ages by 7.1 years. This study has important implications when histological age estimations developed from OPD are conducted on methamphetamine users. As demonstrated, estimated ages for those that abuse the drug are less accurate then non-users. This study demonstrates methamphetamine abuse does affect bone microstructure and impacts the forensic science community by demonstrating that histological age estimations on unknown skeletonized human remains may be less accurate if the decedent abused methamphetamine.

Age Estimation, Skeletal Analysis, Methamphetamine

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