H107 Drug Use, Homeostasis, and the Estimation of Age-at-Death From Skeletal Remains

Nicholas V. Passalacqua, PhD, 1559 Mount Vernon, East Lansing, MI 48823*

The goal of this presentation is to discuss degenerative skeletal aging as a function of biological homeostasis and the potential effect of disruptions to the normal aging process caused by drug and alcohol use.

This presentation will impact the forensic science community by demonstrating that no significant differences in biological age were found between individuals suspected of using drugs and alcohol and those without evidence for drug or alcohol usage.

Age-at-death is routinely estimated as part of the biological profile in order to facilitate the identification of an unknown decedent. The estimation of adult degenerative age is typically conducted using a few, relatively well-documented areas of the human skeleton. The most common are the pubic symphysis and sternal rib ends.[1] While there are a number of publications discussing age-related changes in the pubic symphyseal face and the sternal ends of the fourth rib, the underlying causes of these age-related processes are not well understood; however, neither is degenerative aging in general.[2] Much of the degenerative aging process occurs as a function of maintaining bodily homeostasis and disruptions in homeostasis can produce significant tissue pathophysiology.[3] Disruptions caused by drug and alcohol abuse have been documented as resulting in pathological conditions such as osteosclerosis as a function of a stressed neuroendocrine system.[4,5] However, while the potential skeletal effects of drug and alcohol usage have been documented in single case study contexts, this has yet to be demonstrated on a large population.

To examine the effects of drug and alcohol use on biological markers of age, a sample of 579 documented individuals, processed through Maricopa County Forensic Science Center (FSC) in Phoenix, Arizonia, were examined.[6] Data on the pubic symphysis and the sternal rib ends were collected for individuals with ages ranging from 18 to 99 years. Drug or alcohol use for individuals was established through the presence of drug- or alcohol-related items at the location the decedent was recovered from or from witness accounts. The available documentation was not detailed enough to establish chronic drug or alcohol abuse, but only to infer usage in general. To examine the potential effects of drug or alcohol usage on the degenerative aging process, correlations for each age indicator and combined indicators were examined. Based on the available individuals, samples were divided into drug/alcohol usage (n=94) and non-usage (n=483) and further sub-divided into Younger Adults (aged 18-39 years) and Older Adults (aged 40+ years).

While all age marker correlations decreased with advancing age and all standard errors increased with age, results indicate that drug/alcohol use in the present sample, as suggested via witness statements or the presence of drugs or alcohol, did not affect the ability to estimate age. Correlations were very similar between the two samples; however, the standard errors were comparatively low for drug/alcohol users aged 40+ years; this could be an effect of sample size. Further research using a similar approach on a sample with more detailed background information on drug and alcohol use is necessary and may be able to differentiate individuals suffering from chronic abuse which may significantly affect bodily homeostasis and aging.

References:

1. Garvin HM, Passalacqua NV. Current practices by forensic anthropologists in adult skeletal age estimation. J Forensic Sci 2012;57(2):427-43.
2. Hamerman D. Aging and the musculoskeletal system. Ann Rheum Dis 1997;56:578-85.
3. McEwen BS. Sex, stress and the hippocampus: allostasis, allostatic load and the aging process. Neurobiol Aging 2002;23:921–39.
4. Whyte MP, Teitelbaum SL, Reinus WR. J Bone Miner Res 1996;11(4):554-58.
5. Bab I, Zimmer A, Melamed E. Cannabinoids and the skeleton: From marijuana to reversal of bone loss. Ann Med 2009;41:560-67.
6. Hartnett KM. A re-evaluation and revision of pubic symphysis and fourth rib aging techniques. PhD Dissertation. Arizona State University, Department of Anthropology: Phoenix, AZ: 2007.

Drug Use, Homeostasis, Age-at-Death

 ** Presenting Author*