A91 The Differential Effects of Environmental Factors on Immature and Mature Bone Degradation: A Controlled Experiment Using Pig Skeletal Remains

Shera Fisk, BSc, 3888 Point Grey Road, Vancouver, BC V5A 1S6, CANADA; Francesco Berna, PhD, Simon Fraser University, Dept of Archaeology, 8888 University Drive, Burnaby, BC V5A 1S6, CANADA; Deborah C. Merrett, PhD, Simon Fraser University, Dept of Archaeology, 8888 University Drive, Burnaby, BC V5A 1S6, CANADA; and Hugo Cardoso, PhD, Simon Fraser University, Dept of Archaeology, 8888 University Drive, Burnaby, BC V5A 1S6, CANADA*

After attending this presentation, attendees will understand the chemical changes in bone composition that occur as a result of the postmortem interval, the degradation environment, and the age at death of the individual.

This presentation will impact the forensic science community by not only advancing the knowledge of the dependency of bone weathering on postmortem environments, but also by providing a direct comparison between the relatively poorly studied chemical decomposition of juvenile bone and the more well-known breakdown of adult skeletal remains. This data provides a means for evaluating the current methods of estimating the time since death of juveniles in the forensic context.

Estimation of postmortem interval is an integral aspect of the forensic identification process. Such estimations provide investigators with a timeline, which can rule out suspects and help to narrow the pool of possible victims. In the case of skeletonized remains, time since death is approximated using trends in bone breakdown. These trends were developed using adult remains and have provided investigators with a relatively predictable timeline for adult skeletal decay; however, juveniles have not been sufficiently studied and, therefore, the applicability of time-since-death estimation methods to their remains is not well known.

This study uses a porcine model to explore the role of bone maturity with regard to: (1) overall susceptibility of the skeleton to chemical degradation; and, (2) the interaction of bone material with different burial environments. The ulnae of immature and mature pigs (*Sus scrofa)* were mechanically defleshed and used as a proxy for human bone of distinct infant and sexually mature age groups. Samples (n=200) from both age groups were left to degrade in a climate-controlled greenhouse, either buried or on the soil surface. These two varying environments provide the comparison of differing environmental impacts. Every month, four bones from each age group and environment were collected. Ash weight analysis was performed on each sample to determine the relative water, collagen, and mineral composition of the bones.

The results of this study indicate that, in the early postmortem interval, the degradation rates of collagen and mineral content of both immature and mature bone are relatively similar. While the collagen content of immature bone was initially higher, and the mineral content initially lower than the mature bone samples, the rate at which these values changed through time appears to be impacted solely by the environment. The buried environment resulted in a rapid destruction of collagen in bones from both age groups, with the values remaining relatively constant throughout the rest of the experimental period. The mineral content was inversely affected by the environment within the first month, then remained constant in both age groups until month six, when there was a noticeable decrease in the values, regardless of the environment. The water content, on the other hand, trended upward for both age groups in the buried environment; however, only the mature samples demonstrated a water content increase in the subaerial environment.

These results indicate that degradation environment plays a major role in the chemical decomposition of bone material, while the maturational stage of the bones only has an affect on the changes in water content throughout the postmortem interval. In particular, this study suggests that, unlike popular belief, immature bone does not seem to degrade faster than more mature bone, at least during the early postmortem period. These results have the potential to inform the forensic community of the behavior of juvenile bone in varying degradation environments, subsequently improving the accuracy of estimating time since death and identifying children in the forensic context.

Postmortem Interval, Juvenile, Degradation

*Presenting Author