A85 Skeletal Sun Bleaching and Weathering Patterns in Central Florida: An Approach for Estimating Time Since Death (TSD)

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After attending this presentation, attendees will better understand the progression of skeletal sun bleaching and weathering over time. This presentation will focus on patterns of bone sun bleaching and weathering in order to fill a gap in the literature regarding the time frame in which bones become bleached and weathered in the Central Florida environment during the Postmortem Interval (PMI).

This presentation will impact the forensic science community by discussing the timing and extent of skeletal sun bleaching and weathering. Factors influencing sun bleaching and weathering that will be discussed include the effect of microenvironments (full sun versus shade), length of the PMI, and bone type.

After soft tissue decomposition, taphonomic modifications to the remaining skeletal elements can provide valuable information to investigators regarding TSD. It is therefore important to investigate the timing of sun bleaching and weathering patterns observed during the PMI in order to understand how these taphonomic modifications can contribute to TSD estimations. Investigation into the timing and progression of sun bleaching and weathering was undertaken over six months in Central Florida. Four pig (*Sus scrofa*) carcasses were placed in two microenvironments: two in open, full sun and two in shade. After skeletonization occurred, ten bones from each pig carcass location were assessed weekly for sun bleaching and weathering changes and included cranial elements, mandibles, scapulae, vertebrae, ribs, os coxae, and long bones. The total sample was reduced to 37 bones due to animal scavenging. Bone sun bleaching was assessed once a week using the Munsell soil color charts, with the lightest coloration of the exposed bone scored.[1] A bone was considered to be sun bleached when the lightened color corresponded to the WHITE PAGE, and the extent of the sun bleaching was estimated as <25%, 25% to 50%, >50% to 75%, and >75% to 100%. Additionally, bone weathering was evaluated using the Behrensmeyer stages by scoring weather-related changes on a scale from 0 to 5.[2]

Analysis of sun-bleached skeletal elements demonstrated that microenvironment had the greatest influence for the presence or absence of sun bleaching. Overall, bones in full sun locations exhibited a greater rate of sun bleaching than bones in full shade locations. By month four of the investigation, skeletal elements in full sun locations exhibited approximately 25% more sun bleaching on the exposed bone surface than elements in full shade locations. Bones in full sun locations exhibited approximately 25% to 50% bleaching on the exposed bone surface by day 100 and approximately 50% to 75% bleaching on the exposed bone surface between day 100 and 135. Additionally, bones in full sun and partial sun locations exhibited initial signs of bleaching around day 22 and day 36 of the investigation, respectively; however, by day 135, bones in full shade still exhibited minimal signs of bleaching (<25% of the exposed bone surface).

Skeletal element types displaying sun bleaching earliest in the PMI included ribs and scapulae, whereas os coxae appeared to exhibit bleaching latest in the PMI out of all bone types studied. While the majority of the skeletal elements that were analyzed contained no soft tissue remnants, a few elements that were studied contained minimal desiccated and adhered soft tissue, including articular cartilage, which may have partially shielded the

surface of the bone from sun bleaching. It is important to note that the most challenging issue with scoring sun bleaching was the periodic presence of moist bones from rainfall that affected bone surface coloration, as compared to dry bones. Overall, minimal weathering was noted on the remains after five months. While bones in full shade generally exhibited Stage 0, bones in partial shade and full sun exhibited Stage 1. In addition, one mandible and one scapula in full sun exhibited the beginning progression of Stage 2 on less than 25% of either bone. In conclusion, the combined utilization of sun bleaching and weathering as a taphonomic model that is regionally specific may aid standardization of future studies by increasing accuracy in estimating TSD.

Reference(s):

1. Munsell Color. *Munsell Soil Color Book.* Grand Rapids, MI: Munsell Color, 2009.
2. Behrensmeyer A.K. Taphonomic and ecologic information from bone weathering. *Paleobiology.* 1978;4(2):150-62.

Taphonomy, Sun Bleaching, Bone Weathering