A71 Investigating the Extent of Bone Diagenesis in Short Timescales Through a Histological Approach

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Learning Overview: After attending this presentation, attendees will understand the potential for bone diagenesis, in the form of microbial infiltration, to occur in short forensic (<28 weeks) timescales, as well as the influences microbes, such as those present within the gut microbiome and burial soil, can play. This study will present a potential way of quantifying the bioerosion occurring in bone through the novel method of counting normal osteocyte lacunae present within the sample.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by enhancing existing knowledge of microbial action on skeletal remains. This presentation will show that microbial infiltration occurs to skeletal tissue in the early postmortem period, before skeletonization has occurred, and in partial remains without the inclusion of gut bacteria, highlighting the role the deposition environment plays in bioerosion

The evaluation of bone diagenetic phenomena in archaeological timescales has a long history, yet its occurrence in short timescales has been overlooked.[1,2] The presence of the gut bacteria drive microbial infiltration, but the role of the deposition environment in the early postmortem period is unclear.[3,4] Presented here is a short timescale study that aimed to establish the extent of diagenesis observed on the internal microstructure of skeletal tissue, using the Oxford Histological Index as well as a novel method of counting the normal osteocyte lacunae present within the sample, to assess the level of microbial infiltration occurring over time.[5]

It was hypothesized that microbial infiltration would be seen within 28 weeks, with sample retrievals occurring every 4 weeks. Due to the sensitivity of the diagenetic processes being observed, three tissue types were used: whole remains to include gut bacteria; excised, fleshed limbs for autolytic effects and exclusion of gut bacteria; and defleshed long bones to exclude bacteria associated with soft tissue decomposition. All of these were taken from domestic rats (*Rattus rattus*) in two deposition environments: exposed on a clean plastic surface to allow insect access but exclude soil microbes; and buried in garden soil to include soil microbes. Upon retrieval, the samples were cleaned, and a manual preparation method was used to produce histological sections of around 100µm thick, allowing the lacunae within the microstructure to be observed and quantified using a light microscope.[6]

Results showed that microbial infiltration can occur in short timescales, with alterations to the bone being observed in the early postmortem period (< 28 weeks) in all tissue types (p=0.00). Despite previous observations that many factors can affect bone diagenesis, few differences were found in the extent of diagenetic change when comparing the different tissue types (p=0.505) and when comparing the two deposition environments (p=0.532).[7,8]

This study showed that it is possible for microbial infiltrations to occur to the skeletal tissue in the early postmortem period (<28 weeks), before skeletonization occurs. It has also shown that microbial infiltrations can occur in partial samples without the inclusion of the gut bacteria to drive bone diagenesis, indicating that the deposition environment plays an important role in the deterioration of skeletal remains.

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Bone Diagenesis, Histology, Bioerosion

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