

A139 Fracture Pattern Comparison Between Pig and Human Crania Cremated on an Open-Air Pyre

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After attending this presentation, attendees will understand the differences in fracture patterns between pig and human cranial cremains. Attendees will understand the need for future research on human analogues before further cremation studies using pigs are undertaken.

This presentation will impact the forensic science community by addressing a current problem in cremation studies using pigs (*sus scrofa domestica*) as human analogues. It will assist future researchers in establishing suitable proxies for humans in cremation studies and hopefully promote increased usage of human remains in such experimental studies. These future studies will allow forensic scientists to understand the process of cremation to a fuller extent and help with forensic cases involving cremated or partially cremated remains.

While fully cremated remains are not frequently encountered by forensic specialists, it is highly common for burnt/partially cremated remains to be discovered as part of a crime investigation; when these fragmentary remains are discovered, they can be extremely difficult to interpret and analyze. Cremation (even partial cremation) can obscure a great deal of information that the forensic scientist is familiar with using for purposes of identification, such as estimation of Postmortem Interval (PMI) or Minimum Number of Individuals (MNI) present. For primarily ethical reasons, animal analogues are frequently used in cremation experiments wherein researchers attempt to develop methods for better interpreting cremated human remains.^{1,2} The literature on cremations has yet to establish whether animals are appropriate proxies for humans, and whether the patterns observed on animals can be accurately and comprehensively applied to humans. To address the absence of research in this area, the present study attempted to identify fracture pattern differences between pig and human crania through a comparison of experimentally created pig cremains and archaeological human cremains.

This study used both archaeological cremains from Roman Britain and pig crania cremated on an open-air pyre, constructed to replicate a Roman pyre.^{3,4} Two pig crania were cremated together over a 4-hour period, reaching temperatures exceeding 800°C, therefore reaching the fusion stage of cremation.⁵ The resulting cremains were left to cool and were photographed and weighed.

The archaeological human cremains and pig cremains were analyzed using the same protocol. The photos were uploaded to ImageJ, where the surface area of the fragments was measured along with areas of patina and delamination. Additionally, fractures were counted for each fragment. A total of 248 specimens of pigs and adult humans were analyzed. When measured, each feature (patina, delamination, fracture count) was divided by the total surface area, creating a ratio that allowed fragment size to not affect the results.

Ultimately, it was observed that the pig and human cranial bones were affected differently by the open-air pyre cremation. Pig cranial cremains demonstrated more delamination per mm² than the human cranial cremains. Human cranial cremains exhibited more patina than pig cranial cremains. A greater number of fractures were present in human cranial cremains than pig cranial cremains.

The results observed in this small study suggest that pig crania should not be used in experimental cremation studies as a human analogue. Further studies should be conducted to test the similarities of human and pig post-cranial cremains, as well as the usefulness of other animals as human analogues. The researchers suggest that future studies on cremation processes be conducted on human subjects in crematorium or taphonomic facility settings.

Reference(s):

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Cremation, Fracture Analysis, Thermal Alteration