

A63 Burned Bodies: Positional Change in Decomposed and Fresh Human Remains

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Learning Overview: The goal of this presentation is to provide experimental data assessing body position of decomposed and fresh human remains after burning.

Impact on the Forensic Science Community: This presentation will positively impact the forensic science community by improving the attendee's ability to recognize pre-burn conditions of human remains through experimental examples and analysis of decomposed and fresh bodies and their behavior when burned. Thus, practitioners will be provided a reference to assist in determining whether burned remains were decomposed prior to thermal alteration.

This study examines how decomposed and fresh bodies change position when burned. Previous research indicates fresh bodies shift into a pugilistic posture during burning, but no research has been conducted to determine if decomposed remains respond differently than fresh remains.^{1,2} The anticipated results were that there would be less positional change in the decomposed individual due to the breakdown and dehydration of tissues from decomposition processes. To test this hypothesis, a study was conducted as part of instructional courses for fire investigators at the Forensic Anthropology Center at Texas State (FACTS) Research Facility. Two donors from FACTS' whole body donation program who consented prior to death to be utilized in traumatic research were subjected to thermal trauma. One donor had decomposed on the surface for two months, had a Total Body Score (TBS) of 24, was in the process of actively desiccating, but still retained skin, muscle, and ligament tissues.³ The other donor exhibited no decomposition change (TBS=3). Both were placed in a supine position into a pit on a stack of wooden pallets and were burned without the use of chemical accelerant for approximately 45–60 minutes. The event was video recorded and detailed photos of the pit, body, and pallets were taken before and after the burn for both individuals. These photos were then used to create scaled and georeferenced 3D mesh models using photogrammetric software. Using these models, coordinates for specific body locations were determined and exported with the orthoimage to Geographic Information Software (GIS). In order to examine the change of the bodies' positions without the additional variable of the pallets burning, the body positions were assessed with the pallet elevation removed.

The results indicated that both fresh and decomposed remains demonstrated movement consistent with a shift into pugilistic posture. However, the decomposed remains demonstrated a higher degree of flexion, and individual skeletal elements demonstrated a higher degree of displacement, resulting in more movement in the decomposed remains than the fresh individual. The timing of each flexion event correlated with exposure to heat and took place more rapidly in the decomposed remains. In addition, the decomposed remains experienced a complete loss of soft tissue while the fresh remains experienced only a partial loss over approximately the same length of time, resulting in more calcined bone in the decomposed individual. Factors that may have contributed to this result include less body mass, differential decomposition due to contact with the ground during decomposition, heat sensor wires interfering with flexion, and joint-driven flexion versus flexion driven by the stronger muscle flexor.

The difference in body position change between a decomposed and fresh body when burned could have important implications for forensic analysis of burned scenes. In this case, the decomposed individual demonstrated more change in body position than the fresh individual.

Reference(s):

1. DeHaan, J.D. Fire and Bodies. In: *The Analysis of Burned Human Remains (Second Edition)*, edited by Christopher W. Schmidt and Steven A. Symes, 1–15, 2015. San Diego: Academic Press, 2015.
2. Symes, Steven A., Christopher W. Rainwater, Erin N. Chapman, Desina R. Gipson, and Andrea L. Piper. Patterned Thermal Destruction in a Forensic Setting. In: *The Analysis of Burned Human Remains (Second Edition)*, edited by Christopher W. Schmidt and Steven A. Symes, 17–59. San Diego: Academic Press, 2015.
3. Megyesi, Mary S., Stephen P. Nawrocki, and Neal H. Haskell. Using Accumulated Degree-Days to Estimate the Postmortem Interval from Decomposed Human Remains. *Journal of Forensic Sciences* 50, no. 3 (May 2005): 618–26.

Fire, Decomposition, Body Position