



## Physical Anthropology Section - 2013

### H115 Regional Factors in Central Texas Affecting Postmortem Decomposition in Human Remains

*Daniel J. Wescott, PhD\**, *Michelle D. Hamilton, PhD*, and *Kate Spradley, PhD*, Texas State Univ, Dept of Anthropology, 601 University Dr, San Marcos, TX 78666; *Sophia R. Mavroudas, MA*, Texas State Univ, 601 University Dr, ELA 232, San Marcos, TX 78666; *Amy M. Sears, BA*, Texas State Univ, Dept of Anthropology, 601 University Dr, San Marcos, TX 78666; *Jeffery K. Tomberlin, PhD*, Texas A&M Univ, Dept of Entomology 2475, College Station, TX 77843-2475; and *Lauren R. Pharr, MA*, Louisiana State Univ, Dept Geography & Anthropology, 227 Howe-Russell Geoscience Complex, Baton Rouge, LA 70803

After attending this presentation, attendees will understand how regional ecological factors of central Texas, including climate and local scavenger populations, affect human decomposition stages and rates and complicate estimates of time-since-death.

This presentation will impact the forensic science community by demonstrating the regional variation in decomposition processes and rates in central Texas, the need for collaborative, multidisciplinary research between regions, and the need for regional models for estimating time-since-death.

Forensic anthropologists and entomologists are often asked to predict the time-since-death for a decedent in medicolegal death investigations. Over the past decades, researchers have worked to develop stages and rates of decomposition that can be used to estimate the time-since-death. However, the process of decomposition is highly dependent on microenvironmental and regional-ecological conditions, making it difficult to apply time-since-death estimations across regions.

Located in the Hill Country of central Texas, the Forensic Anthropology Research Facility (FARF) at Texas State University serves as a natural laboratory for examining decomposition in an ecological zone that is transitional between eastern and western climates. The mean annual temperature is 20.3°C, and the mean annual rainfall is 83.1cm. However, central Texas is known for extreme droughts, extraordinary rainfall events, intense sunlight, and strong winds.

A longitudinal study of human decomposition (N=68 as of July 2012) has been in process at the FARF since 2008. Human bodies donated to the Forensic Anthropology Center at Texas State are placed at the FARF on the ground surface in a supine position, usually under a wire cage that prevents scavenging by medium and large mammals and birds. In many ways, bodies placed at the FARF undergo similar decomposition processes that have been recorded in other geographical regions, but there are several ecological factors unique to central Texas that greatly alter the decomposition rate.

Mummification of soft tissue is one factor commonly observed in central Texas that greatly affects the rate of decomposition. Preliminary results of the study indicate that desiccation of the body by the sun, wind, and soil reduces or prevents putrefaction by microorganisms, which leads to natural mummification. Rapid mummification can reduce the duration of other decomposition stages, such as bloat, and increase the time required for skeletonization. By preventing additional visible changes to the remains, mummification can make estimating the time-since-death difficult. At the FARF, skeletonization can take as little as two months to more than two years depending on the degree of mummification that occurs. Accumulated degree days so far for mummification range from 241 to 1,698.

Scavenging by vultures and other animals is another factor that can greatly affect decomposition rates in central Texas, thus complicating the estimate of time-since-death for forensic scientists working in the region. While vultures are found throughout the United States, the greater population sizes of these birds, and the reduced tree cover of central Texas, makes them extremely important in determining time-since-death. Observations of uncaged individuals at the FARF indicate that it can take between three days to approximately one month for the vultures to begin scavenging the human remains. However, once scavenging is initiated, an individual in pre-bloat stage of decomposition can be skeletonized in less than 24 hours.

In addition to climate and scavenging, microbial population densities in central Texas may have an effect on decomposition rates. Postmortem interval studies of microbial populations at the FARF have demonstrated there is likely regional variation in the species, or at least population densities, of microbes present on the body after death due to temperature, humidity, and other environmental factors. Preliminary results show that variation in microbial populations can directly affect insect colonization, thus complicating time-since-death estimations.

Ideally, forensic scientists would like to develop a universal model of human decomposition that can be used to estimate time-since-death. However, regional ecological conditions that affect the rate (and possibly stages) of decomposition appear to make this an unrealistic goal. Until forensic scientists truly understand the rates and stages of decomposition, and how they vary from region to region, it is unlikely that they will develop accurate universal or even regional models for estimating the time-since-death. Answering questions about regional variation in decomposition is going to require collaborative research across regions and disciplines with standardized data and collection protocols.

#### **Taphonomy, Decomposition, Time-Since-Death**