



Physical Anthropology Section - 2014

H125 The Postmortem Interval: A Retrospective Study in Desert Open-Air Environments

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After attending this presentation, attendees will better understand the escalation of migrant deaths along the U.S.-Mexico border and the need to re-examine decomposition rates for human remains recovered from open-air desert environments. This study builds upon previous research by Galloway *et al.* (1989) and contributes an analysis of the postmortem interval for outdoor deaths in the American Southwest that accounts for seasonality, altitude, and precipitation.¹

This presentation will impact the forensic science community by providing a predictive value by which to estimate Postmortem Interval (PMI) in cases of death within an open-air desert environment in seasons of varying temperature and rainfall.

Forensic anthropologists at the Pima County Office of the Medical Examiner (PCOME) in Tucson, Arizona, are tasked with approximately 150 cases per year. Migrants dying in the desert are a prominent component of this caseload and current trends indicate this is increasing border-wide. Many of these remains are not readily identifiable due to quick decomposition in the desert, often further complicated by migrants' efforts to obscure their identities. In these cases, estimating PMI is an important albeit challenging endeavor, as most studies are problematic due to regional differences in climate, as well as complexities in research design such as small sample sizes or the use of pigs as human proxies. Currently, the only relevant PMI estimation method for use within the southwest region is a study by Galloway *et al.*, which uses a retrospective analysis of cases from the PCOME to estimate decay rates of human remains in southern Arizona. While the study addresses a variety of circumstances, only 51% of the cases were found in open-air environments and the sample of individuals within the upper ranges of decay was quite small, due to difficulties in identifying highly degraded remains in the 1980s.

This presentation intends to address these issues by conducting another retrospective study using positively identified individuals who died within an open-air desert setting and had last known alive and recovery dates. In 2011, a decomposition scoring system was devised to classify remains at the PCOME into several categories: (1) fresh; (2) decomposed; (3) decomposed with focal skeletonization; (4) skeletonization with soft tissue mummification; (5) skeletonization with articulation/ligamentous attachment; (6) complete skeletonization with disarticulation; and, (7) skeletonization with bony degradation. These decomposition categories were ascribed to scene and autopsy photographs of 156 identified decedents at the PCOME. For each case, the time-since-death was calculated by the total number of days between last-known-alive and recovery dates. Conditions such as shade, direct sunlight, location within a wash, precipitation, ambient temperature, and season of recovery were noted. Recovery locations were mapped with the Arizona OpenGIS Initiative for Deceased Migrants to record altitude and information about the surrounding topographic environment.² Climatological data was retrieved from National Oceanic and Atmospheric Administrations weather stations.

The results of this study confirm Galloway and colleagues' findings for early decomposition categories, but demonstrate a somewhat accelerated initial skeletonization process. Fresh remains are typically recovered within one week of death and decomposition occurs within a month, with temperature and seasonality playing a large role in the speed of decay. Mummification ranges from 6 to 145 days after death, tends to delay the usual decomposition process and, as Galloway *et al.* point out, is linked to drier months with little precipitation. Focal skeletonization can occur in just a week or two, especially during the rainy monsoon season. In contrast to Galloway *et al.*'s results, this study indicates that skeletonization with articulation/ligamentous attachment can occur as early as 17 days, and skeletonization with disarticulation is seen as early as 39 days in the hot summer monsoon months. For individuals exposed to sunlight, bleaching can occur in just a few months; however, bony degradation to include longitudinal cracking and cortical exfoliation does not typically occur until after 1.5 years. The skeletonization process is quite variable and is likely tied to multiple factors including precipitation, exposure to direct sunlight, and animal scavenging. This research supplements Galloway *et al.*'s study by expanding the sample size of individuals found in open-air settings and provides a standardized means to estimate postmortem interval in the southwestern desert and similar arid environments.

References:



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1. Galloway A, Birkby WH, Jones AM, Henry TE, Parks BO. Decay rates of human remains in an arid environment. *J Forensic Sci* 1989;34:607-16.
 2. Arizona OpenGIS Initiative for Deceased Migrants. Pima County Office of the Medical Examiner and Humane Borders, Inc. www.humaneborders.info. 2013.
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Postmortem Interval, Open-Air Desert, Decomposition