A21 A Preliminary Study for Estimating Postmortem Interval of Fabric Degradation in Central Florida

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After attending this presentation, attendees will understand how forensic anthropologists can use degraded clothing in determining the extended postmortem interval of cases involving skeletal remains.

This presentation will impact the forensic science community by establishing standardized methodologies for the research and analysis of degraded clothing which have the potential of being used as a new method when estimating the extended postmortem interval.

Forensic anthropologists rely on a variety of evidence to estimate the Postmortem Interval (PMI) of a decedent, which includes gross decomposition rates, the life stages of insects, and the degradation of associated material evidence. The degradation of material evidence, in particular, is an underutilized area in estimating PMI. Degraded clothing is a common type of material evidence recovered in association with skeletonized remains that is also modified by taphonomic processes. While previous research has been undertaken regarding how degraded fabric can be used as a PMI indictor, there is no standard methodology for the research design or to quantify the extent of fabric degradation. The purpose of this project was to analyze the degradation of four different fabrics in central Florida and to develop a comprehensive scoring system and descriptive methodology to be used as a standard for scoring fabric degradation. In addition to providing standards for future research, the methods used in this project are applicable to the analysis of forensic cases.

Four types of fabric swatches were tested (100% cotton, 60% polyester/40% cotton, 100% rayon, and 100% cotton denim) at three different burial depths (ground surface, ~30cm below ground surface, and ~60cm below ground surface). Swatches were placed in six groups for each of the three different burial depths. Each group included a total of eight swatches, two of each fabric type (cotton, cotton/poly, rayon, and denim) that were arranged in two different positions, flat (horizontal) and crumpled. While there is no standard for fabric swatch size, this study utilized a 15cm x15cm-size swatch that is suggested as a standard research size. The swatches were washed and dried one time based on recommendations by Mitchell et al., who concluded that clothing found at a crime scene is unlikely to be unlaundered and brand new.[1] In addition, a meat source was incorporated from a butcher to more accurately reflect the degradation process of fabrics found in conjunction with a decomposing body. Combinations of microscopic and macroscopic methods were used to analyze the degraded swatches. These included a stereomicroscope to analyze warp and weft, the Munsell color system to document color changes, and a transparency overlay developed for this project to evaluate the percentage of material loss.

Groups of fabric swatches were retrieved at one-month intervals for the duration of six months. After retrieval, cotton exhibited the highest level of degradation, as one-third of all cotton fabric swatches demonstrated more than 50% total degradation. Furthermore, cotton fabric swatches degraded more at both ~30cm and ~60cm below ground surface than on the ground surface; however, all other fabric types demonstrated slightly more degradation on the ground surface than the other two areas. For all fabric types, swatches that were positioned flat tended to degrade more than those that were positioned crumpled. While soil moisture fluctuated the most on the ground surface, the soil at both ~30cm and ~60cm below ground surface depths retained increased moisture throughout the study period. Overall, cotton was the only fabric type to degrade significantly enough to demonstrate substantial degradation during the research period, while all other fabric types exhibited minimal degradation over six months of monitoring.

In forensic cases lacking soft tissue, degraded clothing is a common example of material evidence recovered at a crime scene with skeletal remains. Overall, this study has developed replicable standards that can be used for scoring and evaluating fabric degradation to be used as an extended PMI indicator. Understanding fabric degradation is critical to establishing a long-term PMI when confronted with skeletal remains and an area of research to consider in the future as forensic anthropologists continue to expand their interdisciplinary tool kit and stimulate new areas of research.

Reference:

1. Mitchell JL, Carr DJ, Niven BE, Harrison K, Girven E. 2012. Physical and mechanical degradation of shirting fabrics in burial conditions. *Forensic Science International* 222:94-101.

Taphonomy, Postmortem Interval, Fabric Degradation