A20 Effect of Body Size on the Rate of Outdoor Human Soft Tissue Decomposition

Lindsey G. Roberts, MA, 912 E Cindy Street, Carbondale, IL 62901; and Jessica R. Spencer, MA, 424 S Front Street, Cobden, IL 62920-2415*

After attending this presentation, attendees will understand the effects of body size on the progression of outdoor human soft tissue decomposition.

This presentation will impact the forensic science community by contributing to a greater understanding of a key variable affecting decomposition and the estimation of Postmortem Interval (PMI).

This research examined differences in the decomposition rate of human subjects with respect to body size. Previous studies have primarily focused on animal models, and yielded conflicting results concerning the impacts of body size on the rate of decomposition, with some suggesting no effect, while others found subject mass to be a key factor in which smaller subjects progressed more rapidly through decomposition than larger subjects, and yet another found mass to differentially affect decomposition depending on the stage of decomposition.[1-6] Due to the liquefaction of adipose tissue and the results of previous studies, this research hypothesized that larger subjects would decompose more rapidly during early decomposition (6.0≤Total Body Score(TBS)<19.0) but less rapidly during advanced decomposition (19.0≤TBS<27.0).[6-7]

Eleven human subjects donated to the Complex for Forensic Anthropology Research (CFAR) at Southern Illinois University (SIU) were placed unclothed, supine, directly on the ground surface within the complex between December 7, 2012, and March 3, 2015. Subjects were placed between 2m-25m apart, resulting in almost identical research environments, and protected from avian and mammalian scavengers by chain-link cages. Subject samples included eight males and three females between the ages of 49 years and 95 years with the following body weights (kg): 73, 77, 84, 104, 109, 112, 113, 127, 136, 136, and 159. After deposition, TBS, photographs, and written qualitative descriptions concerning subject appearance and insect activity were collected daily. Accumulated Degree Days (ADD) were used to assess the thermal energy required for each subject to reach several TBS landmarks: early decomposition (TBS≥6.0); midpoint between early and advanced decomposition (TBS≥12.5); advanced decomposition (TBS≥19.0); halfway through advanced decomposition (TBS≥23.0); and skeletonization (TBS≥27.0).[7]

Preliminary statistical testing showed no significant positive or negative correlation between body weight and ADD at any TBS landmark. At TBS≥6.0, body weight accounted for 2.4% of the variation in ADD (r=0.155, p=0.65, n=11). At TBS≥12.5 (halfway through early decomposition), body weight explained 9.8% of the variation in ADD (r=0.296, p=0.377, n=11). At advanced decomposition (TBS≥19.0), 9.3% of variation in ADD was explained by body weight (r=0.305, p=0.36, n=11). Midway through advanced decomposition (TBS≥23.0), 4.1% of variation was explained by body weight (r=-0.202, p=0.55, n=11). At advanced decomposition (TBS≥27.0), 26.6% of the variation in ADD was explained by body weight (r=-0.516, p=0.29, n=6). Results suggested there is only a minor influence of body weight on the rate of outdoor decomposition in southern Illinois. Although not statistically significant, the correlation between body weight and ADD was positive until midway through advanced decomposition when this relationship became negative: larger-sized individuals required fewer ADD than smaller subjects to reach TBS≥23.0 and TBS≥27.0. The study's hypothesis was not supported by the results: there was no statistically significant correlation between decomposition rate and body size during any stage of decomposition.

In conclusion, results of this preliminary study suggest body weight is not a significant factor in driving human decomposition nor should it significantly impact PMI estimation. Additionally, it should be noted 2.4%-26.6% of variation in decomposition rate was explained by body weight depending on the stage of decomposition. Further research is necessary and ongoing.

*Presenting Author

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