A91 The Effect of Body Composition on Outdoor Human Decomposition

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After attending this presentation, attendees will understand the phases of human decomposition and how they are affected by body composition. The underlying goals are to improve the determination of Postmortem Interval (PMI), provide information useful to the positive identification of remains, and to spark further research into the decomposition variables that show correlation to body composition.

This presentation will impact the forensic science community by providing results of a study regarding how body composition affects the association between human decomposition milestones/phases and Accumulated Degree Days (ADD). This presentation will add to the general understanding of PMI estimation, human decomposition, and one of its key variables, body composition.

This research examined the differences in the rate of decomposition in humans with reference to their Body Mass Index/body composition. For instance, Simmons and colleagues found no effect of body mass on the rate of decomposition, while Sutherland et al.'s study found that small pigs decomposed almost three times as rapidly as large carcasses and Meadows and colleagues study found that obese individuals "quickly loose body mass due to the liquefaction of the body fats," which was supported by Zhou and Byard's case studies.[1, 3-5]

For this study, it was predicted that the body composition will affect the length of various phases of decomposition. Furthermore, it was predicted that more or less ADD will be required to reach specific decomposition milestones depending on body mass. Additionally, body mass may have an effect on how long (ADD) it takes the body to transition from one phase to the next.

A modified version of Megyesi et al.'s total body scoring system was used to examine the influence of body composition on human decomposition using 35 study subjects at the Texas State University's Forensic Anthropology Research Facility (FARF).[2] A total of 32 phases/time periods were established for three anatomical regions. The phases and time periods of decomposition were examined daily until full mummification occurred and ADD were calculated. These results were further statistically analyzed using a Student's Slope *t*-test.

The milestones of decomposition were examined for each individual following Megyesi and colleagues' method every day until full mummification occurred.[2] The dates from the beginning and the end phases and when milestones were reached was recorded and ADD were calculated to measure the thermal units that were required for the subject to reach certain decomposition landmarks (discoloration, bloat, and mummification) and for the bodies to complete certain stages of decomposition (Fresh, Discoloration, Loss of Tissue, Maggot Activity, Bloating and Caving In of Abdominal Cavity, Purge, And Mummification).

The results exhibited a strong statistically significant correlation between ADD and BMI for 7 of the 32 phases and time periods. The Head's Loss of Tissue phase and the Limbs' Placement until Start of Mummification time period showed strong statistically significant correlations (R^2 = 0.70051 and R^2 = 0.77258, respectively). The strongest and most prominent correlations were seen in the Trunk:Purge (R^2 = 0.77396), Placement until End of Purge (R^2 = 0.73464), Caving In (R^2 = 0.77991), Placement until End of Caving In (R^2 = 0.6888), and Mummification (R^2 = 0.71958). The statistical analyses of how phases and time periods correlate to each other presented that the slopes of the Trunk Mummification and Trunk Placement until Mummification and Trunk Purge and Placement until Purge End phases and time periods do not reveal a significant difference and are therefore comparable.

Overall, the study demonstrated that body composition is a factor in human decomposition but is not always a statistically significant one. Therefore, the results should be further examined in order to establish exactly how the correlation works and how the correlation can be used to improve PMI estimation.

Reference(s):

1. Meadows L., Mann R.W., Bass W.M., 1990. Time since death and decomposition of the human body: variables and observations in case and experimental field studies. *Journal of Forensic Science.* 35(1), pp.103-111.
2. Megyesi M.S., Nawrocki S.P., Haskell N.H. 2005. Using accumulated degree-days to estimate the postmortem interval from decomposed human remains. *J Forensic Sci.* 50(3), pp.618-26.
3. Simmons T., Adlam R.E., Moffatt C. 2010. Debugging decomposition data—comparative taphonomic studies and the influence of insects and carcass size on decomposition rate. *Journal of Forensic Sciences.* 55(1), pp.8-13.
4. Sutherland A., Myburgh J., Steyn M., Becker P.J. 2013. The effect of body size on the rate of decomposition in a temperate region of South Africa. *Forensic Science International*. 231(1), pp.257-262.
5. Zhou C., Byard R.W. 2011. Factors and processes causing accelerated decomposition in human cadavers–an overview. *Journal of Forensic and Legal Medicine.* 18(1), pp.6-9.

Body Composition, Human Decomposition, Forensic Anthropology