H138 The Effect of Altitude on Decomposition: A Validation Study of the Megyesi Method

Christiane Baigent, 2601 W Floyd Avenue, Sheridan, CO 80110; Catherine M. Gaither, PhD, 9818 W Cornell Place, Lakewood, CO 80227; and Ciara M. Campbell, 196 Hermosa Street, Lochbuie, CO 80603*

The goal of this presentation is to explore the effect of altitude on decomposition. After attending this presentation, attendees will gain an understanding of the Megyesi method's lack of utility in Colorado's Rocky Mountain region.

This presentation will impact the forensic science community by demonstrating decomposition patterns between high- and low-altitude sites, providing data regarding scavenger behavior, and establishing the regionally specific validity of the Megyesi method.

The Rocky Mountain region is a geographically distinct area characterized by ecozone convergence. Arid canyons, semi-arid grass plains, alluvial valleys, lava fields, volcanic plateaus, woodland hills, forested mountains, glaciated peaks, and a variety of aquatic habitats situated at elevations ranging from 1,010 to 4,400 meters result in closely oriented, dynamic micro-climatic zones. Complex interactions between human remains and the greater ambient environment in which they exist make every death scene distinctive. But, the laws governing the decomposition of human remains can be generally quantified, making the interaction with the environment the greatest variable in an individual case. Decomposition studies, while numerous, have largely been conducted in the southeastern and northwestern United States, and, therefore, the results are limited by geographic circumscription. There is currently a lack of published information on the effects of altitude on human decomposition. The Metropolitan State University of Denver Human Identification Laboratory (MSU Denver-HIL) has, therefore, initiated ongoing inquiries into regionally specific patterns of decomposition and taphonomic progression.

Utilizing four subjects (*Sus scrofa),* a concurrent study of decomposition rates among and between a high-altitude site (2800m) located in Gilpin County and a low-altitude site (1,200m) located in Keenesburg was conducted in July 2012. Over the course of 30 days, two observers participated in the daily completion of scopic-scoring worksheets for each of the subjects. Two observers were used in order to allow for the assessment of inter-observer error. Scavenger activity was documented at each site using motion-activated infrared game cameras, and data pertaining to arthropod progression was collected. Daily temperatures were obtained utilizing portable digital data loggers, and off-site through data provided by the local weather station most closely associated with each site. Both sources were used to calculate actual Accumulated Degree Days (ADD); only marginal deviation was observed between site-specific and site-relative temperatures. The Megyesi *et al.* regression equation was utilized to estimate ADD and the results were compared to the actual ADD using a two-tailed students *t*-test.[1] The same statistical analysis was applied to daily total body scores and average daily temperatures between both the high- and low-altitude sites.

Preliminary results suggest that the Megyesi method is not effective for accurately calculating Postmortem Interval (PMI) at either the high-altitude or the low-altitude site, suggesting that an unaccounted for variable is driving decomposition rates within this geographically distinct region of Colorado. The cadavers at both sites reached a plateau in the decomposition process within one to three weeks resulting in dermal tanning at the high-altitude site and complete mummification at the low-altitude site. The difference between average total body scores between the two sites was not statistically significant implying altitude alone is not a significant factor affecting decomposition. The difference in average temperature between the two sites was statistically significant, and yet, there was not a significant difference between the total body scores suggesting temperature alone is not a significant factor.

Scavenger activity also diverged greatly from expected outcomes. Specifically, scavenger activity was significantly reduced at the high-altitude site and predominantly involved avian and rodent activity. While large scavengers such as black bears (*Ursus americanus*) were observed on numerous occasions, they consistently opted to exploit the arthropod larvae colonizing the remains as opposed to the remains themselves, suggesting that the cadavers were not a preferred food source. At the low-altitude site, scavenger activity was non-existent throughout the study period and mummification occurred rapidly. While adult coleopterans were observed at the site, grasshopper larvae were the primary colonizers of the remains. The atypical activity observed at both sites suggests that numerous additional studies, including those involving dew point, humidity, aridity, and the agency of microbes as competitive scavengers, are necessary in order to understand the complex interaction between local agents affecting decomposition.

Rerference:

1. Megyesi MS, Nawrocki SP, Haskell NH. Using accumulated degree-days to estimate the postmortem interval for decomposed human remains. J Forensic Sci 2005;50(3):1-9.

 ** Presenting Author*

Decomposition, Altitude, Megyesi Method

 ** Presenting Author*