



## Physical Anthropology Section - 2012

### H15 Estimation of the Postmortem Interval of Human Remains in a Subtropical Humid Environment Using Accumulated Degree- Days and Total Body Scoring

Steve A. Noser, BS\*, Box 2296, Huntsville, TX 77341; Ashleigh Gallaway, BS\*, Montgomery County Sheriff's Office, 95 Wood Manor, The Woodlands, TX 77381; Kevin R. Derr, 16410 Locke Haven, Houston, TX 77059; Joe Trevino III, 2401 Montgomery Road, Apartment B 109, Huntsville, TX 77340; and Joan A. Bytheway, PhD, Sam Houston State University, Box 2296, Huntsville, TX 77341-2296

After attending this presentation, attendees will understand the utilization of the total body score (TBS) and accumulated degree days (ADD) to quantitatively estimate the postmortem interval (PMI) in a subtropical, humid environment. This presentation will show the accuracy of the TBS-ADD method to estimate PMI from experimental field studies using human subjects of known date of death and recovery and known postmortem interval.

This presentation will impact the forensic science community by revealing the variability in decomposition scoring on four subjects in two environmentally different settings. The presentation will also impact the forensic science community by showing the accuracy of the TBS-ADD method for estimating PMI based on data from experimental field studies using a controlled sample of human cadavers of a known postmortem interval. It will also show that the method is region-specific and equations must be tailored to each particular environment.

Most forensic taphonomy studies involving postmortem interval data are derived from research conducted in temperate and arid climates and has been qualitative in nature. More limited research has been conducted in the cold weather climate of Edmonton, Alberta (Komar, Weitzel).<sup>1,2</sup> This postmortem interval data has been applied to interpret the rate of decomposition in climates in the US and abroad that are environmentally distinct.

Although qualitative studies have been very useful, there are more recent studies that utilize quantitative data (Megyesi, et al., Adlam and Simmons).<sup>3,4</sup> The Megyesi and colleagues' pilot study claims "80% of the observed variation in human decomposition could be accounted for by the combination of elapsed time and temperature as it is reflected in accumulated degree-days (ADD)" (Megyesi et al.), therefore a more accurate assessment of PMI can be obtained quantitatively.<sup>3</sup> However, Megyesi et al.'s study was based on assessment of PMI from case photos and not from a known sample.

The Southeast Texas Applied Forensic Science Facility (STAFS) at Sam Houston State University is a human decomposition facility located in a subtropical, humid climate zone similar to climates of Louisiana, Mississippi, Alabama, Georgia, most of Florida, South Carolina, and portions of North Carolina.

Human cadavers were used in experimental field studies using TBS during the human decomposition process and ADD to estimate postmortem interval in a subtropical, humid climate.

Four unclothed male subjects of similar weight and age were placed in the outdoor research facility in the summer of 2011. All individuals were placed in a supine position and cages made of a wood frame and galvanized mesh hardware cloth were placed over them. Two individuals were placed in direct sunlight and two were placed in a shaded area. Photographs of each body region were taken daily as well as gross observation descriptors of the human decomposition process. The descriptions previously established for the various stages of the human decomposition process in temperate (Bass) and arid climates (Galloway) were revised to coincide to the process seen in the subtropical, humid environment of southeast Texas.<sup>5,6</sup> Variability in decomposition scoring was also noted. Daily recording of temperatures were also recorded.

Initial results show that there are deviations from and similarities to the human decomposition process recorded for temperate, arid, and cold weather environments.

Human decomposition descriptions were adjusted to correspond to gross observations seen in the subtropical humid environment. For example, desiccation of tissue was moved to early decomposition. Also, as a result of desiccation throughout the body tissue, including the abdominal tissue, bloating is prolonged well into advanced decomposition and therefore the descriptors for advanced decomposition in determining TBS were adjusted.

Subjects placed in the sun reached bloat (TBS 9-11) approximately two to three days after placement, which corresponded to an ADD of 57-88 (C). Subjects placed in the shade reached bloat (TBS 9-11) approximately four to six days after placement, which corresponded to an ADD of 124-189 (C). Megyesi, et al. record bone exposure of the face occurring at a TBS between 14-26.<sup>3</sup> In the present study, no subjects with a TBS between 14-26 had bone exposure of the face.

With these and other distinct differences, the equation designed by Megyesi et al. was adjusted to align with the subtropical humid environment of southeast Texas.<sup>3</sup> This study confirms that the use of the TBS-ADD equation designed by Megyesi et al. to determine postmortem interval must be tailored to fit various types of environments.<sup>3</sup>

#### References:

1. Komar DA. Decay rates in a cold climate region: a review of cases involving advanced decomposition from the Medical Examiner's Office in Edmonton, Alberta. *J Forensic Sci* 1998;43(1):57-61.



## Physical Anthropology Section - 2012

---

2. Weitzel MA. A report of decomposition rates of a special burial type in Edmonton, Alberta from an experimental field study. *J Forensic Sci* 2005;50(3):641-7.
3. Megyesi MS, Nawrocki SP, Haskell NH. Using accumulated degree- days to estimate the postmortem interval from decomposed human remains. *J Forensic Sci* 2005;50(3):618-26.
4. Adlam RE, Simmons T. The effect of repeated physical disturbance on soft tissue decomposition – are taphonomic studies an accurate reflection of decomposition? *J Forensic Sci* 2007;52(5):1007-14.
5. Mann RW, Bass WM, Meadows L. Time since death and decomposition of the human body: variables and observations in case and experimental field studies. *J Forensic Sci* 1990;35:103-111.
6. Galloway A. The Process of decomposition: a model from the Arizona Sonoran Desert. In: Haglund WD, Sorg MH, editors. *Forensic taphonomy: the postmortem fate of human remains*. Boca Raton: CRC Press, 1997:139-150.

### **Postmortem Interval, Human Decomposition, Total Body Score**