H160 Evaluating the Nearest Weather Station as the Best Representation of Scene Temperature in Forensic Entomology Casework

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Learning Overview: After attending this presentation, attendees will gain appreciation of the difficulty of selecting appropriate weather station temperature data to represent insect development conditions at scenes.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by presenting data on long-term comparison between temperatures as encountered at scenes during medicolegal death investigations and the nearest weather stations. These data will also attempt to answer the question of which weather station(s) and temperature data may provide more accurate representation of scene conditions, which directly influence insect development.

Insects are poikilothermic, capable of surviving wide temperature shifts and acquiring much of the heat energy required to complete development from their environment. Forensic entomology depends upon this relationship between insect development and environmental temperature to estimate insect age.[1] Assuming that the insects colonized the deceased following death, the estimated insect age may correspond to the Time Of Colonization (TOC) and a measure of the Postmortem Interval (PMI), depending upon scene conditions and the quality of the underlying data. Recommended practices for forensic entomology rely on collection of weather data from the nearest weather station to feed the calculations underlying insect age estimates.[2] The use of the nearest weather station has been widely assumed to be the most accurate temperature data for a given scene. At outdoor scenes, weather station temperature data appears to be a reasonable surrogate for historical scene temperatures in many scene scenarios. How well the scene temperatures are reflected by the nearest weather station can be evaluated with longer-term scene temperature collections for a calculated comparison and adjustment of the weather station data.[3] However, indoor active temperature modification, away from the nearest weather station temperatures, may be occurring during decomposition and insect development.

This study utilized button temperature sensors to examine the long-term differences between fixed locations, hypothetical scene locations, and the nearest weather stations (Airports: George Bush Intercontinental Airport [IAH], William P. Hobby Airport [HOU], Sugar Land Regional Airport [SGR], Maicai Airport [MCJ], and Conroe-North Houston Regional Airport [CXO]). Furthermore, the study was designed to examine one of the most commonly encountered temperature-modifying effects in medicolegal casework, the effects of being indoors with and without air conditioning/heat. Button temperature sensors recorded hourly temperatures for one calendar year indoors w/air conditioning/heat and outdoors in Houston, TX, and at a location in Conroe, TX, indoors w/out temperature modification and outdoors. These data were then compared to hourly temperature data from five local weather stations at the same times. Regression was used to evaluate the relationship between indoor and outdoor temperatures with the different nearby weather stations.

The results of these long-term evaluations revealed that local outdoor temperatures were informative predictors of indoor temperatures, even in the presence of indoor climate control. Furthermore, the nearest weather station was not always the best predictor of the hypothetical scene temperatures. The results of model validation and evaluation of additional hypothetical scene locations will be presented. Additionally, the potential for directly relating these results to insect development will be discussed.

Reference(s):

1. Amendt J., Krettek R., Zehner R. Forensic entomology. *Naturwissenschaften* 2004;91:51–65.
2. Amendt J., Campobasso C.P., Gaudry E., Reiter C., LeBlanc H.N., Hall M.J.R. Best practice in forensic entomology—Standards and guidelines. *Int J Legal Med* 2007;121(2):90–104.
3. Johnson A.P., Wallman J.F., Archer M.S. Experimental and casework validation of ambient temperature corrections in forensic entomology. *J Forensic Sci* [Internet] 2012 [cited 2013 Jan 29];57(1):215–21. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21854385.

Insect, Temperature, Weather Station

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