## A38 An Innovative Analysis of the Postmortem Interval and Its Role in Juvenile Decomposition

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After attending this presentation, attendees will understand the importance of taphonomic processes in regard to juvenile and infant postmortem interval estimation.

This presentation will impact the forensic science community by presenting a novel statistical technique that can identify key decompositional changes in days that can be used as predictors for time-since-death in juvenile and infant remains.

Eight *Sus scrofa* (three juvenile and five fetal) remains were obtained fresh from the North Carolina State University (NCSU) swine farm in the summer, fall, and winter months of 2013. The initial day of deposition was determined by the traditional calendar for the start of each season. The three juvenile remains that analyzed were all placed on the surface. Each season two fetal pigs were deposited, one wrapped in a cotton blanket and one placed in a plastic garbage bag. The winter season does not contain bagged fetal data due to scavenging. All remains were enclosed in cages to prevent scavenging. Decompositional observations were quantified using Megyesi et al. to obtain a Total Body Score (TBS) and Anderson and VanLaerhoven decompositional stages were used for comparison.[1,2] Fly activity was recorded as adults present, eggs present, larvae present, many larvae present, and none. Accumulated Degree Days (ADD) were calculated from daily maximum temperature with data obtained from the State Climate Office of North Carolina Lake Wheeler Road Field Lab weather station located one-half mile from the open-air site.

Statistical analyses were performed using a time series analysis that accounts for time between observations that can identify significant changes in quantified observations. The time series analysis utilizes an Autoregressive Integrated Moving Average (ARIMA) that incorporates a longitudinal mixed-effects model. The surface juvenile remains showed a significant seasonal pattern in days for decomposition with the summer juvenile reaching a TBS of 26 in eight days (*p-value=0.0001*), the fall juvenile reaching a TBS of 28 in 11 days (*p-value=0.0006*), and the winter juvenile reaching a TBS of 27 in 79 days (*p-value=0.0090*). These TBS values correspond with more than half the remains being skeletonized. The variables analyzed showed significant associations between TBS and ADD for summer, fall, and winter (*p-values=0.0023, 0.0030,* and *0.0022*, respectively). Fly activity was only significant for the summer and fall months (*p-values=0.0046, 0.0345*, respectively); however, there were no significant associations between the TBS and Anderson and VanLaerhoven decompositional stages.

The blanket fetal remains showed significant seasonal changes that mirror those seen in the juvenile remains. The summer fetal remains reached a TBS of 27 in seven days (*p-value=0.0001*), in the fall they reached a TBS of 29 in ten days (*p-value=0.0004*), and in the winter they reached a TBS of 27 in 79 days (*p-value=0.0001*). The variables analyzed showed significant associations between TBS and ADD for summer, fall, and winter (*p-values=0.0023, 0.0300,* and *0.0024*, respectively). Fly activity and Anderson and VanLaerhoven stages were not found to be significant for any of the blanket fetal remains. The bagged fetal remains for summer and fall showed a similar decomposition patterns not related to seasonal deposition with the summer bagged fetal remains reaching a TBS of 26 in nine days (*p-value=0.0004*), and in the fall reaching a TBS of 27 in six days (*p-value=0.0001*). While the Anderson and VanLaerhoven stages did not have a significant association with TBS, fly activity did show a significant association with TBS for the fall bagged fetal remains (*p-value=0.0231*). This may account for the advanced rate of decomposition relative to the summer period.

The results of this study further support the importance of seasonal and burial deposition on the rate of decomposition. The implications that fly activity are of less significance than temperature should be explored and may relate to access to remains. This study also illustrates that more comprehensive stages of decomposition need to be investigated. Multi-environmental approaches in combination with time series analysis in experimental studies may provide predictive power for estimating the postmortem interval in medicolegal contexts.

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**References:**

1. 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):1-9.
2. Anderson, G.S. and S. L. VanLaerhoven. 1996. Initial observations on insect succession on carrion in British Columbia. *Journal of Forensic Sciences*. 41(4): 613-621.

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**Postmortem Interval, Juvenile, Time Series Analysis**