E111 Measuring Desiccation Using Qualitative Changes

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After attending this presentation, attendees will better understand desiccated remains as a major confounding factor in the estimation of the Postmortem Interval (PMI). A novel scoring system tailored to the gross and qualitative changes observed in desiccated remains is proposed as a method for refining extant predictive models.

This presentation will impact the forensic science community by providing results from a controlled experiment that addresses a gap in data concerned with the estimation of PMI as it pertains to desiccated remains. This presentation augments the body of research concerned with forensic taphonomy by demonstrating the analytical power of regionally specific decomposition studies.

Standard methods for estimating the PMI in anthropological perspective rely on gross morphological changes presented along the continuum of decomposition. This process is widely regarded as linear, with an emphasis placed on active decomposition (the brief period of dynamic change that typifies early decay). Prolonged periods of stasis, such as desiccation, are de-emphasized or regarded as too homogeneous to carry probative value. Total Body Score (TBS) shows a high correlation with PMI, but this correlation falters in advanced decay when the microenvironment causes desiccation.[1,2] Once remains progressed to this stage, a period of prolonged stasis, defined by a TBS of 23-24, may persist for months and into years.

Biological stasis is a confounding factor when attempting to use predictive models to estimate PMI. In a longitudinal study in Texas, Suckling et al. demonstrated that the method was not accurate when Megyesi's equation was used for TBS values >22.[3] Connor and France, and Baigent et al. presented similar issues in western and central Colorado, respectively.[4, 5]

Nonetheless, throughout periods of "stasis," remains continue to interact with the microenvironment, suggesting that this period of suspended activity is analytically, as opposed to biologically, defined. Noted changes in the literature include dehydration of outer tissues and reduction of desiccated tissues.[6] While less dynamic than early stages of decomposition, desiccation progresses through significant, definable stages of change, beginning with the drying of digits observed in early decomposition and progressing toward dehydrated tissue overlying bone that precludes skeletonization. Changes in color, tissue quality, the release and integration of moisture, and the thickness of the tissue layer are some specifics noted to date. It was hypothesized that these changes correlate to ranges of ADD and, therefore, may be used to refine methods for estimating the PMI beyond a TBS of 22.

Using longitudinal observations accrued across three years of study at Colorado Mesa University's Forensic Investigation Research Station (FIRS), a new scoring system termed Total Body Desiccated Score (TBDS) was developed to increase the resolution of changes presented by desiccated remains. A pilot experiment produced a scoring scale of 1-100, composed of five categories (color, bloat, moisture, desiccation, and skeletonization). These categories were augmented by the addition of defined qualitative changes to further increase resolution.

Photographic packets were compiled to test the new model. To represent a range of seasons and PMI, a sequential data pool of 40 donors was sampled and every fifth donor was selected (n=8). Each donor was represented by