H47 Changes to the Integrity of Bone Marrow during Decomposition

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After attending this presentation, attendees will be familiar with the microscopic changes that occur to bone marrow throughout the postmortem interval.

This presentation will impact the forensic science community by introducing a potential semi-quantitative indicator of time-since-death from skeletal remains.

The objective of this study was to investigate the potential utility of histological analyzes of bone marrow for use when estimating the time-since-death.

The impetus for this pilot study is a response to recent legal decisions (the *Daubert* criteria), the National Academy of Sciences (NAS) Report on forensic science research, and best practice recommendations from the Scientific Working Group for Forensic Anthropology (SWGANTH) that have encouraged increased quantitative assessment of forensic techniques.

The purpose of assessing the histological appearance of bone marrow throughout the postmortem interval is to determine if bone marrow biopsy can be used as a quantifiable predictive indicator of time-since-death. Six pigs (*Sus scrofa domesticus)* carcasses were acquired from the Cummings School of Veterinary Medicine of Tufts University in Grafton, MA. All animals were euthanized at the same time by captive bolt, an AALAC and USDA approved technique for euthanasia. Each animal was placed in a wire cage, to limit scavenger access, on the ground at the Boston University Outdoor Research Facility in Holliston, MA during September, 2010. Experimental carcasses were placed approximately 15 feet apart. Two bone marrow plug biopsies were obtained from each pig on a graduated schedule, beginning with daily collections during earlier decomposition and ending with one in the fourth and last week of the experiment, as the pigs had skeletonized. Jamshidi Biopsy needles were used and all samples were immediately placed in small bottles containing 10% buffered formalin. The schedule was devised with the hypothesis derived from previous literature that the early decomposition process would exhibit the fastest changes and would gradually slow throughout the decomposition process.

A total of 122 bone marrow biopsy samples were collected over a 30-day period. They were rinsed in distilled water, decalcified in a rapid decalcifying solution, embedded in 5% gelatin and cut using a vibratome. The 40mm-thick sections were then microscopically assessed and scored based on three criteria: Cellular diversity and appearance, osteocyte abundance and appearance, and cancellous bone structure appearance. The three criteria were assigned a numerical value for each sample and then correlated with the known time-since-death to determine the changes that are observed in the biopsies as decomposition proceeded. The average summary scores of the daily samples were also correlated with the average temperature and accumulated degree-days (ADD).

The results showed a positive linear correlation between the scored traits and both time-since-death and average temperature with the exception of the cancellous bone structure. In addition, the results suggest that a strong relationship exists between bone marrow appearance and integrity and the postmortem interval. These observations are encouraging and indicate this approach may have utility as a semi-quantitative predictive tool for estimating the time-since-death from skeletal remains.

PMI, Histology, Bone Marrow

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