H3 Decomposition of Sharpey's Fibers in Estimating Postmortem Interval

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After attending this presentation, attendees will understand the potential for decomposition rates of Sharpey's Fibers of the alveolar bone to be used in estimation of Postmortem Interval using Accumulated Degree Days.

This presentation will impact the forensic community by introducing a new way to establish the postmortem interval after the shorter-term processes of algor, livor, and rigor mortis have completed, and in the absence of other common estimation methods such as forensic entomology.

After initial biological changes associated with *rigor*, *algor,* and *livor mortis* have run their course, the estimation of time since death becomes increasingly more difficult and less precise. Forensic entomology can extend the precision of postmortem interval estimation, but suffers when insect activity is non-existent and when time since death becomes increasingly long. Studies of decomposition rates of the soft tissue can add information to the estimation of postmortem interval, but to date, are limited in climatic region, thus making them less reliable in areas with different climates than the original study area. The utilization of accumulated degree-days for decomposition studies is useful, but often overlooked and marginalized. The single-rooted anterior dentition, particularly the incisors of both the maxilla and mandible, has been observed to fall out of socket after some period of decomposition. It is generally observed that this occurs after skeletonization, but it is unknown how long after. It is also unknown whether this is a regular process or a chance occurrence based on factors intrinsic to each situation. This paper reports the results of a series of experiments designed to test the number of accumulated degree-days necessary for the breakdown of the dental Sharpey's fibers, which serve to bind the cementum of the tooth roots to the alveolar bone. Pig (*Sus scrofa domestica*) dentition was utilized as a substitute for human dentition, as the facilities available are not suitable for human cadaver experiments. The study is limited to observation of the central maxillary and mandibular incisors, as these teeth have morphology quite similar to that of human incisors. None of the other dentition was observed for this study, but the entire dental arcade was exposed to avoid damage to the fibers in question during specimen preparation. To date, a total of seven experiments have been conducted; and more are planned for the upcoming months. Pig head specimens were collected from local butchers. Several were entire specimens with hide and bristles included, while others had been bisected along the mid-sagittal line and the hide removed. Initial tests show no difference in Sharpey's Fibers decomposition rates between the two initial preparations. The test subjects were placed in a rural outdoor environment with mixed exposure to sun and shade. Large wire dog kennels which are open to the elements protect the test specimens. Two locations have been used to date, one being on the margin of a wooded area, the other in a more open pasture area. Each site was established with a DS1921G Thermochron from iButtonLink, which recorded outdoor temperature at hourly intervals from the initial positioning. Test specimens were checked on a daily basis for the first two weeks, and every three days subsequently. During the course of the check, each test subject was examined to identify whether the anterior teeth were still in place. The checks did not involve any contact with the test subject. Research to date suggests that at Sharpey's Fibers may decompose after only 3000°F accumulated degrees. Initial data shows decomposition of the alveolar Sharpey's Fibers sufficient for the loss of anterior dentition can occur in as few as 40 days of exposure during June and July (daily temperature average of 75.55°F). Further tests are currently being planned to support this data and identify which environmental conditions, besides temperature, have effects on the decomposition rates of alveolar Sharpey's Fibers. It is expected that this research will be useful in making more precise estimations of postmortem interval when that period is longer than can be measured using currently available methods.

Forensic Anthropology, Postmortem Interval, Decomposition

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