H131 Differences in Soft Tissue Decomposition Rate and Manner Between Previously Frozen and Never Frozen Domestic Pigs (*Sus Scrofa*)

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After attending this presentation, attendees will understand the effects of previous freezing on the progression of both internal and external soft tissue decomposition.

This presentation will impact the forensic science community by contributing to a greater understanding of the variables affecting decomposition as well as providing a suite of characteristics that warrant consideration of exposure to freezing in forensic cases.

This research examined differences in decomposition rate and manner of domestic pig subjects (*Sus scrofa*) in never-frozen (control) and previously frozen (experimental) research conditions. Due to the detrimental effects of freezing on bacteria responsible for putrefaction and previous taphonomic studies concerning the effects of freezing on rat models and pig skeletal muscle, it was hypothesized that experimental subjects would undergo less putrefaction and decompose at a slower rate than control subjects.[1-3]

Eight control subjects and eight experimental subjects were weight-matched and placed in an outdoor research environment within an hour of each other on the same day during two seasons (fall and winter) at the Complex for Forensic Anthropology Research (CFAR) at Southern Illinois University (SIU). All subjects were obtained from the SIU Swine Research Center and were euthanized due to health issues. No subject was euthanized for the purpose of this research. Subject pairs were placed 1-2m apart in identical environmental circumstances and protected from scavengers under a wire mesh cage. Subjects selected for the experimental condition were frozen at -18°C for a minimum of seven days. Subjects weighed at least 23kg, and weight difference within pairs was minimized (<15%) to ensure observed differences in decomposition were due to the research condition being investigated. Extensive quantitative observations were collected daily: abdominal circumference; Total Body Score (TBS); and temperature.[4] Qualitative observations were also recorded daily: photographs of subjects; descriptive decomposition stages; and general visual observations concerning insect activity and subject appearance.[5] Field necropsies, consisting of qualitative macroscopic observations of the abdominal and thoracic organs, were performed at varying Accumulated Degree Days (ADD) ranging between 50 and 300 (Celsius). Comparison (paired samples *t*-tests) of ADD to three TBS (early decomposition TBS, 9.5 TBS, and advanced decomposition TBS) indicated the rate of decomposition of experimental subjects was significantly slower than control subjects at both early decomposition TBS and 9.5 TBS ($p=0.003$ & $p=0.002$, respectively). In experimental subjects at these two stages, thermal energy was directed toward thaw instead of to decomposition. This, in concert with decreased viable putrefactive bacteria, resulted in a slowed rate of decomposition. However, no difference in ADD required to reach advanced decomposition was observed between the two conditions ($p=0.112$). Only eight subjects reached the advanced decomposition stage; thus, further research is necessary and ongoing for subjects at later stages of decomposition.

Differences in qualitative observations between experimental and control subjects were also noteworthy. Internally, experimental subjects displayed less internal putrefaction, limited internal color change, minimal organ distention, and dehydration of the heart. In contrast, control subjects exhibited increased putrefaction, more internal color change, substantial organ distention, and pleural bubbling around the lungs. Externally, experimental subjects displayed overall gray discoloration, increased desiccation, more oviposition by insects, and nearly non-existent bloat. Externally, control subjects exhibited normal color change during decomposition, with purple and green discoloration being much more common in these subjects. Bloat was extensive in control subjects. The mean of the percent difference in abdominal circumference between experimental and control subjects was significant (control mean = 1.07, experimental mean = 1.00, paired samples *t*-test, $p<0.001$). Due to these differences in rate and manner between experimental and control subjects, this study suggests previously frozen subjects should not be used in taphonomic research, as results may not accurately reflect the "normal" taphonomic condition. In cases of forensic significance, the possibility of freezing should be investigated if the victim displays external gray discoloration, substantial external desiccation, decreased internal putrefaction, minimal organ distention, lack of bloat, and a dehydrated-appearing heart.

References:

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Freezing, Forensic Taphonomy, Decomposition

