H43 Differential Decomposition of Non- Traumatized, Blunt Force, and Sharp Force-Traumatized Buried Pig Carcasses

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After attending this presentation, attendees will have a greater understanding of the effect of peri-mortem trauma on decay of buried remains. The study will specifically address the research question: Does the presence of peri-mortem blunt force or sharp force trauma accelerate postmortem decay of buried remains?

This presentation will impact the forensic community by comparing the differential effects of laboratory-induced blunt force and sharp force trauma on postmortem decay rates of stillborn pigs. These data will aid investigators' understanding of differential decay of traumatized versus non-traumatized remains and may aid in the determination of postmortem interval for such remains.

Forensic anthropologists have suggested that human remains manifesting peri-mortem trauma decay at a faster rate than non- traumatized remains (Mann et al. 1990).[1] Irregular or premature decomposition may occur due to injury which exposes underlying tissue to decomposition agents and insects (Rodriguez 1997).[2] In this pilot study, stages of decomposition are examined for non-traumatized buried newborn pig carcasses compared to carcasses subjected to blunt and sharp force trauma. We hypothesize that pigs with peri-mortem trauma, particularly that which involves exposure of underlying tissue (sharp force trauma), will decay more rapidly than non-traumatized or only minimally traumatized (blunt force) remains.

Nine stillborn pigs (*Sus scrofa)* were obtained for this experiment. Each pig was numbered and its initial weight, maximum length, and width recorded. Pigs 1, 4, and 7 were not subjected to trauma. Pigs 2, 5, and 8 were subjected to blunt force trauma, administered by placing a pig on a metal force plate and impacting the right head and shoulder with a concrete cylinder projectile, dropped through a 50 cm long PVC pipe. The left side of the head and shoulder were impacted by the same projectile dropped through a 108 cm long PVC pipe. A similar procedure was used on Pigs 3, 6, and 9 to simulate sharp force trauma but the projectile used was a sharpened iron wood-splitting wedge. Vertical vector force was recorded by the force plate and, along with impact time, was analyzed by [Logger Pro 3.2 software] to calculate the impulse, or change in momentum of the projectile after striking the carcass. As expected, impulse measurements were higher for projectiles dropped from the 108 cm pipe, since gravitational potential energy is directly proportional to height. Impulse was measured in Newtons/second.

Pigs were then buried at a decay facility in the Spring season in uniform depths of 40 cm in two rows of pits placed at 2 meter intervals. An iButton in each pig's mouth recorded temperature at four-hour intervals. Soil color and texture were described and soil samples collected for determination of pH and soil chemistry (using X-ray fluorescence). Non-traumatized pigs and pigs with blunt and sharp force trauma were alternately buried in individual pits by their number.

The research plan involved exhuming Pigs 1 – 3 after one month, recording their stages of decay and reburying them. After three months, Pigs 1 – 6 were disinterred and described, then reinterred. After three additional months, all nine pigs were disinterred and their pit characteristics and decay rates described and compared. This staged exhumation and reburial was enacted to assess and control for the effects of burial disturbance on decomposition as a potential bias in this investigation.

At one month exhumation, Pigs 1 – 3 had lost over 35% of their body weight. Stage of decomposition was assigned following Galloway (1997).[3] Pig 1 (non-traumatized) manifested the least decomposition (early Phase II) compared to Pigs 2 and 3. Pig 3 (sharp force trauma) showed a slightly higher rate of decomposition compared to Pig 2 (mid- late Phase II).

At the three month exhumation of Pigs 1 – 6, all six pigs manifested skeletonization with only a few portions of hair and tissue associated with bone. Acidic soil, higher summer temperatures, increased insect activity, and higher overall rainfall with retention of moisture in clay soils likely accelerated decay in all pigs.

Results of this pilot experiment demonstrated differences in decay rates between non-traumatized and traumatized buried remains. Although sample sizes were small, pigs subjected to sharp force trauma manifested greater decay compared to other (blunt force-traumatized and non-traumatized) pigs. Factors which may be responsible for this differential decay are discussed and include internal (e.g., accelerated microbial activity) as well as external (increased accessibility to the physical and biological environment) influences. In future, experiments with larger sample sizes and more frequent monitoring through disinterment may enhance detection of variability in decay rates of traumatized and non-traumatized remains.

References:

1 Mann, RW, Bass WM, Meadows L. Time since death and decomposition of the human body: variables and observations in case and experimental field studies. J Forensic Sci 1990;35: 103-111.

2 Rodriguez WC. Decomposition of buried and submerged bodies. In Haglund WA and Sorg MH, editors. Forensic taphonomy: the postmortem fate of human remains. Boca

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Postmortem Decay, Peri-mortem Trauma, Postmortem Interval

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