H26 The Reliability of Cadaver Decomposition: Can Non-Enteric Microbes Rapidly Contribute to Cadaver Breakdown in Soil?

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Following this presentation, attendees will understand that cadaver decomposition in soil is a process that can be associated with low rates of error and the rapid (< 24 hours) participation of non-enteric microorganisms.

This will impact the forensic science community by demonstrating that cadaver decomposition can be a reliable process and soil microbial ecology might be used to accurately estimate the postmortem interval of buried bodies.

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Two topical aims of forensic taphonomy are to locate and date clan- destine graves. Achieving these aims requires an understanding of the funda- mental processes and error rates associated with cadaver decomposition in soil. This understanding is currently lacking. This is primarily because human cadavers are difficult to acquire for decomposition studies (and very difficult to replicate) and forensic taphonomy has relied upon case studies and anecdotal evidence rather than experimental investigation. As a consequence, forensic taphonomy currently operates on several untested assumptions. For example, traditional dogma states that anaerobic enteric microorganisms dominate cadaver breakdown until the latter stages of decomposition, when aerobic soil and/or dermal microbes become active.

This assumption was tested by incubating complete, incised, and evis- cerated juvenile (8-10 days old) rat (*Rattus rattus*) cadavers in soils of contrasting texture (sand, loamy sand, clay). Soils were collected from tropical savanna ecosystems in Pallarenda (19°11'S, 146°46'E) and Wambiana (20°33'S, 146°08'E), Queensland, Australia. Pallarenda soil was a Rudosol and had a sandy texture (97.7% sand, 1.3% silt, 1% clay). Wambiana soil was a Vertosol and had a clay texture (30.9% sand, 20.8% silt, 48.3% clay). Soils were sieved (2 mm), weighed (500 g dry weight) into incubation chambers (2 litre), calibrated to a matric potential of –0.05 mega- pascals (MPa) and incubated at 22 °C for seven days to equilibrate. Following equilibration, rats (*Rattus rattus* L., 18 ± 1 g) were killed with carbon dioxide and subjected to experimental treatment. Treatments comprised a complete cadaver, eviscerated cadaver, cadaver with a sewn incision only (to account for the effect of the incision) and a control (soil without cadaver). Cadavers were buried on their right side at a depth of 2.5 cm. Cadaver decomposition was measured via cadaver mass loss (% wet weight), CO_2-C evolution (an index of aerobic microbial activity and decomposition) and soil pH. This experiment was replicated four times resulting in 192 samples.

Cadaver burial, regardless of treatment, resulted in a rapid (< 24 hours) significant increase in microbial activity, which was positively correlated to cadaver mass loss. Evisceration resulted in less cadaver mass loss and microbial activity in sand, and had no effect on decomposition in clay. It is concluded that soil and/or dermal microbial communities rapidly respond to cadaver burial and play a significant role in cadaver decomposition. These results also show that soil type can significantly affect cadaver breakdown.

The relative variation (standard error/mean) of mass loss and CO_2-C evolution show that the measurement of CO_2-C was a more reliable method for assessing cadaver decomposition. The relative variation of mass loss measurements varied from 3%-47%. However, the relative variation of CO_2- C measurements ranged from <1% to 21%, with variation increasing during the latter stages of breakdown. These results provide further evidence that processes associated with cadaver decomposition can be associated with a low rate of error and might be developed into methods to accurately estimate the postmortem interval of buried bodies.

Forensic Taphonomy, Reliability, Microbial Activity

 ** Presenting Author*