## H70 Human Decomposition Ecology at the University of Tennessee Anthropology Research Facility

*Franklin E. Damann, MA*, National Museum of Health and Medicine, AFIP, PO Box 59685, Washington, DC 20012-0685; and Aphantree Tanittaisong, MS, AFIP Armed Forces DNA Identification Laboratory, 1413 Research Boulevard, Rockville, MD 20850*

After attending this presentation attendees will understand the importance of ecosystem ecology to studies of human decomposition.

This presentation impacts the forensic community by providing a framework for study in forensic taphonomy as those studies relate to understanding decomposition, microbial activity, and time since death.

Microbially-mediated decomposition of a corpse impacts the body and the soil environment. Carter and colleagues[1] referred to microbially- mediated alteration of the landscape as a Cadaver Decomposition Island (CDI) since the normal processes of the terrestrial ecosystem change in response to a pulse of high-quality resource over a small area. The addition of a rich nutrient source is defined by an increase in total carbon and water that supports an increase in the carrying capacity of the niche. An increase in microbial biomass and energy transformation follows, until the substrate cache of energy-bound biomolecules and nutrients are depleted and the site of cadaver decomposition returns to a level consistent with the larger biogeographical footprint.[1,2]

In order to study changes in the ecological setting of human decomposition, research was conducted at the University of Tennessee Anthropology Research Facility (UTARF). The UTARF has been engaged in human decomposition research for 28 years. Between 1981 and 2006, 782 bodies have decomposed over a small wooded 1.3 acre plot of land.[3] As such, the goal of this research is to identify variation of soil parameters as they relate to microbial biomass, microbial community structure, and human decomposition. To that end, the spatial distribution of soil conditions at was addressed. Specific attention was given to soil type, organic content, moisture content, and pH as these modulators contribute to the underlying chemical environment where the thermodynamic activities of energy transformations control microbial activity.[4] Total carbon, nitrogen, microbial biomass, and microbial community structure were evaluated in conjunction with these basic soil parameters. Soil samples were collected following a stratified random sampling strategy. Strata were determined based on cadaver decomposition density per unit. A negative control stratum was defined as the area adjacent to the facility, located no less than five meters beyond the outer perimeter. In total, 57 soil samples were collected from the A-horizon (zero to 10 cm) of five different strata; with 12 originating below actively decomposing corpses. The samples were sifted to remove large debris, homogenized, and stored at -20˚C until analysis.

Results of soil analysis classify the soils as very deep, well-drained, clayey soils that are derived from calcareous sandstone and shale.[5] The area encompassing the decomposition facility consists of partially decomposed hardwood leaf litter and dark reddish brown loam (5 YR 3/3) making up the major component, with minor components being composed of yellowish-brown loam (10 YR 5/4). The western half of the facility has less slope than the eastern half, which approaches 25% and also includes a greater concentration of rocks. Chemical analysis of the recovered sediments indicated an average soil pH of 6.6 that varied from 4.8 to 8.0. These recordings are consistent with that reported previously.[2,5] Soil organic matter (SOM) was determined by loss-on- ignition and is reported as a percentage. For the sampled areas, SOM varied from 0.68 to 4.37 percent, and showed only slight differences among the sampled strata. Soil moisture content determined by oven drying 3.0 g to 5.0 g varied from 3 to 27 percent and showed significant differences between low and high concentrations of decomposition density. Interestingly, differences in mean water content were best explained when the data were split by terrain (i.e., slope), rather than the distribution of cadaver decomposition density.

This project evaluated physical and chemical constituents of UTARF sediments since these parameters affect microbial biomass and microbial community structure. As evidenced by the basic soil data collected for this study, soil factors such as water content, organic content, and pH are largely determined by state factors (i.e., climate, topography, parent material, time) of a temperate urban forest biome, rather than the ephemeral and localized pulses of a CDI that have a greater effect on the influx of carbon and nitrogen and the composition of the microbial community.

**References:**


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 ** Presenting Author*

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**Decomposition Ecology, Microbe Community Structure, Taphonomy**