G153 Microbial Communities and Necrophilous Insects Associated With Cadaver Decomposition Islands in Southeast Louisiana

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The goal of this presentation is to provide attendees with knowledge of the microbial diversity and forensically important insects related to the five stages of decomposition.

This presentation will impact the forensic science community by demonstrating the importance of understanding biological and ecological aspects of both forensically important insects and microorganisms associated throughout the decay process.

Microorganisms in topsoil and forensically important insects are both pivotal in the decomposition of vertebrate carrion. Decomposition of vertebrate tissues results from both internal and external factors including autolysis, putrefaction, and diagensis, as well as scavenging of tissues by insects, vertebrates, and microorganisms. In forensic biology, there is limited information available regarding the microbial communities associated with the decay of large vertebrates above-ground (*i.e.*, cadaver decomposition islands). Most studies regarding microbial diversity and community structure are associated with profiling soil microbial populations, clandestine graves, or small-scale laboratory studies. However, the majority of decomposing remains of forensic interest (humans and poached wildlife) are recovered above-ground and often placed directly onto vegetation, leaf litter, soil surface, etc. Furthermore, soil microbes could be of particular forensic importance in later stages of decay when insect abundances have declined. From an investigative and evidentiary point of view, the more information one has, the stronger the case. Thus, this research was designed to produce a comprehensive database of microbial diversity, community structure, and succession using adult swine carcasses (i.e., human representative and reference model for forensic entomology research).

This study includes four series of seasonal experiments conducted in a woodland habitat in Hammond, LA, during the winter and summer seasons during 2010 – 13. The primary goals of this research are twofold: (1) to establish a microbial diversity database and successional patterns of soil microbes associated with cadaver decomposition islands in southeastern Louisiana; and, (2) to correlate the microbial soil profiles with the observed stages of decay and faunal succession patterns of necrophilous insects. Each seasonal experiment consisted of three adult swine carcasses (~60 – 160kg) placed directly on the leaf litter/soil surface. Each seasonal study was conducted for 12 months with sampling events and protocols varying for insect and soil core collections throughout the five stages of decay. Entomological data were collected both manually and using pitfall traps. Each sampling event included collection of insects both manually and using pitfall traps as well as two soil samples (~12cc each) collected beneath each carcass using a soil-coring device. Soil cores consisted predominantly of aerobic microorganisms associated with decaying detritus and organic-rich topsoil of the forest floor. Topsoil cores were also collected per sampling event at a control site approximately 15 meters away from the carcasses.

Processing of the soil samples included the following: soil characterization (soil texture, pH, total organic carbon, and total organic nitrogen), microbial enumeration, DNA extraction and purification, PCR amplification, T-RFLP analysis, and sequencing analysis. The primary sarcosaprophagous fly species associated with the swine carrion during the winter 2011 study were two Calliphoridae species (*Calliphora vicina* (Robineau-Desvoidy) and *Phormia regina* (Meigen)) and one Muscidae (*Hydrotaea leucostoma* (Wiedemann)). Data generated from this study will produce successional patterns of insects and microbes, which could potentially elucidate estimations of time since death for large vertebrate carcasses above-ground. More importantly, microbial topsoil diversity data will likely be more informative during later stages of decay such as advanced decay and putrid/dry remains. Data from the winter 2011 study (February 5, 2011 to December 6, 2011) will be presented.

Decomposition, Insects, Microbes

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