H99 The Composition and Shifts of Soil Bacterial and Fungal Communities Following Cadaver (*Sus Scrofa* Domesticus) and Plant Litter (*Quercus Robur*) Burial

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Learning Overview: After attending this presentation, attendees will understand how soil bacterial and fungal communities change during carcass decomposition and the potential exploitation of this phenomenon to estimate time since death.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing an insight into the shifts in soil bacterial and fungal communities up to 24 months after piglets' burial in contrast with oak leaves decomposition. Furthermore, it suggests the use of soil bacterial and fungal communities to assess time since death and locate clandestine graves.

The scientific community's growing interest in cadaver decomposition in soil is reflected by the increasing numbers of publications on this topic. Nevertheless, there is still a gap in the knowledge about some key processes, such as human decomposition, soil microbial communities associated with the different decomposition stages, their role and effect on decomposition, and their value as a forensic tool.[1]

This study aims to expand the knowledge base of subsurface decomposition within a forensic context by comparing soil microbial communities associated with the decomposition of mammalian surrogates (*Sus scrofa* domesticus) and plant litter (*Querus robur*) in a natural setting.

The experimental design consisted of three piglet (*Sus scrofa* domesticus) burials, three plant litter (*Quercus robur*) burials and three soil-only burials (controls). The subsurface decomposition experiment was conducted in a natural setting in secure land in North East England (North Yorkshire, United Kingdom).

Soil pH, soil temperature, atmospheric temperature, and precipitation were monitored, and the associated soils profiled for shifts in bacterial communities by Denaturing Gradient Gel Electrophoresis (DGGE) and high throughput sequencing using 16s ribosomal RNA (rRNA) gene-specific primers. Soil fungal communities were monitored by DGGE using 18s rRNA gene specific primers. Soil samples were collected at regular intervals over a 24-month period. The different treatments were sampled monthly during the first year, then every two months until the end of the study. Sampling was performed at 50cm–60cm deep, without disturbing the buried material. At each time point, four soil samples were collected from around each treatment using a soil corer and combined into a 25ml sterile universal tube, then transported to the laboratory, on ice, and stored at -20°C until required.

The ecological indices calculated after DGGE and data obtained from 16s rRNA high-throughput sequencing allowed a profiling of the soil bacterial and fungal communities at each time point. The results have shown a direct relationship between seasonal temperature changes and shifts in microbial activity, together with exploitable shift patterns with the potential to be used for the estimation of time since death.

Soil microbial communities can be of great value for time-since-death/-burial estimations due to their recognized potential to facilitate higher accuracy by complementing the existing tools.[2] Nevertheless, more research is needed to understand the microbial communities' dynamics in different deposition conditions and their interactions with soil, the cadaver, and its inherent microbiome.

Reference(s):

1. Bisker, Chawki and Ralebitso Senior, T. Komang. The Method Debate: A State-of-the-Art Analysis of PMI Estimation Techniques." In: *Forensic Ecogenomics*, edited by T. Komang Ralebitso, Senior, 61-86. London: Academic Press, 2018.
2. Ralebitso Senior, T. Komang, Tim J.U. Thompson, and Helen E. Carney. Microbial Ecogenomics and Forensic Archaeology: New Methods for Investigating Clandestine Gravesites. *Human Remains and Violence: An Interdisciplinary Journal*, 2, no.1 (2016): 41-57.

Cadaver Decomposition, Soil Microbial Communities, Time Since Death