G69 Microbes and Decomposition: Foundations in Decomposition Ecology and Forensic Applications

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After attending this presentation, attendees will have a greater appreciation for the role microbes play in decomposition ecology and the forensic application of such information.

This presentation will impact the forensic science community by showing that microorganisms play a significant role in the decomposition of human and human analogue remains. Some aspects of this role are predictable and potential exists for microorganisms to serve as valuable physical evidence in medicolegal death investigation.

Historically, microbes have been overlooked in terms of their importance in decomposition ecology and their application in estimating the time-since-death of human remains. Much of this has been due to the inability to identify the microorganisms associated with decomposition. Traditional techniques rely on culturing microorganisms in the laboratory, which is highly selective and restrictive to a small component of microbial communities. Furthermore, well-established culture-independent techniques to investigate the whole microbial community, such as the analysis of fatty acids, provide little insight into the taxonomy of microbial communities. As a result, lab experiments are often restricted to investigating microbes that are culturable or identifying changes in microbial community structure without knowledge of the taxa involved.

The significance of microorganisms as physical evidence has increased predominately due to the development of novel technologies allowing for the quantification and description of the whole postmortem microbiome. High-throughput sequencing techniques now allow us to examine microbial communities in their entirety from samples taken from the environment. We can now collect microorganisms from a death scene and identify them using 16S and 18S RNA genes. We have learned that these microorganisms are typically identified to phylum and family level, but it is possible to identify microbial species with a high degree (~97%) of reliability. This advancement means that microbial structure and function as related to the greater ecosystem (i.e., human remains found in nature) can be investigated and potentially modeled, validated, and then used in forensic investigations. It is predicted that these developments will result in a forensic microbiology that will contribute unprecedented insight into death investigation and forensic pathology.

A series of presentations will be given that discuss the roles of microbes in the decomposition process of human and animal remains. Researchers from across the United States have been active within this field for the past five years and are now able to present data that provide novel insight into this process. Topics to be covered will be the following: (1) microbial and insect structure and function associated with humans remains and human analogues; (2) the role of quorum sensing by bacteria in regulating arthropod colonization of human remains; (3) the utilization of swine carcasses as models for decomposition; and, (4) using microbes to estimate a minimum postmortem interval.

Taphonomy, Microbiology, Postmortem Interval

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