H4 Decomposition of Mouse Carcasses Infected With Fluorescently Labeled Bacteria Provide Insight on Postmortem Microbial Translocation

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After attending this presentation, attendees will understand how host commensal microorganisms translocate and thrive immediately following the death and decomposition of the host. In addition, these microbial communities possess investigative potential during the discovery of remains in determining the postmortem interval.

This presentation will impact the forensic science community by providing original data that investigates how commensal bacterial populations translocate, colonize, and proliferate following death and successional decomposition of the associated host. Data obtained will significantly further investigations identifying specific microbial taxa or metabolic signatures for potential use in quantifiable, precise measurements of postmortem interval used in forensic science along with providing a visual fluorescent representation of bacterial translocation.

Microbially mediated mechanisms of human decomposition begin immediately after death and are a driving force for conversion of a once-living organism to a resource of energy and nutrients. Little is known about postmortem microbiology in cadavers, particularly the microbial structure of microflora residing within the human ecosystem, and their associations with decomposition stages. Recent work suggests that these bacterial communities are surprisingly dynamic during the postmortem interval.

This presentation describes how the microbiome of a living host changes and translocates within the body after death, linking the microbiome of a living being to the postmortem microbiome changes, which have demonstrated such promise as usable evidence in criminal investigations. The postmortem microbial community structure and function of *Staphylococcus aureus* (aerobic) and *Clostridium perfringens* (anaerobic) in the animal model *Mus musculus* (mice) were investigated to study how translocation of bacterial species can aid in the determination of postmortem intervals. The immunocompetent mice were inoculated nasally with fluorescently labeled *S. aureus*-Red Fluorescent Protein (RFP) and *C. perfringens*-Cyan Fluorescent Protein (CFP). A subset of mice was immediately surface sterilized with a 10% bleach solution following sacrifice and compared to non-surface sterilized mice in order to determine the influence of external microbiota. Both labeled bacteria were tracked using *in vivo* and *in vitro* imaging and analysis of gene expression to determine colonization routes and bacterial regulation response associated with different physiological events of host decomposition with time points starting at one hour and ending at 60 days. DNA was isolated from mice tissue samples that were preserved in DNA-RNA shield. The resulting DNA was purified for library preparation and whole genome shotgun sequencing.

These methods provide original data to uncover how commensal bacterial populations translocate, colonize, and proliferate following death and successional decomposition of the associated host. Data obtained significantly furthers investigations identifying specific microbial taxa or metabolic signatures for potential use in quantifiable, precise measurements of the time of death used in forensic science.

Microbial Translocation, Commensal, Postmortem Interval