G80 Quorum Sensing Regulates Blow Fly Attraction and Colonization of Human Remains: Greater Insight Into the Pre-Colonization Interval

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After attending this presentation, attendees will have a better understanding of the mechanisms potentially regulating arthropod attraction and colonization of human remains.

This presentation will impact the forensic science community by illustrating how these data are important as they bridge microbial community ecology and arthropod behavioral ecology as related to the colonization of human remains. Additional research in this area could lead to a great understanding, and potential prediction, of the time interval from death to insect colonization. Furthermore, this research could lead to novel diagnostic tests allowing for the estimation of the minimum Postmortem Interval (PMI_{min}) by characterizing and quantifying chemicals present on the surface of human remains not colonized by arthropods, also known as the pre-colonization interval.

Arthropod succession is a known process that can be used to estimate PMI_{min} of human remains. However, the mechanisms regulating this process have historically been relegated to arthropod interactions. Data from two research projects will be presented that demonstrate that many of the behaviors exhibited by blow flies (Diptera: *Calliphoridae*) are partially regulated by quorum sensing by bacteria associated with multicellular organisms that colonize and consume human remains, as well as those bacteria intimately associated with the remains themselves. Quorum sensing is the biochemical pathway through which bacteria communicate and make group decisions.

Proteus mirabilis is a common gram-negative bacterium associated with blow flies. This study isolated *P. Mirabilis* from *Lucilia sericata* (Diptera: *Calliphoridae*) and created a knockout library. Strains from this library were unable to demonstrate swarming which is a quorum-sensing response associated with this bacterium. Furthermore, the swarming behavior could be rescued with known fly attractants, indicating a possible relationship between compounds that are known to elicit a quorum-sensing response and fly attraction.

This presentation demonstrates that the lack of a quorum-sensing behavior results in reduced attraction (38%) and oviposition (63%) and that the behavioral responses of blow flies are dependent on their nutritional background, sex, and age. Flies, regardless of age, exhibited a 63% chance of responding to the wild type *P. Mirabilis* than did the mutant. However, older females were more likely to oviposit on the mutant than the wild type, demonstrating a lower level of selectivity. Furthermore, gravid females are ideal models for measuring the impact of bacteria and quorum-sensing compounds on their behavioral responses.

These data are important as they bridge microbial community ecology and arthropod behavioral ecology as related to the colonization of human remains. Additional research in this area could lead to a great understanding, and potential prediction, of the time interval from death to insect colonization. Furthermore, this research could lead to novel diagnostic tests allowing for the estimation of the PMI_{min} by characterizing and quantifying chemicals present on the surface of human remains not colonized by arthropods, also known as the pre-colonization interval.

Quorum Sensing, Blow Fly, *Proteus Mirabilis*

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