G72 Microbes Associated With Decomposing Remains Regulate Insect Colonization

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The goal of this presentation is to give attendees a better understanding of the role microbes play in regulating colonization of decomposing remains by blow flies (Diptera: Calliphoridae).

This presentation will impact the forensic sciences community by providing a more in depth understanding of the ecological principles governing insect succession of human remains.

Explaining why insects delay their colonization of human remains in some instances while colonizing immediately in others is a fundamental question in forensic entomology. Two of the authors of this presentation, Tomberlin and Benbow, along with others have developed and proposed a new framework for studying human decomposition. They point out that a majority of past research focuses on the post-colonization interval (post-CI) which extends backwards in time from the discovery of the insect infested remains to the point that the insects initially colonized the remains. The time of colonization estimation is viewed as the period of insect activity (PIA) and is often considered the minimum postmortem interval (minimum PMI). The time frame prior to colonization has been termed the pre-colonization interval (pre-CI). Speculations as to why insects delay colonization have been suggested and small advancements explaining this ecological unknown have been made. Known abiotic factors, such as temperature, wind, and rain play a role in regulating colonization of human remains. It is hypothesized that microbial populations associated with human remains represent a major biotic factor regulating insect colonization.

Human remains represent nutrient rich resources for many organisms ranging from microbes to vertebrate scavengers. Microbes were initially thought of only as nutrient recyclers. However, recently other hypotheses have been suggested. Some researchers speculated that microbes were resource competitors with other consumers, including insects. Microbes may alter food resources and produce toxins that affect the "appeal" of the resources, and themselves, to other consumers. It is hypothesized that volatiles emitted by microbes associated with carrion, regulate the attraction to and diversity of colonization of the remains by insects. It is futher hypothesized that volatiles emitted by microbes associated with and physiological by-products produced by blow fly larvae feeding on the remains influence the attraction and colonization of the resource by future blow fly species. It has been demonstrated that many saprophagous insects feed directly on microbes associated with decomposing material as part of their diet. In addition, microbes can have a mutualistic relationship with these arthropods. It is hypothesized that specific bacterial species which survive digestion and pupation with one fly species, may not with another fly species. Therefore, bacterial proliferation and dispersal is mitigated by colonization patterns of fly species. Such an association could, however, prove detrimental to both microbe and associated fly if the volatiles emitted also attract predators. Basically, it would be a two-way ecological chess match where the pawns are the insects and the players are the associated microbes. But, these roles can be reversed depending on those involved. This model examines if the volitles emitted by the native species, *Cochliomyia macellaria*, larvae (the prey) and associated bacteria attract the introduced predatory blow fly, *Chrysomya rufifacies.*

A series of laboratory experiments were conducted examining the interactions between microbes associated with carrion (beef liver) and the attraction of *C. rufifacies* and *C. macellaria* adults. Furthermore, two field experiments were conducted examining the interaction of microbes on carrion with the attraction of blow flies as well as the role of excretions/secretions of blow flies on the attraction of Diptera. These results will be provided in this presentation and will hopefully shed light on biotic factors governing the time span of the pre-CI.

Forensic Entomology, Microbes, Trophic Interactions

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