



Pathology Biology Section – 2009

G98 First Insect Succession Study on a Human Cadaver in Texas

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After attending this presentation, participants will be introduced to the first succession of insects observed on a human cadaver in Texas.

This presentation will impact the forensic community by providing information on the succession patterns and abundances of forensically important insect species attracted to a human cadaver.

These data can potentially be used to determine a more refined estimate of the period of insect activity (PIA) on human remains discovered in the southwestern United States. Correctly identifying arthropod species found associated with a body allows for time approximations to be made based on development data and behaviors. The PIA is divided into two ecological phases termed the pre-colonization (pre-CI) and post-colonization (post-CI) intervals. Insects arrive at bodies in waves or seres. The pre-colonization interval (pre-CI) is defined by insects being initially attracted to remains without colonizing the resource. Various species arrive at different times based on seasonality and abiotic factors. Insects are attracted to a body in a predictable pattern based on its stage of decomposition. Many of these insects will colonize (post-CI) the resource once the remains are discovered. Succession patterns may be influenced by the condition of the body and the area in which it is located. The following factors about the condition of the body may influence the rate of colonization, species richness, and abundance: direct sunlight, partially shaded, indoors, urban, rural, buried, or submerged. Applying the knowledge of arrival time (pre-CI), colonization patterns (post-CI), and associated behaviors allows for a better assessment to be made concerning approximations in the length of time a body may have been at a specific location.

Blow flies (Diptera: Calliphoridae) were initial colonizers of the human remains in this study. Over the duration of this study three blow fly species were regularly collected in the vicinity of the body: *Cochliomyia macellaria*, *Chrysomya rufifacies*, and *Phormia regina*. There were also *Piophilidae casei*, as well as Muscidae and Sarcophagidae species collected from the body. Coleoptera species also will colonize a body because of the readily available food resource of dipteran larvae as well as decomposing materials. Five beetle families were collected near or around the body: Cleridae, Histeridae, Silphidae, Staphylinidae, and Dermestidae.

C. macellaria is one of the initial colonizers in warmer temperatures while *P. regina* is more active during cooler weather. The diversity of flies collected may be an indicator of the range of temperatures experienced during the study. The hairy blow fly larva, *C. rufifacies*, is a facultative predator and will feed on larvae of previous colonizers such as *C. macellaria*. The hairy maggot blow fly can be distinguished from other maggots on a resource by the spine-like projects on each segment. It was interesting to note that there was a delayed colonization of Calliphoridae. Abiotic factors such as temperature may have influenced the colonization times or other unaccounted factors may have influenced the delay of oviposition but it is important to note that the body was not immediately colonized. Various ants from the family Formicidae and fleas, *Xenopsylla cheopis*, were also collected during this study. Postmortem ant bites on a body have been previously documented in other studies. Fleas collected near the body do not imply that the subject was infested; rather it may represent the environmental fauna and the potential pests they carry. This study appears to have followed known succession patterns expected for the arthropod species collected; however, this is the first study in the state of Texas to examine insect succession patterns using a human cadaver.

This study is also important because it allows forensic entomologists to better assess delay in colonization estimations of insect activity on remains as it relates to the pre-CI. The specific time when a body is placed out into the field can be compared to estimations based on entomological development data. Establishing the accuracy of time estimations using development data for those insects collected from the remains may lead to more refined methods for calculating how long a body has been in a particular area prior to colonization. It is noted that this is a primary study with many more conditions to be replicated as potential body recovery sites and thoroughly analyzed to gain a better understanding of attraction, colonization time, development, and interactions among insect species on a human resource.

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