H92 Morphological Comparison of Insect Artifacts From Six Species of Necrophagous Flies

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After attending this presentation, attendees will understand what insect artifacts are, their importance to bloodstain pattern analyses, and limitations to current methods used for detection of insect artifacts.

This presentation will impact the forensic science community by expanding the knowledge base of insect artifacts associated with crime scenes and challenging current practices for detection of artifacts produced by flies.

Several species of insects are attracted to human remains and exuded body fluids as sources of nutrients. The best-studied examples are adult flies in the family Calliphoridae (blow flies), which walk along body surfaces or through pools of bodily fluids. Flies leave behind traces of their activity in the form of artifacts (e.g., stains, spots, and transference) that are deposited in numerous locations on and around the site of body decomposition.[1,2] Such activity has the potential to distort the shape of existing bloodstains as well as mechanically transfer small drops of wet blood to other locations. Compromising the physical evidence even further is that as a fly feeds, it will regurgitate and defecate some of the ingested food onto surfaces near the crime scene or other locations, resulting in intermixing of fly artifacts with human body stains.[2,3] Despite claims that fly artifacts can be detected based on morphological features, alternate lighting, and presumptive chemical tests, less than 0.2% of all forensic fly species (~1,400) known in the United States have been examined by the reported methods for discernment.[3,4] In this study, the morphological characteristics of artifacts (regurgitate and feces) from six species (*Calliphora vicina*, *Chrysomya megacephala*, *Ch. rufifacies*, *Sarcophaga bullata*, *Phormia regina*, and *Cynomya cadaverina*) of necrophagous flies were examined as the first step toward developing a method to distinguish insect artifacts from human body stains. Artifact shape, size, and color were compared between species, based on adult diet (liquid blood, fresh tissue, powdered milk, and mouse carcass) and on the length of exposure to a given food source. Regurgitate volumes were also estimated for each species and correlated with adult body mass and artifacts deposited on smooth surfaces. The results indicate that artifact shapes and sizes are highly variable and species specific. Larger-sized adults (*C. vicina*, *Cy. cadaverine*, and *S. bullata*) consistently deposited the largest artifacts, especially when feeding on blood. By contrast, *P. regina*, *Ch. Rufifacies,* and *Ch. megacephala* were more likely to yield transference stains from pulvilli after walking through liquid blood or moist tissue surfaces than the other species examined. The color of artifacts was dependent on diet of the adults, regardless of species. Longer exposure periods to food sources yielded more total artifacts deposited, especially defecatory stains, than when feeding was restricted to <24h. Stains resulting from regurgitation and defecation from all fly species fluoresced at 385nm – 400nm, but the number of artifacts that autofluoresced was highly variable between species and was influenced by diet. None of the artifacts could be distinguished by species, type of artifact, or from bloodstains based on morphological characteristics alone. This is consistent with the view that current methods of visual, contextual, and chemical analysis do not permit reliable or quantifiable discrimination between insect artifacts and human body fluids.[5] Thus, there is an absolute need to develop methods of identification for insect-based evidence such as fly artifacts that are precise, reliable, and are open to use by a broad cadre of well-trained forensic experts.

Reference(s):

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Insect Artifacts, Blow Flies, Forensic Entomology