



G59 Maggot Development During Morgue Storage and the Effects on Estimating the Postmortem Interval

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The goal of this presentation is to present to the forensic sciences community research which demonstrates the potential for insect development during pre-autopsy morgue storage which may in turn affect estimates of postmortem intervals by forensic entomologists.

This presentation will impact the forensic community and/or humanity by demonstrating the need to consider insect development during morgue storage.

Forensic (or medicocriminal) entomology, the use of arthropods in legal investigations, is most frequently employed to estimate the postmortem interval (PMI) of victims of violent crimes or suspicious deaths. The most commonly used method of PMI estimation employs temperature-dependent developmental rates of blow fly larvae (Diptera: Calliphoridae). Retrospective scene temperatures, those temperatures, which the insects experienced during development, are used in combination with known developmental rates of the species involved to estimate the age of the larvae, which often correspond closely with the time of death of the victim. When insect evidence is obtained during autopsy, forensic entomologists often need to make decisions regarding the effects of low temperature (-1°C to 4°C) storage of the body and associated insects when estimating the PMI. Some have argued that development ceases during refrigeration, while others suggest that maggot mass temperatures go unchanged.

During the course of a 2003 homicide investigation, temperatures experienced by the insects associated with the victim were recorded from the time the body was removed from the scene until autopsy using an Onset Hobo H8 data logger. During the intervening time the body was kept in a standard morgue cooler and the temperatures which were recorded showed that the insects were able to maintain high enough temperatures to be able to continue development despite the cold storage temperature. Consequently, subsequent experiments with decomposing pigs were conducted to confirm observations on maggot development in morgue coolers and to establish the magnitude of temperature differences.

Seven porcine cadavers were used: "small pigs" (approx. 11 kg) and "big pigs" (38 kg avg.). Pigs were placed in the field for up to 14 days to allow for insect colonization and maggot mass formation, which were defined as aggregations of feeding third stage blow fly larvae. Upon removal from the study site, each pig was wrapped in a clean sheet and placed in a medium-duty body bag, as is standard procedure for human remains. Thermocouples were attached to each replicate and temperatures inside and outside of body bags were measured during storage in a morgue cooler. Temperatures remained significantly higher ($P < .05$) inside of the body bags relative to the cooler, and remained at levels sufficient for maggot activity (feeding and development). Maggot development was slowed, but not enough to discount insect development between removal of the body from the scene and autopsy. If the assumption is made that no insect development takes place during pre-autopsy refrigeration, potential error rates in PMI estimation of 8.6 – 12.8% occur. The potential for blow fly larvae to undergo significant development, including stadia transitions, while being stored in the morgue is a real possibility. Forensic entomologists must consider this continuing development during the course of an investigation involving samples collected at autopsy.

Forensic Entomology, Postmortem Interval, Autopsy