G108 Improving Postmortem Interval (PMI) Estimations Through Curvilinear Development Modeling of the Blowfly *Lucilia Sericata* (Meigen)

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After attending this presentation, attendees will have a better understanding of the importance of forensic entomology in estimating postmortem interval (PMI) and the advantages of using curvilinear development data for postmortem interval calculations.

This presentation will impact the forensic science community by vastly improving on the current developmental data available for Lucilia sericata and increasing the accuracy of PMI estimations in human death investigations.

The blowfly *Lucilia sericata* is among that group of insects that can occur rapidly on decomposing animals. When found on a human body, the developing eggs, larvae, or pupae of *L. sericata* could be used as an index pointing to the initial time of death (postmortem interval or PMI). Estimating the PMI is crucial in most human death investigations, because time of death is needed for properly reconstructing events before and after death. To use the insects, like *L. sericata*, in estimating PMI we must be able to determine the insect age at the time of discovery and backtrack to time of oviposition. Consequently, understanding temperature-specific development rates is essential. Unfortunately, existing development models of forensically important insects are only linear approximations.

Here, experiments and findings for building a curvilinear developmental model for *L. sericata* are reported. Experimental considerations include diet, humidity, light cycle, temporal patterns of stage transitions, and temperature measures. Experiments were conducted over ten temperatures (10°C, 12.5°C, 15°C, 17.5°C, 20°C, 22.5°C, 25°C, 27.5°C, 30°C, and 32.5°C). Twenty eggs (collected immediately after oviposition) were placed on 25g (0.05lb) of beef liver that was on a $5cm^2$ ($2in^3$) moist paper towel in an 88mL (3z) plastic cup. The cup was placed in a $9cm^3$ ($3.5in^3$) plastic container that had 2.5cm (1in) of wood shavings in the bottom. A thermocouple was placed in the containers to monitor the internal temperatures. Measurements were taken at intervals calculated from accumulated degree hours (ADH). Each life stage had five measurement points: at the beginning, one-quarter mark, one-half mark, three-quarter mark, and the end. Each point was replicated four times, for a total of 20 measurements per life stage. During each measurement, the cups were pulled from the chamber and the stage of each maggot documented with a microscope using the posterior spiracle slits of each maggot (the number of slits corresponds to the life stage).

The *L. sericata* data illustrate the advantages of curvilinear models in describing development at environmental temperatures near the biological minima and maxima, and the practical significance of curvilinear models over linear approximations. Results here represent the first in a series of larger studies modeling development of key forensically important blowflies of North America.

Blowfly Development, Decomposition, Human Death Investigation

