G34 Postmortem Interval (PMI) Determined by Analyzing Temperature Variations of Maggot Masses

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The goal of this presentation is to measure temperature variations within maggot masses and compare these with published temperature studies of dipteran developmental cycles conducted in labs for forensic growth rate base lines.

Hypothesis: the in vivo maggot mass temperature will result in increased growth rate of the larvae when compared to laboratory studies on developmental cycles.

A black bear carcass approved for research by the Florida Fish and Wildlife Conservation Commission Wildlife Research Laboratory in Gainesville, FL was placed into a remote, semi-wooded location within their grounds. The bear was struck by a car and the carcass arrived in early June 2002. Within five hours of the carcass being exposed to the environment a HOBOä external logger was placed at the carcass site and set to record wet bulb temperature, air temperature, and temperature of the soil beneath the bear carcass, and in the center of the largest maggot mass present at the time. Temperature was recorded continuous @ 10 minute intervals for ca. 1.5 months. Adult insects and developing larvae were collected about 6 PM until carcass decomposition was complete. The adult beetles and flies were killed using an ethyl acetate kill jar. Fly larvae were initially placed into empty vials, and then taken back to the lab to be boiled briefly for preservation purposes and then placed into 70% ethyl alcohol. Pictures of the various insects and the growing maggot masses were taken every other day, along with shots of the different decomposition stages the carcass went through. These photos were made with a 35mm camera with macro close up attachments. A separate 35mm camera with an infrared filter was used to take IR shots of the maggot mass for observation of the heat spots. Sketches of the maggot mass locations and decomposition stages were taken daily for visual reference.

Results showed varying temperatures in the maggot mass corresponding with the ever-changing Florida summer weather. The greatest temperature was recorded at maggot mass locations with the greatest number of larvae. When the weather was overcast or immediately following rain the mass temperature was much lower than on days with clear skies and no rain. The larvae were observed moving in and out of the center of the mass in a routine motion as if they are were making a circle in to the mass and back out again. The highest temperatures were taken in the center of the mass with temperatures decreasing exponentially farther away from the center. The larvae composing the first maggot masses were first instars on June 5 and began to migrate away from the carcass on June 13. Several of these larvae were taken in to the lab to be raised during the pupal stage at a set temperature of 26°C; pupation occurred by June 15 and adults emerged on June 20. The remaining larvae left in the field on the carcass developed similarly. The maggot masses began appearing at the orifices within the first four days that the carcass was exposed to the environment. From there they moved around the perimeter of the carcass encasing all of the extremities, the head and the anus region. The masses then moved in towards the center of the carcass as decomposition progressed with the last masses being observed around the exposed vertebral column. The maggot mass was composed primarily of *Chrysomya rufifaces* (Macquart) (Diptera: Calliphoridae) larvae throughout the duration with a few other species intermixed throughout.

Conclusion: Whether the hypothesis was verified has yet to be determined because data are still being analyzed. Species found in and on the carcass are summarized in the poster tables. Variations in species may have increased if insect collections were made at a different time of year and day. The insect faunal succession change with decomposition levels as related to time of day and this could lead to a variety of temperatures and developmental rates. The maggot ball temperature varied with environmental temperature. The maggot ball consisted of the hairy blow fly, C. rufifacies. The maggots in the maggot ball moved in and out of the high temperature center of the maggot ball.

Maggot Mass, *Chrysomya rufifaces*, Developmental Cycle

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