G104 Blowfly Oviposition Dynamics on Liver Bait and Swine Carcasses Exposed at Dusk

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After attending this presentation, attendees will better understand nocturnal and diurnal oviposition (i.e., egg laying) behavior of blowflies, and the possible implications to estimates of the minimum postmortem interval (mPMI) and period of insect activity (PIA). Attendees will learn how environmental conditions affect blowfly oviposition dynamics, and how this can impact insect colonization throughout decomposition.

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One aspect of forensic entomology concerns the use of arthropod evidence at crime scenes to estimate a mPMI based on the species that colonize and develop on the remains. The major assumption that blowflies do not oviposit at night can influence the length of the PIA and thus entomologically-based mPMI estimates. Previous field studies have indicated either an absence of nocturnal oviposition or highly reduced activity that may have been associated with artificial lighting. The objectives of this study were: (1) to test for nocturnal blowfly oviposition and evaluate the effects of different lighting conditions (i.e., artificial and natural) on oviposition using liver baits as a resource; and, (2) monitor oviposition on replicate swine carcasses exposed to the environment at dusk, in different habitats and temporally (i.e., three years).

In the first experiment (Liver Experiment), blowfly oviposition of liver baits was evaluated under experimental light treatments in wooded lot. We hypothesized that nocturnal oviposition would not occur, but initial diurnal oviposition would be correlated with abiotic conditions (i.e., temperature, humidity, precipitation). In a wooded habitat near Xenia, OH, from July-October, 2009, 35.0±2.0g pieces of beef liver bait (N=3/treatment) were placed under three artificial lighted conditions: high (6 lx), low (3 lx), and no light (0 lx). Different bait locations, 1m off the ground and on the ground, were also evaluated to understand the effect of height above ground on oviposition. Oviposition was monitored for 24 hours beginning with bait exposed two hours prior to sunset (determined by NOAA). At each time point, approximately 25% of collected eggs were reared for identification, while the remaining were weighed. A regression analysis for *Phormia regina* was developed to predict the number of egg/larvae from egg mass ($F=1775$, $df=43$, $p<0.0001$, $R^2= 0.97$). Temperature and humidity were monitored.

From all treatments and replicates only 90 eggs were collected within two hours of sunset and no oviposition was documented during the nighttime hours. There were statistically significant effects of light ($F=27.86$, $df=3$, $p<0.0001$) and height above ground ($F=15.8$, $df=2$, $p=0.0004$) on diurnal oviposition in August 2009. August was significantly the warmest month as statistically determined using one-way ANOVA, with a mean nighttime temperature of 20°C. There was less diurnal oviposition during the other months when average nocturnal temperatures ranged from 10-20°C, while average nighttime temperatures <10 °C were associated with no oviposition the following day. Further, the greatest diurnal oviposition was associated with high artificial light and location (height-above-ground) treatment effects.

In the second experiment, replicate swine carcasses were exposed to the environment two hours before sunset and monitored for oviposition as in the liver experiment described above. During the summer of 2009 this was done in a small forested lot using six replicate carcasses, while in 2010 and 2011 identical trials were conducted in a different forested lot about 25km from the first location and using four and six carcasses, respectively.

Similar to the liver experiment, little to no nocturnal oviposition was documented on most carcasses in 2009, 2010 and 2011; however, there was notable exception with one carcass in 2009. On an evening with temperatures only between 15-20°C and rainfall, active oviposition was observed by one female *Lucilia* spp. approximately 0.5 hours before sunset under 0 lux conditions in the mouth of one out of the six carcasses. These are environmental conditions that are never expected to be associated with blowfly oviposition and could be important to estimates of PIA (and thus mPMI) in criminal investigations. Although it requires additional study, it is reported here that there is approximately a 17% chance that early nightfall oviposition can occur during rainfall under relatively mild temperatures during mid-summer in southwest Ohio. Diurnal oviposition in these trials was similar to the Liver Experiment. In 2009, 2010, and 2011, oviposition occurred no later than sunset and no earlier than two hours after sunrise. The average humidity, temperature, and lux that initial oviposition occurred during the three years was 71%, 25°C, and 30lx, respectively. This study demonstrates that early sunset/sunrise oviposition by

blowflies varies greatly even within the same habitat, and the variability due to location, temperature, humidity, and light should be taken into consideration when making estimates of the PIA and mPMI using insect evidence.

Phormia Regina, Oviposition, Decomposition

 ** Presenting Author*