

### F41 Cooperation Between Law Enforcement and Entomologists Leads to Practical Research Questions

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After attending this presentation, attendees will better understand how entomologists and law enforcement can work together during a case, and how case work can inform research questions.

If chemicals are applied to a body and that has an effect on the blow fly activity, then the estimation of the Postmortem Interval (PMI) is therefore compromised. The data obtained from this research will impact the forensic science community by helping to overcome this obstacle when chemicals are involved and yield more accurate assessments by forensic entomologists.

**Hypothesis:** It was hypothesized that chemicals would deter insect activity and when they are used in a suspicious death, it is important for law enforcement and the entomologist to understand the effects on PMI estimations.

**Synopsis of Methods:** This study sought to: (1) observe the effects of chemicals on blow fly oviposition timing; and, (2) observe differences among treatments in terms of blow fly development and species composition and the effect they would have on PMI estimates. Seven chemicals were tested: (1) ammonia; (2) bleach; (3) gasoline; (4) lime; (5) muriatic acid; (6) OFF!® (active ingredient DEET); and, (7) Raid® (active ingredients permethrin, tetramethrin, d-cis/trans allethrin). Pigs with no treatment served as controls. The experiment took place in the summer and fall of 2008, spring, summer, and fall of 2009, and the spring of 2010 in West Lafayette, IN.

**Summary of Results:** Significant interactions were found between event and season, season and treatment, and event and treatment. Pairwise comparisons found significant differences in the accumulated degree hour estimations between the control and bleach, muriatic acid, OFF!®, and lime. Pigs treated with Raid® were attractive to adult flies, but no oviposition occurred in six trials.

**Conclusions:** This research was conceptualized from previous work with law enforcement. The results reveal that it is important for forensic entomologists and law enforcement agencies to take chemical effects into consideration when providing PMI estimations. This information was later helpful when collecting insects from a local murder investigation where muriatic acid was used on the corpse.

After attending this presentation, the audience will have a better understanding of the effects that household chemicals have on the insect's role in the decomposition of the human body. Forensic entomology uses data derived from insects to assist the criminal justice system.<sup>1,2</sup> There have been many cases to document the effects of drugs on blow fly growth and development but none on the effects of household chemicals. This research was inspired from a murder that occurred in Lafayette, IN, where the perpetrator sprayed Raid® on the body of the victim. This led researchers to question what effects Raid® and other household chemicals have on blow fly activity and, subsequently, estimations of the PMI.

Forty pigs (*Sus scrofa*) weighing an average of 1kg each were obtained from the Purdue University swine unit and frozen. Prior to the start of the experiment, the pigs were thawed for 15hr in a room without fly access. Pigs were placed in the field at 9:00 a.m. hours. Seven chemicals were tested: four liquids (muriatic acid, Clorox® bleach, Great value® ammonia, and Marathon® 87 octane unleaded gasoline); two aerosol sprays (Raid® (active

ingredient 0.05% permethrin, 17.5% Tetramethrin, 0.05% d-cis/trans allethrin) and OFF!® Deep Woods Sportsman (active ingredient 15% DEET)); and one powder (hydrated lime). Pigs were treated with the chemicals on both sides of the body and open orifices in the following amounts: 500mL of the liquids, 382g of the powder, and until run-off occurred with the aerosol sprays (200g of Raid® and 80g of OFF!®). There were five replicates of each chemical per trial and five controls (no chemical treatment). Adults and larvae were collected following standard operating procedures outlined in Haskell and Williams each day to document any differences in species composition or development among treatments.<sup>2</sup> Larvae were collected in KAA (composed of 95% ethanol (77%), acetic acid (15%), and kerosene (8%)) and adults in 70% Ethyl Alcohol (EtOH).

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Forensic entomologists are often asked by law enforcement agencies to provide an estimation of the PMI using insects. If chemicals are applied to a body and that has an effect on the blow fly activity, the estimation of the PMI is therefore compromised.

### Reference(s):

1. Byrd J., Castner J. 2010. *Forensic Entomology: The Utility of Arthropods in Legal Investigations*, 2<sup>nd</sup> ed. CRC Press, Inc., Boca Raton, Florida. 681 pages.
2. Haskell N., Williams R. 2008. *Entomology and Death: A Procedural Guide*, 2<sup>nd</sup> ed. Forensic Entomology Partners, Clemson, South Carolina. 182 pages.

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### Law Enforcement, Blow Flies, Forensic Entomology