H100 A Field Study on the Effects of Morphine on the Carrion Decomposition Process and Dipteran Larvae Development

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Learning Overview: After attending this presentation, attendees will learn how morphine affects Dipteran larvae development and carrion decomposition process from a field study in comparison to laboratory research.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by looking at morphine effects on carrion decomposition and Dipteran larvae development outside of a controlled laboratory setting.

Laboratory studies have shown that toxicants, in general, can influence the growth and development of maggots.[1-3] These were in controlled environments with fly eggs of specific species being placed on the food source and an infinite food source, in some studies. With taking the research to the field, verification of the laboratory research results can be achieved. Throughout the beginning stages of the blow fly life cycle, larvae are feeding on tissue around the natural orifices and any trauma-created openings. Because not all organs and tissues will have the same concentration of morphine, not all tissue will affect the larvae the same. Lower levels of concentration will result in little to no effect on the growth and development of the Diptera larvae, while tissues with higher levels, such as the liver, are more likely to affect their growth and development.

Current research has shown that morphine has a negative effect on the growth and development of the blow fly larvae—the same effect it has on humans.[3] Morphine can also have a stimulating effect on the growth and development of flesh fly larvae, the opposite effect it has on blow fly larvae and humans.[4] This possible increase/decrease will directly affect the postmortem interval estimation, causing it to be over- or underestimated. Examining these processes will help determine if morphine will affect the postmortem estimation.

This field study looked at the effects of morphine on the growth and development of maggots, colonization rate, and carrion decomposition rate. Five pigs were injected with morphine along with five control pigs being punctured with a needle for five days prior to being euthanized. All ten pigs were allowed to decompose as naturally as possible, in an open field with no vegetation coverage with open exposure to solar radiation. Dipteran larvae were collected in a way that would be comparable to collections at a crime scene. The initial decomposition rate appeared to be faster among the treated pigs as compared to the control pigs but was not significantly different. The larval lengths of individuals belonging to forensically important family, Diptera: Calliphoridae, were not significantly different between the treated and control pigs, in any instars on days three, six, and ten.

Reference(s):

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2. Monthei, D.R. *Entomotoxicological and Thermal Factors Affecting the Development of Forensically Important Flies*. PhD diss., Virginia Tech, 2009.
3. Bourel, B., Hédouin, V., Martin-Bouyer, L., Bécart, A., Tournel, G., Deveaux, M., and Gosset, D. Effects of Morphine in Decomposing Bodies on the Development of *Lucilia sericata* (Diptera: Calliphoridae). *Journal of Forensic Sciences* 44, no.2 (1999): 354-358.
4. Goff, M.L., Brown, W.A., Hewadikaram, K.A., and Omori, A.I. Effect of Heroin in Decomposing Tissues on the Development Rate of *Boettcherisca peregrine* (Diptera: Sarcophagidae) and Implications of this Effect on Estimation of Postmortem Intervals Using Arthropod Development Patterns. *Journal of Forensic Sciences* 36, no. 2 (1991): 537-542.

Entomotoxicology, Morphine, Entomology

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