



### E50 The Effects of Ketamine and Xylazine on Larval Development in the Blow Fly (*Phormia Regina*)

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**Learning Overview:** After attending this presentation, attendees will better understand how the presence of ketamine and xylazine in the diet of black blow fly (*Phormia regina*) maggots affects their growth and development throughout the larval stages.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing entomological data to increase the accuracy of Postmortem Interval (PMI) determinations.

Entomotoxicology is an expanding field of forensic entomology that focuses on the effects of drugs and other toxins on insects. This project spans both main branches of entomotoxicology, growth/development studies and extraction/qualitative studies. This study focuses on development and will report the extraction results elsewhere. Insect larvae also produce a unique opportunity for toxicological samples when all other body tissues and fluids have degraded in late stages of decomposition. Previous studies have shown that there are various effects of drugs on the growth and development of insects. For example, ketamine and xylazine are sedatives that are commonly used in veterinary medicine. Ketamine is a common party drug that is known on the street as Special K. It is also associated with drug-facilitated crimes. Xylazine is not commonly abused on its own, but it has been found in street heroin samples. Since these two drugs are both found on the street, they are of forensic importance. Asian blow fly, (*Chrysomya megacephala*) development may be affected when reared on rat meat dosed with ketamine and xylazine compared to those reared on drug-free meat.<sup>1</sup> These differences can lead to errors in PMI estimation. However, development may speed up or slow down depending on drug dose and the stage of larval development.

Preliminary research conducted on flesh-eating beetles (*Dermestes maculatus*) indicated there was no development change when the beetle larvae were exposed to ketamine in their rat meat diet. The purpose of this experiment is to evaluate temporal dynamics of larval instar-related developmental changes when exposed to ketamine and/or xylazine in a North American blow fly, *P. regina* (as overall developmental rate may not be affected).

*P. regina* is a cosmopolitan species that is commonly encountered and utilized in forensic entomology. The present study describes the effects of ketamine and xylazine on the development of *P. regina* from first to third instar. Twenty Sprague Dawley rats were dosed with ketamine and/or xylazine in saline via intraperitoneal injection as follows: K1 at 100mg/kg of ketamine, X1 at 10mg/kg of xylazine, K2X2 at 300mg/kg ketamine and 30mg/kg of xylazine, and K3X2 at 450mg/kg of ketamine and 30mg/kg of xylazine. The first two doses are therapeutic levels and the last two are lethal doses. A control group was injected with saline. All rats were then euthanized and dissected; the brain, liver, and heart were removed. Ten maggots were then placed onto each organ, and larval stage was recorded twice per day. Temperature was monitored to determine Accumulated Degree Hours (ADH) to provide a more accurate measure of PMI.

The results indicate that there is an effect on early instar developmental rate (instars 1 and 2) which is drug- and dose-dependent; however, larval development (to instar 3) is similar to controls. This highlights the importance of determining drug presence in tissues and understanding instar-dependent variation of PMI estimations utilizing *P. regina*.

#### Reference(s):

1. Singh, D., Heer, B.K., and Wadhawan, B. Effect of Ketamine Hydrochloride in Combination with Xylazine on the Development of *Chrysomya megacephala* Fab. *Indian Journal of Forensic Medicine & Toxicology*, vol 8(1), (January 2014):140-144.

#### Entomotoxicology, Ketamine, Xylazine