



## Pathology/Biology Section - 2015

### H35 Effects of Amitriptyline on the Development of *Megaselia Scalaris* (Diptera: Phoridae) and Implications on the Estimation of the Minimum Postmortem Interval

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After attending this presentation, attendees will have novel information about the effect of amitriptyline, a tricyclic antidepressant commonly used in cases of major depressive disorder with a high toxicity in cases of overdose, on the development of a forensically important indoor species, *M. scalaris*.

This presentation will impact the forensic science community by offering new data on entomotoxicology.

The study focuses on amitriptyline, a tricyclic antidepressant, never tested in Phoridae. The last data about effects of this molecule on forensically important flies, such as Sarcophagidae and Calliphoridae, were published in the 1990s.

In forensic entomology, the estimation of the age of the insects is used for the estimation of the minimum Postmortem Interval (mPMI). Insect development rate is mainly temperature dependent despite other parameters like photoperiod, overcrowding, and food availability. In addition, several studies demonstrated that drugs and other chemicals can affect the growth of larvae feeding on the dead body, leading to incorrect mPMI estimations.

Amitriptyline is a commonly used antidepressant in cases of major depressive disorder. It is a tricyclic molecule absorbed in the gastrointestinal tract and metabolized in the liver. This molecule shows a high toxicity in cases of overdose.

Studies on the effect of amitriptyline on insect development and accumulation/excretion have been performed in the 1990s on *Parasarcophaga ruficornis* (Diptera: Sarcophagidae) and on *Calliphora vicina* (Diptera: Calliphoridae) whereas no data are available for other taxa. The results of these studies demonstrated no effect of the molecule on the growth rate. During the same time period, amitriptyline and derivatives were isolated from empty puparia of *Megaselia scalaris* (Diptera: Phoridae) and from skin and fecal material of *Dermestes maculatus* (Coleoptera: Dermestidae) collected from a mummified body in New England.

The goal of this study was to investigate the effect of amitriptyline, often found in cadavers, on the development of *Megaselia scalaris*, a common species found on indoor cases both in Europe and in the United States. This species is very important for mPMI estimation in indoor cases, as observed in this study and reported in the specific literature.

Larvae of *M. scalaris* were reared on pork liver with four different concentrations of amitriptyline (0=control, 120, 240, 800ng/g). One hundred twenty larvae per each concentration were killed in hot water after 48 and 72 hours from the experiment beginning (eggs) and measured using a stereomicroscope equipped with a camera and microscope imaging software with an automatic calibration of the measurements. Pupa and wing measurements were also collected and analyzed.

Statistical tests (one-way and factorial Anova, Tukey post-hoc) were performed using microscope imaging statistical software, using 0.05 as significant level.

Statistically significant differences were observed in the larval size of the four treatments after 48hrs and 72hrs ( $F_{3, 476}=62.59$   $p=0.000$ ;  $F_{3, 476}=13.66$   $p=0.000$ , respectively). The same result was obtained for the pupa length ( $F_{3, 476}=12.42$   $p=0.000$ ).

The wing size, used in order to detect differences in size in the adults, shows statistically significant differences ( $p=0.000$ ) with the control being smaller when compared to the specimens fed on food with different antidepressant concentrations.

Durations of the immature stage (larval and puparial stages) despite the size differences were not statistically different from the control at all the tested concentrations.

In conclusion, this experiment demonstrated that for *M. scalaris* amitriptyline has an effect on the larval size but not on the total immature developmental time, so the mPMI estimation can be affected if based on the larval size and not on the complete development.

#### Entomotoxicology, mPMI, Forensic Entomology