## G151 Initial Investigations of Hyperspectral Remote Sensing for Postmortem Interval Estimations in Forensic Entomology

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After attending this presentation, attendees will be introduced to the initial applications of hyperspectral remote sensing to forensic entomology and understand its potential for increasing the precision of current immature blow fly age estimates and successively increasing the accuracy of postmortem interval estimates.

This presentation will impact the forensic science community by illustrating the opportunities offered by hyperspectral remote sensing into an entirely new area, entomology, and its possible future potential value in forensic or medicolegal entomology.

Current methods examining dipteran larval development to estimate minimum elapsed time since death are based on a minimum tenure of the insects on the body. Immature blow flies develop at a predictable rate and, based on the insect stage, a minimum postmortem interval is estimated. Unfortunately, in some instances, because some of the stages can be lengthy, only a crude estimate can be provided. This initial proof of concept investigation examines the use of hyperspectral remote sensing to reduce the estimate in the postmortem interval. The use of hyperspectral remote sensing in forensic entomology is unheard of, but remote sensing is successfully being applied to many other sciences including many forensic sciences. The objective of this investigation was to examine the use of hyperspectral remote sensing in increasing the precision of current blow fly (Diptera: Calliphoridae) age estimates and consequently increasing the accuracy of postmortem interval estimates

Daily spectral measurements of immature *Protophormia terraenovae* (R-D), a common blow fly, spanned the 325 – 1025nm range but the measurements were condensed to reduce excessive noise. Measurements were obtained using a handheld spectrometer once daily. Immature development was examined in two parts due to time constraints. Measurements were obtained from second instar to the pupal stage and from the beginning of the pupal stage until adult emergence. The adult colony was raised on milk powder, sugar, and water ad libitum. A CMP 4030 Conviron chamber was used to maintain the adult colony as well as the experimental animals. Development occurred at 25°C, a 14:10 (L:D) photoperiod of 20µmol of light and a relative humidity of 75%. The immature insects were raised on milk-fed veal liver in the Phytotron at McGill University, and then insects were transported daily to the spectrometer for measurement. Despite the transport, the average temperature recorded by a data logger remained at 24.6°C. Matlab R2011b and PRtools 4.1 were used to complete the spectral analysis. Also, a fourth order polynomial Satvitsky-Golay smoothing filter was applied. A forward feature selection was used to designate the top 25 discriminating bands.

This proof of concept investigation introduces a comparison of how the spectral signatures of *P. terraenovae* change from day to day within the immature stages. The results are more than promising and show a potential method for narrowing the original estimates and offering a better overall estimate of insect age, and therefore, postmortem interval estimation.

**Protophormia Terraen, Hyperspectral Remote, Forensic Entomology**

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