



## Pathology Biology Section - 2012

### G79 Fire, Flies, and Wasps: PMI Estimation of Burned Remains

Cristina Cattaneo, PhD, MD, LABANOS Lab, Universta Degli Studi Di Milano, Milan, ITALY; and Stefano Vanin, PhD\*, University of Huddersfield, Queensgate, Huddersfield, HD1 3DH, UNITED KINGDOM

After attending this presentation, attendees will have novel information about the advantages of the practical applications of Forensic Entomology (FE) on burnt remains. In this particular condition FE could be the only method for PMI estimation.

This presentation will impact the forensic science community by validating the entomological approach in the PMI estimation on burnt bodies. The two reported cases, based on experiments, statistically confirm the applicability of the entomological approach based on the fly developmental rate for PMI estimation.

Different methods can be used in order to destroy a body or make its identification impossible: mutilation, burning, burying, acid dissolution, and concealment into concrete blocks. Burying and burning are perhaps the most common. Cases of burnt bodies found in different locations such as open fields, cars, and indoors have been reported regularly in literature. In burnt bodies, arthropod specimens may be the only tool useful in the estimation of the minimum time of death (mPMI). In fact, burning prevents the use of the classical thanato-chronological techniques (e.g., body temperature, livor, rigor, algor mortis, [K+]) for mPMI estimation.

This work deals with PMI estimation of two cases of burned bodies found during the summer of 2009, in Northern Italy, in the region around Milano. The two cases show several common characters, and in both cases the PMI estimation was (and could only be) performed using an entomological approach. This was possible thanks to data collected during experiments carried out during the previous years, in the same region (Vanin, Cattaneo, in prep). Insects were collected both from the crime scene and during the autopsy following standards and guidelines proposed by the European Association of Forensic Entomology (Amend et al., 2007).

Late June 2009, the burned body of a man was found along a river in a suburban area. The body was lying on the ground in a mostly skeletonized stage, with some areas of putrefied skin still surviving on forearms, lower limbs, and head which appeared dry due to heat and air exposure. The torso and hip regions had been completely burnt and presented as charred osseous remains. The Diptera samples were composed by larvae (maggots), pupae and puparia of three species *Lucilia sericata*, *Phormia regina* (Calliphoridae) and *Stearibia nigriceps* (Piophilidae). Several puparia of the blowflies were parasitized by the wasp *Nasonia vitripennis*. Among the Coleoptera, larvae and adults of *Dermestes frishii* (Dermestidae) were sampled, whereas all the other coleopters (Cleridae, Histeridae, Silphidae, Staphylinidae) were collected only at the adult stage. The entomological evidence allowed for estimation of a mPMI between 24 and 31 days. This value was obtained adding the time of development of the host, *Phormia regina*, and the time of development of the parasitoid, *Nasonia vitripennis*.

In July 2009, the body of a woman was found in the garden of an abandoned house in a village. The body, almost completely skeletonized, with some signs of burning to the extremities of arms and legs, was lying on the ground in a supine position and was covered by a plastic sheet. The Diptera samples were composed by larvae (maggots), pupae and puparia of three species *Lucilia sericata* (Calliphoridae), *Hydrotea capensis* (Muscidae), and *Fannia canicularis* (Fanniidae). Several puparia of the blowfly *L. sericata* and one of the muscid *H. capensis* showed the typical holes of a parasitoid infestation. The parasitoid presence was confirmed by the emergence in the rearing chamber of several *Nasonia vitripennis* adults.

Coleopteran species were collected both at the adult and larval stages. In particular, several larvae and adults of the dermestid *Dermestes frishii*, *Necrobia rufipes*, and *N. violacea* were collected. Histeridae, Staphilinidae, Nitidulidae, and Tenebrionidae were collected only at the adult stage. The entomological evidence allowed for an estimation of a mPMI between 57 and 63 days. This value was obtained adding the time of development of the host, *H. capensis*, and the time of development of the parasitoids, *Nasonia vitripennis*. This estimation was confirmed by the developmental rate of the beetle *Dermestes frishii*.

These two cases demonstrate, in agreement with previous experiments (Vanin, Cattaneo in prep), that in burned remains the first waves of insect colonization (Calliphoridae, Muscidae, Sarcophagidae) are the same as in the case of “fresh” bodies. This supports the application of the entomological approach, based on the developmental rate, for PMI estimation. In contrast the composition of the community cannot be used due to the occurrence at the same time of insects belonging to different “colonization waves.”

It is worth mentioning that the presence of the parasitoid *Nasonia vitripennis* offers additional information for PMI estimation.

#### PMI, Burned Remains, Forensic Entomology