



### G152 Radiocarbon Analysis of Fly Pupal Cases to Estimate Date of Death

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After attending this presentation, attendees will understand the potential value of radiocarbon analysis of fly pupal cases associated with recovered human remains to estimate the date of death.

This presentation will impact the forensic science community by demonstrating how radiocarbon analysis of fly pupal cases can be used to estimate the date of death of the associated human remains, offering a less invasive sample alternative which yields more accurate results.

Beginning in the 1950s, atmospheric testing of thermonuclear devices produced elevated levels of artificial radiocarbon in the atmosphere that subsequently entered the food chain and were incorporated into the tissues of living organisms, including humans. These levels reached a peak in 1963 and, subsequently, have declined following the cessation of atmospheric testing. Research and casework have demonstrated how analysis of the radiocarbon content of human tissues can be used to estimate the date of death when compared to the documented values of the "bomb curve." Human soft tissues are especially useful in this regard since their radiocarbon values are relatively close to the atmospheric levels in comparison with skeletal tissues. Of course, following decomposition and skeletonization, soft tissues may not be available for analysis. Since fly larvae associated with decomposing human remains feed on the human soft tissues, the radiocarbon values of those soft tissues would be expected to be incorporated into the tissues of the larvae, including the puparial cases. The durable puparial cases can be found associated with human remains long after the adult insect emerged. Radiocarbon analysis of recovered puparial cases thus produce values consistent with the human soft tissues and can be used to estimate date of death.

Five human skeletons with preserved fly puparial cases and known death dates were located in the Human Rights Division of the Servicio Médico Legal in Santiago, Chile. Documented death dates were 1973, 1974, 1979, 1986, and 1986. Samples of puparial cases from each were submitted for radiocarbon analysis to an ISO 17025 accredited radiocarbon laboratory. The following summarizes the results for each of the five samples, listing the conventional radiocarbon age expressed in Percent Modern (pMC), the actual death date of the associated individual, and the date of intersect of the radiocarbon value and the bomb curve (using values from both the northern and southern hemisphere).

1. 131.2 pMC; death date of 1979; intersect dates 1978 – 1979
2. 140.3 pMC; death date of 1974; intersect dates of 1973 – 1974
3. 144.7 pMC; death date of 1973; intersect dates of 1972.5 – 1973
4. 122.5 pMC; death date of 1986; intersect dates of 1983 – 1985
5. 122.0 pMC; death date of 1986; intersect dates of 1983.5 – 1985

As indicated in the information presented above, radiocarbon analysis produced values that intersected the bomb curve either on the date of death or within one year of it.

When working with fly puparial cases associated with unidentified human remains, context and/or radiocarbon analysis of carefully selected human tissues can clarify if the puparia values relate to the earlier ascending aspect of the bomb curve or the later descending aspect. During recovery of skeletonized human remains, preserved fly puparia should be collected since they potentially provide valuable information on date of death of the associated individual.

#### **Radiocarbon, Puparia, Remains**