

Forensic Entomology: Estimating Time Since Death Using Insect Evidence

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Introduction

Forensic entomology is a specialized discipline within forensic science that utilizes insect activity to assist in medico-legal investigations. It plays a critical role in estimating the post-mortem interval (PMI), particularly in cases where conventional autopsy findings are inconclusive or limited due to advanced decomposition (1,2).

Principles of Forensic Entomology

Following death, decomposing tissues attract necrophagous insects, most notably blowflies (family Calliphoridae). These insects colonize remains in a predictable sequence, beginning with egg deposition followed by larval and pupal stages. The rate of insect development is influenced by environmental factors, particularly temperature, making these life cycles reliable biological indicators of elapsed time since death (1).

Methods for Estimating Post-Mortem Interval

PMI estimation in forensic entomology is based on several established approaches:

- **Larval Development Analysis:** Determination of larval age using size and developmental stage
- **Insect Succession Patterns:** Observation of temporal colonization by different insect species
- **Temperature-Based Models:** Use of accumulated degree hours (ADH) to estimate developmental timelines (2,3)

Accurate interpretation requires integration of entomological findings with environmental data and species identification.

Forensic Applications

Forensic entomology is particularly useful in:

- Advanced decomposition stages
- Outdoor or exposed environments
- Cases involving delayed discovery of remains

In addition to PMI estimation, insect evidence may provide insights into post-mortem body movement, environmental exposure, and possible neglect (3).

Limitations and Challenges

Despite its utility, forensic entomology has limitations, including environmental variability, geographic differences in insect fauna, and restricted access of insects to remains. These factors necessitate cautious interpretation alongside other forensic evidence (2).

Conclusion

Forensic entomology represents a scientifically robust tool in modern death investigation. When applied systematically, it enhances the accuracy of PMI estimation and contributes significantly to medico-legal analysis.

Conflict of Interest

The author declares no conflict of interest.

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Ethical Approval

Not applicable as this study is a narrative review.

Data Availability

No new data were generated.

References

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