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Mitochondrial DNA cytochrome oxidase I gene: potential for distinction between immature stages of some forensically important fly species (Diptera) in western Australia

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Abstract

Forensic entomology requires the fast and accurate identification of insects collected from a corpse for estimation of the postmortem interval (PMI). Identification of specimens is traditionally performed using morphological features of the insect. Morphological identification may be complicated however by the numerical diversity of species and physical similarity between different species, particularly in immature stages. In this study, sequencing was performed to study the mitochondrial DNA (mtDNA) as the prospective basis of a diagnostic technique. The sequencing focused on a section of the cytochrome oxidase I encoding region of mtDNA. Three species of calliphorid (blow flies) commonly associated with corpses in western Australia, *Calliphora dubia*, *Chrysomya rufifacies* and *Lucilia sericata*, in addition to specimens of *Calliphora augur* and *Chrysomya megacephala* were studied. Phylogenetic analysis of data revealed grouping of species according to genus. The DNA region sequenced allowed identification of all species, providing high support for separation on congeneric species. Low levels of variation between some species of the same genus however indicate that further sequencing is required to locate a region for development of a molecular-based technique for identification.

Keywords: Calliphorid; Forensic entomology; Cytochrome oxidase I; Mitochondrial DNA

1. Introduction

Forensic entomology involves the study of the interaction of insects and other arthropods with legal matters [1]. An important contribution made by the forensic entomologist is the estimation of the time since death or postmortem interval (PMI). Insects collected from a corpse must be identified accurately [2], their age estimated and relevant developmental data applied to approximate the PMI.

Accurate estimation of the PMI requires accurate identification of insects, as misidentification may result in the application of incorrect developmental data. Identification of the individuals may be complicated by many factors, which include the diversity of adult fly species, the particular larval life stage collected and the collection of dead insects only. Immatures are most frequently collected, yet their diagnostic characters may be difficult to recognise in these stages and there are few comprehensive larval keys to Australian species. Immatures, therefore, may require rearing to adult stage for accurate identification, a time-consuming process. Furthermore, specimens may be killed before presentation to the entomologist, or damaged specimens may lack diagnostic characters. In many legal systems, the maintenance of integrity of evidence for presentation in court proceedings is of high importance [3], and integrity may be regarded by some judicial parties as being compromised where rearing has occurred, as it involves a change in the form of the evidence.

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