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Invertebrate-derived dna (iDNA) as a source for vertebrate biodiversity and disease monitoring

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Abstract

The use of invertebrates as a source of vertebrate DNA (iDNA) has emerged as a powerful tool for monitoring biodiversity. iDNA can be used to generate barcodes that identify local fauna, and various invertebrates such as hematophagous, saprophagous, and coprophagous species can provide vertebrate material. Mosquitoes and carrion flies are among the most ubiquitous taxa and are easily found in different environments and climates. In this presentation, I will share results from several studies that explore the potential of iDNA in ecological and evolutionary studies involving vertebrate species and populations. These include 1) a comparison between mosquitoes and carrion flies in detecting vertebrate fauna in a semi-urban environment, where the the use of flies in the detection of wildlife in a suburban environment showed to be more effective in terms of collection of samples and detection of vertebrates, 2) the analysis of fly diversity across a gradient of urbanisation, where the abundance of flies was shown to decline with urbanisation, although several species remained highly abundant across the urban gradient, 3) the analysis of vertebrate DNA carried by flies in urban, rural, and forest areas, which detected the mammal assemblage in forest or rural habitats to be dominated by non-domestic animals while the urbanised environment is characterised mainly by human and domestic animals, and 4) the assembly of mitochondrial genomes of different vertebrate species from invertebrate sources such as leeches and flies using taxon-specific DNA capture. In this study, sixty percent of the iDNA extracts allowed for the recovery of (near) complete mammalian mitochondrial genomes that could be used for phylogenomic analyses. Looking ahead, future perspectives include the possibility of using iDNA to associate host-vector and host-carrier for diseases that cross species boundaries.

Keywords: Biodiversity, iDNA, invertebrates, vertebrates

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