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Genetic Structure of Sympatric Populations of Female Lutzomyia Longipalpis (Diptera: Psychodidae) In Sobral and Caririaçu, Ceará State, Brazil

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Abstract

Objectives: Accurate identification of these insects is critical to avoiding mistakes in the recognition of vector and non-vector species, so the invariant phenotypic patterns displayed by the females of L. longipalpis require the implementation of molecular methods of identification. Our goal was to examine genetic variation in the females of L. longipalpis using the SNPs reported in the males of this vector species.

Keywords

Population genetics; Visceral leishmaniasis; sand fly; species complex; period gene; Northeast; Lutzomyia longipalpis.

Introduction

The phlebotomine sand fly Lutzomyia longipalpis sensu lato is that the principal vector of kala-azar (VL) within the New World [1]. L. longipalpis males have either one pair of pale spots on the fourth tergite (the 1S morphotype) or two pairs on the third and fourth tergites (the 2S morphotype). The second pair on the third tergite may be smaller than the pair on the fourth and this is sometimes designated as an intermediate form [2]. There are reports of intermediate forms of L. longipalpis in some localities, especially round the Northeast coast, indicating intraspecific polymorphism [2]. Several studies have shown that spot morphology cannot be used as a species-specific character [2,3]. Although these patterns of pale spots are not species-specific, they may be useful in identifying sympatric species in localities where intermediates are very rare, as occurs in Sobral [4], Jaiba, and Estrela de Alagoas [5]. The polymorphisms within the longer fragment of the amount gene strongly suggest that this may additionally be the case in Bodocó and Caririaçu [6]. Molecular (microsatellite markers and speciation genes) and behavioral (sexual pheromones and courtship/mating sounds) analyses have also demonstrated the existence of differences between the 1S and 2S morphotypes and have provided further evidence of a L. longipalpis species complex [7]. Unlike the males, however, the females are morphologically undistinguishable: they do not present abdominal pale spots (either 1S or 2S), and this causes difficulties in studies of courtship and mating behaviors. In Brazil, Ceará state has the third-highest number of VL cases, about 12.2% of the total reported in the country. Over the past 10 years, 4351 autochthonous cases were recorded in Ceará, and 578 of these cases (~13.3%) occurred in the municipality of Sobral.

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For each value of K (1 to 10), 10 interactions were performed to estimate the K values, and the most likely population (or cluster) number was determined by ΔK analysis, as described by Evanno [29]. Genetic diversity Intra-population genetic diversity was assessed in terms of haplotype and nucleotide diversity, K value (number of genetic groups), number of polymorphic sites, and number of transitions and transversions; diversity was measured using DnaSP v. 4.0 [30] and Arlequin v. 3.5 [31]. Genetic differentiation was assessed with the pairwise fixation index Fst using Arlequin v. 3.5 [31]. The average number of substitutions per site among populations (Dxy), the entire number of substitutions per site among populations (Da), the amount of shared polymorphisms among populations (Ss), and the number of fixed differences among populations (Sf) were calculated using DnaSP v. 4.0 [30].

References

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