CBGP Centre de Biologie pour la Gestion des Populations

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Grande salle + visio.

How to balance in sympatry Lessons from fruit fly *mt*DNA

par
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- Mitochondrial DNA (*mt*DNA) is uniparentally inherited, haploid, and contains a tightly packed set of genes essential for cellular metabolism. Therefore, the presence of stable, adaptive *mt*DNA variation within populations is difficult to explain. This variation may be maintained through epistatic interactions with nuclear genes (*nu*DNA). Products from both genomes interact functionally in mitochondria, and their joint action can be observed through protein-protein, protein-DNA and protein-RNA interactions.
- Using fruit flies of the Obscura group species (*Drosophila subobscura* and *D. obscura*) as model systems, balancing selection mechanisms that maintain sympatric *mt*DNA are reviewed: (1) sex-specific selection, where genotypes have different selective values depending on the individual's sex; (2) environment-specific selection, where genotypes differ in fitness across environments; and (3) negative frequency-dependent selection, where the fitness of a haplotype is inversely correlated with its frequency. Over recent decades, *D. subobscura* has been established as a model in this respect, as all natural populations contain two *mt*DNA haplogroups at similar frequencies. Less is known about *D. obscura* variation, however the species is also abundant in nature and relatively easy to study. In natural populations of *D. subobscura*, mito-nuclear interactions in an adaptive context have been studied through analysis of linkage disequilibrium (LD) between *mt*DNA haplotypes and chromosomal inversions. Presence of LD is variable across populations and can support local adaptations.
- The adaptive aspect of sympatric mitochondrial and mitonuclear variation is studied through fitness assays at two different temperatures. Flies are collected from nature and used to establish isofemale lines. Backcrosses are then performed to create stable mito-nuclear introgression lines with specific genotypes. Life history traits are assayed and the fitness of genotypes is examined in relation to sex and environment. Genotypes are also competed under different laboratory conditions and their frequencies are monitored.
- Results from the Obscura group species show that all analyzed balancing selection mechanisms can contribute to maintaining sympatric *mt*DNA variation. The relative importance of each mechanism can be discussed in relation to species and experimental design. It should be emphasized that selection primarily targets mito-nuclear genotypes, rather than *mt*DNA variation alone.