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SÉMINAIRE

Two mitochondrial genomes for one bivalve, a major dilemma for the long-lived clam Arctica islandica

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Mitochondrial genomes (mtDNA) are normally maternally inherited and encode for subunits of respiratory chain complexes and ATP synthase among others. The integrity of mtDNA is crucial for cellular energetic and redox homeostasis, and mtDNA mutations are associated with modifications of individual fitness and longevity. Bivalves are the only zoological group in which Doubly Uniparental Inheritance (DUI), characterized by the presence of two divergent mitochondrial genomes within different tissues of male individuals, is frequently observed. The F-genome, maternally inherited, is found in somatic tissue and female gonads whereas the M-mtDNA is found in male gonadic tissue only. The clam Arctica islandica is widely distributed throughout the North Atlantic shelf regions. Due to different environmental regimes (salinity, temperature, oxygen), the maximum lifespan of its populations varies between >500 years around Iceland and 35 years in the Baltic Sea. I will present our recent investigations that describe for the first time the existence of the DUI system in Arctica islandica. Based on 16S and cytochrome b markers, we highlight the presence of an M-genome in male gonads in individuals belonging to Baltic and North Sea populations. The two genomes show a low level of sequence divergence compared to other DUI species, around 6-8% at the nucleotide level. Whilst the analysis of mitochondrial markers generally indicated genetically homogeneity of all North Atlantic populations, they further reveal few clam individuals that carry a "divergent" mtDNA haplotype, resembling the M-genome. These individuals occurred however exclusively in the Icelandic population. Unlike the M-genome, which is confined to male gonadic tissue in DUI species, this "divergent" mtDNA occurs in somatic tissues from 20% of individuals of both sexes. In association with transcriptomic and biochemical data, we will discuss the possible impacts of this uncommon mitochondrial genome on Arctica islandica biology and cellular physiology. This study will enhance the understanding of the role of DUI and mtDNA in general for fitness, aging and adaptation of bivalves.