Genomic and Physiological to Extreme Heat: A Comparative Study of Desert Rodents

Summary:

Deserts occupy roughly one-third of Earth's land mass. Yet, only a small fraction of these are classified as hot deserts; places where lifeforms evolved unique adaptations to thrive under relentless heat and water scarcity [1-5]. To address the molecular landscapes leading phenotypic adaptations to hot desert we will focus on rodent species from two distant, but similar, ecosystems: the arid habitat of the Sonora Desert—the hottest desert in North America [6]—and the Arabian Desert sitting in the antipode parallel. Preliminary analysis highlights an extreme transformation in lipid physiology in these mammals at the molecular level where the concurrent outcome of gene loss and duplication led to the evolution of adaptations resulting in the highest blood cholesterol levels among the mammalian lineage. Using a layered approach, from genomes to phenotypes, we expect to identify the evolutionary mechanisms leading to the physiological outcomes that enable life under heat without using water.

Objectives:

1. Describe the comprehensive genomic landscape of rodent species living in hot desert areas (gene duplication, loss, mutation and selection);
2. Highlight convergent processes among geographically and phylogenetically independent species;
3. Experimentally address the impacts of the observed genomic changes on phenotypes.

Main Metodologies:

The main methodologies include bioinformatic tools and pipelines to perform: genome assemblies, transcriptomic analysis, orthology assignments, retrieve and curate sequences, synteny analysis and phylogenetic inference. Additionally, computational methods will be used for protein structure analysis and modelling. Experimental, "wet lab" approaches will be carried out to test protein function from target animals: using cell and in vitro functional assays [6-9]. Field work to collect tissue samples will be included.

References:

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Place of Work

CIIMAR - Interdisciplinary Centre of Marine and Environmental Research, Terminal de Cruzeiros do Porto de Leixões

Will the proposal research idea be funded by a specific project?

Yes, by Marma Detox (NFR, Norway) e COB-CIIMAR (Raquel Ruivo)

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