PERSONA CIÈNCIA EMPRESA
UNIVERSITAT RAMON LLULL

CHLOROPLAST GENOMIC AND METABOLIC ENGINEERING FOR REDIRECTING MICROALGAE METABOLISM TOWARDS THE PRODUCTION OF RHAMNOLIPID BIOSURFACTANTS

Summary:

Background: Metabolic engineering of biological systems allows redirecting cell metabolism towards the production of complex biomolecules of interest. Microalgae are unicellular photosynthetic organisms that are emerging as important sustainable hosts for industrial biotechnology, as they can use photosynthetic light to efficiently transform CO_2 into high-value bioproducts such as rhamnolipid used as preferred biosurfactants in several industries (pharmaceutical, food, agriculture, petroleum or bioremediation).

We have engineered the chloroplast genome of the green microalgae *Chlamydomonas reinhardtii* to introduce *Pseudomonas aureginosa* RhlA, an enzyme catalyzing the biosynthesis of HAA, a lipid precursor of rhamnolipids. Expression of RhlA was confirmed by RT-qPCR and Immunoblot analysis, and preliminary GC and HPLC-MS/MS analysis identifies intracellular and extracellular accumulation of HAA.

Objectives: Through the typical synthetic biology Design-Build-Test cycle, you will optimize HAA precursor production and will introduce the subsequent RhlB rhamnosyltransferase enzymatic step that rhamnosylates the HAA precursor to produce monorhamnolipids. This strategy involves: (i) Bioinformatic analysis for a rational metabolic pathway design; (ii) plasmid construction and genetic engineering of chloroplast genome; (iii) molecular and biochemical characterization of new strains including gene expression and glycolipid analysis.

Technical skills: Microalgae chloroplast transformation, molecular biology, polycistronic gene construction, gene expression analysis (qRT-PCR, western blot), glycolipid analysis (GC-MS, HPLC-MS/MS), bioinformatics.

More information at:
https://planaslab.iqs.edu/research/synthetic-biology-and-molecular-biotechnology-in-green-microalgae/

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