GQBB
LABORATORY OF BIOCHEMISTRY

BIOLOGICAL CHEMISTRY AND BIOTECHNOLOGY GROUP
BIOENGINEERING DEPARTMENT

IQS
UNIVERSITAT RAMON LLULL

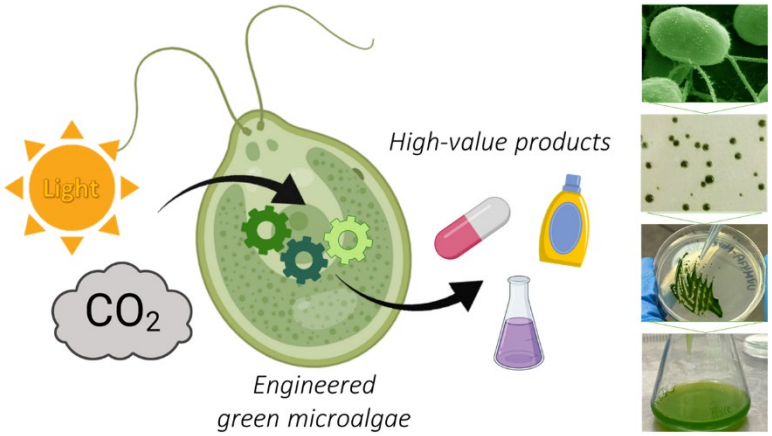
Project:
ENGINEERING PHOTOSYNTHETIC MICROALGAE AS A GREEN CELL PLATFORM FOR THE SUSTAINABLE PRODUCTION OF ADDED-VALUE BIOPRODUCTS.

Vacant:
1 Master research project (6-9 months)

Summary:
Background. **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 **rhamnolipids,** which are used as preferred **biosurfactants** in several industries (pharmaceutical, food, agriculture, petroleum or bioremediation) thanks to their enhanced biodegradability and excellent physicochemical properties.
Optogenetics is an emerging discipline that uses **light** to control genetic circuits in living cells, and it is pioneering research in neurobiology and optopharmacology. In contrast to chemical inducers, light provides fast and reversible responses (millisecond scale diffusion rate) with spatial resolution. **Light-switchable control of gene expression** typically uses two genetically-encoded proteins that are able to sense the light (photosensor) and transport this signal into target promoters (transcriptional effector).

Objectives. The student can join one of the two research topics:
1- CHLOROPLAST GENOMIC, METABOLIC & BIOPROCESS ENGINEERING IN GREEN MICROALGAE FOR THE SUSTAINABLE PRODUCTION OF RHAMNOLIPID BIOSURFACTANTS.
Through the SynBio design-build-test cycle approach, we are engineering the chloroplast genome of the green microalgae *Chlamydomonas reinhardtii* to redesign metabolism towards producing and optimizing rhamnolipids. An extension of the project focuses in product optimization though bioprocess engineering.
2- BUILDING AN OPTOGENETIC SYSTEM FOR THE CONTROL OF GENE EXPRESSION IN MICROALGAE CHLOROPLAST AS A SYNTHETIC BIOLOGY PLATFORM.
We are developing a novel **optogenetic system** to control the expression of target genes in the chloroplast of *Chlamydomonas reinhardtii*. We envision the development of a tool that allows the control the production of rhamnolipids and other bioproduts by light.

Technical skills: Chloroplast transformation, polygene cloning, golden gate assembly, gene expression analysis (qRT-PCR, western blot), glycolipid analysis (GC-MS, HPLC-MS/MS), Bioinformatics, bioprocess/bioreactor, photobiology, protein-protein/DNA interaction analysis, reporter gene expression.



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

Director(s): Dr. Pablo Leivar (pablo.leivar@iqs.url.edu), Dr. Marc Carnicer (marc.carnicer@iqs.url.edu), Dr. Antoni Planas (antoni.planas@iqs.url.edu)