**Master 2 internship project**

**Year 2023-2024**

**Laboratory/Institute:** LPCV **Director:** Eric Maréchal

**Team:** Lipid **Head of the team:** Juliette Jouhet

**Name and status of the scientist in charge of the project:**  **HDR: yes 🗷 no ☐**

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**Program of the Master’s degree in Biology:**

**☐** Microbiology, Infectious Diseases and Immunology **☐** Structural Biology of Pathogens

**🗷** Physiology, Epigenetics, Differentiation, Cancer **☐** Neurosciences and Neurobiology

**Title of the project:**

**Study of algae mutants impacted in lipid synthesis**

Objectives (up to 3 lines):

The objective is to characterize Phaeodactylum tricornutum (a diatom) mutants that are devoid of the enzymes involved in phosphatidylcholine or betaine lipid synthesis by studying their physiology, their lipidome and their cell architecture in normal condition and in phosphate starvation.

Abstract (up to 10 lines):

Phosphate (Pi) starvation is a stress frequently encountered in the natural environment by plants and algae. In order to adapt to this stress, photosynthetic organisms set up different mechanisms to increase the assimilation of extracellular Pi and to remobilize intracellular reserves. Phosphated membrane lipids, called phospholipids, contain cellular Pi and therefore constitute an important reserve of Pi. These lipids are degraded during Pi starvation and replaced by non-phosphated lipids, such as betaine lipids in algae. Betaine lipids have chemical structure close to the phospholipid phosphatidylcholine and could therefore replace it, allowing the remobilization of the Pi reserves. Our project aims to understand the impact of the absence of phosphatidylcholine or betaine lipid in algae during phosphate deficiency. Our working model is the diatom *Phaeodactylum tricornutum*. We already obtained CrispR/Cas9 mutants KO for DGTS synthase or PEAMT, involved respectively in betaine lipids and phosphatidylcholine synthesis, that need to be characterized.

Methods (up to 3 lines):

Algae culture

Lipidomics (gaz chromatography, liquid chromatography, mass spectrometry)

Electronic microscopy

Up to 3 relevant publications of the team:

A physicochemical cause of betaine lipid evolutionary loss in seed plants?

Bolik Stéphanie, Schlaich Alexander, Mukhina Tetiana, Amato Alberto, Bastien Olivier, Schneck Emanuel, Demé Bruno, Jouhet Juliette. bioRxiv 2023.01.24.525350; doi: https://doi.org/10.1101/2023.01.24.525350

Acyl‐CoA :lysophosphatidylcholine acyltransferase from the unicellular diatom Phaeodactylum tricornutum ( PtLPCAT1 ) is involved in triacylglycerol and galactoglycerolipid synthesis and enhances eicosapentaenoic acid accumulation in recombinant oleaginous yeast

Lingjie You, Juliette Jouhet, Eric Maréchal, Alberto Amato, Xiahui Hao, Donghui Zhang, Antoni Banaś, Yangmin GongPlant Biotechnology Journal, 2023, 21 (2), pp.238-240. ⟨10.1111/pbi.13952⟩

Biophysical properties of glycerolipids and their impact on membrane architecture and biology

Bolik Stéphanie, Demé Bruno, Jouhet JulietteFabrice Rebeille; Eric Marechal. Lipids in Plants and Algae: From Fundamental Science to Industrial Applications, 101, Elsevier, pp.1-57, 2022, Advances in Botanical Research, 978-0-12-820803-8. ⟨10.1016/bs.abr.2021.09.001⟩

Requested domains of expertise (up to 5 keywords):

Cell culture, biochemistry, molecular biology, electronic microscopy