PhD POSITION

Regulation of CO_2 acquisition and assimilation by diatoms: monitoring enzymatic activity of key photosynthetic enzymes

We are seeking a highly-motivated doctorate candidate to join our group at the BIP laboratory, Marseille (https://bip.cnrs.fr/). The overarching aim of the research project is to understand the regulation of the CO_2 acquisition and assimilation by diatoms.

Photosynthesis occurs in the chloroplast of diatoms, and their molecular properties differ from that of other models (chloroplast of viridiplantae or cyanobacteria)[1]. CO_2 is accumulated in the chloroplast by a CO_2 concentration mechanism and its actors are bicarbonate transporters and carbonic anhydrases. Among them, the diatoms possess a peculiar carbonic anhydrase: the iota-CA, that is active without metallic cofactor, and that is expressed upon change in the culture conditions from high to atmospheric or low CO_2[2]. The objective of the PhD candidate is to determine the enzymatic properties of iota-CA from *Phaeodactylum tricornutum*, and its cofactor. The PhD candidate will set up new CA activity assays and will use wild type and mutant recombinant enzymes (already produced in the lab)[3]. In parallel, the partners of this CA will be identified by biochemistry approaches (pool down).

CO_2 is assimilated by the Ribulose 1,5 Bisphophate Carboxylase/Oxygenase (RuBisCO), and its substrate is renewed by the Calvin Benson Bassham cycle (CBB). The regulation of some CBB enzymes such as phosphoribulokinase or glyceraldehyde 3-phosphate dehydrogenase differ in diatom compared to in viridiplantae [4]. The PhD candidate will use established activity assays to determine the molecular properties of these enzymes and the conditions of their activation (pH, redox, cofactors). The PhD candidate will compare the catalytic activity of recombinant enzymes compared to that in cell extracts. Hypothetical supramolecular complexes will be searched by pool down approaches and their interacting partners will be identified.

In a second period, the PhD candidate will use wild type and mutant diatoms (deleted of regulatory proteins or of iota-CA) obtained by the project AlgAdvance in order to compare the amount of photosynthesis metabolites by NMR in collaboration with the BIP02 group and the amount of protein by quantitative proteomic in collaboration with the IMM proteomic plateform.

This project is part of the AlgAdvance project that aims at optimizing lipid production by diatoms, and the doctorate will benefit from expertise of the consortium. Travels in lab of the consortium will be expected (Laboratoire Physiologie Cellulaire & Végétale of Grenoble, Institut de Biosciences & biotechnologies d'Aix-Marseille of Cadarach, Laboratoire GEnie des Procédés Environnement – Agroalimentaire of Saint Nazaire).

Candidates must hold a Master II in protein biochemistry including protein expression, purification and enzymology. Experience on spectroscopic methods such as UV-vis absorption or Nuclear Magnetic Resonance is a plus but is not mandatory. Similarly, experience on plant biology or microalgae culture is a plus but is not mandatory. The candidates will have a demonstrated ability to work independently, with strong oral and written communication skills, and ease in a multidisciplinary team.

Application should include a CV, motivation letter including a description of your research interests, and the names and contact details of two referees. Applications are online on the CNRS website:
https://emploi.cnrs.fr/Offres/Doctorant/UMR7281-AURBIM-020/Default.aspx

Contact : Group « Enzymology in a complex medium » : https://bip.cnrs.fr/groups/bip02/
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References :

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4. Avilan, L.; Maberly, S.C.; Mekhalfi, M.; Plateau, J.; Puppo, C.; Gontero, B. Regulation of Glyceraldehyde-3-Phosphate Dehydrogenase in the Eustigmatophyte *Pseudocharaciopsis Ovalis* Is Intermediate between a Chlorophyte and a Diatom. *European Journal of Phycology* **2012**, *47*, 207–215, doi:10.1080/09670262.2012.687459.