EPIgenetic regulation of bioactive Compound production from microalgae (EPIC)

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Abstract

Microalgae are eukaryotic unicellular organisms known to release a series of compounds with antipredator, allelopathic, antibacterial and cell-to-cell signalling properties in the marine environment. The molecular mechanisms at the basis of this production are often unknown. The aim of this project is to investigate the epigenetic landscape regulating the activation of biosynthetic pathways responsible for the generation of specific compounds by microalgae. By focusing on compounds with possible applications for human health (e.g. sulfolipids and monogalactosyldiacylglycerols), this project will attract both ecological and biotechnological interest. In particular, the student will focus on the sulfolipids and monogalactosyldiacylglycerols biosynthetic genes in the model diatom *Phaeodactylum tricornutum*, and the epigenetic marks that may regulate their activation. The student will use different culturing conditions and histone modification inhibitors in order to characterize pathway activation/deactivation. A multidisciplinary approach, including chromatin immunoprecipitation (ChIP), qPCR, RNA sequencing and metabolomics, will help to characterise the epigenetic landscape at the basis of the production of the bioactive molecules from *Phaeodactylum tricornutum* and identify the condition(s) where there is a higher production of bioactive molecules. The project results will have a great impact at ecological and biotechnological levels, shedding light on some fine-tuning regulation mechanisms underpinning the production of chemical communication molecules at sea.