EPIgenetic regulation of bioactive Compound production from microalgae (EPIC)

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Abstract

Microalgae are eukaryotic unicellular autotrophic organisms known to release a variety of compounds with antipredator, allelopathic, antibacterial and cell-to-cell signalling properties in the marine environment. The molecular mechanisms underpinning 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 promising translational potential (e.g. carotenoids, sulfolipids and monogalactosyldiacylglycerols), this project will attract both ecological and biotechnological interest (such as for human health applications). In particular, the student will focus on bioactive compound biosynthetic genes in microalgae, such as the diatom *Cylindrotheca closterium* and the model diatom *Phaeodactylum tricornutum*, and the epigenetic marks that may regulate their activation. The student will use different microalgal 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 microalgae and identify the condition(s) where there is a higher production of bioactive molecules. Thus, the successful candidate will be equipped with a solid understanding of, and practical experience on, state-of-the-art experimental methodologies used in molecular biosciences. The project results will have a great impact at ecological and biotechnological levels, shedding light on some fine-tuning regulatory mechanisms underpinning the production of chemical communication molecules at sea.