Microalgal enzymes with biotechnological applications

Director of Studies: Chiara Lauritano

Department of Integrative Marine Ecology Department

Project Summary

Recent reports on microalgae genomics/transcriptomics are uncovering a variety of novel enzymes such as lipases, phosphatases, amylases, gelatinases, ureases and catalases that may be of use for various biotechnological applications. Transcriptome sequencing of the bioactive species identified in the EU FP7-funded PharmaSea project (including diatoms, dinoflagellates and flagellates) has recently started. The first transcriptome sequenced during this project was the dinoflagellate *Amphidinium carterae* that showed strong antifungal activity. Several enzymes were identified including L-asparaginase (used for the treatment of leukemia), a cellulase (used in food, detergent, brewing, textile and paper manufacturing, animal feed industries and biofuel production) and a gene cluster involved in the synthesis of secondary metabolites with antipredator, allelopathic, antimicrobial, anticancer and toxic activities (i.e. polyketide synthases or PKS). Although enzymes are currently used in a wide range of biotechnological and industrial applications, there is an increasing demand to identify new enzyme sources as well as improve older ones, especially for extreme industrial conditions.

The objectives of this PhD will be (1) to analyze the transcriptomes of active microalgal species identified in previous EU-funded projects, (2) to sequence and analyze at least two new transcriptomes of active microalgae, (3) identify gene clusters involved in secondary metabolite production and other enzymes with possible biotechnological applications, (4) select the two most promising enzymes for heterologous expression and further functional characterization. The project will identify new enzymes from microalgae with industrial and therapeutical applications, together with enzymes that may have applications in bioremediation strategies.