



Università degli Studi di Napoli Federico II

PhD in Biotechnology - 37th cycle

Dr. Francesca Maria Pia Paragliola

Identification, characterization, and modification of enzymes active on carbohydrates from (hyper)thermophilic microorganisms for biocatalysis and biotransformations

Tutor(s): Marco Moracci, Andrea Strazzulli

Department: Department of Biology, Via Vicinale Cupa Cintia, 80126

Napoli NA, Edificio 7, Complesso Universitario di Monte S. Angelo

Biomasses are an important and heterogeneous bioresource, not yet fully exploited¹. Among biomasses, those from algae represent an important carbohydrate source for biorefineries and oligosaccharides production. Due to the structural complexity of their hydrolysis-recalcitrant polysaccharides, the use of algal biomasses for industrial applications is severely limited². The development of an enzymatic approach represents a solution for the hydrolysis of this recalcitrant biomass for the large-scale production of the compounds of interest. The discovery of new Carbohydrate-Active enZymes (CAZymes) is indispensable for the use of suitable enzymatic cocktails, for the degradation, modification and production of the glycosidic bonds³. In particular, the use of (hyper)thermophilic CAZymes has different biotechnological advantages, allowing them to work under industrial conditions where mesophilic enzymes would quickly denature. Hence, the discovery of novel enzymes is indispensable for advances in the field of biocatalysis, reducing the cost of the bioprocesses⁴. The aim of this PhD project is the discovery and characterization of novel (hyper)thermophilic CAZymes involved in the hydrolysis and modification of recalcitrant biomasses, as the algal ones, for biotechnological purposes, with combined approaches of *in silico* metagenomics and enzymology.

References

1. Moustakas, K. & Loizidou, M. Waste and biomass management and valorization. *Environ. Sci. Pollut. Res.* **28**, 24224–24229 (2021).
2. Bornscheuer, M. B. T. D. and U. T. Marine Polysaccharides: Occurrence, Enzymatic Degradation and Utilization. (2021).
3. Drula, E. *et al.* The carbohydrate-active enzyme database: functions and literature. *Nucleic Acids Res.* 1–7 (2021) doi:10.1093/nar/gkab1045.
4. Cabrera, M. Á. & Blamey, J. M. Biotechnological applications of archaeal enzymes from extreme environments. *Biol. Res.* **51**, 1–15 (2018).