Università degli Studi di Napoli Federico II

PhD in Biotechnology - 35th cycle

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Cold-adapted bacteria response to temperature changes: from physiology to exploitation of their biotechnological potential

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Psychrophilic microorganisms evolved key features to thrive in cold environments. Understanding these mechanisms is crucial in view of their potential biotechnological application as hosts for the production of recombinant protein and secondary metabolites. Furthermore, global warming is expected to have serious effects on microbial communities, especially on Antarctic marine bacteria which are adapted to moderate temperature fluctuation. The first objective of my project is to understand how psychrophilic marine bacteria face with temperature changes, by studying the regulation of global gene expression. Bacteria are indeed very effective in fine-tuning their genome-wide transcription by global Transcription Factors (TF), which directly controls the expression of many genes/operons (collectively known as regulons). This goal will be achieved by comparing whole transcriptomes of four Antarctic marine bacteria (including two model strains *Ph*TAC125[1] and *Pseudoalteromonas sp*. TB41[2]) grown at two different temperatures, 0°C and 15°C. The information obtained by the identification of genes and TFs involved in adaptation to temperature changes will be used for the improvement of the *Ph*TAC125 bacterium in biotechnological applications. In detail, the identification of the mechanisms involved in the adaptation at higher temperature will be used for the set-up of an optimal growth medium for industrial requirements, to develop new expression systems and for the construction of *Ph*TAC125 genomic mutant able to efficiently produce recombinant protein in a wider range of temperature.

References

1. Medigue, C. *et al. Genome Res.* **15**, 1325–1335 (2005).
2. Mocali, S. *et al. Sci. Rep.* **7**, 839 (2017).