



Università degli Studi di Napoli Federico II

PhD in Biotechnology - 36<sup>th</sup> cycle

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**Discovery and characterization of new fungal biosurfactant proteins for bioremediation and biomedical application**

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**SSD:** BIO/10

**Biosurfactants (BS)** are amphiphilic molecules produced by several microorganisms. Thanks to their amphiphilic nature they can distribute themselves between two immiscible liquids, with the effect of reducing the surface/interfacial tensions and increasing polar compounds solubility in non-polar solvents<sup>1</sup>. BS are considered as “green molecules” because of their wide applications in **bioremediation** processes of soil and water. In some cases, these molecules exhibit anti-microbial and anti-biofilm activities, inhibiting the adhesion of pathogenic microorganisms on functionalized surfaces, without the use of synthetic drugs or chemicals. Despite numerous **fungi** are a great source of BS, they have been less studied than their bacterial counterparts. Fungi have developed an extraordinary ability to tolerate several types of pollutants and use them as source of energy, thanks to their enzymatic system, their ability to produce BS proteins (like hydrophobins) and their cellular ability to penetrate three dimensional substrates <sup>2</sup>.

The main purposes of this PhD project are focused on:

- Selection of new BS proteins from different fungal strains, with a focus on fungi able to degrade plastics.
- Exploitation of growth conditions that stimulate production of BS, identification and characterization of BS proteins.
- Recombinant expression of BS proteins in selected hosts (bacteria, yeasts).
- Exploitation of application fields of BS proteins.

**References**

1. Fenibo, E. O., Ijoma, G. N. & Selvarajan, R. Microbial Surfactants : The Next Generation Multifunctional Biomolecules for Applications in the Petroleum Industry and Its Associated Environmental Remediation. 7, 1–29 (2019).
2. Sánchez, C. Fungal potential for the degradation of petroleum-based polymers : An overview of macro- and microplastics biodegradation. *Biotechnol. Adv.* **40**, 107501–107513 (2020).