Università degli Studi di Napoli Federico II

PhD in Biotechnology - 39th cycle

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Fungal self-assembling proteins and their engineered variants as building blocks for the production of functional and derivatized materials

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Considering the demand for innovative materials and the biocompatibility and sustainability of natural biomaterials, this PhD project addresses two primary challenges. The first objective is the production of functional proteinaceous materials using two fungal self-assembling proteins, Vmh2 and PAC3, as building blocks for their formation. These proteins share the same ability to form isolated, long and twisted amyloid fibrils, and will be produced by testing wastes as growth substrates. [1] Then, techniques as microfluidics and electrospinning will be employed for the formation of aligned fibers from them. The second aim is the obtainment of immunosensors and antimicrobial surfaces in direct food contact using Vmh2-engineered variants. The Vmh2-chimeric proteins, besides retaining the ability of the native Vmh2 to adhere to hydrophobic surfaces, also exhibit the additional feature attributed to the fused partner.[2] Therefore, Vmh2 adhesiveness will be used to functionalize surfaces with single-chain fragment variable, protein A and antimicrobial peptides as secondary elements to develop derivatized materials.

References

1. Pitocchi R. *et al.* “Evidence of Small Fungal Cysteine-Rich Proteins Acting as Biosurfactants and Self-Assembling into Large Fibers”. Int. J. Mol. Sci. (2023), 24, 13843
2. Alessandra Piscitelli *et al.* “Vmh2 hydrophobin as a tool for the development of “self-immobilizing” enzymes for biosensing”. Biotechnol. Bioeng. (2017);114: 46–52