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ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY OF A NEW SOLVENT-CAST FILM BASED ON A FUNCTIONALIZED ELASTIN-LIKE POLYMER

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The spread of antimicrobials resistant microorganisms and the lack of new antibiotic discoveries in last years have triggered the search for new advanced antimicrobial materials for many fields of application, especially for medical devices. These advanced materials need to have the ability to kill microorganisms without damaging human tissues. Recent advances in material fabrication technologies and characterization, and especially through the use of synthetic biology approaches, it is now possible to reengineer novel functionalities and structures of protein-based materials, by taking advantage of their extreme versatility and applicability.

The combination of antimicrobial peptides (AMPs) with recombinant protein-based polymers can be explored for the development of advanced medical devices, to overcome biofilm formation and nosocomial infections. AMPs are normally cationic, small molecules that occur as part of the innate immune system in many organisms, and present even in microbes and virus. Here we describe the design, biological production and processing of a protein-based-polymer containing a functional domain based on a synthetic cationic AMP, ABP-CM4, fused in frame with an elastin-like-polymer consisting of 200 repeats of the structural unit VPAVG (A200). The functionalized protein-based-polymer was produced in *Escherichia coli* and further purified by exploring the thermoresponsiveness property of poly-VPAVG.

Free standing films, were obtained by solvent-cast especially thinking in future downstream processing for its application in coating of medical devices. The antibacterial and antifungal activities of the cast films were confirmed against different bacterial and fungal species, by *in vitro* and *ex vivo* assays. The recombinant CM4::A200 biopolymer displayed high growth inhibition against a wide range of bacterial species, both gram negative and positive, and yeast species. The antimicrobial activity was time dependent and remarkably, in some bacterial species, almost 100% of cell death was detected after 30 minutes of cell suspension in contact with cast films.

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