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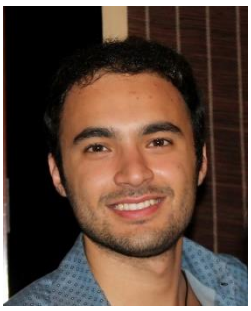


Novel anti-biofilm strategies based on innovative antimicrobial nanoparticles: physicochemical and technological issues

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Abstract

Treatment of biofilm-related infections represents a major challenge in public health management. Therefore, the accurate identification of both the composition and architecture of bacterial biofilms, in terms of microorganisms and surrounding extracellular polymeric substances (EPSs), represents a fundamental pre-requisite for the rapid diagnosis of recurrent/resistant biofilm-based infections as well as for the management of several industrial processes. Here, the results of a combined approach involving scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy in attenuated total reflectance geometry (FTIR-ATR) and μ-Raman spectroscopy for the structural and dynamical properties of single-species bacterial biofilms produced by *Pseudomonas aeruginosa* (PAO1) and *Escherichia coli* strains, both proficient in infecting human cells and in colonizing medical devices, are presented. Moreover, preformulation studies were conducted on novel chitosan-based nanoparticles, comprising an in-depth technological physicochemical characterization. These systems were developed to increase the anti-biofilm activity of natural and synthetic molecules, reduce their side effects, and achieve sustained release.

The topics here discussed fall in the framework of the PRIN 2022 *FINI* (*Future challenges in management of recurrent/resistant Infection: development of antimicrobial Nanoparticulate systems and physical-chemical investigation of their Interactions with biofilm-associated infection*) project, CUP: J53D23008880006, funded by the European Union - *Next Generation EU*, PNRR – Mission 4, Component 2, Investment 1.1 – PRIN 2022 Call for Proposals - Directorial Decree No. 104 of 02-02-2022.