Engineered Nanoparticles as An Emerging Platform to Fight Antimicrobial Resistance

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Abstract

Antimicrobial resistance (AMR) is one of the biggest public health issues, causing more than 700,000 deaths per year worldwide [1]. This number is expected to rise to 10 million by 2050 unless preventive measures are taken. Specifically, the World Health Organization (WHO) has designated the development of therapeutic strategies against *Staphylococcus aureus* (*S. aureus*) as a top priority, as it is the most common and one of the most dangerous pathogens involved in numerous infections [2]. A promising approach to fight *S. aureus* is using engineered nanoparticles (NPs) capable of targeting *S. aureus* and delivering antibacterial agents directly to the site of infection. In this work, polymeric NPs made of poly(lactic-co-glycolic acid) (PLGA) were produced by the emulsion solvent evaporation method. The surface of the PLGA NPs was modified with different ligands, including folic acid and cell-penetrating peptides (CPP), to increase the nanocarriers' specificity and penetration into *S. aureus*. NPs were characterized by dynamic light scattering (DLS), electrophoretic light scattering (ELS), and Fourier-transform infrared spectroscopy (FTIR). The different NPs showed monodispersed distribution with mean hydrodynamic diameters lower than 220 nm and negative zeta potential values. Moreover, all the produced engineered NPs remained stable for at least two months. The ability of the functionalized NPs to target and penetrate S. aureus was demonstrated by microscopy using rhodamine B-loaded NPs. Overall, the developed NPs show promising characteristics for the targeted treatment of *S. aureus*.

References

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[2] Larsen, J., et al., Emergence of methicillin resistance predates the clinical use of antibiotics, Nature 2022, 602, 135-141.