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SYNERGISTIC ERADICATION OF BACTERIAL BIOFILM USING NITRIC OXIDE-LOADED ANTIMICROBIAL POLYMER

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The formation of bacterial biofilms on the surface of body tissues and medical devices is considered as a critical healthcare issue causing chronic and recurrent infections. In biofilm mode bacteria cells are enclosed in a polymeric self-secreted matrix which makes them highly resistant to hostile environmental conditions and antibiotic treatments. Co-administration of two mechanistically different antimicrobial agents seems to be a potential approach to overcome challenges in treatment of biofilm-related infections. In this study, Author reports the synthesis of a novel antimicrobial/antbiofilm agent that consists of biocompatible antimicrobial polymer and nitric oxide (NO)-releasing functional groups. The NO-loaded polymer has dual-action capability as it can release NO which triggers the dispersion of biofilm whereas the polymer can induce bacteria cell death via membrane wall disruption. Synergistic antimicrobial activity was observed in biofilm dispersal, planktonic and biofilm killing activities against Pseudomonas aeruginosa upon the incorporation of (NO)-releasing functional groups into the structure of the antimicrobial polymer. The NO-loaded polymer results in 80% reduction in biofilm biomass and kills >99.999% of planktonic and biofilm P. aeruginosa cells within 1hr of treatment at a polymer concentration of 64 µg/ml. To fulfil this synergistic effect, NO donors and antimicrobial polymer should necessarily exist as a single compound, instead of a cocktail physical mixture of two individual components.