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PLURONIC F-127 AND CHITOSAN HYDROGEL DELIVERING NITRIC OXIDE WITH ANTIBACTERIAL EFFECT AND CYTOCOMPATIBILITY

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Nitric oxide (NO) is a small molecule involved in a wide range of physiological and pathophysiological processes, including vasodilatation, control of inflammatory pain, wound healing, and antibacterial activities. As NO is a free radical, the design of drugs that generates therapeutic amounts of NO in controlled spatial and time manners is still a challenge. In this study, the NO donor S-nitrosoglutathione (GSNO) was incorporated into the thermoresponsive pluronic F-127 (PL) - chitosan (CS) hydrogel, in an easy and economically feasible methodology. CS is a polysaccharide with known antimicrobial and biocompatibility properties. Scanning electron microscopy, rheology and differential scanning calorimetry techniques were used for hydrogel characterization. The results demonstrated that the hydrogel has a smooth surface, thermoresponsive behavior, and good mechanical stability. The kinetics of NO release and GSNO diffusion from GSNO-containing PL/CS hydrogel demonstrated a sustained NO/GSNO release, in concentrations suitable for biomedical applications, at physiological and skin temperatures. The GSNO-PL/CS hydrogel demonstrated a concentration-dependent toxicity to Vero cells and antimicrobial activity to Pseudomonas aeruginosa (minimum inhibitory concentration and minimum bactericidal concentration values of 0.5 µg•mL-1 of hydrogel, which correspondents to 1 mmol•L-1 of GSNO). Interestingly, the concentration range in which the NO-releasing hydrogel demonstrated antibacterial effect was not found toxic to Vero mammalian cell. Thus, GSNO-PL/CS hydrogel is suitable biomaterial for topical NO delivery applications.

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