

Chitosan Hydrogel Containing Nitric Oxide Donors with Potent Antibacterial Effect

Authors : Milena Trevisan Pelegrino, Bruna De Araujo Lima, Mônica H. M. Do Nascimento, Christiane B. Lombello, Marcelo Brocchi, Amedea B. Seabra

Abstract : 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 $\mu\text{g}\cdot\text{mL}^{-1}$ of hydrogel, which corresponds to 1 $\text{mmol}\cdot\text{L}^{-1}$ of GSNO). Interesting, 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.

Keywords : antimicrobial, chitosan, biocompatibility, S-nitrosothiols

Conference Title : ICPNDDS 2018 : International Conference on Pharmaceutics and Novel Drug Delivery Systems

Conference Location : London, United Kingdom

Conference Dates : April 24-25, 2018