CHITOSAN NANOPARTICLES AND PLURONIC F-127 HYDROGELS COMBINED FOR DRUG DELIVERY OF NITRIC OXIDE

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Chitosan nanoparticles are an interesting vehicle for drug delivery for biomedical applications and have been successfully applied for the topical applications of nitric oxide (NO). NO is a small molecule with promising clinical applications, for instance, dressing for burn wounds, cutaneous healing, and antibacterial effects. Although chitosan nanoparticles are mucoadhesive, they showed low viscosity, which is not suitable for a dermatological application. This study evaluated the incorporation of chitosan nanoparticles into a hydrogel matrix based on Pluronic F-127 for dermatological applications. The S-nitrosoglutathione (GSNO), an NO donor, was incorporated into chitosan nanoparticles. Chitosan nanoparticles were characterized through dynamic light scattering (DLS) and exhibited hydrodynamic size narrow-range of 95.84 ± 0.48 nm, polydispersity index (PDI) of 0.330 ± 0.008, and a zeta potential of 18.7 ± 0.2 mV. The hydrodynamic size was similar when the nanoparticle was dispersed in simulated body fluid (SBF), further, the physiological pH contributes for the equilibrium of charges in the surface of the nanoparticle and avoid aggregation for at least 24 h. The moderate PDI value indicates a good dispersion of the nanoparticles and homogenous size distribution. The rheological analysis shows that the incorporation of chitosan nanoparticle (hybrid group) into the polymeric matrix do not negative interfere in the stability or the sol-gel temperature (Tgel) of the Pluronic F-127 hydrogel. The structure of this system was evaluated through small angle X-ray scattering (SAXS) analysis, which shows that chitosan nanoparticles were concentrated in the intermicellar spaces of the hydrogel. In addition, the release of GSNO was evaluated *in vitro* using a vertical diffusion system and the hybrid group exhibited a 2 to 3-fold slower rate of GSNO release than free GSNO and the NO release is based on Fick Law (Higuchi). These results indicate the potential of these materials for the delivery of NO at constant rates in the skin.