

# Topical cellulose nanocrystals-stabilized nanoemulgel loaded with ciprofloxacin HCl with enhanced antibacterial activity and tissue regenerative properties

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## Abstract

Spray-dried cellulose nanocrystals (CNC) were investigated as a potential stabilizer for the preparation of nanoemulsion gels (nanoemulgels) loaded with ciprofloxacin hydrochloride to act as dual-role gels capable of stimulating the tissue regeneration as well as inhibition of microbial growth. The selected nanoemulgel (NEG/2) which was composed of 10 % w/w linoleic acid and 4 % w/w CNC had a particle size of 203.2 nm, drug content of 95.5%, zeta potential of -31.1 mV and polydispersity index of 0.34. Comparing the in-vitro drug release results, NEG/2 attained the highest percentage release efficiency with the most sustained behavior (release rate = 18.9 %/h). The selected nanoemulgel possessed a thixotropic, shear thinning behavior favorable for dermal preparations. Results also revealed that NEG/2 showed improved antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* bacteria in addition to improved cytocompatibility and cell regenerative characters on human dermal fibroblasts. In conclusion, the proposed formulation offered a safe, biocompatible and promising approach for injured skin care.

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