

Development and Optimization of Antimicrobial Nanoemulsion-loaded into Two Bigels: A Comparative Study

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Abstract

Nanoemulsions and bigels are biphasic drug delivery systems used for topical routes. Nanoemulsions are thermodynamically stable systems with droplet diameters of <100nm. Whereas, bigels are semisolid preparations prepared by mixing oleogels and hydrogels at different ratios. The aim of this study was to incorporate an oil-in-water ciprofloxacin hydrochloride nanoemulsion into two types of bigels (oleogel-in-hydrogel (Type I) and hydrogel-in-oleogel (Type II)) and compare them to enhance drug penetration through the skin to treat skin infections. Bigels that were physically stable were subjected to rheological, microstructure, antimicrobial activity, and stability studies. Bigels exhibited shear-thinning and viscoelastic properties. A complete drug release was achieved after 4-5h. Bigels showed antimicrobial activity against different bacterial strains. Stability studies showed that the rheological properties decreased over time at room temperature. Microscopic images showed a highly structured network of the oleogel and hydrogel with nanoemulsion droplets dispersed within bigel networks. Therefore, bigels can be used as a potential matrix for topical drug delivery systems.

Keywords: Drug delivery systems, Nanoemulsions, Bigels, Oleogel-in-hydrogel, Hydrogel-in-oleogel.