



Colon-Targeted Eudragit-S-100 Coated Nanostructured Lipid Carriers for Enhanced Rebamipide Delivery in Ulcerative Colitis

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Abstract

Ulcerative colitis (UC) is a chronic inflammatory condition of the colon that causes mucosal damage and requires targeted drug delivery for effective treatment. Rebamipide (RBM), a gastroprotective agent with anti-inflammatory and antioxidant properties, suffers from poor solubility and limited gastrointestinal absorption, reducing its clinical effectiveness. In this study, a novel colon-targeted nanostructured lipid carrier (NLC) system was developed and coated with Eudragit-S-100 to enhance RBM's solubility, stability, and colonic delivery. RBM-loaded NLCs were prepared using hot homogenization followed by probe sonication and optimized using Box–Behnken design. The optimized formulation was characterized for particle size, zeta potential, morphology, thermal behavior, entrapment efficiency, and drug release profile. In vitro release kinetics and in vivo efficacy were evaluated using Wistar rats. The optimized coated NLCs exhibited a particle size of 269.2 nm, larger than uncoated NLCs (175.6 nm). In vivo studies using female Wistar rats with acetic acid-induced UC demonstrated that the coated formulation significantly improved clinical activity scores ($p < 0.001$), minimized neutrophil infiltration, and improved colon histopathology. Notably, enhanced reactive oxygen species (ROS) scavenging and improved mucosal healing were also observed. This study introduces a novel colon-targeted Eudragit S100-coated RBM-loaded NLC system as a promising strategy for the effective management of UC, offering improved bioavailability, targeted delivery, and reduced systemic side effects.

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