Fabrication, Characterization, and Biological Evaluation of Coal Tar-Encapsulated Polymeric Nanoparticles for Psoriasis Treatment

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Abstract

Coal tar (CT) is a commonly used therapeutic agent in psoriasis treatment. Current CT formulations in clinical use have limitations leading to patient non-adherence for the treatment. This study aimed to develop a new formula for CT using poly(lactide-co-glycolide) polymeric nanoparticles (NPs). The optimized formula's physicochemical properties were characterized using dynamic light scattering and high-performance chromatography. *In vitro* biocompatibility of the NPs was examined in MCF-7 breast cancer cells and human dermal fibroblasts. Permeation, washability, and staining experiments were carried out using Strat-M membranes in Franz diffusion cells. Characterization of the optimized CT-NPs showed the production of 133nm NPs with high monodispersity and excellent loading efficiency. The biocompatibility assays indicated that the NP formulation significantly reduced the cytotoxicity of crude CT. Permeation studies revealed that only a negligible amount of CT-NPs could cross the Strat-M membrane after 24h unlike crude CT, indicating their extensive skin accumulation. The superiority of CT-NPs was further demonstrated by the notably diminished staining ability and enhanced washability compared to crude CT. Our results provide a promising NP formulation for CT that can overcome its limitations in the treatment of psoriasis and other skin disorders.

Keywords: Coal tar, PLGA, polymeric nanoparticles, psoriasis, nanomedicine.