Surfactin-stabilized poly(D,L-lactide) nanoparticles for potential skin application

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In recent years polymeric nanoparticles stabilized by biocompatible polyesters of poly(D,L-lactide) origin have been under investigation due to their favorable properties as drug nanocarriers useful for cosmetics and pharmaceutical applications. However, their design and fabrication are still limited to nonionic or polymeric stabilizers whose surface activity, toxicity, and biocompatibility may be insufficient for biological issues including transdermal applications. Therefore, there is still an ample room to look for more modern ionic biosurfactants that, apart from favorable surface properties, can ensure high biocompatibility of the system, increase the skin penetration of the active substance, and, in the future, possibly also the antimicrobial and antitumor activity of the produced nanocarrier. Accordingly, herein, we present poly(DL-lactide) nanoparticles stabilized by surfactin - a biocompatible anionic biosurfactant, for potential transdermal administration. The nanoparticles were obtained via a nanoprecipitation approach, and their physicochemical evaluation including size, surface charge, morphology, and colloidal stability was assessed. DLS measurements TEM and AFM confirmed, respectively, the obtained nanoparticles' diameter below 200 nm as well as their morphology and shape. Electrophoretic light scattering provided negative ζ-potential of the studied nanoobjects while backscattering profiles made it possible to prove their long-term kinetic stability. In order to test the optimized nanoparticles under the surfactin concentration, cytotoxicity of the obtained systems was evaluated *in vitro* upon two normal human skin cell lines, i.e., HaCaT (human epidermal keratinocytes) and NHDF cells (normal human dermal fibroblasts). These studies indicated the safest concentration of the biosurfactant for nanoparticle stabilization. The skin permeability tests provided on pig ear skin proved the enhanced ability of the nanoparticles to deeper penetrate the epidermis after 5 hours of the permeation test. The presented results prove that these surfactin-stabilized poly(D,L-lactide) nanoparticles are good biocompatible candidates for transdermal applications.

Słowa kluczowe

Biosurfactants, Nanoprecipitation, skin permeation, HaCaT cells, NHDF cells

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