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Investigation of lidocaine-containing NLC systems for dermal application

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Topically applied anaesthetics are employed in order to eliminate pain caused by needle insertion and injection, thus ameliorating patient compliance. Furthermore, they are devoid of symptoms of superficial trauma and local reaction. Therefore, the aim of this work was to develop a new formulation of lidocaine, proposed to improve its clinical effectiveness in topical anaesthesia in terms of both enhanced anaesthesia and a prolonged duration of action. For this purpose, we incorporated lidocaine in nanostructured lipid carriers (NLC). Particle size and zeta potential measurements, Fourier transform infrared spectroscopy and Raman spectroscopy were performed to characterize the NLC system. Furthermore, DSC and XRD measurements were conducted to investigate lipid crystallization which plays a very important role in the performance of NLC carriers. Additionally, membrane diffusion and penetration studies were completed *in vitro* and *ex vivo*, followed by measurements on skin hydration and transepidermal water loss *in vivo*. Our results lead us to the conclusion that the developed nanostructured lipid carrier is a promising vehicle for the topical delivery of lidocaine. The penetration of the NLC formulation was remarkable through heat separated epidermis after 24 hours, and the observed skin hydrating and occlusive effect also makes this formulation a favourable dermal carrier system.

Recent Publications

1. Ribeiro L N, et al. (2016) Nanostructured lipid carriers as robust systems for topical lidocaine-prilocaine release in dentistry. *European Journal of Pharmaceutical Sciences* 93: 192–202.
2. Puglia C, et al. (2011) Development, characterization, and *in vitro* and *in vivo* evaluation of benzocaine- and lidocaine-loaded nanostructured lipid carriers. *Journal of Pharmaceutical Sciences* 100(5):1892–1899.
3. Pathak P and M Nagarsenker (2009) Formulation and evaluation of lidocaine lipid nanosystems for dermal delivery. *AAPS PharmSciTech* 10(3):985–92.
4. Muller R H, M Radtke, and S A Wissing (2002) Solid lipid nanoparticles (SLN) and nanostructured lipid carriers (NLC) in cosmetic and dermatological preparations. *Advanced Drug Delivery Reviews* 54(1):131–55

Biography

Mónika Bakonyi completed her Master's degree in Pharmaceutical Sciences in 2015 at University of Szeged. Since 2015, she is a PhD student at the Institute of Pharmaceutical Technology and Regulatory Affairs of the University of Szeged. Her research focuses on transdermal delivery of active agents, active and passive penetration enhancement techniques and electroporation. Her studies include experiments with Franz cell diffusion method, tape stripping method, Corneometer and Tewameter, ATR-FTIR and Raman spectroscopy. She has done a three month internship at the University of Freiburg, learning liposomes preparing and evaluating methods.

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