

4th International Conference and Exhibition on Pharmaceutics & Novel Drug Delivery Systems

March 24-26, 2014 Hilton San Antonio Airport, San Antonio, USA

Microneedle mediated transdermal drug delivery

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Microneedles are tiny micron sized structures that can be used to disrupt the stratum corneum for increasing skin permeation of drugs. We have investigated the utility of microneedles (from Dermaroller™) in increasing in vitro skin permeation of prochlorperazine and betablockers. Microneedles when used either alone or in combination with iontophoresis, enhanced the transdermal flux of drugs investigated. The Dermaroller™ induced microchannels were visualized using methylene blue staining and scanning electron microscopy. Transepidermal water loss was measured to confirm localized disruption of the stratum corneum. *In vitro* skin permeation studies were performed using vertical static Franz diffusion cells. Iontophoretic protocols involved application of direct current at a density of 0.1-0.5 mA/cm² using Ag as an anode and Ag/AgCl as a cathode. The effect of drug concentration, number of passes of microneedles (0, 5, 10 and 20) on both iontophoretic and passive delivery was investigated. The effect of lipophilicity of drug on the microneedle mediated transdermal iontophoretic delivery was also investigated. The Dermaroller™ was found to successfully breach the skin barrier and a linear relationship ($r^2=0.99$) was observed between the number of passes of the Dermaroller™ and the number of microchannels created. The transdermal flux increased following pretreatment with microneedle (used alone or in conjunction with iontophoresis). Depending on the physicochemical properties of the drug, there was about 8-80 fold increase in transdermal flux as compared to passive delivery. Lipophilicity of the molecule played a significant role on the electrically assisted transdermal delivery of drugs across the microporated skin.

Biography

Chandra Sekhar Kolli obtained his Bachelor's, Master's and Ph.D. degree in Pharmacy from Kakatiya University (India) followed by a Post-Doctoral training from Mercer University (GA, USA). He is currently working as Associate Professor of Pharmaceutics at California Health Sciences University (CA, USA). His research interests include transdermal drug delivery using active enhancement strategies and transmucosal drug delivery. He authored and co-authored publications and presentations related to drug delivery. He is also serving as a sub-chair for scientific abstract screening committee in AAPS, Associate editor for two journals and reviewer for several peer reviewed scientific journals.

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