Research paper

Using a simple equation to predict the microporation-enhanced transdermal drug flux

Alexey S. Rzhevskiy, Krishna Telaprolu, Yousuf H. Mohammed, Jeffrey E. Grice, Michael S. Roberts, Yuri G. Anissimov

PII: S0939-6411(17)31228-6
DOI: https://doi.org/10.1016/j.ejpb.2018.01.019
Reference: EJPB 12679

To appear in: *European Journal of Pharmaceutics and Biopharmaceutics*

Received Date: 24 October 2017
Revised Date: 30 January 2018
Accepted Date: 30 January 2018

Please cite this article as: A.S. Rzhevskiy, K. Telaprolu, Y.H. Mohammed, J.E. Grice, M.S. Roberts, Y.G. Anissimov, Using a simple equation to predict the microporation-enhanced transdermal drug flux, *European Journal of Pharmaceutics and Biopharmaceutics* (2018), doi: https://doi.org/10.1016/j.ejpb.2018.01.019

Using a simple equation to predict the microporation-enhanced transdermal drug flux

Alexey S. Rzhevskiy[1], Krishna Telaprolu [2], Yousuf H. Mohammed [2], Jeffrey E. Grice [2], Michael S. Roberts [2,3], Yuri G. Anissimov[4,1,*]

[1] Institute of Molecular Medicine, Sechenov First Moscow State Medical University, Trubetskaya 8, 119991 Moscow, Russia

[2] Therapeutics Research Centre, School of Medicine, The University of Queensland, Translational Research Institute, Brisbane, Australia

[3] School of Pharmacy and Medical Sciences, University of South Australia, Adelaide, Australia

[4] School of Natural Sciences, Griffith University, Gold Coast, Queensland, 4222, Australia.

* Correspondence: email: y.anissimov@griffith.edu.au, phone: +617 55528496

Abstract

The mathematical model describing drug flux through microporated skin was previously developed. Based on this model, two mathematical equations can be used to predict the microporatio-enhanced transdermal drug flux: the complex primal equation containing a variety of experimentally-determined variables, and the simplified straightforward equation. In this study, experimental transdermal fluxes of three corticosteroids through split-thickness human skin treated with a microneedle roller were measured, and the values of fluxes compared with those predicted using both the more complex and simplified equations. According to the results of the study, both equations demonstrated high accuracy in the prediction of the fluxes of corticosteroids. The simplified equation was validated and confirmed as robust using regression analysis of literature data. Further, its capability and ease of use was exemplified by predicting the flux of methotrexate through the skin microporated with laser and comparing with published experimental data.

Keywords: Mathematical modelling; Microporation; Percutaneous penetration; Skin flux enhancement; Transdermal drug delivery