Modelling and numerical simulation of a iontophoresis device

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ABSTRACT

In the last decades, intelligent drug delivery devices have been developed to deliver therapeutical drugs, in a controlled environment, to specific locations. Some of these devices have polymers that react to external stimuli, such as temperature or electric fields.

The application of electric fields to enhance drug delivery in such devices is quite popular in the transdermal drug delivery field. Depending on the type of drug to deliver, two procedures are followed: iontophoresis (the application of low intensity electric fields for a long period of time, see [1,2]) or electroporation (application of high intensity fields for a very short period of time, see [3,4])

In an iontophoretic procedure, a low intensity electric field is applied to the coupled system to drive the drug transport. The generated electric field induces a flux in the system which depends on the drug molecules valence, intensity of the electric field, temperature, electric conductivity of both media and drug diffusion (see [1,2]).

In this talk we present a simplified drug delivery device composed of a reservoir in contact with the skin. We assume that the drug transport in the coupled system is enhanced by a low intensity electric field which induces a convective field. Energy estimates for the coupled system are established and a numerical method to solve the coupled system is proposed and analysed.

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