Modelling drug delivery in ophthalmic systems with multi-layer framework

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ABSTRACT

Drug delivery systems via contact lenses is an important topic that can potentially improve the life of patients. Mathematical modelling provides a valuable tool to help design and optimise such systems [1,2]. Building on previous experience [3,4], we apply a one-dimensional multilayer framework implemented by a finite element approach to model drug delivery from soft contact lenses (SCLs). The model is also used for Franz Diffusion Cell (FDC) experiments to estimate the values of the physical parameters of such lenses, such as the diffusion coefficient within the lens, the partition coefficient at the surface, and the mass transfer coeffficient, describing possible surface barrier effects. Good fit was obtained with FDC experimental results carried out at different temperatures and starting conditions but with the same physical parameter values. The framework can subsequently be applied to simulate the interaction of drug-loaded SCLs in the eye using the estimated parameter values from experimental data.

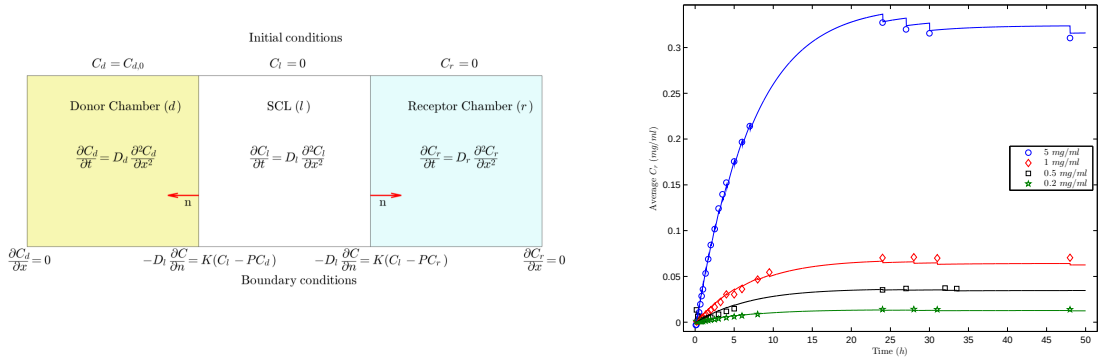

Figure 1: Left: Schematic of experimental system. Right: Release profiles compared with experimental data.

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