Mathematical aspects of controlled drug delivery

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Abstract

Recent advances in polymer science have led to the development of drug delivery systems used for maintaining drug concentration in the blood or in selected tissues at a desired level and during an extended period of time. A class of models for absorption and release by drug delivery systems is proposed. The models are constructed assuming that the diffusing drug causes a deformation which induces a stress driven diffusion and consequently a non Fickian mass flux. A non linear dependence between the strain and the drug concentration is established and introduced in a Boltzmann integral with a kernel computed from a generalized Maxwell method. The influence of visco-elastic properties in the total mass delivered and the time it takes the drug to reach therapeutic effects are studied and their dependence on the visco-elastic parameters is analyzed. The procedure allows the tailoring of the delivery in order to fit a predefined release profile.

Keywords: diffusion, viscoelasticity, drug delivery.

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