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Review Paper

Role of Mathematical Modeling in Controlled Drug Delivery

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Abstract

Controlled drug delivery occurs when a polymer or lipid (natural or synthetic) is judiciously combined with a drug or other active agent in such a way that the active agent is released from the material in a pre-designed manner. The aim of controlling the drug delivery is to achieve more effective therapies while eliminating potential for both under- and overdosing. Controlled delivery systems includes the maintenance of drug levels within a desired range, the need for fewer administrations, optimal use of the drug in question, and increased patient compliance. Mathematical modeling of controlled drug delivery can help to provide a scientific knowledge base concerning the mass transport mechanisms that are involved in the control of drug release. Mathematically, it is identified for designing a particular pharmaceutical system and it can be used to simulate the effect of the device design parameters (viz., geometry and composition) on the resulting drug release kinetics. The objective of this review outlines the application of mathematical modeling to the controlled drug delivery mechanisms, focusing particular attention on drug transport in human breast cancer, treated with the drug Doxorubicin.

Keywords: Controlled drug delivery; Diffusion; Doxorubicin; Mathematical Modeling; Release Kinetics.

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