Predicting the Drug Release Kinetics of Matrix Tablets

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A matrix (or sustained release) tablet is designed to release a pharmaceutically active drug over 12-24 hours and might contain three times the dose of drug that is contained in an immediate release tablet. We develop two mathematical models to predict the release kinetics of a water soluble drug from a polymer/excipient matrix tablet. The first of our models consists of a random walk on a weighted graph, where the vertices of the graph represent particles of drug, excipient and polymer, respectively. The graph itself is the contact graph of a multidisperse random sphere packing. The second model describes the dissolution and the subsequent diffusion of the active drug out of a porous matrix using a system of partial differential equations. The predictions of both models show good qualitative agreement with experimental release curves. The models will provide tools for designing better controlled release devices.

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