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Supporting Information

for

Berberine-loaded polylactic acid nanofiber scaffold as a drug delivery system: The relationship between chemical characteristics, drug-release behavior, and antibacterial efficiency

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Mathematical models

1. Mathematical models

In order to distinguish the release mechanism of BBR from BBR/PLA and BBR NPs/PLA nanofiber scaffolds, the experimental data of BBR release were described by four kinetic models, including the zero-order model, first-order model, Higuchi model, and Ritger–Peppas model.

1.1. The zero-order model

The zero-order model is described in Equation (2):

$$\frac{C_t}{C_\infty} = K_0 t, \tag{2}$$

where C_∞ and C_t are the concentration of drug release at infinite time and at time t (hours), respectively. K_0 is the zero-order release constant. This model stands for a drug release system in which the rate of drug release is not dependent on concentration.

1.2. The first-order model

The first-order model is described in Equation (3):

$$\frac{C_t}{C_\infty} = 1 - e^{K_1 t}, \tag{3}$$

where K_1 is the first-order constant. This model expresses a drug release system in which the rate of drug release is concentration dependent.

1.3. Higuchi model

The Higuchi model is shown in Equation (4):

$$\frac{C_t}{C_\infty} = K_H t^{\frac{1}{2}}, \tag{4}$$

where K_H is the Higuchi dissolution constant. This model is used to study the release mechanism of water-soluble and low-soluble drugs loaded into solid matrices. The drug release according to the Higuchi model follows a diffusion process based on Fick’s law.

1.4. Ritger-Peppas model

The Ritger-Peppas model is represented in Equation (5):

$$\frac{C_t}{C_\infty} = K_R t^n, \qquad (5)$$

where K_R is the Ritger–Peppas kinetic constant, n is the diffusion exponent indicating the release mechanism of drug from polymer matrices. When $n \leq 0.5$, the release mechanism follows a Fickian diffusion. $0.5 < n < 1.0$ indicates non-Fickian diffusion, including other mechanisms associated with the diffusion. A value of $n = 1$ represents zero-order release, which is independent of time.

2. Results

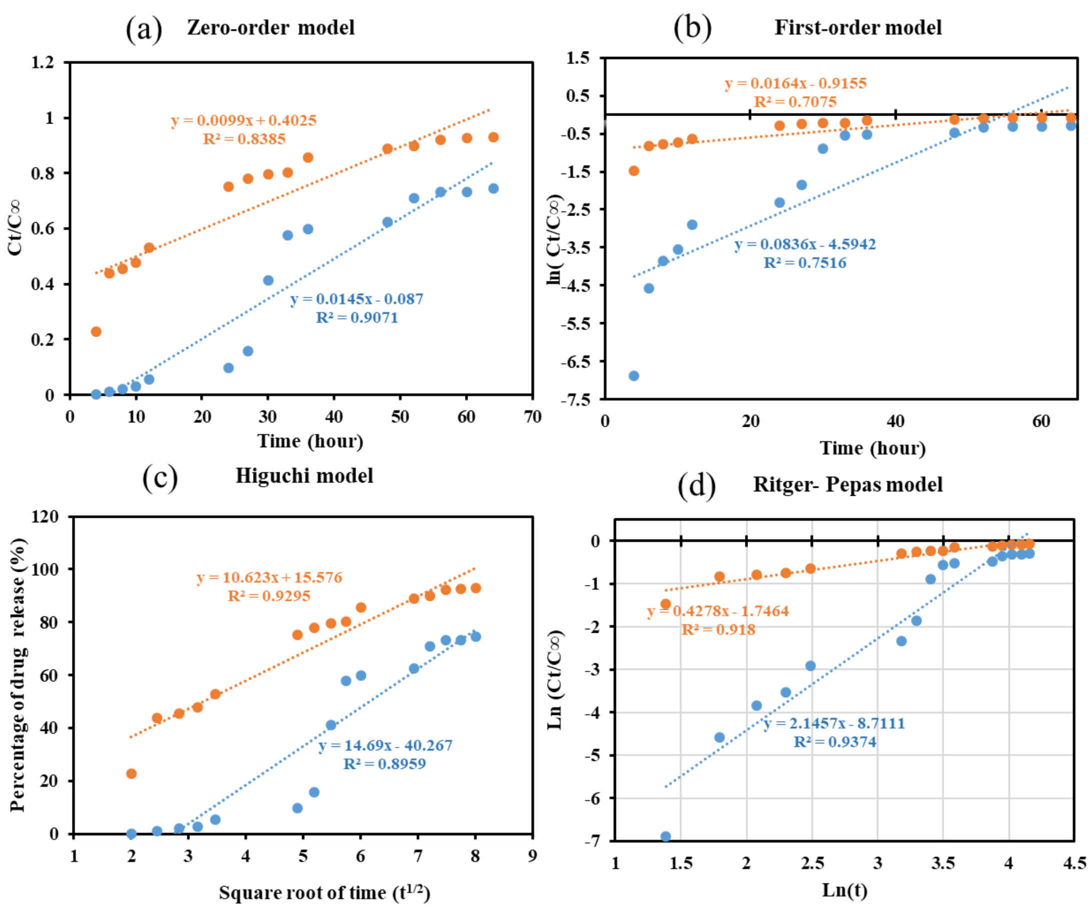

Figure S1: The equations and parameters determined by fitting BBR release data to mathematical models of (a) the zero-order model, (b) the first-order model, (c) the Higuchi model, and (d) the Ritger–Pepas model. The blue curves represent the BBR/PLA nanofiber scaffold and the orange curves represent the BBR NPs/PLA nanofiber scaffold.