Surfactant Interactions and Solvent Phase Solubility Modulate Small Molecule Release from Emulsion Electrospun Fibers

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Abstract

Emulsion electrospinning represents a tunable system for the fabrication of porous scaffolds for controlled, localized drug delivery in tissue engineering applications. This study aimed to elucidate the role of model drug interactions with emulsion chemistry on loading and release rates from fibers with controlled fiber diameter and fiber volume fraction. Nile Red and Rhodamine B were used as model drugs and encapsulation efficiency and release rates were determined from poly(caprolactone) (PCL) electrospun fibers spun either with no surfactant (Span 80), surfactant, or water-in-oil emulsions. Drug loading efficiency and release rates were modulated by both surfactant and aqueous internal phase in the emulsions as a function of drug molecule hydrophobicity. Overall, these results demonstrate the role of intermolecular interactions and drug phase solubility on the release from emulsion electrospun fibers and highlight the need to independently control these parameters when designing fibers for use as tunable drug delivery systems.

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