Effect of Trehalose and Poly (lactic-co-glycolic acid) (PLGA) Microparticles on the Release Kinetics of Hydrophobic Drugs in Polyurethane Scaffolds

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There are 35 million cases of significant skin loss in a year. Biodegradable polyurethane (PUR) scaffolds can support cellular proliferation and differentiation and are capable of releasing drugs to aid wound healing. To facilitate hydrophobic drug delivery using PUR scaffolds, the drug must be encapsulated in micelles, a spherical lipid aggregate. This study investigated the encapsulation method of the drugs in the micelles and the effect of trehalose and PLGA microparticles on the release kinetics of the drug-loaded micelles from PUR scaffolds. Nile red, a fluorescent dye, simulated hydrophobic drugs. Molecular weight, hydrophobic tail content, and polymer-to-Nile red ratio of the polymer Poly(EG-b-(DMAEMA-co-BMA)) were changed to find the optimal encapsulation efficiency of Nile red. The polymers containing a higher percentage of the hydrophobic block and molecular weight resulted in the highest encapsulation efficiency. The concentration of trehalose and the microspheres' size were altered to tune the drugs' release kinetics. The addition of trehalose to the PUR composition did not have a significant impact on the drugs' release kinetics while the PLGA microparticles significantly decreased the release kinetics. The size of the PLGA microparticles was inversely related to the release kinetics. These results can aid in tailoring drugs and optimizing wound-healing.

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