Journal of Materials Science

The fabrication and characterization of a PLGA nanoparticle–Pheroid® combined drug delivery system combined drug delivery system

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Abstract

The combination of polymeric nanoparticles (NPs) as a core and lipid vesicles as a shell has emerged to be a robust and promising drug delivery strategy. This study explores the development of a novel combined delivery system where poly d,l, lactic-co-glycolic acid (PLGA) NPs are entrapped within Pheroid® drug delivery system. The solid NPs were combined with the Pheroid® vesicles using two different methods: pre-mix and post-mix. The surface properties of the PLGA NPs were altered through the inclusion (pos-NPs) and exclusion (neg-NPs) of chitosan (CT) and polyethylene glycol (PEG), to evaluate their interaction with the Pheroid® Vesicles. The average particle size of the novel NP–Pheroid® combined system ranged from approximately 1990–2450 nm while the zeta potential (ZP) ranged from -18 to -30 mV, measured using dynamic light scattering (DLS) and electrophoretic velocity techniques, respectively. The NP/Pheroid® mixing ratio experiment indicated that a maximum of 2.5% (w/v) NPs can be optimally added to the Pheroid® vesicles without compromising the structure and the stability of the NP–Pheroid® combined system. Visual analysis of this system was done through transmission electron microscopy (TEM), cryogenic (cryo) TEM and confocal laser scanning microscopy (CLSM) techniques to obtain adequate information of this novel combined drug delivery system which includes the localization of the PLGA NPs with the Pheroid® vesicles.