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Temperature-responsive PVCL-based hydrogel as a promising novel nanocarrier for drug delivery

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Among various dedicated nanoparticles for drug delivery applications, hydrogels have been mostly studied. Hydrogels are 3D structures with high water-content capacity that is made up of hydrophilic polymers. In addition, hydrogels have significant physicochemical properties, such as permeability, porosity, physical interactions and some smart ones are capable of responding to environmental stimuli like temperature, pH and ionic strength. Poly vinyl caprolactam (PVCL) as one of the most extensively studied thermoresponsive polymers, has a continuous coil-to-globule phase transition behavior with the lower critical solution temperature (LCST) ranging from 32 to 50°C, which depends on PVCL molecular weight and concentration. In this study, novel temperature responsive hydrogel based on poly(vinylcaprolactam) (PVCL) were prepared via reversible addition-fragmentation chain-transfer (RAFT) polymerization, where PEG- diacrylate served as cross-linker, and lysine was used as linking agent and applied for drug delivery. First, PVCL-PEG nano-hydrogel was prepared by RAFT polymerization in dioxane solvent, and then lysine was added to PVCL-PEG. After that, doxorubicin as an anti-cancer drug, was conjugated to lysine moiety of a prepared structure via Schiff-base reaction. Obtained nano-gels were characterized by FT-IR, 1H-NMR and their effective sizes were checked by dynamic light scattering analysis. LCST were determined and the drug release profile was tested *in vitro*. The 1H-NMR analysis of PVCL-PEG and PVCL-PEG-lysine confirmed the synthetic steps. DLS analysis represents the particles hydrodynamic size with average diameter of 20 nm. The LCST behavior was measured to lie at 37°C. Synthesized PVCL-PEG-lysine were observed to disperse well in aqueous solution without precipitation which show their high potential as a nanocarrier for drug delivery.

Biography

Elaheh Entezar-Almahdi completed her PharmD at Shiraz University of Medical Sciences in 2016. Currently, she is a PhD student of Pharmaceutics. Her research interests include, designing novel smart DDS, targeted drug/gene delivery system for cancers, and nanoparticulate DDS.

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