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RESEARCH PAPER

pH-Responsive Nano Carriers for Doxorubicin Delivery

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ABSTRACT

Purpose The aim of this study was to design stimuli-responsive nanocarriers for anti-cancer drug delivery. For this purpose, doxorubicin (DOX)-loaded, polysebacic anhydride (PSA) based nanocapsules (NC) were combined with pH-sensitive poly (L-histidine) (PLH).

Method PSA nano-carriers were first loaded with DOX and were coated with poly L-histidine to introduce pH sensitivity. The PLH-coated NCs were then covered with polyethylene glycol (PEG) to reduce macrophage uptake. The drug release profile from this system was examined in two different buffer solutions prepared as acidic (pH5) and physiological (pH 7.4) media. The physical and chemical properties of the nanocapsules were characterized by Fourier transform infrared spectroscopy (FTIR), dynamic light scattering (DLS), ultraviolet and visible absorption spectroscopy (UV–VIS), and scanning electron microscopy (SEM). *In vitro* studies of the prepared nanocapsules were conducted in MDA-MB-231 breast cancer cells.

Results The results obtained by SEM and DLS revealed that nanocapsules have spherical morphology with an average size of 230 nm. Prepared pH sensitive nanocapsules exhibited pH-dependent drug release profile and promising intracellular release of drug. PEGylation of nanoparticles significantly prevented macrophage uptake compared to non-PEGylated particles.

KEY WORDS doxorubicin · nanocapsule · pH-responsive · poly L-histidine · polysebacic anhydride

ABBREVIATIONS

ATCC	American type culture collection
DAPI	4′,6-diamidino-2-phenylindole
DCM	Dichloromethane
DLS	Dynamic light scattering
DNA	Deoxyribonucleic acid
DOX	Doxorubicin
EE	Encapsulation efficiency
EPR	Enhanced permeability and retention
FDA	Food and drug administration
FTIR	Fourier transform infrared spectroscopy
GPC	Gel permeation chromatography
H-NMR	Proton nuclear magnetic resonance
LC	Loading capacity
MTS	3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium
MW	Molecular weight
NCs	Nanocapsules
PBS	Phosphate buffered saline
PDI	Poly dispersity index

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