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Novel folate-modified lipid-polymer hybrid nanoparticles for targeted paclitaxel delivery

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Lipid-polymer hybrid nanoparticles (LPNPs) are polymeric nanoparticles enveloped by lipid layers that combine the highly biocompatible nature of lipids with the structural integrity afforded by polymeric nanoparticles. In this study, a novel lipid-polymer hybrid nano-carrier was synthesized that composed of folate (as targeting ligand), DSPE-PEG2000 (as lipid-shell) and PCL-PEG-PCL (as self-assembled core). Sustained, controlled and targeted delivery of the anticancer drug PTX (Paclitaxel) from the hybrid nanoparticles was successfully demonstrated both *in vitro* and *in vivo*. The PTX-loaded FLPNPs (folic acid modified lipid-shell and polymer-core nanoparticles) were prepared using thin-film hydration and ultrasonic dispersion method. TEM (Transmission electron microscopy) image confirmed that the FLPNPs exhibited homogeneous spherical shapes with apparent hydrophobic polymer core and lipid monolayer shell on the surface. CLSM (confocal laser scanning microscopy) image further confirmed the “core-shell-shell” structure of the FLPNPs, where the inner lipid-shell was labeled with rhodamine-PE. Nile Red-loaded FLPNPs showed higher efficient endocytosis abilities in FR-overexpressing EMT6 cells when compared to nontargeted LPNPs. In BALB/c mice bearing EMT6 tumors, PTX-loaded FLPNPs showed similar antitumor efficacy but low toxicity compared to Taxol® via intratumoral chemotherapy. More importantly, PTX-loaded FLPNPs exhibited superior therapeutic efficiency than the PTX-loaded LPNPs, confirming the effective cellular accumulation and anticancer activity of folate targeted NPs via receptor-mediated endocytosis. These findings indicated that the PTX loaded-FLPNPs with mixed lipid monolayer shell and biodegradable polymer core would be a promising nanosized drug formulation for tumor-targeted therapy.

Biography

Linhua Zhang has completed her PhD from Peking Union Medical College in 2015. She focus her work on developing novel polymeric materials for anticancer drugs, therapeutic genes and immunomodulatory molecules delivery. She is a Full Professor at the Institute of Biomedical Engineering, Peking Union Medical College and Chinese Academy of Medical Sciences. She has published more than 30 papers in reputed journals.

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