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Development and characterization of targeting ligand decorated multi-walled carbon nanotubes for targeting potential to cancer cells

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The main purpose of the investigation was to develop and evaluate the cancer targeting potential of the DOX loaded folic acid-polyethylene glycol-4000-bis amine- and folic acid-multi walled carbon nanotubes (DOX/FA-PEG-MWCNTs and DOX/FA-MWCNTs, respectively) nanoconjugates with improved therapeutic outcomes of DOX. The pristine MWCNTs were firstly purified and oxidised then carboxylated MWCNTs were acetylated and amidated according to the method previously reported from our laboratory. Then folic acid conjugation was done onto the amine terminated MWCNTs and collected and vacuum oven dried. The synthesized folic acid tethered MWCNTs were characterized by various physicochemical and physiological parameters on MCF-7 cancer cell line. The loading efficiency was determined to be 92.0±0.92 (DOX/FA-PEG-MWCNTs) in PBS (pH 7.4) ascribed to π-π stacking interaction. The developed nanoconjugates were evaluated for *in vitro* DOX release, erythrocytes toxicity, *ex vivo* cytotoxicity and cell uptake studies on MCF-7 (breast cancer cell line). The DOX/FA-PEG-MWCNTs nanoconjugate affords higher efficacy in tumor growth suppression due to its stealth nature and most preferentially taken up by the cultured MCF-7 through caveolae-mediated endocytosis as compared to free DOX. The median survival time for tumor bearing rats treated with DOX/FA-PEG-MWCNTs (30 days) was extended very significantly as compared to free DOX ($p<0.001$). It can be concluded that the DOX/FA-PEG-MWCNTs showed better *in vitro*, *ex vivo* and biocompatibility profile with sustained release profile especially at acidic microenvironment corresponding to conditions existing at cancerous tissues/sites.

Biography

Neelesh Kumar Mehra received his BPharm and MPharm (Pharmaceutics) in 2005 and 2008 respectively, from the Department of Pharmaceutical Sciences, Dr. H. S. Gour University, India. Currently, he is pursuing his Ph.D. under the supervision of Prof. N K Jain at Pharmaceutics Research Laboratory, Department of Pharmaceutical Sciences, Dr. H.S. Gour University, India. He received various awards in the field of drug delivery for his outstanding innovative research work. He has actively participated in 20 national and international conferences in India and abroad. He has twenty publications in international and national journals and has contributed three international book chapters.

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