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Highly efficient gene carriers based on carbon nanotubes: A new method for friedel-crafts acylation of single-walled carbon nanotube using trinuclear oxo-centered iron complex

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Carbon nanotubes (CNTs) have been extensively explored due to their unique physical, optical and chemical properties. Their biocompatibility and ability to penetrate cell membrane have extended their application to biomedical research. Chemical functionalization is the main method to overcome the low solubility of CNTs. Friedel-crafts acylation, non-destructive method preserving the superior properties of CNTs, is the least studied method compared to other chemical functionalization approaches. We previously reported a method for friedel-crafts acylation of multi-walled carbon nanotube (MWNT). In this study, we report a novel method using trinuclear oxo-centered iron complex for acylation of single-walled carbon nanotube (SWNT) using different alkyl carboxylic acids with different alkyl chain length (C_6 , C_{10} and C_{16}). Functionalized SWNTs (F_6 , F_{10} and F_{16}) were then conjugated with polyethylenimine (PEI) with different molecular weights (MW: 1800, 10000 and 25000 kDa). In this project, different nanocarriers were synthesized all capable of effective condensation of plasmid DNA. All nanocarriers

were characterized by TGA, TEM, zetasizer, IR spectra. Cytotoxicity of all vectors were evaluated by MTT assay. All synthesized nanocarriers were tested for their transfection efficacy after condensing plasmid encoding enhanced green fluorescent protein (EGFP). The effect of length of alkyl chain and molecular weight of PEI on transfection efficiency of final conjugates were studied. Results of luciferase assay and fluorescence live cell imaging confirmed the high levels of EGFP gene expression.

Speaker Biography

Azadeh H Nia has completed her PhD in the field of Organic Chemistry at Ferdowsi University and Postdoctoral studies in nanomedicine at Mashhad University of Medical Sciences. Her area of research covers biomedical application of nanomaterials in health sciences. She has recently joined World Academy of Medical Sciences (WAMS) as a Faculty Member and Editor In-Chief of *WAMS journal*. She has served for more than 10 years in academic research positions, she has published more than 12 papers in reputed journals and has been serving as an Editorial Board Member of different journals in the nanotechnology field.

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