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Single-Walled Carbon Nanotube Transporter for Gene Delivery PU-CHUN KE, QI LU, JESSICA MOORE, RAHUL RAO, KATHERINE FREEDMAN, APPARAO RAO, Clemson University, LABORATORY OF SINGLE-MOLECULE BIOPHYSICS AND POLYMER PHYSICS TEAM, NANOMATERIALS LABORATORY TEAM — Recent studies have shown great promises in integrating nanomaterials in biomedicine. To explore the feasibility of using single-walled carbon nanotubes (SWNTs) as transporters for gene delivery, we have investigated the binding of SWNTs and RNA polymer poly(rU), and the diffusion and the translocation of the SWNT-poly(rU) complexes. Through single-molecule fluorescence imaging, we have found that the pi- stacking dominates the hydrophobic interactions between the carbon rings on tubes and the nitrogenous bases of RNA. Our diffusion study has further demonstrated the feasibility of tracking the motion of water soluble SWNT-poly(rU) complexes. The uptake of SWNT-poly(rU) by breast cancer cells MCF7 was observed using confocal scanning fluorescence microscopy. It was evident that the complexes could penetrate through cell membrane into cytoplasm and cell nucleus. Our cell culture, MTS assay, and radioisotope labeling showed the negligible cytotoxicity of surface modified SWNTs with RNA polymer and amino acids in cell growth medium. These studies have paved the way for gene transfection using SWNTs as transporters.

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