

Cells and intracellular organelles imaging using supramolecular fluorescent probes or single-walled carbon nanotubes hybrid assemblies

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In the last decade fluorescence imaging has become the most powerful technique to visualize and monitor specific biological targets or processes in living systems. Subsequently, fluorescent dyes have been extensively investigated to improve their abilities of analytical specificity and sensitivity. In our investigation we report preparation of a new staining system based on host-guest inclusion complex between fluorescent indoliziny-pyridinium salt derivatives and β -cyclodextrin, possessing interesting cell staining properties. The cytotoxicity of the starting compounds and their inclusion complexes were systemically investigated and evaluated, as well as cell membrane permeability on two cell lines. The obtained results confirmed the formation of an inclusion complex between indolizine derivative and β -cyclodextrin in 1:1 and 1:2 ratios and the fact that the complexation reduced considerably the toxicity of free indolizines. The nontoxic inclusion complexes mixture could not only pass through the cell membrane, but also specifically accumulates in cell acidic organelles.

However, since some fluorescent dyes suffer from several fundamental problems including toxicity, low water solubility and poor membrane permeability, we also investigate alternative approaches for cell staining, based on the carbon nanotubes and their specific Raman signals. Single-walled carbon nanotubes (SWNTs) are 1D nanostructures with distinct physical and chemical properties that have shown great promise for applications in many fields, including biomedicine. These particular applications owe to the unique one-dimensional structure of SWNTs which exhibit distinctive resonance-enhanced Raman signatures for Raman detection or imaging. Furthermore, decoration of SWNTs with noble metal nanoparticles will induce an excellent surface-enhanced Raman scattering (SERS) effect of the nanoparticles-SWNTs nanocomposites, which might be utilized in cell imaging. Herein, we present a facile strategy for the DNA-assisted decoration of SWNTs with gold nanoparticles (AuNPs) and their application in SERS imaging of cells. Transmission Electron Microscopy and Atomic Force Microscopy were involved for the characterization of final nanocomposites. SWNTs-AuNPs hybrids possessed low cytotoxicity and were successfully used for the imaging of HeLa cells.