

Functionalized Single Walled Carbon Nanotubes: Targeting, Cellular Uptake, and Applications in Photodynamic Therapy

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Abstract : In recent years, nanotechnology coupled with photodynamic therapy (PDT) has received considerable attention in terms of improving the effectiveness of drug delivery in cancer therapeutics. The development of functionalized single-walled carbon nanotubes (SWCNTs) has become revolutionary in targeted photosensitizers delivery since it improves the therapeutic index of drugs. The objective of this study was to prepare, characterize and evaluate the potential of functionalized SWCNTs using hyaluronic acid and loading it with photosensitizer and to effectively target colon cancer cells. The single-walled carbon nanotubes were covalently functionalized with hyaluronic acid and the loaded photosensitizer by non-covalent interaction. The photodynamic effect of SWCNTs is detected under laser irradiation in vitro. The hyaluronic acid-functionalized nanocomposites had a good affinity with CD44 receptors, and it avidly binds on to the surface of CACO-2 cells. The cellular uptake of nanocomposites was studied using fluorescence microscopy using lyso tracker. The anticancer activity of nanocomposites was analyzed in CACO-2 cells using different studies such as cell morphology, cell apoptosis, and nuclear morphology. The combined effect of nanocomposites and PDT improved the therapeutic effect of cancer treatment. The study suggested that the nanocomposites and PDT have great potential in the treatment of colon cancer.

Keywords : colon cancer, hyaluronic acid, single walled carbon nanotubes, photosensitizers, photodynamic therapy

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