Developing a Stimuli Responsive Drug Delivery System Based on the Non-covelant Self Assembly of Phospholipid/Polymers on Single Walled Carbon Nanotubes

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Chemotherapeutics are commonly used as a treatment for malignant tumors, however usage of these medications is limited because of the accompanying systemic side effects, and the dose limit. Therefore, pharmacists and scientists are dosage range restricted in what is called the Therapeutic Window when it comes to the application of the potent anti-cancer chemotherapy drugs. The use of Nano-transporters to maintain release localization and increase dosage limits is promising. The aim of this project is to synthesize modified Single Walled Carbon Nanotubes (SWCNTs) as biological-transporters for chemotherapy release near the cancerous cells. This process is initiated by using cancerous cells' unique acidic microenvironment and the bond breaking heat initiation. The bio-compatibility of purified SWCNTs' was increased by coating it with Poly-acrylic Acid and Polyethylene glycol phospholipids. These modified SWCNTs were loaded with Doxorubicin (DOX), which acted as a sample chemotherapy agent. Acid labile cross-linkers were added to act as a sensitive reagent for the pH initiated release. The functionalized-SWCNTs were examined using the High Resolution Transmission Electron Microscopy HR-TEM and revealed a modified, non aggregated structure of SWCNTs fully dissolved in an aqueous solution. The effects of pH changes and NIR laser irradiation with a wavelength of 808 nm and power of 5 Watt/Cm^2 on drug release intensity were examined by using the UV-VIS-NIR Spectroscopy and showed promising results. This systematic procedure may not only decrease side effects, but also may eliminate dosage limitations thereby revolutionizing chemotherapy release

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