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Carbon nanotubes in cancer diagnosis and therapy

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During the past years, Carbon Nanotubes (CNTs) have attracted considerable interest since their first discovery. Great progress has been made in the field of nanomaterials given their great potential in biomedical applications. Carbon Nanotubes (CNTs), due to their unique physicochemical properties, have become a popular tool in cancer diagnosis and therapy. They are considered one of the most promising nanomaterials with the capability of both detecting the cancerous cells and delivering drugs or small therapeutic molecules to these cells. Because of the unique structure, extremely high specific surface area to-volume ratio enable them to use in an intense real time applications such as detection and treatment of cancerous cells, nervous disorders, tissue repair and excellent electrical and mechanical properties carbon nanotubes composed of excellent mechanical strength, electrical and thermal conductivities makes them suitable substance towards developing medical devices. CNTs have been explored in almost every single cancer treatment modality, including drug delivery with small nanomolecules, lymphatic targeted chemotherapy, thermal therapy, photodynamic therapy and gene therapy and demonstrate a great promise in their use in targeted drug delivery systems, diagnostic techniques and in bio-analytical applications. Majority of the biomedical applications of CNTs must be used after successful functionalization for more potential applications than pristine CNTs. There are several approaches to modify pristine CNTs to potentially active. CNTs poised into the human life and exploited in medical context. Here in, we reviewed the following topics: (1) Functionalization of CNTs; (2) CNTs in real time applications such as drug delivery, gene therapy, biosensors and bio imaging; (3) CNTs 3D printed scaffolds for medicine and (4) biocompatibility and biodegradability. The types of CNTs, properties, methods of synthesis, large scale production method, purification techniques and characterization aspects of carbon nanotubes. In the second part of the review, the functionalization of carbon nanotubes is reviewed in detail, which is not only important to make them biocompatible and stable in biological systems but also render them a great property of loading various biomolecules, diagnostic and therapeutic moieties resulting in diversified applications. In the final part of the review, emphasis is given on the pharmacokinetic aspects of carbon nanotubes including administration routes, absorption mechanisms, distribution and elimination of carbon nanotubes based systems. Lastly, a comprehensive account about the potential biomedical applications has been given followed by insights into the future carbon nanotubes from synthesis to *in vivo* biomedical applications.

Biography

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