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Editorial

Recent Advancement of Carbon-based Nanomaterials (CBNs)

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Introduction

The carbon-assisted nano substances intensifies and exhilarating chemical and physical features for rapid drug delivery at cellular level. Some of the prime most carbon-based nanomaterials (CBNs) such as graphene, carbon nanotubes, fullerenes, nanodiamonds, and carbon nanodots, have lately picked up significant considerations from scientists of the healthcare field. Of course, CBNs have found their place in a rigorous series of biomedical applications due to extensive study using ongoing advancements in the technology. As of now, these materials primarily impact three different fields of Medicine: treatments, diagnostics, and imaging. Each of these zones has immense potential for remedy in healthcare fraternity.

Cancer therapy

Cancer is found to cause a collective number of deaths every year because of multiple problems related to its treatment. Over the last few decades, researchers have been continuously studying to overcome these issues. Thus, it has experienced a pattern modification from the conventional mode of treatment approaches to the nanomaterial-based targeted drug delivery. The carbon-based nanomaterials can carry water-insoluble drugs, antigens, antibodies, nucleic acids into cancer cells, where the therapeutic molecules can be securely unloaded and used to boost anticancer activity. Furthermore, one of the beneficial aspects of developing such a drug delivery carrier with a set of predefined capabilities is the scalability of carbon allotropes. Being nano has advantages when it comes to navigating through biological barriers, which many times are desirable.

Tissue imaging

Biomedical uses of CBNs include bio-imaging, diagnostics, medication delivery, and near-infrared (NIR) light-induced photothermal treatment. Bioimaging is essential in both research and clinical therapy because it allows for the observation and investigation of biological processes at all levels, from cellular and subcellular to small animals. Optical imaging using CBNs is a non-invasive process that collects detailed images of organs and tissues and small entities such as cells and molecules, using visible light and the specific properties of photons. Compared to other imaging modalities, it has advantages such as low cost, high sensitivity, quick acquisition time, nonionizing radiation, real-time imaging, and multiplexing performance. CBN's show robust light absorption in near-infrared Raman scattering and optoacoustic properties, broadening the scope of *in vivo* applications as they may have bio-imaging and tracking capabilities along with drug delivery.

Optical biosensors

Nanotechnology has enabled new diagnostic procedures with enhanced sensitivity and specificity, multiplexed sensing; direct sensing in blood and other bodily fluids; single-cell analysis, and real-time analytics. T2 NMR is an example of a nano-diagnostic platform that provides a quick, sensitive, and straightforward alternative to traditional diagnostic procedures. Furthermore, in combi-

nation with CBNs, a wide range of biorecognition components and nanomaterials improve biosensor performance (e.g., antibodies and their fragments, receptors, lectins, enzymes, peptides, nucleic acids, aptamers, etc.) may be used.

Recent advancements of CBNs

The recent thrust and advancements in the concept of Carbon-based nanoparticles are well experiential in association to biomedical applications, tissue imaging, and cancer treatment like inhibition of breast cancer. In addition to this, other scientific evidences indicate the tremendous applications of CBNs medicinal agents, controlled drug delivery systems. However, such as some of the challenging applications are for the early identification, diagnosis, and management of tumor cells (breast cancer). Literature studies demonstrate that so many imaging therapies like ultrasound magnetic resonance imaging (MRI) for breast cancer identification acute stages. Some of the other therapies, chemotherapy, radiotherapy, advanced surgery to eradicate the tumor cells developed to the targeted area. But the latest advancement in CBN is an emerging area of science and technology that finding a complete pathway of resolution for metastatic breast cancer patients. Furthermore, the carbon nanomaterials like nanotubes, graphene, fullerene are unique materials of interest, to the society as well as to the research arena for their absolute physicochemical, biological properties, chemical composition agglomeration, as well as solubility characteristics, etc. can have a better impact on the biomolecules and the cells of the target.

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