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Editorial

How Nanotechnology can be used to Treat Cancer

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INTRODUCTION

Nanotechnology has multiple areas to deal with & has a great cutting edge. It has a very wide range of applications and a promising industrial future in cancer monitoring and treatment, particularly in terms of drug delivery and resistance. Nanotechnology is defined as study on materials at the Nano scale, which has been advanced through multidisciplinary collaborations involving chemistry, physics, biology, and engineering. Now, nanotechnology is playing a key role in developing novel cancer treatment solutions, such as how to identify tumours earlier, accurately target cancer cells, and improve radiotherapy treatments. Nanotechnology can also be employed to create highly sensitive diagnostic gadgets, allowing treatment to begin before metastasis occurs and improving patient outcomes. The nanometre system of physics, Nano chemical, nanomaterial's science, Nano biology, Nano electronics, Nano processing, and Nano mechanics are the seven branches of nanotechnology. Nano materials have chemical and physical properties that are distinct from bulk materials due to their size. Nano materials have been used to improve drug delivery, cancer cell targeting via protein and small molecule binding, intracellular drug release, ex vivo diagnostic applications, imaging, and combination therapies, such as theranostic integration of molecular imaging with drug administration. Nanoparticle formulations can reduce or eliminate systemic toxicity by delivering drugs specifically to cancerous tissues via size-mediated passive targeting and physiologically-mediated active targeting; they can improve early detection by delivering molecular imaging agents to tumors for improved diagnostic imaging and intraoperative imaging to guide surgical removal of cancerous cells; and they can address drug resistance by delivering multi-drug combinations to cancerous tissues [1]. Nano medicines have been studied in anticancer therapies to improve drug delivery, therapeutic efficacy, adverse effects, and drug resistance. Over the last decade, the number of studies published in the fields of "Nano medicine," "Nano science" and "nanotechnology" has exploded [2]. The number of articles increased as more nanostructures were discovered and their potentials were better appreciated, peaking in 2011. Nanoparticle knowledge is continually growing, with an emphasis on safety and efficacy [3]. Because of various variables such as pollution of the environment, air, water, and some chemical goods, the prevalence of cancer has steadily increased over the last two decades. However, breakthroughs in early detection and treatment have resulted in a dramatic drop in cancer-related death rates [4]. However, the cancer treatment technique has remained largely unchanged: surgical removal of the tumor followed by chemotherapy, radiotherapy, or a combination of the two, each of which frequently inflict non-selective damage to good tissue [5]. Treatment failure can also be caused by a variety of circumstances, including the presence of remaining cells after the tumour has been surgically removed, chemotherapeutic resistance, and physiological barriers to treatment. Such as the blood-brain barrier, cellular barriers preventing access to pharmacological targets, devastating systemic toxicities, and chemotherapeutics with low bioavailability or pharmacokinetic [6]s. As a result, new cancer medicines must be developed to address therapy failures in other areas such as the tumor microenvironment, cancer genetics, metastatic evolution, and proteomics. Nanotechnology is a popular study topic, particularly for biomedical applications (in this article, it refers to cancer). Targeted medication therapy and time-release pharmaceuticals are two examples of nanoparticle applications [7]. A powerful medicine dose may be supplied to a specific region, but it would be timed to release over a period of time to guarantee optimal efficacy and patient safety [8]. AuNPs are useful as heat mediating objects due to their strong light absorbing characteristics; the absorbed light energy is diffused into the particles' surroundings, resulting in an elevated temperature in their vicinity. This phenomenon can be utilized to open polymer microcapsules for medication delivery, for example, and it can even kill malignant cells. Antibodies specific to malignant cells are added to the nanoparticles [9]. The targeted cells were precisely bound by the functionalized nanoparticles, which were then destroyed by hyper thermal treatment, which involved heating the particle-loaded tissue. However, in such in vivo applications, the nanoparticles' potential cytotoxicity may become a concern, which should be thoroughly explored [10].

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