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Commentary

Role of Nano Pharmaceuticals in the Cancer Treatment

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DESCRIPTION

Since developed nanodevices and nanostructures are used to operate massively in parallel at the single-cell level, performing "single-cell medicine," the goal of nanomedicine is to comprehensively monitor, control, build, repair, Molecular defence and improvement of human biological systems. The application of nanoscale technology to the practise of medicine will fundamentally alter how we approach disease diagnosis, treatment, and prevention. We will begin, for example, detecting and treating illnesses at the single-cell level rather of just treating illnesses at the organ level.

As it relates to nanomedicine, general principles of nanotechnology include:

1. Biomimicry is the strategy used by cells to route chemicals both within the cell and/or to the correct cells in the body.

2. Biocompatibility and biological effectiveness are influenced by size and location.

3. Implement feedback control in medical systems (e.g., therapeutic gene synthesis).

4. Engineering molecules to carry out certain physical activities, like as opening ion channels, to change the behaviour of cells and organisms.

5. "Pseudointelligence" produced by intelligent design, such as the extracellular matrix (ECM) molecules' ability to assemble themselves.

6. Highly interdisciplinary endeavour: Nanotechnology creation frequently requires knowledge of biology, engineering, chemistry, and physics.

Biological ecosystem's functional characteristics are determined by both their component components and how they are put together. The way that the pieces work together, the type and flow of information inside the system, and the outputs that the system produces are all governed by this assembly. As a result, one biological principle that may be essential for the development of nanomachines in medicine is that the spatial control of nanomachine distribution directly affects the efficacy of macromolecular assembly and the kind of work product produced by this assembly.

The use of nanomedicine in the treatment of human tumours has special benefits. Nanomedicine has made it feasible to develop new therapeutic strategies that can be used to fight viral infections and boost treatment effectiveness. In nucleic acid therapies, including DNA and RNA, nucleic acids are employed as medications (which regulate genetic information). In comparison to conventional medicines, nucleic acid medicine is the drug discovery technology of the future. We discuss the numerous nucleic acid treatments in this chapter. The development of nanomedicine depends on the development of novel nanocarriers and drug delivery systems. However, there is still much to learn about the novel field of nanomedicine. We consider potential applications of nanotechnology and nanomedicine to the treatment of cancer.

Nanomedicines and related nanopharmaceuticals are gaining importance in the treatment of cancer and developing at a rapid rate. They have been constantly developed and are now entering clinical trials for commercial use since 1980. The first nanomedicine ever was a PEGylated liposomal Doxorubicin known as "Doxil," which was approved by the USFDA in 1995 to treat a variety of cancers. Since then, various nanopharmaceuticals or nanomedicine-based nanoformulations such as nanocrystals, liposomes, micelles, dendrimers, protein, and metallic-based NP products have been introduced and successfully marketed. While new distribution mechanisms are described based on physicochemical factors, nanomedicines are created using a formulation technique. There are restrictions in the clinical translation when researchers are eager to combine nanomedicine with pathological applications. Understanding the interaction between technology and biology will allow us to find the relationships between pharmaceutical substances in animals and people as well as comprehend the characteristics of accumulation and dispersion of nanomedicine inside pathophysiological conditions. So they can successfully translate nanomedicine into the clinical setting. It's important to comprehend the pharmacological relationship between the distribution method and *in vivo* behaviour. It is advised to enhance clinical translation in order to build and design

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nanomedicine that can endure under pathophysiological situations. The inability to successfully translate nanomedicines into clinical trials is primarily due to this. For the pharmaceutical industry's efforts to create nanomedicines, these biological difficulties are crucial. Preclinical data should be assessed, and elements like the safety of distribution pharmacokinetics in animal models should be considered as they are related to the human disease, in order to reduce the risk of a bad investment. The animal models also describe the limited range of that particular clinical condition, and they can offer valuable information that can safeguard the appropriateness of a particular nanomedicine for a certain patient subgroup.