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Opinion

Opinion on Nanoparticles for Cancer Remediation

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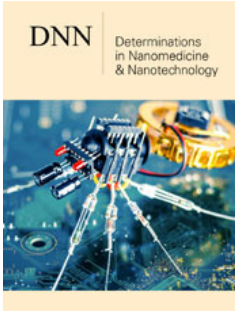

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Since the innovation of nanomedicine decades ago, significant advances have been made, especially with cancer as an objective. Nanoparticles in cancer remediation intends to cover different important aspects in this field including development of nanocarrier, delivery of gene, intrinsically active nanoparticles (NPs), microenvironment of tumor, toxicity, and immunology. The mostly applied biocompatible nanocarriers in clinical experiments are lipid, polymer, and protein-based materials. Polymeric micelles are a common type of nanocarriers for drug delivery due to their multifunctionality, controllable release, and biocompatibility. Doxorubicin as a model drug was successfully loaded into the micelles and presented a complete and rapid drug release at pH=5.0. The drug loaded NPs had high anti-tumor activity to kill the cancer cells but minimum toxicity to ordinary cells. Targeting dendritic cells (DCs) by nanotechnology attitudes as a promising delineation for immunotherapy of cancer. The physicochemical properties of NPs effects on their interactions with DCs, thus modifying the immune outcome of DCs by changing their functions in the processes of antigen, homing, maturation processing, and presentation of antigen. The microenvironment of tumor plays a pivotal role in adjusting distribution of nano-chemotherapeutics and their biological effects. Nanotechnology has also shown different advantages over widely used conventional methods in uro-oncology. For example, different types of NPs enhance the solubility of poorly soluble drugs, and multifunctional NPs have good specificity toward bladder, renal, and prostate cancer. Moreover, nanotechnology can also merge with other novel technologies to further enhance efficacy. As our understanding of nanotechnologies grows, extra opportunities to enhance the treatment and diagnosis of urological cancer are expected to arise. As attention of the toxicity of nanomaterials are growing, a safety estimation becomes a routine assessment nowadays as a necessary for nanomedicine. In recent years, nanotechnology has shown many advantages over traditional approaches for cancer prevention, diagnosis, and treatment, and clinical trials are being implemented every year. However, challenges are still overwhelming especially in human experiments, regulatory, and formulation issues. With new advancements in biology, nanoscience, materials chemistry, and medicine, one can envision that devastating cancer will be curable some day and, in that achievement, the nanoscale approaches will have played an important role.