## Nanotechnology

Nanotechnology involves the manipulation of materials and structures at the nanoscale, typically at the level of individual molecules or atoms. In the context of drug delivery, nanotechnology has been explored for its ability to enhance the targeted delivery of drugs to specific cells or tissues within the body. This can improve the efficacy of treatments while minimizing side effects.

One approach to nanotechnology-based drug delivery involves the use of nanoparticles. These nanoparticles can be designed to encapsulate drugs and transport them to specific sites in the body, such as tumors or inflamed tissues. Some common types of nanoparticles used in drug delivery include liposomes, polymeric nanoparticles, and dendrimers.

The immunosuppressive tumor microenvironment (TME) of cancer strongly hinders the anti-tumor immune responses, thereby resulting in disappointing responses to immunotherapy. Chemoattractive and promotive traits of chemokines exerted on leukocytes have garnered interest in improving the efficiency of immunotherapy by increasing the infiltration of immune cells in the TME. In a study, a folic acid (FA) -modified gene delivery system based on the self-assembly of DOTAP, MPEG-PCL-MPEG, and FA-PEG-PCL-PEG-FA, namely F-PPPD, was developed to deliver plasmids encoding the immunostimulating chemokine CKb11. The delivery of plasmid CKb11 (pCKb11) by F-PPPD nanoparticles resulted in the high secretion of CKb11 from tumor cells, which successfully activated T cells, suppressed the M2 polarization of macrophages, promoted the maturation of dendritic cells (DCs), facilitated the infiltration of natural killer cells and inhibited the infiltration of immunosuppressive cells in tumor tissues. Administration of F-PPPD/pCKb11 also significantly suppressed the cancer progression. The study demonstrated a nanotechnology-enabled delivery of pCKb11, that remodeled the immunosuppressive TME, for cancer treatment <sup>10</sup>.

## 1)

Nie W, Yu T, Liu X, Wang B, Li T, Wu Y, Zhou X, Ma L, Lin Y, Qian Z, Gao X. Non-viral vector mediated CKb11 with folic acid modification regulates macrophage polarization and DC maturation to elicit immune response against cancer. Bioact Mater. 2021 Apr 6;6(11):3678-3691. doi: 10.1016/j.bioactmat.2021.03.031. PMID: 33898872; PMCID: PMC8056185.

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