Nanotechnological approaches for immune modulation against solid cancers

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Abstract

Despite the remarkable efficiency of cancer immunotherapies, only a low percentage of patients achieve long lasting clinical responses. Non-tumor cells within the tumor microenvironment (TME), including tumor vasculature and immune stromal cells, dictate the overall therapeutic efficacy[1].

We developed nano-sized medicines to re-educate and harness patient immune responses against tumors, yielding an immunological memory able to control tumor relapse without any follow-up treatment.

Nanomaterials were synthesized[2] to co-incorporate tumor-associated antigens, clinically relevant toll-like receptor ligands and regulators of tumor-related pathways, namely immune checkpoints, and cytokines. Nanoparticle (NP) physico-chemical properties were fully addressed. The immunotherapeutic potential of our multifunctional nano-based vaccines was assessed *in vivo* in melanoma (B16F10, B16-OVA), MC38 colorectal cancer (CRC) and 4T1 triple negative breast cancer (TNBC) mouse models, isolated and in combination with modulators of immune checkpoint function and cytokine secretion. We evaluated tumor volume, survival, and characterized the TME-infiltrating immune cells.

Our nanovaccine remodeled the TME and sensitized melanoma, CRC, and TNBC to immune checkpoint therapy, significantly delaying tumor development and increasing disease-free survival rates. These nano-based immunotherapies led to the induction of a broad effector and memory anti-tumor immune response, demonstrating that our new nanovaccine constitutes a promising immunotherapy clinically translatable to defeat solid tumors.

REFERENCES

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