Docket #: S18-383

Theranostic Nanoparticles for Identification and Reduction of Myeloid Cell-Mediated Immunosuppression in Cancer

These dual-function nanoparticles improve selectivity of myeloid treatment via identification and reduction of tumor progression in a two-step process: initial accumulation in tumor microenvironments, followed by targeted delivery of a therapeutic payload. Surface functionalization (using G-CSF) of the nanoparticles preferentially targets myeloid cells to promote uptake and avoids unwanted accumulation in secondary sites and undesired accumulation in off-target cells. The nanoparticles are loaded with metabolism altering small molecule drugs, which are delivered selectively to tumor microenvironments, and may also be loaded with fluorescent dyes, such as ICG, to allow for easy imaging. These nanoparticles can retain 80% of their payload within 5 hours after exposure to biological media, making them useful for reducing tumor progression and potentiation of cytotoxic effects of co-administered therapies. The nanoparticles show efficacy in reducing tumor burden alone pre-clinically, may synergize with existing therapies, and are fabricated with components already approved by regulatory agencies.

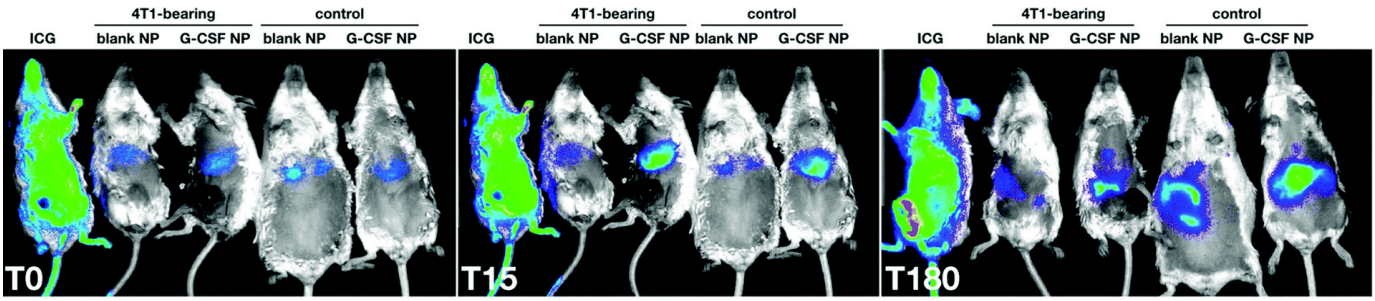


Image Description: Tumor microenvironment study to test the effect of G-CSF decoration of nanoparticles on biodistribution and tumor MDSC accumulation in 4T1 breast carcinoma-bearing mice. Ref: Margulis et al. Nanoscale (2020)

Stage of Research

- in vivo and in vitro studies

Applications

- **Reduction of pro-tumor immunosuppression in cancers such as:** Breast, prostate, lung and brain
- **Prognostic function via measuring localization, size and movement of myeloid cells**
- **Therapeutic function through encapsulated pharmacological agents**

Advantages

- **All components have prior FDA approval**
- **No off-target side effects:** Nanoparticles preferentially accumulate in myeloid cells
- **> 80% retention of drug payload within 5 hours of exposure to biological medium**

Publications

- Margulis et al. Nanoscale (2020) "Nanoparticles Decorated with Granulocyte-Colony Stimulating Factor for Targeting Myeloid Cells"

Patents

- Published Application: WO2021127000
- Published Application: 20220370644

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