Docket #: S17-231

Nanoparticle platform to activate self-specific CD8+ T cells to improve antitumor immune response

Researchers at Stanford have developed a nanoparticle-based platform to enhance activation of self-specific CD8+ T cells in the tumor microenvironment to fight cancer while minimizing toxic side effects. Cancer immunotherapies have been developed to modulate the body's immune system to fight its own cancer. However, there can be challenges with these therapies including systemic toxicity and an inability to activate self-specific CD8+ T cells. To overcome these challenges and enable sustained immune activation in the tumor microenvironment the inventors have developed this technology. It provides PLGA nanoparticles functionalized with anti-CD28 antibody to deliver immunostimulants, including IL-2, TLR2 agonist and NOD2 agonist, in a controlled manner. This nanoparticle platform enables the immunostimulants to be released at the tumor site to activate self-specific CD8+ T cells to fight the cancer. Furthermore, this localized delivery minimizes potential systemic toxicities. This technology provides the means to enhance the antitumor immune response.

Figure:

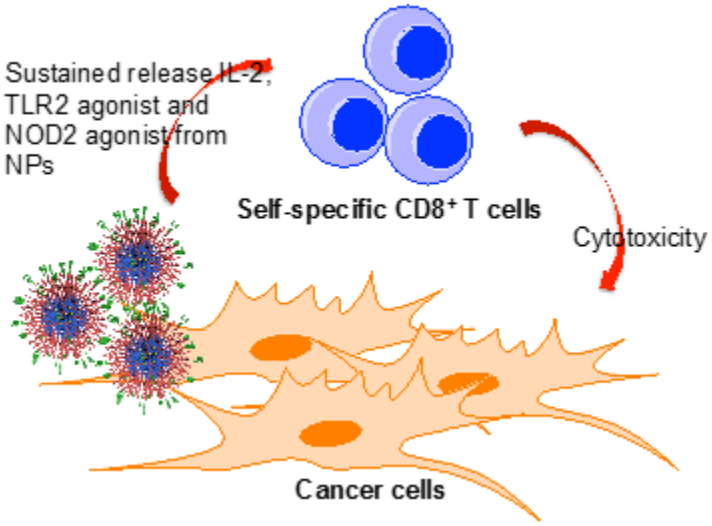

Figure Description: PLGA nanoparticles (middle left) functionalized with anti-CD28 antibody and loaded with IL-2, TLR2 agonist and NOD2 agonist activate self-specific CD8+ T cells for cancer immunotherapy.

Applications

- Cancer immunotherapy

Advantages

- New strategy for *in situ* activation of self-specific CD8+T cells to fight cancer
- Nanoparticle platform:
  - Protects cargos from proteases
  - Allows for targeted sustained release of immunostimulants
  - Minimizes systemic toxicities
  - Allow easy surface modification- including labeling for *in vitro* and *in vivo* tracking
  - PLGA is an FDA approved biodegradable polymer with excellent biocompatibility
- Fabrication of PGLA nanoparticle is low cost and easily achievable

Publications

- Yin Q, Yu W, Grzeskowiak CL, Li J, Huang H, Guo J, Chen L, Wang F, Zhao F, von Boehmer L, Metzner TJ, Leppert JT, Chien YH, Kuo CJ, Davis MM. Nanoparticle-enabled innate immune stimulation activates endogenous tumor-infiltrating T cells with broad antigen specificities. Proc Natl Acad Sci U S A. 2021 May 25;118(21):e2016168118.

Patents

- Published Application: WO2019023622
- Published Application: 20200164090
- Issued: 11,925,693 (USA)

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