
NanoFun-CARs – Nanoparticle-functionalization of CAR-T cells for targeted tumor enrichment and reduction of inflammatory side effects

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The Nano-FunCARs project aims to develop a new type of cell therapy using chimeric antigen receptor T cells (CAR-T cells). These cells are loaded with superparamagnetic iron oxide nanoparticles (SPIONs), which make them magnetically controllable. This enables the magnetic enrichment of the CAR-T cells in the tumor tissue. On the other hand, the nanoparticles suppress the CAR-T cells' secretion of inflammatory messenger substances. This can represent a significant safety advancement, as it may minimize the risk of life-threatening cytokine release syndrome (CRS). Macrophages play an important role as well because they are attracted to and activated by CAR-T cells, producing cytokines that can trigger CRS.

Based on existing data, the researchers will isolate monocytes from human blood and differentiate them into macrophages. In parallel, they will produce CAR-T cells via mRNA electroporation, load them with nanoparticles, and analyze the antitumor immune response and cytokine production in a co-culture with tumor cells and differentiated macrophages. They will then verify the results in an ex vivo model with human tumor biopsies. This data should enable a well-founded evaluation of the safety and efficacy profile of the innovative therapeutic approach, paving the way for clinical translation.
