Protein-structure based CAR-T cell design for cancer therapy

Chimeric Antigen Receptor (CAR)-T cells specifically attack cancer cells that they recognize via certain surface proteins. These therapies are very effective in the treatment of B-cell lymphomas, but not yet for solid tumors.

We want to use protein design and synthetic biology to create and test new, improved CAR-T cells. This research will deepen our understanding of the role of protein structures in immunotherapy and lay the foundation for a new approach to CAR-T cell therapies with increased efficacy and safety for solid tumors.

One focus of my work will be to use protein design and synthetic biology to develop CARs that can only recognize the surface proteins of the cancer cell if they simultaneously bind to certain soluble factors. I have selected the soluble factors (e.g. VEGF, ATP, PSA, p53) in such a way that they should only occur in the required concentrations in the tumor and not in healthy tissue. This construction of an AND-gate logic (surface protein AND soluble factor) increases tumor specificity and minimizes the risk of off-tumor toxicity. The improved safety of these strategies may enable the development of more effective therapies that would otherwise be toxic. Through these new approaches, we hope to take another step toward the development of therapies against solid tumors.

Data protection relevant: Information about your age and sex will be required. Parts of your genetic material will be sequenced.

Specific research project: "Microenvironment-Specific CARs for Solid Tumor Immunotherapy" (Ethics vote 25-4292-101)

Cooperation with other institutions:
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