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Doctoral Training Support Fund 2022

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Investigating the molecular impact of dual antigen targeting with CD19\CD22 Chimeric Antigen Receptor (CAR) T-cells

Despite considerable therapeutic progress, cancer remains lethal. The identification of cancer weaknesses could be exploited to design effective treatments. Decades of research show that the patient's immune system is well-equipped to exploit cancer weaknesses and kill cancer, but not always effectively. Immunotherapy gives the immune system a helping hand by boosting its cancer recognition and killing capabilities. One such approach is 'Autologous CAR-T Therapy' which utilizes T-lymphocytes, isolated from the patient, genetically enhanced with one or more artificial Chimeric Antigen Receptor (CAR), and re-infused into the patient. The CAR allows T-lymphocytes to selectively recognize -and kill- cancer by unique characteristics like a clown is recognized by its flamboyant custom, unique make-up face, and funny hats. Although this approach has yielded life-saving results, either the cancer changes 'its costume' or the CAR-T-lymphocytes fail to survive in the bloodstream long enough. Our team hypothesized that genetic enhancement by incorporating either one or more CARs influences natural T-lymphocyte biology. Thus, we aim to dissect differences between Tlymphocytes carrying one or more CARs by looking at their genetic profile (scRNA-sequencing), protein profile (Mass-Cytometry), and cell surface (Flow-Cytometry, DNA-PAINT-Super-Resolution-Imaging). By doing so, we could help fellow scientists optimize their CAR-T designs to benefit more patients.

The Great Ormond Street Biomedical Research Centre is funded by the NIHR and is a collaboration between Great Ormond Street Hospital and UCL Great Ormond Street Institute of Child Health