Direct Detection of T cell Mediated Immune Responses Using Peptide MHCs (pMHCs) Displayed on Multimeric Protein Scaffolds

The recognition of peptide-MHC (pMHC) complexes by T cells is the cornerstone of cellular immunity, enabling the elimination of infected or tumoral cells. pMHC can thus be leveraged as a detection tool for T cells. The molecule naturally exists in a monomeric form, which impedes easy detection of T cells due to their weak equilibrium dissociation with the lymphocyte. To overcome this limitation, inventors at Stanford have developed a flexible pMHC display system on a self-assembling protein scaffold. Termed a spheromer, the platform has high compatibility with currently available pMHC molecules and streptavidin reagents that are routinely used for T cell analysis. Due to its increased specificity and sensitivity, the pMHC-spheromer platform overcomes the current limitations of existing T cell detection platforms. The platform is a valuable tool that can be used for the detection, isolation, and activation of antigen-specific T cells, enabling the successful tracking and modulation of the adaptive immune response.

Applications

- Detection and quantitation of disease-relevant T-cells
- Disease tracking, such as immunity in vaccinated individuals
- Induction of antigen-specific immunological tolerance to treat autoimmune conditions

Advantages

- Greater detection efficiency than any commonly used pMHC multimer reagents
- Customizable system enabling addition of co-stimulator molecules
- Modulation of anti-tumor/anti-viral immunity by inducing antigen-specific responses

Publications

- Mallajosyula et al. (2021). [CD8+ T cells specific for conserved coronavirus epitopes correlate with milder disease in COVID-19 patients](). *Science Immunology*, Vol 6, Issue 61.

Patents

- Published Application: [WO2022133347]()
- Published Application: [20240076356]()

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