Cleveland Clinic Innovations

PRODUCT
Novel method for functional enrichment of T cell pools

INDICATION
GMP-compatible manufacturing of enriched T-cells for cell therapy

VALUE PROPOSITION
- Removes unwanted cell populations from peripheral blood-derived T cells.
- Purifies highly functional populations known to enhance efficacy of engineered CAR T cells.
- Generates an untouched T cell pool via negative selection through multiple defined antigens.
- Compatible with industry-standard, FDA-approved manufacturing methods.

DEVELOPMENT STAGE
In vitro proof of concept established for manufacturing process. Moving towards *in vivo* efficacy studies.

INTELLECTUAL PROPERTY
Patent Pending

CONTACT INFORMATION
Heather Callahan
General Manager, Business Development and Licensing
callahh@ccf.org
216.379.1226
IDF# 2023-073

Precision Manufacturing of Functionally Enriched CAR T Cells

Inventors: Celine Grégoire, MD, PhD & Jan Joseph Melenhorst, PhD
Center for Immunotherapy and Precision Immuno-Oncology (CITI)

UNMET NEED

Isolation of T cells directly from patient and large-scale peripheral blood collections ("aphereses") is the crucial first step in manufacturing cell therapies like CAR T cells. Single-cell technologies demonstrate profound diversity in function of patient T cell pools, which can be modulated by patient demographics, disease type, duration of disease, and pre-treatment disease burden. T-cell intrinsic factors arising from this diversity have been blamed for the limited and heterogenous efficacy of cell therapies. In particular, the persistence of both dysfunctional CD8+ T cells and immunosuppressive regulatory T cells (Treg) within the infused CAR T cell population contribute to treatment failure. FDA-approved cell therapies including Breyanzi™, Tecartus™ and Kymriah™ rely on manufacturing methods that have not addressed these crucial shortcomings.

SOLUTION

By leveraging the inherent diversity of patient T cells, we have developed a novel enrichment process that yields a pure pool of peripheral blood-derived T cells that is functionally enriched for beneficial phenotypes. Our clinical manufacturing (GMP)-amenable approach relies on combinatorial negative selection against pre-defined cell surface antigens, expressed by undesired cell populations. T cells enriched by our method are themselves untouched by antibodies, facilitating unencumbered manipulation and downstream manufacturing of CAR T cells. Head-to-head comparison with a commercial T cell isolation kit shows that our purified T cells are abundant in naïve and early memory "stem-like" populations that are known to enhance differentiation, proliferative capacity, and sustained anti-tumor activity; concomitantly, our depletion method also removes immunosuppressive Treg and effector and exhausted CD8+ T cells that contribute to treatment failure (see Figure). Our data and significant literature precedent suggest that CAR T and other cell therapies engineered from T-cell pools functionally enriched in this manner will improve clinical success rates across indications.