Method and Device to Screen and Sort Cancer Immunotherapy Cells

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WARF: P180292US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing optical technology for sorting T cells by activation state. This non-invasive method uses the autofluorescence signals of NAD(P)H and FAD to determine T cell activation state without the use of contrast agents or requiring tissue/cell fixation.

Overview

A new cancer treatment being studied at a few major centers including UW Health is CAR T (Chimeric Antigen Receptor T cell) therapy. CAR T therapy uses a patient's own cells and 'reengineers' them to fight cancer. The procedure starts with removing the patient's T cells from the blood and sending them to a lab where they are altered to produce cancer-fighting proteins called chimeric antigen receptors (CARs) on their surface. These 'supercharged' or activated T cells are multiplied at the lab, and then shipped back to the hospital where they are reinjected into the patient's blood.

Determining T cell activation is imperative for studying these cells *in vivo* and for quality control of cell therapies like CAR T. Current methods to determine T cell activation (e.g., flow cytometry, cytokine release assay) are either invasive, requiring the use of contrast agents and possibly tissue/cell fixation, or cannot capture population heterogeneity.

The Invention

UW–Madison researchers have developed a highly accurate label-free method to non-invasively detect T cell activation by detection of free-NAD(P)H fraction, NAD(P)H α_1. NAD(P)H α_1 can be measured by fluorescence lifetime imaging or spectroscopy systems. The device could also sort T cells based on NAD(P)H α_1. If increased accuracy of T cell activation is needed for a specific application, additional measurements of the other NAD(P)H and FAD autofluorescence endpoints can be obtained and used for classification.

Applications

- Screening and sorting T cells

Key Benefits

- Non-invasive and contrast agent-free
- Classification accuracy exceeds 95 percent

Stage of Development

Most of the difference between the activated and not activated T cells comes from one feature, NAD(P)H α_1. Using only this top feature, the classification accuracy is 97 percent. Accuracy increased to 99 percent for the CD8 specific subset of T cells.

Additional Information

For More Information About the Inventors

- Melissa Skala

Related Technologies

- WARF reference number P190306US02 describes algorithms to classify T cell activation by autofluorescence imaging. These algorithms can be applied to NAD(P)H images taken with commercial imaging flow cytometers/sorters, and fluorescence microscopes.

Publications

- Classification of T-cell activation via autofluorescence lifetime imaging. Walsh AJ, Mueller KP, Tweed K, Jones I, Walsh CM, Piscopo NJ, Niemi NM, Pagliarini DJ, Saha K, Skala MC. Nat Biomed Eng. 2020.

Tech Fields

- Analytical Instrumentation, Methods & Materials : Microscopy
- Medical Devices : Diagnostics & monitoring tools

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846