NATIONAL CANCER INSTITUTE
Technology Transfer Center

Molecular Nanotags for Detection of Single Molecules

Summary

Researchers at the National Cancer Institute (NCI) developed novel molecular nanotags for single biological nanoparticle detection, resolution, and sorting, by flow cytometry. The National Cancer Institute (NCI) seeks licensing and/or co-development research collaborations to further advance this technology with extremely broad biomedical, biodefense, industrial, environmental, and other applications.

NIH Reference Number

E-238-2015

Product Type

- Research Tools

Keywords

- Biological Nanoparticle, Nanoscale Molecular Tags, Nanotags, Extracellular Vesicles, EVs, Flow Cytometer, Biomarker, Jones

Collaboration Opportunity

This invention is available for licensing and co-development.

Contact

- Ricquita Pollard
  NCI TTC

  ricquita.pollard@nih.gov (link sends e-mail)

Description of Technology

Biological nanoparticles, like extracellular vesicles (EVs), possess unique biological characteristics making them attractive therapeutic agents, targets, or disease biomarkers. However, their use is hindered by the lack of tools available to accurately detect, sort, and analyze. Flow cytometers are used to sort and study individual cells. But, they are unable to detect and sort nanomaterials smaller than 200 nanometers with single epitope sensitivity.

Researchers at the National Cancer Institute (NCI) developed a new class of nanoscale molecular tags (nanotags) allowing the detection and sorting of single biological nanoparticle using conventional flow cytometers. Otherwise, using standard methods such as fluorescently labeled antibodies, very few epitopes are detected. These nanotags

are composed of materials with high refractive indices, high optical absorption, and remarkable spectral scattering properties. These properties allow both low epitope number determination and spectral phenotyping of biological nanoparticles – such as EVs, lipoproteins, RNA-protein complexes and other circulating submicron particles with significant biomedical applications.

The NCI seeks commercial partners to co-develop and/or license this technology.

Potential Commercial Applications

- Research tool for studying structure and function of biological nanoparticles
- Diagnostic tool for detection of clinical biomarkers
- Tool for characterization of industrial and environmental nanoparticles
- Biodefense
- Industrial sectors
- Environmental applications

Competitive Advantages

- Detect, sort and analyze nanomaterials <200 nanometers with single epitope sensitivity
- Enumeration of the number of labeled molecules beyond the capabilities of current flow cytometric labels and instruments
- Improved detection above background noise
- Improved signal:noise ratio

Inventor(s)

Jennifer C JONES MD (NCI), Aizea Morales Kastresana Ph.D (NCI), Jay A Berzofsky M.D. PH.D (NCI), Joshua A Welsh Ph.D (NCI), Ari Rosner M.D. Ph.D (NCI)

Development Stage

- Discovery (Lead Identification)

Publications

Welsh JA, et al. Prospective Use of High-Refractive Index Materials for Single Molecule Detection in Flow Cytometry. [PMID 300715]

Patent Status

- **U.S. Provisional:** U.S. Provisional Patent Application Number 62/411,324, Filed 21 Oct 2016
- **PCT:** PCT Application Number PCT/US2017/057928, Filed 23 Oct 2017
- **Foreign Filed:** - Patent Application 2017345814, Filed 23 Oct 2017
- **Foreign Filed:** - Patent Application 3041059, Filed 23 Oct 2017
- **Foreign Filed:** - Patent Application 201780079138.7, Filed 23 Oct 2017
- **Foreign Filed:** - Patent Application 17809073.4, Filed 23 Oct 2017

- **Foreign Filed:** - Patent Application 2019-521089, Filed 23 Oct 2017
- **U.S. Patent Filed:** U.S. Patent Application Number 16/342,345, Filed 16 Apr 2019
- **Foreign Filed:** - Patent Application 62020003242.8, Filed 24 Feb 2020

Related Technologies

- E-008-2018 - Optical Configuration Methods for Spectral Scatter Flow Cytometry
- E-105-2018 - Biomarker Analysis Software for High-Throughput Diagnostic Multiplex Data

Therapeutic Area

- Cancer/Neoplasm
- Infectious Diseases
- Hormonal Systems, Endocrine, and Metabolic Diseases

Updated

Tuesday, September 13, 2022

Source URL:https://techtransfer.cancer.gov/availabletechnologies/e-238-2015