New 3D-Exoquant Method For The Analysis Of Surface Molecules And Quantification Of Tissue-Specific Exosomes In Biological Fluids

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SUMMARY

UCLA researchers in the Department of Neurology have developed a novel high sensitivity exosome and extracellular vesicle disease detection technology for use in the clinical and research setting.

BACKGROUND

Detection of surface biomarkers located on extracellular bodies, such as vesicles and exosomes is of great clinical and research significance as they can be indicative of disease onset. These vesicles can be found in the blood, saliva, cerebrospinal fluid, and other biological fluids. Detection of a specific type of extracellular vesicle (e.g. exosomes), in a complex mixture such as blood, is a challenge, and assessment of tissue specific subpopulations of exosomes is even more difficult. However, this level of detection and sensitivity is necessary for obtaining clinically relevant information about the disease state of the tissue system from which the exosome originated. An attractive work-around is using multiple surface biomarkers to isolate and detect these clinically important exosomal subpopulations. Yet, this has limitations as many potential disease-related markers of interest are expressed in more than one cell type or tissue, limiting the utility of exosome biomarker based detection technologies in certain applications. The development of a novel detection technology that only selectively assesses biomarkers present on disease relevant exosomes would revolutionize clinical and research exosome biomarker detection assays.

INNOVATION

Prof. Varghese John and colleagues at UCLA have developed a novel high specificity and sensitivity exosome and extracellular vesicle biomarker detection platform for use in either the clinical or research setting. The 3D-ExoQuant method can be used to analyze a variety of surface molecules as well as quantification of tissue-specific exosomes present in biological fluids using an AlphaLISA-based approach. They have demonstrated the utility of their technology by detecting amyloid beta (Aβ) peptide, an important biomarker related to Alzheimer's disease (AD), from brain-derived exosomes found in human blood plasma, which correlated to patient disease diagnosis. This opens up wide possibilities for early-detection, non-invasive tests for neurological and other diseases and disorders. Use of the ExoQuant method for detection of AD biomarkers in brain-derived exosome from patient blood is completely novel. Additionally, researchers developed the ExoSense platform which allows for high sensitivity detection of extracellular vesicle biomarkers without the need for enrichment of these vesicles for verification and quantification of disease-associated markers in the research setting. These related technologies have a wide variety of applications ranging from disease state detection, monitoring the efficacy of drug treatment, and validation of new clinically relevant biomarkers.

APPLICATIONS

- Early and non-invasive detection of disease state exosomes and extracellular vesicle biomarkers
- E.g. Alzheimer's Parkinson's disease, and Multiple Sclerosis
- Validation of clinically relevant biomarkers for a variety of diseases and disorders
- Monitor the efficacy of drug treatment (correlating to exosome biomarker levels)

ADVANTAGES

This technology allows for early and non-invasive detection of a variety or surface biomarkers present on exosome and extracellular vesicles.

The ExoQuant method is the only method of its kind that allows for non-invasive detection of AD biomarkers from brain-derived exosomes.

Additionally, this technology is less expensive than current methods and could be amenable to in home point-of-care mobile platform

CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.

INVENTORS

- John, Varghese

OTHER INFORMATION

KEYWORDS

exosome, extracellular vesicle, AlphaLISA, ExoQuant, ExoScreen, biomarker detection, exosome biomarker, Alzheimer's disease detection, exosome detection, extracellular vesicle detection, tissue-specific exosome, exosome biomarker detection, extracellular

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Medical**
  - Diagnostics
  - Disease: Central Nervous System
  - Research Tools
- **Nanotechnology**
  - NanoBio

RELATED CASES

2016-305-0, 2016-731-0

technology.

STATE OF DEVELOPMENT

Researchers have developed working prototypes of the ExoQuant and ExoScreen platforms. Additionally, they have validated these technologies by quantifying Alzheimer's disease biomarkers in patients, which correlated with disease diagnosis. Current efforts are under way to adapt the assay for Parkinson's disease and Relapsing-Remitting Multiple Sclerosis.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,243,215	02/08/2022	2016-305

RELATED MATERIALS

- Nanoscale Extracellular Vesicle Analysis in Alzheimer's Disease Diagnosis and Therapy, Heinzelman, P., Bilousova, T., Campagna J., and John, V. International Journal of Alzheimer's Disease, 2016:8053139.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Identification And Development Of Dual nSMase2-AChE Inhibitors For Neurodegenerative Disorders
- Allosteric BACE Inhibitors For Treatment Of Alzheimer's Disease

UCLA Technology Development Group
10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095
tdg.ucla.edu
Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu