Nanowire Sensor Array-based Assay for Early Diagnosis of Alzheimers Disease

https://neurodegenerationresearch.eu/survey/nanowire-sensor-array-based-assay-for-early-diagnosis-of-alzheimers-disease/

Principal Investigators

ALAM, MAKSUDUL

Institution

INNOSENSE, LLC

Contact information of lead PI
Country

USA

Title of project or programme

Nanowire Sensor Array-based Assay for Early Diagnosis of Alzheimers Disease

Source of funding information

NIH (NIA)

Total sum awarded (Euro)

€ 1,407,876.15

Start date of award

15/09/2016

Total duration of award in years

2

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Acquired Cognitive Impairment... Aging... Alzheimer's Disease... Alzheimer's Disease including Alzheimer's Disease Related Dementias (AD/ADRD)... Bioengineering... Brain Disorders... Dementia... Nanotechnology... Neurodegenerative... Neurosciences... Prevention

Research Abstract

PROJECT SUMMARY Alzheimer’s disease (AD) is a complex and severe neurodegenerative disorder. AD is characterized by synapse and neuron loss in the brain with the accumulation of senile plaques (protein containing deposits) and neurofibrillary tangles. Approximately 5.4 million Americans and globally 30 million people are affected and this number is growing rapidly. In 2015, the cumulative cost of care for AD and other dementia was estimated at $226 billion. Yet, there is no definitive point-of-care (POC) diagnostic for AD. Current standard methods of AD diagnosis involve a combination of imaging and cognitive tests which are expensive and require complicated, time-consuming laboratory-based analysis while definitive diagnosis is made postmortem. Because early diagnosis could enable better planned and coordinated care, there is an urgent need to develop a cost-effective, highly sensitive and selective diagnostic tool for pre-symptomatic AD diagnosis which could also be used as a convenient monitoring device for bedside or primary POC use. In Phase I, InnoSense LLC (ISL) developed a conducting polymer nanowire-based biosensor, Adnos, for detecting AD biomarkers. ISL constructed a working model and demonstrated its capability for detecting AD-associated biomarkers in spiked solutions with phosphate buffered saline and artificial cerebrospinal fluid (aCSF) as well as CSF samples from patients. ISL demonstrated that Adnos devices had an average limit of detection of 100 fM for AD-specific biomarkers. The results indicate that Adnos has better sensitivity than standard laboratory tests such as Enzyme-Linked Immunosorbent Assay (ELISA) (nanomolar) for AD protein analysis. In Phase II, ISL will further develop, fine tune, and rigorously evaluate Adnos performance for detecting AD-specific biomarkers. ISL will: (1) optimize the Adnos nanowire sensor fabrication process, (2) toward assay development construct a prototype with necessary electronics and software, (3) fine-tune the prototype performance for accurate detection and monitoring of AD-specific biomarkers with a limit of detection of 100 fM in less than 30 min, (4) demonstrate ability of a prototype Adnos to detect AD biomarkers in clinical CSF samples and compare the performance with standard ELISA and dot blot tests, and (5) prepare to secure CLIA waiver while we explore commercial options. The ability to detect the earliest stages of AD, prior to onset of symptoms, could potentially have a powerful impact on families to: (1) plan for future healthcare needs, (2) development of early stage intervention strategies, and (3) gain the ability to understand and manage the entire lifecycle of the disease. Use of the Adnos system will be highly valuable as a tool providing monitoring data for clinical studies in search of effective treatments for AD.

Lay Summary

PROJECT NARRATIVE Alzheimer’s disease (AD), a debilitating and progressive neurodegenerative disease with no known cure, is the leading cause of dementia among Americans over age 65. In Phase I, InnoSense LLC (ISL) developed Adnos, a sensitive biosensor that proved capable of detecting 100 femtomolar level AD specific biomarkers in artificial cerebrospinal fluid (aCSF)—thereby indicating a potential to outperform standard laboratory tests such as Enzyme-Linked Immunosorbent Assay (ELISA) (nanomolar) for AD protein analysis. In Phase II, ISL will further-develop the assay and rigorously evaluate Adnos performance for detecting AD biomarkers in a microliter volume of CSF in the femtomolar range in less than 30 min.

Further information available at:

Types:

Investments > €500k

Member States:

United States of America

Diseases:
Alzheimer's disease & other dementias

Years:
2016

Database Categories:
N/A

Database Tags:
N/A