In vivo Amyloid-Beta Imaging in Mouse Brain Using Stochastic Object Models

https://neurodegenerationresearch.eu/survey/in-vivo-amyloid-beta-imaging-in-mouse-brain-using-stochastic-object-models/

Principal Investigators

SHOKOUHI, SEPIDEH

Institution

VANDERBILT UNIVERSITY

Contact information of lead PI
Country

USA

Title of project or programme

In vivo Amyloid-Beta Imaging in Mouse Brain Using Stochastic Object Models

Source of funding information

NIH (NIA)

Total sum awarded (Euro)

€ 834,326.61

Start date of award

01/02/2014

Total duration of award in years

2

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Amyloid beta-Protein, Image Reconstructions, Alzheimer's Disease, in vivo imaging, reconstruction

Research Abstract
The overall goal of the proposed research is-to develop novel in vivo imaging methods for A(3

plaque detection and classification in transgenic mice using positron emission tomography (PET). The reduction of amyloid beta plaques is among the main therapeutic objectives for the treatment of Alzheimer's disease (AD). Ap imaging with PET has now entered the realm of the revised criteria for diagnosis of AD. In vivo imaging of Ap in mouse brain would facilitate the study of the AD pathology and testing of drugs that could stop or decelerate the disease progress. However, the heterogeneous microstructure of the plaques makes an in vivo approach to detecting and quantifying the plaque burden challenging due to insufficient resolution. Also, current image reconstruction techniques are not well adapted to the reconstruction of heterogeneous microstructures. The candidate is proposing a method that takes advantage of a stochastic object model of AP to improve in vivo imaging. The parameters of this model are sampled from distributions that contain information about the size and number of plaques in different brain regions as well as their variations among animals and changes overtime. These parameters are obtained from in vitro data using advanced stereological analysis methods. The stochastic object model will be incorporated into an optimization method, such as simulated annealing. The objective of this process is to search for a random realization of the object model that provides the best fit between the estimated and the measured data from the imaging system by minimizing a target function. The candidate's training in the K99 phase has provided the required skills to establish herself in this interdisciplinary field. It is also a logical extension of her past experience in PET/SPECT instrumentation and image reconstruction. The specific aims of the ROO phase outline studies to explore the feasibility of this technique with animal scans. The candidate's long-term goal is to develop signal detection and pattern recognition tools to overcome the practical limitations of iri vivo imaging systems while maintaining her focus on their implementation in AD research.

Lay Summary
The studies outlined in the Research Strategy propose new compoutational techiques for conducting preclinical molecular imaging of Alzheimer's disease (AD) and can be implemented to study new radiotracers and treatment monitoring. There is a potential for translating these techniques into human AD imaging using PET or PET/MRI.

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