

The Molecular Anatomy of Neurons

<https://neurodegenerationresearch.eu/survey/the-molecular-anatomy-of-neurons/>

Principal Investigators

Institution

Contact information of lead PI

Country

European Commission

Title of project or programme

The Molecular Anatomy of Neurons

Source of funding information

European Commission FP7-Seventh Framework Programme

Total sum awarded (Euro)

€ 1,985,063

Start date of award

01/04/2014

Total duration of award in years

5.0

The project/programme is most relevant to:

Alzheimer's disease & other dementias|Parkinson's disease & PD-related disorders

Keywords

Research Abstract

The brain is nowadays the object of a number of extensive systematic studies that focus on seemingly all aspects of its morphology and function, from overall brain architecture to neuronal connections, neuronal morphology and gene expression. However, at least one basic aspect is as yet incompletely studied: the molecular anatomy of the neuron, i.e., the copy numbers and the spatial arrangement of molecules within the neuronal cell. This cannot be addressed by gene expression or proteomics approaches, as they do not have sufficient spatial precision. Electron microscopy, ideal for unraveling the neuronal morphology, does not have sufficient protein labeling efficiency. My project aims to fill this gap by a combination of super-resolution fluorescence microscopy, advanced fluorescence labelling techniques and advanced biochemistry tools such as quantitative mass spectrometry. My objectives are fourfold: 1) to determine the molecular organization of at least 200 major neuronal proteins: their exact copy numbers and their position within the cell determined with nanoscale precision; 2) to generate a bank of biochemistry and microscopy sample preparations that will be available world-wide for

the characterization of 1000-2000 additional proteins; 3) to integrate results into an in silico neuronal model that can be used for modelling functional neuronal parameters; 4) to use this technology to determine the changes in neuronal anatomy caused by neurodegeneration in Alzheimer's and Parkinson's Diseases. My group has already performed key preliminary work towards these aims. Our preliminary work focused on the synapse, where we ascertained copy numbers and positions for proteins adding up to more than 50% of the synapse's protein mass (see figure). We are thus ready to embark on this large-scale, risk-taking project. We are confident that the in silico neuron and the preparation bank we will create will represent key new resources for future studies in neurobiology.

Lay Summary

Further information available at:

Types:

Investments > €500k

Member States:

European Commission

Diseases:

Alzheimer's disease & other dementias, Parkinson's disease & PD-related disorders

Years:

2016

Database Categories:

N/A

Database Tags:

N/A