

# Predictive model of spread of Parkinsons pathology using network diffusion

<https://www.neurodegenerationresearch.eu/survey/predictive-model-of-spread-of-parkinsons-pathology-using-network-diffusion/>

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### Country

USA

## Title of project or programme

Predictive model of spread of Parkinsons pathology using network diffusion

## Source of funding information

NIH (NINDS)

## Total sum awarded (Euro)

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## Start date of award

15/07/2016

## Total duration of award in years

5

## The project/programme is most relevant to:

Parkinson's disease & PD-related disorders

## Keywords

predictive modeling, Diffusion, Parkinson Disease, Pathology, regional atrophy

## Research Abstract

PROJECT SUMMARY / ABSTRACT Project Summary Parkinson's disease (PD) is a debilitating neurodegenerative disease characterized by progressive bradykinesia, rigidity,

tremor and postural instability. The etiology, mechanism and progression of pathology and its relationship to clinical manifestations is not fully understood. These factors, coupled with its insidious onset, clinical heterogeneity, overlap with dementias, and the variability in speed and pattern of symptom progression, make a rigorous characterization and prognosis of PD difficult. Recent bench research on the trans-neuronal “prion-like” transmission of misfolded proteins is at last filling the gaps in the pathological context of PD, whereby misfolded alpha-synuclein protein can trigger misfolding in adjacent cells. If this spread mechanisms could be quantitatively modeled, it could enable accurate prediction of PD progression. This is the aim of our proposal. We will turn hitherto qualitative neuropathological insights into a rigorous “network-diffusion” model of disease spread. The model will be fed baseline in vivo MRI of PD patients, and will produce a deterministic and testable prediction for PD progression and conversion to dementia. By explicitly incorporating the brain’s connectivity network, our model will quantify the role of the brain’s anatomic connectivity network in disease transmission. We are targeting various applications, including diagnostic imaging biomarker, prognostic tool for assessing likely future patterns of disease and future neurocognitive status including likelihood of conversion to dementia. Relevance Parkinson’s Disease is a debilitating and common age-related degenerative disorder. The proposed network model will yield a validated deterministic and predictive model for PD progression, with applications in prediction of a patient’s future atrophy patterns, neurocognitive and motor scores.

### **Lay Summary**

NARRATIVE Parkinson’s Disease is a widespread and debilitating age-related degenerative disorder now known to involve trans-neuronal spread of pathology. By capturing these findings in a quantitative and mathematical model based on the brain’s connectivity network, the proposed project aims to obtain a fully validated deterministic and predictive tool for diagnostic and prognostic purposes in Parkinson’s Disease.

### **Further information available at:**

#### **Types:**

Investments > €500k

#### **Member States:**

United States of America

#### **Diseases:**

Parkinson's disease & PD-related disorders

#### **Years:**

2016

#### **Database Categories:**

N/A

#### **Database Tags:**

N/A