



PRESS RELEASE

Geneva | 16 March 2022

WARNING: embargoed until 17 March 2022, 10:00 GMT

A gene could prevent Parkinson's disease

A UNIGE team has identified a gene whose overexpression prevents the development of Parkinson's disease in the fruit fly and the mouse.

Parkinson's disease is a neurodegenerative disorder characterized by the destruction of a specific population of neurons: the dopaminergic neurons. The degeneration of these neurons prevents the transmission of signals controlling specific muscle movements and leads to tremors, involuntary muscle contractions or balance problems characteristic of this pathology. A team from the University of Geneva (UNIGE) has investigated the destruction of these dopaminergic neurons using the fruit fly as study model. The scientists identified a key protein in flies, and also in mice, which plays a protective role against this disease and could be a new therapeutic target. This work can be read in the journal *Nature Communications*.

Apart from rare forms involving a single gene, most Parkinson's cases result from an interaction between multiple genetic and environmental risk factors. However, a common element in the onset of the disease is a dysfunction of mitochondria in dopaminergic neurons. These small factories within cells are responsible for energy production, but also for activating the cell's self-destruct mechanisms when damaged.

The laboratory of Emi Nagoshi, Professor in the Department of Genetics and Evolution at the UNIGE Faculty of Science, uses the fruit fly, or *Drosophila*, to study the mechanisms of dopaminergic neuron degeneration. Her group is particularly interested in the *Fer2* gene, whose human homolog encodes a protein that controls the expression of many other genes and whose mutation might lead to Parkinson's disease via mechanisms that are not yet well understood.

In a previous study, this scientific team demonstrated that a mutation in the *Fer2* gene causes Parkinson's-like deficiencies in flies, including a delay in the initiation of movement. They had also observed defects in the shape of the mitochondria of dopaminergic neurons, similar to those observed in Parkinson's patients.

Protecting neurons

Since the absence of *Fer2* causes Parkinson's disease-like conditions, the researchers tested whether - on the contrary - an increase in the amount of *Fer2* in the cells could have a protective effect. When flies are exposed to free radicals, their cells undergo oxidative stress which



© Emi Nagoshi / UNIGE

Emi Nagoshi is an Associate Professor in the Department of Genetics and Evolution in the Faculty of Science.

High resolution pictures

leads to the degradation of dopaminergic neurons. However, the scientists were able to observe that oxidative stress no longer has any deleterious effect on the flies if they overproduce *Fer2*, confirming the hypothesis of its protective role.

“We have also identified the genes regulated by *Fer2* and these are mainly involved in mitochondrial functions. This key protein therefore seems to play a crucial role against the degeneration of dopaminergic neurons in flies by controlling not only the structure of mitochondria but also their functions,” explains Federico Miozzo, researcher in the Department of Genetics and Evolution and first author of the study.

A new therapeutic target?

To find out whether *Fer2* plays the same role in mammals, the biologists created mutants of the *Fer2* homolog in mouse dopaminergic neurons. As in the fly, they observed abnormalities in the mitochondria of these neurons as well as defects in locomotion in aged mice. “We are currently testing the protective role of the *Fer2* homolog in mice and results similar to those observed in flies would allow us to consider a new therapeutic target for Parkinson’s disease patients,” concludes Emi Nagoshi.

contact

Emi Nagoshi

Associate Professor
Department of Genetics
and Evolution
Faculty of Science

+41 22 379 63 46
Emi.Nagoshi@unige.ch

DOI: [10.1038/s41467-022-29075-0](https://doi.org/10.1038/s41467-022-29075-0)

UNIVERSITÉ DE GENÈVE
Communication Department

24 rue du Général-Dufour
CH-1211 Geneva 4

Tel. +41 22 379 77 17
media@unige.ch
www.unige.ch