

Faulty energy production in brain cells leads to disorders ranging from Parkinson's to intellectual disability

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Neuroscientist Patrik Verstreken of VIB (Flanders Institute for Biotechnology) and KU Leuven has shown for the first time that dysfunctional mitochondria in brain cells can lead to learning disabilities. The link between dysfunctional mitochondria and Parkinson's disease is known, but this new research shows that it is also present in other brain disorders.

Patrik Verstreken (VIB / KU Leuven): "This discovery shows that energy production in [brain cells](#) is the basis of various [brain](#) disorders. We hope that a better understanding of the mechanisms used by the cell to maintain optimum energy levels will lead in the long term to medical applications that prevent or cure these diseases."

Dysfunctional mitochondria toxic for the brain cell

Well-functioning [mitochondria](#) – the [organelles](#) that generate energy in cells – are essential for a healthy brain. They provide the energy needed for communication between brain cells, which is crucial for transmitting [stimuli](#) and signals and thus for optimal functioning of the body. Earlier research has shown that Parkinson's disease is often paired with dysfunctional mitochondria. Moreover, dysfunctional mitochondria are not efficiently discarded from the cell, which complicates the operation of other healthy mitochondria and leads to insufficient energy production in the cell. They can be compared to a faulty engine that

emits [toxic fumes](#).

Quality control by the brain cell

The Leuven-based VIB researchers Dominik Haddad, Vanessa Morais and Patrik Verstreken have unraveled the mechanism by which brain cells trigger the destruction of dysfunctional mitochondria. Once the mechanism is triggered, communication between brain cells is reestablished. The researchers were surprised to find that this mechanism is not only defective in Parkinson's disease, but also in specific cases of [intellectual disability](#). These results indicate the wider importance of mitochondria for optimal functioning of our brains. Haddad, Morais and Verstreken hope that their insights eventually contribute to the prevention of various brain disorders.

Brain disorders in Europe

1 in 3 Europeans will suffer from a brain disorder during his or her lifetime. All of us know people with dementia, schizophrenia, intellectual disability or another brain condition. Each of these diseases penetrates to a person's core and have a huge impact on the patient and his or her family. They also carry an economic impact: €800 billion is spent each year in Europe to cover brain disorder-related health needs.

Bart De Strooper (VIB/KU Leuven): "The brain is decisive in shaping who we are, but from a scientific standpoint, it is uncharted territory. This research constitutes an important piece of the complex puzzle. Brain research is vital, especially because [brain disorders](#) weigh so heavily on patients, their families and society. I am delighted that May 2013 has been designated the European Month of the Brain."

More information: Haddad et al. Mutations in the Intellectual

Disability Gene Ube2a Cause Neuronal Dysfunction and Impair Parkin-Dependent Mitophagy, *Molecular Cell*, 2013.

Provided by VIB (the Flanders Institute for Biotechnology)

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