

Parkin larvae bring researchers closer to solving Parkinson's disease puzzle

January 16 2012

(Medical Xpress) -- Scientists at the University of York have made a significant step forward in isolating the cause of Parkinson's disease in younger adults.

Research by a team in the University's Department of Biology found evidence that movement disorders, including tremor and slowness of movement (bradykinesia), associated with Parkinson's disease (PD) may be due to a defect in energy production in the nervous system. The advance may help to identify young adults who may be susceptible to the disease.

Parkinson's, the second most common form of neurodegenerative disease, principally affects people aged over 60, but some forms – known as juvenile PD – usually start in the 30-40 age group. One in 20 people diagnosed with Parkinson's are under 40 and such early onset PD is often inherited. Previous research has identified the genes which cause the disease and found them to be linked in a common pathway to failure of the mitochondria – the power source within each cell.

In the latest research, part-funded by leading research charity Parkinson's UK and published in *Human Molecular Genetics*, scientists at York studied the effect that parkin, one of the genes which cause juvenile PD, has on the larva of the fruit fly, *Drosophila*.

They discovered that parkin faithfully models the locomotory defects of PD with a marked reduction in speed, and slower muscle contractions,

reminiscent of bradykinesia.

Dr Chris Elliott, who led the study, said: “Our experimental evidence confirmed that this was due to a defect in the nervous system. This was important because previous work had suggested a big impact on the muscles, but PD is associated with neuronal failure.”

The research team, which included undergraduate and postgraduate students, found that oxygen consumption and the production of ATP (the chief supply of energy inside cells) were drastically reduced. In response, lactate was increased.

The researchers also discovered that parkin larvae showed oxidative stress due to high levels of reactive oxygen species (ROS; also known as free radicals, such as hydrogen peroxide) which have been suggested as a key component of PD. The study suggested that relieving the ROS had only a marginal effect on mitigating slowed locomotion.

Dr Elliott added: “These findings show drastic failure in energy production by parkin larvae, and suggest that biochemicals related to lactate may be worth investigating as biomarkers for the progress of PD.

“We believe that the larval bradykinesia is a consequence of neuronal energy deficit, which leads to failure in neural communication. Oxidative stress is a consequence, rather than cause, of PD.”

Dr Kieran Breen, Director of Research and Innovation at Parkinson’s UK, comments:

“This study shows just how vital models like the fruit fly are in helping us understand what happens to the nerve cells that are affected in Parkinson’s.

“We already knew that mitochondria were important in Parkinson’s but this research suggests that mitochondrial problems may be the root cause of the problems that lead to nerve cell death.

“So finding ways to protect and enhance the mitochondria may be the key to treatments that can slow or even stop Parkinson’s in its tracks.”

More information: Amanda Vincent, Laura Briggs, Griff F.J. Chatwin, Elizabeth Emery, Rose Tomlins, Matt Oswald, C. Adam Middleton, Gareth J.O. Evans, Sean T. Sweeney and Christopher J.H. Elliot, parkin-induced defects in neurophysiology and locomotion are generated by metabolic dysfunction and not oxidative stress, *Hum. Mol. Genet.* (2012) [doi: 10.1093/hmg/ddr609](https://doi.org/10.1093/hmg/ddr609) , First published online: January 3, 2012.

Provided by University of York

Citation: Parkin larvae bring researchers closer to solving Parkinson's disease puzzle (2012, January 16) retrieved 2 May 2024 from <https://medicalxpress.com/news/2012-01-parkin-larvae-closer-parkinson-disease.html>

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