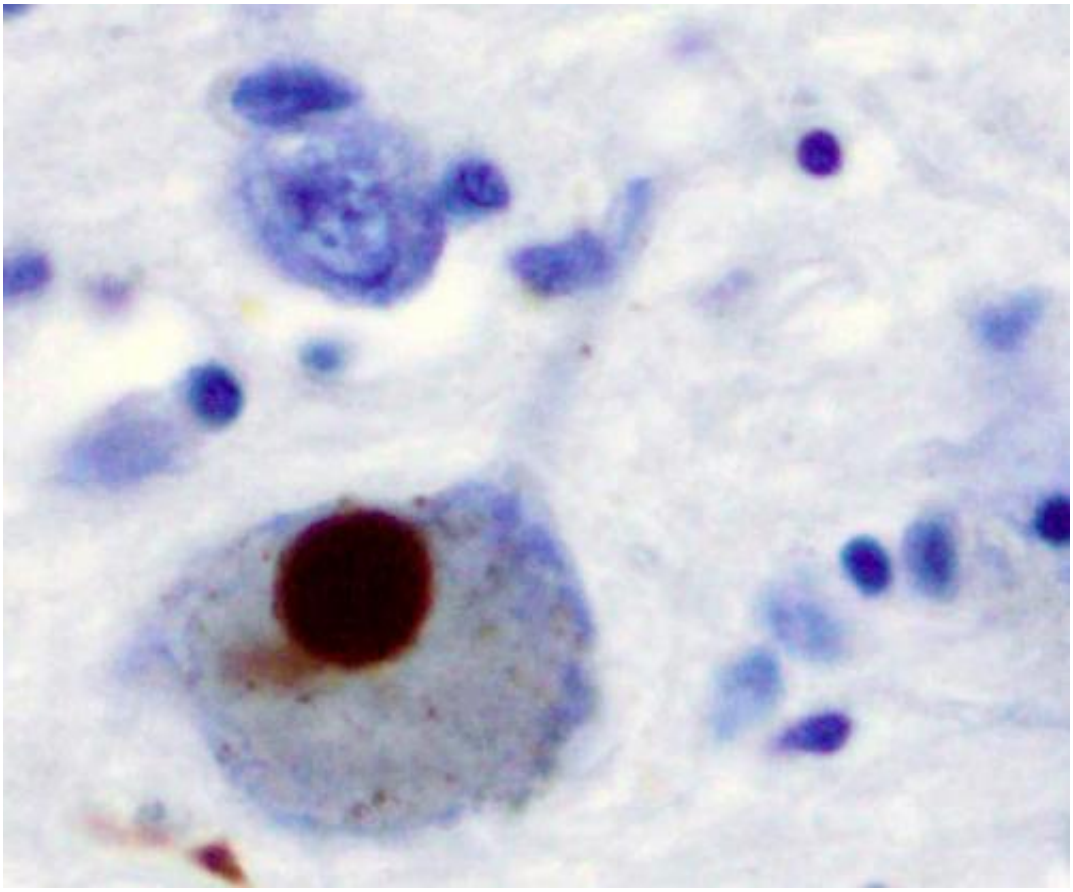
Researchers shed light on why exercise slows progression of Parkinson's disease

December 22 2017



Immunohistochemistry for alpha-synuclein showing positive staining (brown) of an intraneural Lewy-body in the Substantia nigra in Parkinson's disease. Credit: Wikipedia

While vigorous exercise on a treadmill has been shown to slow the

progression of Parkinson's disease in patients, the molecular reasons behind it have remained a mystery.

But now scientists at the University of Colorado Anschutz Medical Campus may have an answer.

For the first time in a progressive, age-related mouse model of Parkinson's, researchers have shown that exercise on a running wheel can stop the accumulation of the neuronal protein alpha-synuclein in brain cells.

The work, published Friday in the journal *PLOS ONE*, was done by Wenbo Zhou, PhD, research associate professor of medicine and Curt Freed, MD, professor of medicine and division head of the Division of Clinical Pharmacology and Toxicology at the CU School of Medicine.

The researchers said clumps of alpha-synuclein are believed to play a central role in the brain cell death associated with Parkinson's disease. The mice in the study, like humans, started to get Parkinson's symptoms in mid-life. At 12 months of age, running wheels were put in their cages.

"After three months," Zhou said, "the running animals showed much better movement and cognitive function compared to control transgenic animals which had locked running wheels."

Zhou and Freed found that in the running mice, exercise increased brain and muscle expression of a key protective gene called DJ-1. Those rare humans born with a mutation in their DJ-1 gene are guaranteed to get severe Parkinson's at a relatively young age.

The researchers tested mice that were missing the DJ-1 gene and discovered that their ability to run had severely declined, suggesting that the DJ-1 protein is required for normal movement.

"Our results indicate that exercise may slow the progression of Parkinson's disease by turning on the protective gene DJ-1 and thereby preventing abnormal protein accumulation in brain," Freed said.

He explained that his animal experiments had very real implications for humans.

"Our experiments show that exercise can get to the heart of the problem in Parkinson's disease," Freed said. "People with Parkinson's who exercise are likely able to keep their brain cells from dying."

Parkinson's is a disease caused by the death of brain cells that make a critical chemical called dopamine. Without dopamine, voluntary movement is impossible. Most people with Parkinson's disease take a drug called L-DOPA to treat their symptoms. The oral drug is converted into dopamine in the brain allowing patients to get up and move.

In 1988, Freed and his colleague Robert Breeze, MD, performed the first transplant of human fetal dopamine cells into a Parkinson's patient in the United States. His lab is currently working to convert human embryonic stem cells to dopamine neurons. These techniques should make it possible to produce unlimited quantities of dopamine cells for transplant.

Provided by CU Anschutz Medical Campus