Funded by Parkinson Society British Columbia

Pilot Project Grant

An examination of the impact of chronic oxidative stress and changes in mitochondrial trafficking in neurodegeneration and Parkinson's disease

Dr. Gordon Rintoul

Dr. Rintoul received his BSc (Honours) from the University of Western Ontario and his PhD from the University of British Columbia. He undertook his post-doctoral training in Mitochondrial Biology at the University of Pittsburgh. He has been an Assistant Professor in the Department of Biological Sciences at Simon Fraser University since 2006. Dr. Rintoul's lab focuses on mammalian neuronal mitochondria, particularly the role they play in neurodegeneration.

One Year Award $45,000

Mitochondria – the microscopic structures found inside cells – are usually described as the cells' "powerhouse" because they convert nutrients into energy for cells to use. But as neurobiologist Gordon Rintoul is discovering, that description is misleading.

"A powerhouse implies they are a stationary structure," says Rintoul, an assistant professor at Simon Fraser University in Burnaby, B.C. "During my post-doctoral fellowship at the University of Pittsburgh, we observed that these little things were quite mobile, within neurons. They're like little Meals on Wheels – they go to where energy is needed."

Rintoul believes that mitochondria in healthy brain cells usually zip up and down those cells, pausing at the areas that need energy the most. But as neurons age, the delivery process – the mitochondria's mobility – might be disrupted. That could make the neurons more susceptible to Parkinson's disease.

The mitochondria's mobility might also be disrupted by a process known as chronic oxidative stress. Oxidative stress is a by-product of energy generation, caused by the production of too many destructive, oxygen-containing molecules. Oxidative stress may be responsible for the aging process, and some researchers have also linked it to Parkinson's disease and progressive brain disorders.

Rintoul and his students are investigating whether chronic oxidative stress disrupts the way mitochondria move to deliver energy to necessary parts of brain cells, making those cells more vulnerable to Parkinson's disease or contributing to the disease itself.

"We hope this will give us insight into the underlying cause or susceptibility to disorders like Parkinson's disease … and potentially provide targets for treatment," says Rintoul.

He will try to prove his thesis by studying cell cultures, using fluorescent probes that light up the mitochondria to watch them move around in the cells, and then comparing cells treated with chemical antioxidants to those not treated with antioxidants.

Rintoul's research into what causes neurons to die is driven by his interest in figuring out exactly how things are put together.

"Every once in a while you make some little discovery, and it's exciting – some little piece of information that you know and nobody else knows," he says.

Mitochondrial research is at the centre of the investigation of the cause of Parkinson's disease – and Rintoul is at the forefront of that research.