Parkinson Society British Columbia

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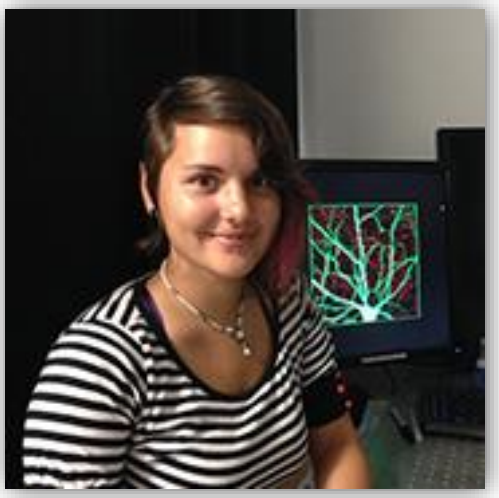
Research Profile:
Naila Kuhlmann



Research Project:
Morphological and electrophysiological investigation of the role of LRRK2 in activity-dependent striatal synaptic plasticity.

Project Grant: $30,000 over two years

Project Description:
How One Parkinson's Gene can Change the Shape and Function of Brain Cells

"I want to identify the characteristics at the beginning of the disease, in order to be able to intervene at that stage."

One of the most fascinating areas of neuroscience concerns the plasticity of the brain – its ability to adapt and to form new connections in response to new information, or damage from injury or illness.

At the University of British Columbia's Djavad Mowafaghian Centre for Brain Health, graduate student, Naila Kuhlmann, studies the plasticity of neurons in the area of the brain called the striatum, which is affected in Parkinson's disease.

Kuhlmann examines the structure of the neurons themselves. She focuses on parts of the brain cells called dendrites, which look like tree branches, and the knobs on the cells called spines, where connections form to other cells. Kuhlmann studies the way changes in a gene called LRRK2 affects these neurons. Mutated forms of LRRK2 are the most commonly known genetic cause of Parkinson's disease. Kuhlmann investigates whether changes in the LRRK2 protein affect the transmission of chemicals among brain cells, and the structure of dendrites and spines.

“I'm looking at whether that mutation is having a direct effect on the structure of the neurons,” Kuhlmann says. “Structure is related to function. We know that there's some kind of altered function in the pathology of Parkinson's disease.”

If Kuhlmann can figure out how the mutated LRRK2 and its associated protein alter the structure of the other brain cells that regulate dopamine, the brain chemical required for muscle movement, that fundamental knowledge might help researchers design new drugs. They could then stop the progression of Parkinson's disease at a very early stage.

“Sometimes just varying the amount of protein could fix the problem,” Kuhlmann says. Identifying problems at the cellular level is important because if researchers determine where Parkinson's disease originates, they may be able to intervene at that point.

Growing up, Kuhlmann had a family friend with Parkinson's disease who was a fellow piano student. She was struck by how he gained better control of his movements when he played piano. She has thought often of her friend as she conducted her research – and his email encouraging her to keep going has inspired her. “That was a really good moment to see who I'm affecting, and to know that people actually care about my research,” she says.

Biography:
Kuhlmann’s fascination with neuroscience began in high school, when she volunteered in a cognitive neuroscience lab at the University of Saskatchewan in order to get research experience. There, she got exposure to a number of language processing theories, and learned how to develop and conduct functional magnetic resonance imaging studies.

Kulmann proceeded to complete a BSc. double Honours (in Biology and Psychology) at the U of S, at which time she studied rodent models of neurodevelopmental disorders in Dr. John Howland’s lab. Through this research, she was able to examine the effects of perturbations in the prenatal environment on the cognitive and behavioural development of the (rat) offspring. In September 2013, she moved to Vancouver to start my graduate studies at UBC, under Prof. Matt Farrer’s and Dr. Austen Milnerwood’s guidance at the Centre for Applied Neurogenetics (CAN).

Kuhlmann had been interested in studying neurodegenerative disorders, and was particularly intrigued by investigating the genetic basis of Parkinson’s and integrating this closely with molecular in vitro and in vivo methods. Joining CAN has given her the opportunity to use a myriad of sophisticated techniques to address her research questions, and collaborate with a number of experts in the field.

Kulmann’s current focus is examining synaptic and structural plasticity changes in transgenic mouse models of Parkinson’s disease, particularly with respects to LRRK2 PD-causing mutations. Her goal is to further elucidate the role of early synaptic alterations implicated in the pathophysiological progression of PD, which will aid in the development of intervening therapeutics.