University of Lethbridge News Release

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U of L researchers use Alberta Prion Research Institute grant to help unlock molecular mechanisms involved in Alzheimer's disease

Drs. Athan Zovoilis, a professor of bioinformatics in the Department of Chemistry and Biochemistry, and Majid Mohajerani, a professor of neuroscience, have secured a grant worth $200,000 from the Alberta Prion Research Institute to study how the misfolding of proteins causes symptoms of Alzheimer's disease.

"We know that protein misfolding, a molecular process in which biomolecules called proteins get an abnormal 3D conformation, is associated with the development of this debilitating disease. However, we still don't have a clear picture of how this protein misfolding leads to brain cell death and subsequently to dementia," says Zovoilis, who was recruited to the U of L from Harvard Medical School as a Canada Research Chair in RNA Bioinformatics and Genomics. "Now we have new genomic technologies, such as next-generation sequencing, that give the ability to better understand what is happening at the molecular level in the brain cells due to protein misfolding."

Zovoilis' RNA Genomics Laboratory is the first in Western Canada to get access to a new cutting-edge sequencing platform called PromethION that enables a better insight into the biology of Alzheimer's disease through a novel approach called direct, long range RNA-sequencing.

Identifying the mechanisms that underlie Alzheimer's disease is a big challenge so Zovoilis teamed up with Mohajerani to approach the problem in an interdisciplinary manner. The team tackling the question consists of bioinformaticians, who use software tools to understand biological data, wet lab scientists and neuroscientists.

"Our research interests and experimental skill sets are complementary," says Mohajerani. "We are searching for biomarkers at different levels, from molecules to brain network activity, that could be used for early diagnosis and disease progression. We have state-of-the-art research facilities within both the Department of Neuroscience and Chemistry & Biochemistry and capitalizing on complementary resources will help us reach consensus on our scientific voyage to understand the neurobiology of Alzheimer's disease."

Zovoilis and Mohajerani are using these new genomic technologies to examine the relationship between misfolded proteins and brain cell death more closely. They'll be looking specifically at a group of biomolecules called non-coding RNAs they suspect may be involved in the process.

"At the moment, there's really no cure for Alzheimer's disease," says Zovoilis. "In order to design drugs against specific targets within the cells, we first need to know the pathway from protein misfolding to cell death. That is what's missing. We know the trigger — protein misfolding and the plaques — and we know the result — cell death — but we have no idea what happens in between. By identifying new pathways, we might be able to also identify potential targets for therapeutic intervention."

The research work has begun and Zovoilis says they are already seeing very encouraging results. In the next two years, they plan to have published the research and set the foundations of followup projects to determine how intervening in the process might accelerate or delay the progress of the disease.

"There is a significant time window that separates basic science from the moment we have a new drug on the market," says Zovoilis. "If we don't start now, we cannot expect to have a new treatment 10 years from now. It was very wise of the province to create and support the Alberta Prion Research Institute, as well as support us to establish a frontline RNA Genomics Laboratory here at the U of L. This is a game changer and it is really going to help us face this challenge. "

This news release can be found online at Alberta Prion Research Institute grant.

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