Award Details

Assessing defects in embryonic development due to loss of protein fucosylation

Research Details

Competition Year:	2019	**Fiscal Year:**	2019-2020
Project Lead Name:	French, Curtis	**Institution:**	Memorial University of Newfoundland
Department:	Medicine, Faculty of	**Province:**	Newfoundland and Labrador
Award Amount:	30,000	**Installment:**	1 - 5
Program:	Discovery Grants Program - Individual	**Selection Committee:**	Genes, Cells and Molecules
Research Subject:	Animal circulation	**Area of Application:**	Life sciences (including biotechnology)
Co-Researchers:	No Co-Researcher	**Partners:**	No Partners

Award Summary

Lay Summary***Protein fucosylation is an evolutionary conserved process that occurs in all animals. Protein fucosylation refers to the addition of sugar (fucose) molecules to target proteins in order to ensure their proper function. We use the small brackish fish, (Danio rerio) to study what happens to an embryo when protein fucosylation is disrupted. Upon making a mutation in a gene required for protein fucosylation in these fish, their embryos developed cerebral hemorrhages. This indicates that protein fucosylation is required to build stable, functioning blood vessels. We use the zebrafish to try and figure how the gene, and protein fucosylation in general, is required to build blood vessels. ******Zebrafish with defects in protein fucosylation have a number of other problems in addition to cerebral hemorrhages. For example, their tails are bent and they swim in circles. These problems, and the cerebral hemorrhages, can all be explained by defective cilia. Cilia are important structures located on almost all of our bodies cells, and are critically important for normal embryo development. Cilia for example, can beat and move fluid through the spinal columns, and defects in these cilia are known to cause bent tails in fish. Zebrafish also have cilia on the outside of their body that detect changes in water currents, and defects in these cilia can cause circular swimming behavior. Finally, cilia point into our blood vessels, and play an important role in vessel development and the regulation of blood pressure. Defects in these cilia are known to cause cerebral hemorrhages. In my lab, we are able to visualize cilia in our mutant zebrafish that lack protein fucosylation, to see if there are any defects. We look at the cilia in blood vessels, in the spinal column, and on the outside of the body to see if defective cilia are responsible for the cerebral hemorrhages, bent tails, and circular swimming behavior in our protein fucosylation deficient zebrafish.******This work is important to help us understand how cilia function and why they are important, and help us to learn about how they might be important in humans. For example, defects in cilia that cause bent tails in zebrafish can cause scoliosis (bent spines) in humans. Humans have cilia in our ears that help us hear, and are almost identical in structure to the cilia on the outside of zebrafish that help them swim. Humans can also be at increased risk for cerebral blood vessel defects due to problems with cilia, so our zebrafish serve as a useful tool to understand the underlying biological problems that lead to vascular diseases such as stroke. Lastly, as all animals require protein fucosylation, our work can translate across scientific disciplines to give us clues as to how other animals use protein fucosylation in order to maintain normal body function. **