Studying Regeneration in Zebrafish

Daniel Goldman, Ph.D, Research Professor University of Michigan

By: Sheridan Reed, Office of Research Editorial Assistant

Daniel Goldman is a Research Professor in the Molecular and Behavioral Neuroscience Institute and a Professor of Biological Chemistry. The research done in his lab focuses on creating a better understanding of the zebrafish’s remarkable capacity for regeneration, specifically in terms of retinal regeneration. In response to injury, the Muller Glia cells of the zebrafish reprogram their genome to dedifferentiate into multipotent progenitors to acquire the properties of retinal stem cells. This reprogramming then allows the cells to differentiate into the various retinal cells that were damaged during injury.

Professor Goldman uses transgenic fish to study the global changes in DNA and RNA as the Muller Glia transition from a differentiated cell to a stem cell, specifically focusing on changes and differences in DNA methylation and RNA expression.

Professor Goldman’s lab utilizes several of the cores in the Biomedical Research Core Facilities. “The Cores are essential to the success of our projects” explained Professor Goldman.

His research depends on understanding the difference between dedifferentiated cells and normal retinal cells. The transgenic fish used in their lab uses fluorescent proteins to label these two cell types. The Flow Cytometry Core then helps them purify cells so they can study their differences. Using the DNA Sequencing Core, they investigate the differences in DNA methylation and RNA expression. With the help of the Bioinformatics Core, Goldman’s lab is able to formulate new hypothesis about how the Muller Glia reprogram their genome. The Core allows them to map sequencing reads to the zebrafish genome and filter out the differences as the cells transition. These differences allow them to identify some of the mechanisms involved in reprogramming.

“All of these Cores have been a huge help to our research and we are very grateful for their advice and expertise,” Dr. Goldman said.