Control of Eye Regeneration in *Xenopus laevis*

Regeneration is a response to injury that results in the functional regrowth of damaged or lost body parts. Uncovering this mechanism is part of the NASA Mission Directorate Strategic Goal 1: Expand Human Knowledge Through New Scientific Discoveries. However, regeneration mechanisms are not well understood. Studying a highly regenerative animal model can further our understanding of the natural regeneration process. The African clawed frog, *Xenopus laevis*, is an excellent model for studying regeneration as it can regenerate multiple organs including the eyes. *Xenopus* embryos regenerate eyes within 5 days (Kha et al., 2018). The vacuolar-ATPase (V-ATPase) is a proton pump that moves hydrogen ions across the cell membranes. This pump is important in regulating the membrane voltage of cells and is known to control limb regeneration. Chemical inhibition of V-ATPase blocked *Xenopus* eye regeneration and resulted in small regrowth-inhibited eyes. Thus, V-ATPase function is required for this process. This project aims to determine the role of V-ATPase during eye regeneration by examining the defects caused by V-ATPase inhibition. My results show that regrowth-inhibited eyes are on average 50% smaller than the contralateral eye. Tissue sections showed that the overall morphology of the regrowth-inhibited eye is the same as a normal eye, suggesting that there is unlikely to be defects in eye formation. Thus, our data indicate that the role of V-ATPase during eye regeneration is to control eye stem cell proliferation. Knowing this process may give us insight into why humans lack this capability and allow for research in medicinal applications. The development of this application may benefit humanity in improving the quality of life for humans that are seriously injured.