

## **Tau Oligomers Toxicity and Spreading Through the Eye Brain Axis**

Alzheimer's disease is the most common neurodegenerative disorder and there are currently no effective treatments. The main risk factor is age, meaning that as life expectancy continues to increase the number of people affected will only rise.

Tau protein is found in the brain and is known to be of importance for the growth of brain cells and for the transport of nutrients and waste in the brain. It is well-known that tau takes on a different form in Alzheimer's disease and other brain disorders. This alteration to tau prevents its ability to complete its job in the cell and causes it to accumulate and affect other cell processes, leading to memory impairment and other symptoms. After extensive study on the toxic effects of tau, we and others have shown that a small clumped form of the protein called a tau oligomer is likely the main cause of many of the symptoms in disease. Importantly, these tau oligomers seem to be capable of spreading from one area in the brain to another, causing the spread of the disease.

It has been suggested that the eye may be a window into the brain, allowing scientists and doctors to evaluate brain changes in a non-invasive way, as cells in the eye connect directly to the brain. In order to study the connection between the brain and the eye as it applies to toxic tau protein in disease, we will inject tau oligomers into the eye in mice and evaluate the capability of the protein to spread to different areas in the brain. These studies will provide novel insights on the spreading of tau oligomers in disease and the connection between the brain and the eye. We will evaluate effects of tau oligomers on brain function, as well as on the eye in order to address the feasibility of using retinal imaging as a potential diagnostic in disease.