Age and Glaucoma Induced Changes in Retinal Ganglion Cell Function

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Glaucoma is a neurodegenerative disease that causes ganglion cell death in the retina, leading to vision loss. To study the effects of glaucoma, the DBA/2J mouse has proven to be a precise model of inherited, age-related progressive glaucoma that parallels human patients. Here, it is shown how glaucoma affects specific populations of retinal ganglion cells as a function of age. In vitro RGC spiking activity was recorded using a 60 unit multi-electrode array and classified based on the spiking responses to light: ON, OFF, or ON-OFF. RGCs which respond to the onset (ON) or offset (OFF) of light were sub classified into transient and sustained duration of response. Reported in this project is the change in the distribution of major RGC subclasses over time in the DBA/2J and non-glaucomatous control mice. A major risk factor for glaucoma, elevated intraocular pressure (IOP), was also monitored. It was found that distinct stages of pre- and post-glaucoma revolve around the period of approximately 9-11mos, during which, the IOP becomes elevated. Data also showed that there is a significant increase in the proportion of Sustained ON cells in the 11+month group compared to the 6-9month group in the DBA/2J. When comparing cell type distribution across genotypes, it was found that there is an inverse relationship between the proportion of Sustained On cells and ON-OFF cells. Future experiments will seek to clarify the mechanisms involved in this change in cell type distribution.

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