The Role of Mitochondria in Glaucoma

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Blocked flow of aqueous humor leads to vision loss

Aqueous humor overproduction or outflow blocked → Intraocular Pressure (IOP) increases → Compression at optic nerve head (ONH) → Damage to retinal ganglion cells (RGCs) → Vision loss
Blocked flow of aqueous humor leads to vision loss
Model Glaucoma in Mice:

Mice with pigment dispersion disease

→ Secondary form of Glaucoma

→ Pigment gets caught in trabecular meshwork

→ Increases IOP
Axons

- RGC axons form optic nerve
- Axon conduction is lost early with Glaucoma. This is seen in tests when high energy input leads to low potential vision.
- This leads to the question: *Is the axon the source of the problem?*
- Axons are simply made up of neurofilaments, mitochondria, and other organelle traffic.
- *Are mitochondria the problem in the axons?*
Role of Mitochondria

Mitochondria produce ATP which creates the energy in axons.

This energy is used to open and close the ion channels which allow transmissions through the nerve, which is the signaling for vision.
Optic Nerve Analysis of Mitochondria

Measure

1. Length
2. Width
3. Distance from myelin
4. Distance to neighbor

Goal: Determine health of mitochondria through examination of cristae and membrane
Decreased size and quantity of mitochondria in mice with glaucoma, which is consistent with the low ATP levels. More experiments are taking place to understand if mitochondria are the source of the problem or a consequence of glaucoma.
Any Questions?