About the Goal

The AGI is stimulating the development of new therapies for vision loss and blindness. With continued support and guidance through the National Eye Institute, it aims to regenerate the light-sensitive retina and its connections to the brain.

The future of AGI – tackling the challenges of transplantation

Whether replacement cells come from one’s own body or another person’s, we need to understand how the immune system reacts to replacement eye tissue. The AGI is exploring the conditions and methods needed that will allow replacement cells or tissue to restore visual function.

Learn more about AGI and read the report on AGI accomplishments at nei.nih.gov/agi

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Some of the most common and devastating vision disorders affect the neural retina and its connections with the brain. Age-related macular degeneration (AMD), glaucoma, and retinitis pigmentosa are just a few conditions that can cause irreversible vision loss. Our data suggests that by 2050, as many as 9 million Americans will have low vision, and 4 million will be blind, the majority from diseases like AMD and glaucoma.

AGI projects are laying the groundwork for clinical studies of new strategies for reversing vision loss. Currently, three research consortia are bringing different perspectives to this problem.
Regenerative Factor Discovery Consortium
AGI discovery projects are searching for factors such as genes, proteins, and other cellular messengers that are important for neural regeneration. The consortium is developing a database to make information from the projects publicly available.

Most human neurons fail to regenerate on their own. However, many species of fish and amphibians have the ability to regenerate neuronal structures and regain function. AGI scientists are learning how to unlock similar regenerative capacity in humans.

Understanding the Retina
Several types of neurons and support cells exist in the retina, all of which are necessary to carry visual information to the brain. Discovery projects are investigating three key cell types:

- **Photoreceptors** are the light-sensing cells of the retina. Scientists are studying how to connect transplanted photoreceptors to their neural neighbors so they can transmit visual information to the brain.
- **Retinal ganglion cells** (RGCs) relay information from photoreceptors to the brain via the optic nerve. AGI research teams are testing how to replace these cells after they have been damaged.
- **Müller glia** support retina neuron structure and function. In zebrafish, Müller glial cells can reprogram into fully functional photoreceptors after injury. Scientists are studying Müller glia in different animals and are searching for factors that could enable vision restoration in humans.

Translation-Enabling Models Consortium
The AGI translation-enabling models projects are bridging the gap between basic research and clinical trials. Project scientists are developing new models for glaucoma and other degenerative retinal diseases. These models will help researchers learn the root cause of disease, study disease progression, and test potential therapies.

Most existing eye disease models poorly emulate human cases. The AGI Translation-Enabling Models Consortium is generating new models to inform human clinical trials of vision-restoration therapies.

New disease models
AGI teams are developing models that mimic important aspects of human vision, including the presence of cone photoreceptors, which are important for sharp central vision and color perception. Most animal models lack cone photoreceptors, so AGI scientists are developing new cone-rich animal models such as the ground squirrel and tree shrew.

AGI research teams are developing models for testing therapies that replace RGCs and photoreceptors. Follow-up projects will fine-tune surgical techniques and measures of cell survival and function in preparation for clinical trials.