



National Institutes of Health
National Eye Institute
Bethesda, Maryland 20892

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Contact:
National Eye Institute
(301) 496-5248
neinews@nei.nih.gov

Statement of Paul A. Sieving, M.D., Ph.D., Director, National Eye Institute, National Institutes of Health, on World Glaucoma Day

NEI-Supported Research Continues to Advance Understanding of Glaucoma and to Contribute to Development of Therapies

The National Eye Institute (NEI), one of the federal government's National Institutes of Health (NIH), joins today with other groups around the globe to observe World Glaucoma Day. NEI reaffirms its commitment to support ongoing research to better understand glaucoma, to identify risk factors that lead to the development of the disease, and to prevent vision loss and blindness.

Glaucoma is a group of disorders that damages the optic nerve and leads to loss of visual function. If left untreated, it leads to blindness. An estimated 2.2 million Americans have glaucoma, and an additional two million do not know they have it. All of these cases can be attributed to a form of the disease known as primary open-angle glaucoma (POAG), the most common form of glaucoma and one of the nation's leading causes of vision loss. Approximately 120,000 Americans are blind from the disease. Worldwide, nearly 70 million people are affected by glaucoma.

Glaucoma usually begins in midlife and progresses slowly. If detected early, disease progression often can be stopped or slowed with eye drops or surgery. High pressure inside the eye, which may be associated with glaucoma, does not by itself mean that a person has glaucoma. With its painless and gradual loss of vision, glaucoma may have no early warning signs, but it can be detected during a comprehensive dilated eye examination. An eye care professional can see inside the eye to detect signs of glaucoma, such as subtle changes to the optic nerve, before any symptoms appear. Once vision is lost, it is gone forever.

NEI's support of glaucoma research continues to generate breakthroughs in understanding the disease. These advances in scientific knowledge encourage the development of new diagnostic tests and therapies to prevent and treat glaucoma. For example, NEI supported the basic research that led to the development of the drug latanoprost to treat glaucoma.

NEI currently supports 244 glaucoma studies at a cost of approximately \$60 million. Over 15 years, investigators conducting a number of NEI-supported studies have reported significant findings. For example, in the Early Manifest Glaucoma Trial, scientists found that the progression of glaucoma was less frequent in patients who were treated early than in those who were treated later or who received no treatment. In the treated group, eye pressure was lowered by an average of 25 percent. This finding has led to the emerging consensus in the medical community that lowering pressure inside the eye can, in many cases, slow glaucoma damage and vision loss.

In another trial, the Ocular Hypertension Treatment Study (OHTS), investigators discovered that eye drops used to treat high pressure inside the eye are effective in delaying the onset of glaucoma in people at higher risk for the disease. The pressure-lowering eye drops reduced by more than 50 percent the development of POAG. Those at higher risk for developing glaucoma are:

- African Americans over age 40
- Everyone over age 60, especially Mexican Americans
- People with a family history of the disease.

In addition, OHTS investigators identified other risk factors, such as certain anatomical features of the optic nerve and the thinness of the cornea. These discoveries have been useful in helping eye care professionals predict who will likely develop glaucoma and who will benefit from therapy.

Another area of progress in developing therapies for treating glaucoma and other diseases in which nerve cells are damaged is called neuroprotection. Among the approaches being studied are stem cell therapy, gene transfer therapy, and the use of proteins called neurotrophic factors. The major feature of glaucoma is the death of retinal ganglion cells (RGCs), the nerve cells that make up the optic nerve. NEI-supported investigators recently used gene transfer therapy in rodent models of glaucoma to provide an ongoing supply of an essential neurotrophic factor to the optic nerve and were able to show significant improvement in the survival of RGCs.

NEI-supported scientists have made considerable progress in understanding the genetic and cellular bases of glaucoma, whether accompanied by high pressure inside the eye or not. For example, mutations in a gene called *myocilin* have been linked to a rare, inherited form of glaucoma in which the fluid filtering part of the eye, called the trabecular meshwork, is involved. This genetic mutation may be another contributing factor in causing high pressure inside the eye.

Though vision loss from glaucoma is often associated with pressure that damages the optic nerve, some glaucoma patients do not have high pressure. These people are said to have normal-tension or low-tension glaucoma. NEI-supported scientists have made considerable progress in understanding the genetic and cellular bases for this type of glaucoma as well as for the other forms of glaucoma. For normal-tension glaucoma, investigators have identified a gene known as *OPTN*. Four different mutations in this gene have been found in families with normal-tension glaucoma. In addition, this gene produces a protein called optineurin that is found in both retina and brain tissue and that interacts with other proteins associated with optic nerve damage. Research into *OPTN* reinforces the importance of protecting the optic nerve's RGCs.

NEI applauds the establishment of World Glaucoma Day and looks forward to contributing in the years ahead to the advancement of public awareness of glaucoma through its National Eye Health Education Program (NEHEP), increased public acceptance of the need for regular comprehensive dilated eye exams, and the importance of continuing scientific research and development of effective therapies.

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The National Eye Institute (NEI) is part of the National Institutes of Health (NIH) and is the federal government's lead agency for vision research that leads to sight-saving treatments and plays a key role in reducing visual impairment and blindness. For more information, visit the NEI Website at <http://www.nei.nih.gov>.

The National Institutes of Health (NIH) - The Nation's Medical Research Agency - includes 27 Institutes and Centers and is a component of the U. S. Department of Health and Human Services. It is the primary federal agency for conducting and supporting basic, clinical, and translational medical research, and it investigates the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit <http://www.nih.gov>.