

NATIONAL EYE INSTITUTE

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Mission:

The National Eye Institute (NEI) conducts and supports research, training, health information dissemination, and other programs with respect to blinding eye diseases, visual disorders, mechanisms of visual function, preservation of sight, and the special health problems and requirements of the blind. More than 12 million people in the United States suffer from some significant, noncorrectable impairment of vision. To attain the goal's of the institute's mission, over 85 percent of the NEI's appropriated funds are used to support extramural research and research training at universities, medical schools, hospitals and other institutions throughout the United States and abroad.

For nearly 30 years, NEI-supported research has led to numerous discoveries that have saved countless people worldwide from vision loss or blindness. These accomplishments include conducting pioneering research in the use of laser treatment for a variety of eye diseases, and improving treatment for diseases, such as diabetic retinopathy, glaucoma, uveitis, eye disorders in premature infants, ocular herpes, and cytomegalovirus retinitis. NEI's research activities are organized into five programs: retinal diseases; corneal diseases; lens and cataract; glaucoma; and strabismus, amblyopia, and visual processing.

Selected Achievements and Initiatives:

Adult bone marrow stem cells in retinitis pigmentosa: A recent NEI-supported study found that eye injections of bone marrow derived stem cells prevented vision loss in two rodent models of retinitis pigmentosa (RP). RP is the name given to a family of diseases that result from harmful mutations in rod photoreceptor cell genes. Rod photoreceptors are the light sensitive cells in the retina that provide peripheral and night vision. RP causes the loss of these cells and results in night blindness and loss of peripheral vision. For reasons that are not entirely understood, the sick and dying rod cells also cause cone photoreceptor cells to die. Cone cells are concentrated in the macula, the center of the retina, and provide the sharp visual acuity that allows us to read, recognize faces, and perform detailed tasks that require hand-eye coordination. As the disease progresses patients lose their central vision, resulting in severe visual impairment or total blindness. This study raises the possibility that patients could receive an injection of their own bone marrow stem cells to preserve central vision.

Lens Borrows Cell Death Enzymes to Maintain Its Structure: The lens is a dense, compact structure containing two cell types: metabolically active epithelial cells and quiescent fiber cells. Throughout life, the lens carries out a process of continued growth with epithelial cells dividing and differentiating into fiber cells. As epithelial cells differentiate into fiber cells they become denuded of organelles such as the nucleus and mitochondria. Elimination of organelles is critical because they would interfere with the refractive index and lead to cataracts. It has been suspected that epithelial cells "borrow" enzymes involved in programmed cell death, or apoptosis, to mediate organelle destruction. Apoptosis is a normal biologic process that guides an orderly destruction of

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cells that are no longer functional or needed. In a recent study, NEI-supported scientists have shown that specific forms of caspases, a group of protein degrading enzymes critical to dismantling organelles during apoptosis, are also involved in fiber cell formation as well. This study defines a critical step in how fiber cells are formed and will spark further investigation into whether alterations in caspase enzymes play a role in cataract formation.

Early treatment effective for African Americans with glaucoma: The prevalence of glaucoma is three times higher in African Americans than in non-Hispanic whites. Additionally, the risk of visual impairment is much higher and the age of onset is earlier than in whites. About 70 percent of glaucoma cases are associated with a history of elevated intraocular pressure (IOP). An NEI-supported follow-up study to the Ocular Hypertension Treatment Study (OHTS) found that early treatment of elevated IOP reduces the risk of developing glaucoma in African Americans. Of the participants in the treatment arm of the study, 8.4 percent developed glaucoma whereas 16.1 percent in the observation group developed the disease. Additionally, the OHTS follow-up study found that certain biological characteristics of the eye including corneal thickness are helpful in predicting who will likely develop glaucoma and who will benefit from therapy.

Effectiveness of vision screening tests for preschoolers evaluated: Healthy vision is an important part of a child's success in school. A great deal of classroom instruction is conveyed visually through books, computer screens and chalkboards. Children who enter school with eye diseases or visual impairments are at a distinct disadvantage when encountering visually-based instruction. Childhood visual impairment can also result in developmental delays, the need for special education programs, social services and a lifetime of irreversible visual impairment. It is estimated that 20 percent of preschool children ages 3-4 have a treatable eye condition. While many states are developing guidelines for preschool screening programs, none of the commonly used vision tests have been evaluated in a research-based environment to establish their effectiveness. Results from the NEI-sponsored Vision in Preschoolers (VIP) Study found that 11 commonly used screening tests vary widely in identifying children with symptoms of common childhood eye conditions such as amblyopia, strabismus, and significant refractive error. When the best tests are used by highly skilled personnel in a controlled setting, approximately two-thirds of children with one or more of the targeted disorders were identified. These better tests were able to detect 90 percent of children with the most severe visual impairments. The VIP study will provide state and local agencies with data to select the most effective vision screening exams that are currently available. The VIP study will also help ensure that more children are detected and treated at an early stage when therapy is most effective.

Appropriations History

(\$ in thousands)

FY 2001	\$510,352 (+13.3%)
FY 2002	\$580,713 (+13.8%)
FY 2003	\$633,148 (+9.0%)
FY 2004	\$653,052 (+3.1%)
FY 2005	\$669,070 (+2.5%)

Extramural Research Project Grants

(Includes SBIR/STTRs)

FY 2001	1,158
FY 2002	1,205
FY 2003	1,250
FY 2004	1,288
FY 2005	1,274

Success Rate — Research Project Grants

FY 2001	40%
FY 2002	41%
FY 2003	33%
FY 2004	30%
FY 2005	21%

Research Training Positions Supported

FY 2001	267
FY 2002	289
FY 2003	292
FY 2004	331
FY 2005	334

Research Centers

FY 2001	39
FY 2002	39
FY 2003	39
FY 2004	40
FY 2005	42