

Vision Loss

Making a Difference Today

As the population of the United States ages, vision loss is becoming an increasingly serious public health problem. Already, approximately 3.3 million Americans over the age of 40, or one person in 28, are either blind or have low vision (vision so poor that it significantly interferes with everyday life and can't be corrected, even with eyeglasses). That number is expected to reach 5.5 million by 2020.

Vision loss is a devastating experience that exacts a huge emotional, social, and financial toll on individuals and their families. The financial burden to United States taxpayers is also immense. According to a joint report by Prevent Blindness America and the National Eye Institute (NEI), blindness and vision loss cost the federal government more than \$4 billion annually in benefits and lost income.

Treatment Breakthroughs

The leading threats to vision in the United States are age-related macular degeneration (AMD), diabetic retinopathy, glaucoma, cataracts, and retinitis pigmentosa. More than 70 million Americans currently have these potentially blinding diseases. Fortunately, basic research into the biology of the eye has led scientists to develop increasingly effective surgical and pharmaceutical treatments for glaucoma, cataracts, and diabetic retinopathy, particularly if the diseases are diagnosed early. These treatments are quite costly—for individuals and for the federal government. Cataract treatment alone accounts for 60 percent of vision-related Medicare costs.

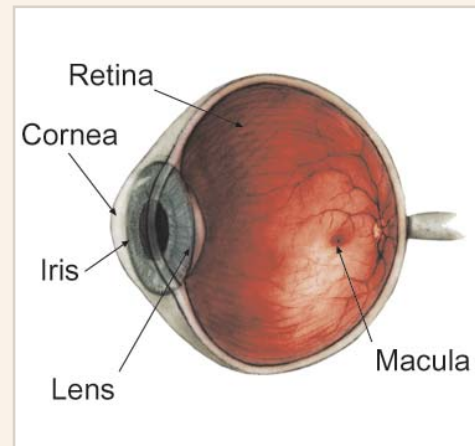
There are no preventive treatments or cures for AMD or retinitis pigmentosa, although a 2001 NEI-funded study found that high levels of antioxidants and zinc can significantly reduce the risk of vision loss associated with advanced AMD. Research has also found that photodynamic therapy, which uses a combination of lasers and medications to seal leaking blood vessels in the eye, can slow vision loss in some people with AMD. Vitamin A has also been shown to decrease symptoms of certain forms of retinitis pigmentosa.

Promising Strategies

With funding from the National Institutes of Health (NIH), scientists continue to aggressively search for better ways of diagnosing, treating, and preventing potentially blinding eye diseases. Several strategies show particular promise.

In gene therapy, new genes are introduced into the eye to either correct mutations or deliver therapeutic drugs. Cell-based therapies include neurotrophic factor implants that contain engineered cells to deliver a neuroprotective protein that prevents or retards vision loss. In addition, electronic prosthetic chips are being designed to function like natural photoreceptor cells in the retina.

Thanks in part to funding by the National Institutes of Health, scientists are moving forward on these and other strategies.



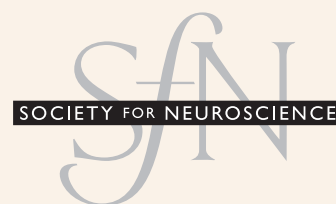
The macula is a small area at the back of the eye that allows us to see fine details clearly. When the macula doesn't function well, vision is blurry and cloudy, making it difficult to read or thread a needle.

Continued funding for research could lead to:

- A better understanding of the genetic factors that play a role in the development of blinding eye diseases.
- The development of gene therapies that can halt or perhaps even reverse vision loss.
- The development of cell-based therapies, including the implantation of special cells in the eye that produce sight-preserving proteins.
- The development of retinal prosthetic devices that can act as artificial retinas and help restore lost sight.

For more information please email brss@sfn.org.

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Vision Loss

Making a Difference Tomorrow

As the baby boomer generation ages, more Americans than ever face the prospect of losing their sight from an age-related eye disease. Did you know that:

- More than 900,000 Americans over the age of 40 are blind, and an additional 2.4 million Americans in that age group have low vision.
- Blindness or low vision affect approximately one in 28 Americans over the age of 40.
- The number of blind people in the United States is expected to increase by 70 percent to 1.6 million by 2020. About 3.9 million Americans are projected to have low vision by that time.

Research Brings Hope for the Future

With funding from the National Institutes of Health, scientists have made tremendous progress during the past decade in understanding the basic biology that underlies eye diseases. Some of the most exciting developments have occurred in the field of genetics. Within the past few years, scientists have identified dozens of genes with hundreds of mutations that can cause vision loss. Such findings promise to lead to earlier detection and treatment for people with inherited eye diseases.

Exciting new breakthroughs in gene therapy—the replacement, removal, or introduction of new genes into the eye to correct the mutations that cause blindness—have also occurred. In animal studies, researchers have been able to use gene therapy to prevent the worsening of some eye diseases; for example, they've been able to slow down the growth of abnormal blood vessels in the eye, which is a major factor behind the vision loss associated with age-related macular degeneration and diabetic retinopathy.

In 2001, scientists reported a stunning success story: Using gene therapy, they were able to restore sight in three dogs that had been born with a blinding eye condition that closely resembles a rare inherited human eye disease known as Leber congenital amaurosis. This remarkable achievement has potential ramifications for other, more common blinding eye diseases. Phase I clinical trials in humans are scheduled to begin in 2005.

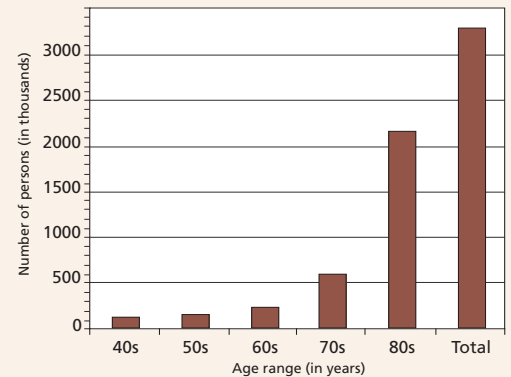
In other animal studies, scientists have had success introducing proteins called growth factors (also known as trophic factors or neurotrophic factors) into the eye to slow down the degeneration of diseased photoreceptor cells that occurs in retinitis pigmentosa and other eye diseases that affect the retina. Phase I trials in humans are already underway. Another exciting avenue of research involves the development of retinal prosthetic devices—tiny microchips that are implanted in the eye to replace the photoreceptor cells in the retina that normally convert light into electrical signals that the optic nerve then sends to the brain. Scientists hope that such devices may one day provide “artificial vision” to people who have lost their sight due to diseases affecting the retina.

Hope for Other Diseases

Only with continued funding will researchers be able to bring about the medical breakthroughs needed to prevent increasing numbers of at-risk Americans from going blind. But the benefits do not end there. Research into eye diseases also helps scientists gain a better understanding of a wide range of other degenerative diseases of the central nervous system, such as Parkinson's disease and amyotrophic lateral sclerosis (ALS)—diseases that disable tens of thousands of additional Americans annually.

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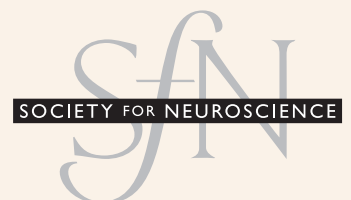
Vision impairment
in adults 40 years and older in the United States



The risk of vision loss increases with age. As America's population grows older, the need for strategies to prevent and treat vision impairment becomes even more urgent.

Already research has led to:

- More effective surgical and medical treatments for blinding eye diseases.
- The identification of dozens of gene mutations that cause people to be susceptible to eye diseases that cause vision loss.
- The discovery that certain antioxidants and zinc can reduce the rate of vision loss in some people with age-related macular degeneration.
- The remarkable finding that gene therapy can restore sight in dogs with a rare form of inherited blindness.



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