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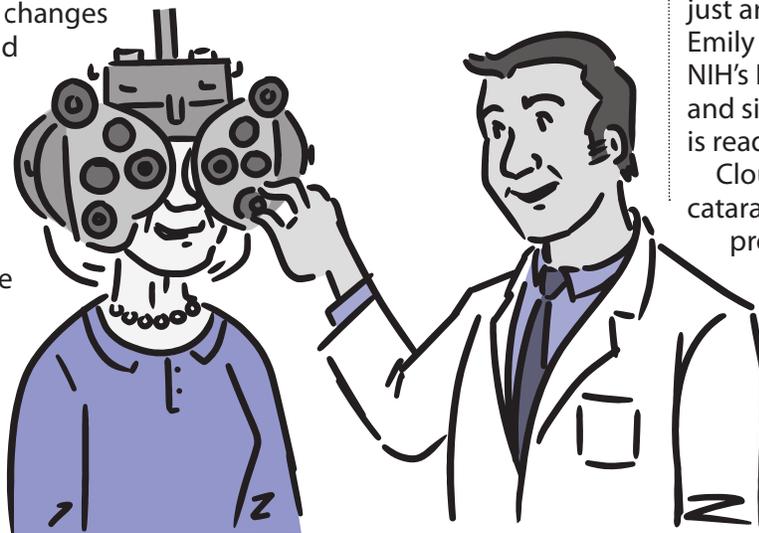
Inside News: 3 Protein Shapes... 4 Dialysis and Kidney Patients... College Drinking... Dietary Supplements

Your Aging Eyes How You See as Time Goes By

You may barely notice the changes at first. Maybe you've found yourself reaching more often for your glasses to see up close. You might have trouble adjusting to glaring lights or reading when the light is dim. You may even have put on blue socks thinking they were black. These are some of the normal changes to your eyes and vision as you age.

As more Americans head toward retirement and beyond, scientists expect the number of people with age-related eye problems to rise dramatically. You can't prevent all age-related changes to your eyes. But you can take steps to protect your vision and reduce your risk for serious eye disease in the future. Effective treatments are now available for many disorders that may lead to blindness or visual impairment. You can also learn how to make the most of the vision you have.

"Vision impairment and blindness are among the top 5 causes



of disability in older adults," says Dr. Cynthia Owsley, an eye researcher at the University of Alabama at Birmingham. Vision changes can make it difficult to perform everyday activities, such as reading the mail, shopping, cooking, walking safely and driving. "Losing your vision may not be life-threatening, but it certainly affects your quality of life," Owsley says.

The clear, curved lens at the front of your eye may be one of the first parts of your body to show signs of age. The lens bends to focus light and form images on the **retina** at the back of your eye. This flexibility lets you see at different distances—up close or far away. But the lens hardens with age. The change may begin as early as your 20s, but it can come so gradually it may take decades to notice.

Eventually, age-related stiffening and clouding of the lens affects just about everyone. You'll have trouble focusing on up-close objects, a condition called presbyopia. Anyone over age 35 is at risk for presbyopia.

"You might find you're holding your book farther away to read it. You might even start thinking your arms just aren't long enough," says Dr. Emily Chew, a clinical researcher at NIH's National Eye Institute. "A good and simple treatment for presbyopia is reading glasses."

Cloudy areas in the lens, called cataracts, are another common eye problem that comes with age.

More than 22 million Americans have cataracts. By age 80, more than half of us will have had them. Some cataracts stay small and have little effect on eyesight, but others become large and interfere with vision. Symptoms include blurriness,

difficulty seeing well at night, lights that seem too bright and faded color vision. There are no specific steps to prevent cataracts, but tobacco use and exposure to sunlight raise your risk of developing them. Cataract surgery is a safe and common treatment that can restore good vision.

The passage of time can also weaken the tiny muscles that control your eye's **pupil** size. The pupil becomes smaller and less responsive to changes in light. That's why people in their 60s need 3 times more light for comfortable reading than those in their 20s. Smaller pupils make it more difficult to see at night.

Trouble seeing at night, coupled with a normal loss of peripheral

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Definitions

Retina

Light-sensitive tissue at the back of your eye that converts light into electrical signals that travel to your brain.

Pupil

The round, black-looking opening that lets light into your eye. It gets smaller in bright light and larger in dim light.

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vision as you age, can affect many daily activities, including your ability to drive safely. Loss of peripheral vision increases your risk for automobile accidents, so you need to be more cautious when driving.

"Keeping older adults active and on the road as drivers, as long as they're safely able to do so, is considered important to their health and psychological well-being," says Owsley. But she notes that tests for motor vehicle licenses tend to focus on visual acuity—how well you can read the letters on an eye chart.

"Visual acuity tests may not be the best way to identify drivers at risk for crashes," she says. "Other issues are also important, like contrast sensitivity, your peripheral vision and



Wise Choices Protect Your Vision

- Have a comprehensive eye exam each year after age 50.
- Stop smoking.
- Eat a diet rich in green, leafy vegetables and fish.
- Exercise.
- Maintain normal blood pressure.
- Control diabetes if you have it.
- Wear sunglasses and a brimmed hat any time you're outside in bright sunshine.
- Wear protective eyewear when playing sports or doing work around the house that may cause eye injury.

your visual processing speed—how quickly you can process visual information and make decisions behind the wheel."

To find better ways to assess driver safety, Owsley and her colleagues are giving 2,000 older drivers different types of vision screening tests, including tests of visual processing speed. By tracking their driving records for several years, the scientists can figure out which tests were best at predicting safe or dangerous driving, including car crashes. These findings might eventually lead to more accurate screening tests to identify potentially unsafe drivers.

If you're not convinced you should have regular eye exams, consider that some of the more serious age-related eye diseases—like glaucoma, age-related macular degeneration (AMD) and diabetic eye disease—may have no warning signs or symptoms in their early stages.

Glaucoma comes from increased fluid pressure inside the eye that damages the **optic nerve**. "Glaucoma can slowly steal your peripheral vision. You may not notice it until it's advanced," says Chew. It can be treated with prescription eye drops, lasers or surgery. If not treated, however, it can lead to vision loss and blindness.

AMD causes gradual loss of vision



Definitions

Optic Nerve

The largest sensory nerve of the eye. It carries signals for sight from the retina to the brain.



Web Links

For more about eyes and aging, see our links online:

<http://newsinhealth.nih.gov/issue/Jan2011/Feature1>

in the center of your eyesight. "AMD is the leading cause of blindness in Americans over age 65," says Chew.

A large NIH-supported clinical study by Chew and others found that a specific combination of vitamins and minerals can prevent AMD from progressing to a more severe form. Scientists also found that people who eat diets rich in green, leafy vegetables—such as kale and spinach—or fish are less likely to have advanced AMD. A larger study of 4,000 AMD patients is now testing to see if fish oil or a vitamin/mineral combination might slow progress of the disease.

Diabetic eye disease, another leading cause of blindness, can damage the tiny blood vessels inside the retina. Keeping your blood sugar under control can help prevent or slow the problem.

The only way to detect these serious eye diseases before they cause vision loss or blindness is through a comprehensive dilated eye exam. Your eye care professional will put drops in your eyes to enlarge, or dilate, the pupils and then look for signs of disease. "Having regular comprehensive eye care gives your doctor a chance to identify a problem very early on and then treat it," says Owsley. Annual eye exams are especially important if you have diabetes.

"Many of the healthy behaviors that help reduce your risk for long-term diseases, like heart disease and cancer, can also help to protect your eyesight," says Owsley. These include not smoking, eating a healthy diet and controlling conditions like diabetes and high blood pressure.

"It's nice to know that healthy living not only adds years to your life, but also protects your vision as you get older," Owsley says. ■

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Biological Blueprints

Protein Shapes Help Treat Disease

How many proteins do you think you have in your body? The answer is in the billions. Proteins deliver oxygen to your tissues, defend against infection, digest food and even make new proteins. These molecules are uniquely designed to carry out their tasks. If we can understand how protein shapes affect what they do, we might be able to understand what goes wrong in some diseases and develop better treatments.

Proteins are made of long strings of amino acids. These basic building blocks are chained together in a specific sequence dictated by that protein's **gene**. In less than a second, the chain twists and buckles into a 3-dimensional structure. Each protein's shape is unique. The shape lets the protein interact with other molecules to trigger all the reactions that run our bodies.

Shape is so important that just one amino acid change can alter a protein's entire structure—and its performance. These switches can lead to life-threatening disorders like sickle cell disease, cystic fibrosis and Alzheimer's disease. Knowing a protein's shape can help scientists design drugs that fix the flawed protein or even block its activity.

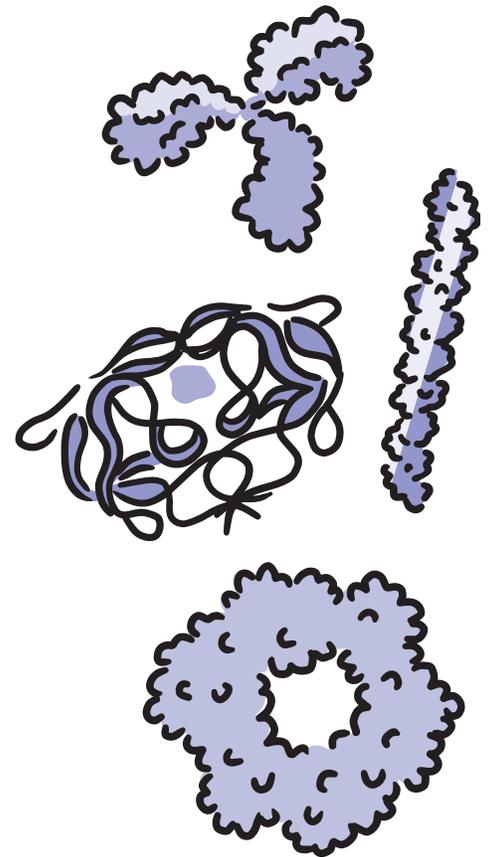
Protein structures can also help pinpoint the Achilles' heels of

disease-causing viruses or bacteria. One structure-based success came in 1989, when NIH-funded scientists discovered the shape of HIV protease, a protein that helps the AIDS virus get into our cells. The researchers showed that the protein, like a butterfly, was made up of two equal halves, and the site at the protein's center was essential for infecting new cells.

Eventually, other researchers used this knowledge to come up with a new class of drugs, called protease inhibitors, that are now widely used to block the action of HIV protease and stop the virus from infecting more cells. Protease inhibitors helped to revolutionize the treatment of HIV/AIDS, transforming HIV infection from a death sentence into a treatable condition that people can live with for decades.

Unfortunately, HIV is a moving target. When it reproduces inside the body, it can churn out slightly altered viruses with different protease shapes. The inhibitor drugs might not work on these altered proteins. Some researchers are now developing new generations of HIV protease inhibitors that will combat these drug-resistant viral strains.

Scientists have also been using their structural knowledge of HIV to develop other approaches for combating the virus. They recently identified an unchanging region on the HIV surface and isolated human **antibodies** that react with it. The antibodies were able to stop more



than 90% of known global HIV strains from infecting human cells. This advance will hopefully let researchers design more effective HIV vaccines.

Many other scientific problems will benefit from a better understanding of protein shapes. NIH researchers recently used discoveries about the influenza (flu) virus structure to generate antibodies that attack a wide array of influenza viruses in mice, ferrets and monkeys. This accomplishment may point the way to a universal flu vaccine. Trials are already under way in humans to test the approach.

In the future, research on protein structures could lead to new treatments for a variety of diseases and conditions that are more potent, more convenient to take and have fewer side effects. ■



Wise Choices Help Fight AIDS

Did you know you can help NIH scientists fight AIDS by donating unused time on your home computer? FightAIDS@Home provides free software that you download and install. The software uses your computer's idle cycles to help researchers discover new drugs and build on our growing knowledge of the structural biology of AIDS. To learn more, go to <http://fightaidsathome.scripps.edu>.



Definitions

Gene

A stretch of DNA, a substance you inherit from your parents, that dictates the order in which amino acids link together to form a protein.

Antibodies

Germ-fighting molecules made by the body.



Web Links

For more about research on protein structure, see our links online:

<http://newsinhealth.nih.gov/issue/Jan2011/Feature2>

Health Capsules

For links to more information, see these stories online:
<http://newsinhealth.nih.gov/issue/Jan2011/Capsule1>

More Frequent Dialysis Helps Kidney Patients

Kidney patients fare better on an almost-daily hemodialysis regimen than on the standard 3-times-a-week plan, scientists report. Although more research is needed, the finding could lead to changes in the standard of care for patients who need dialysis.

Nearly 400,000 Americans depend on dialysis to survive. These treatments are needed when kidneys fail and can no longer remove waste products from the body. In the most common kind of dialysis, hemodialysis, your blood flows through a special filter that removes wastes and extra fluids. The clean blood is then returned to your body.

Despite recent advances in technology and medication, up to 1 in 5 patients on dialysis die each year. NIH-funded scientists set out to test whether adding more dialysis sessions could improve patients' survival and well-being.

The researchers randomly assigned nearly 250 dialysis patients to 2 groups. One group received 6 treatments a week. The other received 3 treatments each week.

The scientists found that patients receiving more frequent dialysis had improvements in heart health and blood pressure, as well as in overall health. More frequent treatments also helped avoid high blood levels of phosphate, which are often a problem for patients on dialysis. A downside is that access to blood vessels needed to be modified about twice as often in patients who received more treatments.

The scientists couldn't address whether more frequent treatments affected death rates. Still, this study offers hope that simple changes to current dialysis treatments could greatly improve the health of the patients who need them. ■



Featured Web Site NIH Office of Dietary Supplements

<http://ods.od.nih.gov>

Most adults in the U.S. take one or more dietary supplements. Learn how to choose and use these products wisely, and get reliable answers to common questions at this newly updated site. Download a free mobile app for the iPhone or iPad to track the supplements you take.



Reducing College Drinking

College students are less likely to get drunk when universities and surrounding communities work together to reduce drinking, a new study finds. Similar strategies may help reduce drinking on campuses nationwide.

Each year among U.S. college students, alcohol contributes to about 1,800 deaths, 600,000 unintentional injuries and 700,000 assaults. Many college efforts have tried to reduce drinking by targeting students on campus. But fewer studies have looked at a broader approach.

To test a community-based program, NIH-funded scientists worked with 14 public universities. Half the schools used community-based alcohol interventions for at least 2 years. The program included drunk-driving checkpoints, better prevention of alcohol sales to minors and stiffer penalties to prevent parties that disturb the peace. The other 7 schools were monitored for comparison.

The researchers analyzed about 20,000 online student surveys collected over 4 years. Results showed

that students at the intervention schools were much less likely to drink to intoxication at off-campus parties, bars and restaurants.

"Nearly as significant was that we saw no concurrent increase in drinking at non-targeted settings such as parks, beaches or residence halls," says lead researcher Dr. Robert Saltz of the Prevention Research Center in Berkeley, California. "Some fear that more rigorous alcohol control measures will merely drive college student drinking to other, presumably more dangerous, settings. But this was not the case here." ■

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