

# TAKING A CLOSER LOOK AT AGE-RELATED MACULAR DEGENERATION





Cover: Georgia O'Keeffe, American, 1887-1986, Black Rock with Blue Sky and White Clouds, 1972, oil on canvas, 36x30 1/2 in., Alfred Stieglitz Collection, bequest of Georgia O'Keeffe, 1987. 250.3, Reproduction, The Art Institute of Chicago.

*"It's like there are little holes in my vision. I can't see straight on very well. But around the edges are little holes where I can see quite clearly."*

Georgia O'Keeffe continued to paint (including the cover image) while suffering from AMD.

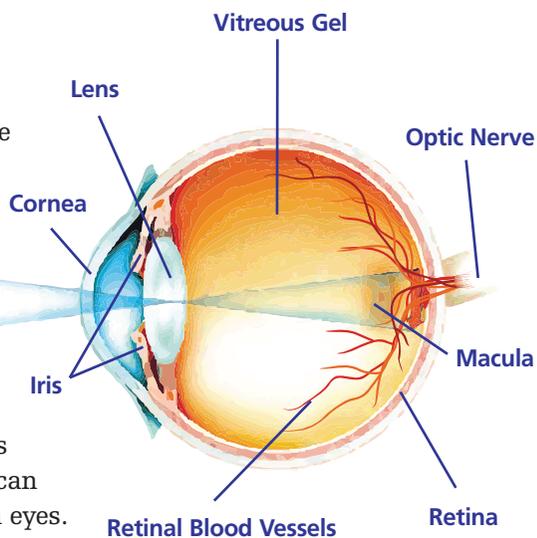
## TAKING A CLOSER LOOK AT AGE-RELATED MACULAR DEGENERATION

**Age-related macular degeneration (AMD) is the leading cause of irreversible vision loss in Americans over 65 years of age.<sup>1</sup>** It is a progressive eye disease that causes deterioration of the macula—the small, central part of the retina that allows us to see fine details. While AMD rarely causes total blindness, it often results in significant loss of central vision.

Close to 2 million Americans are estimated to have advanced AMD, and an additional 7.3 million people are at substantial risk of losing vision from the disease.<sup>2</sup> However, new therapies that help slow and even reverse vision loss are available.

# WHAT IS AMD?

AMD is an eye disease that causes the deterioration, or breakdown, of the macula—the light-sensing, central portion of the retina—resulting in the loss of sharp, central vision. AMD is painless and usually progresses slowly. In fact, once diagnosed with AMD some patients may go for years without any noticeable loss of vision. However, in others the disease may progress faster and can lead to significant vision loss in both eyes.



AMD almost always develops in both eyes, although one eye may be much more severely affected. The rate at which it develops usually depends on which of the two types of AMD you have—the more common “dry” AMD or the more severe “wet” AMD.

## “Dry” AMD

“Dry” AMD is the most common type of AMD, accounting for more than 85%-90% of all cases.<sup>3</sup> Dry AMD occurs when small, yellowish deposits called drusen start to form and collect beneath the macula. While drusen can be harmless, in AMD the deposits are related to the breakdown of the light-sensing cells in the macula, which slowly blurs and distorts central vision. Dry AMD usually progresses slowly and in stages—early, intermediate, and advanced—and can develop into wet AMD. While dry AMD affects the ability to read, recognize faces, and see fine details, it usually only causes mild vision loss.

## “Wet” AMD

“Wet” AMD occurs in around 10% of individuals with AMD<sup>4</sup> and is caused by the growth of abnormal blood vessels under the macula. Because these vessels are very fragile, they often leak blood and fluid, damaging the macula and causing visual cells to die. This damage results in distortion and loss of central vision. Unlike dry AMD, wet AMD does not have stages but is considered advanced—in fact, all people who have wet AMD had dry AMD first. With wet AMD severe vision loss can occur rapidly, sometimes in as little as 3 months, and without treatment results in legal blindness for most people.

# HOW DOES AMD AFFECT MY VISION?

**AMD affects the ability to see centrally, both near and far.** This loss of central vision makes everyday tasks such as driving, reading, and watching television difficult. You may also find it hard to recognize faces and adjust from dark to light conditions. However, most people with AMD keep a reasonable amount of their peripheral vision and can learn to adapt and make the most of their remaining vision.

## Dry AMD

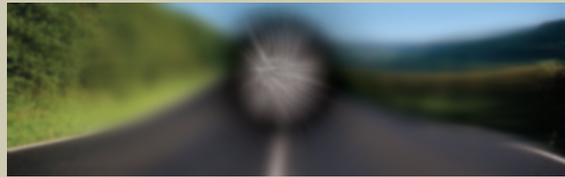
In the early stage of dry AMD there are usually no symptoms or vision loss, although you may find it hard to read in low light or see small electronic screens. During this stage drusen begin to collect and can be detected during an eye exam. If detected at this early stage, it may be possible to slow down or prevent future vision loss.

During the intermediate stage of dry AMD a blurred spot in the center of your vision may start to develop. You may also need more light or magnification for reading or seeing fine details, and you may have a hard time recognizing faces.

With advanced dry AMD the drusen deposits start to cause the loss of important cells in the center of your retina. At this point the blurred spot in your central vision will get larger and darker, causing increasing vision loss. Dry AMD only rarely causes major vision loss, but can progress into the more severe form—wet AMD.



Normal vision



The same scene as viewed by a person with AMD

## Wet AMD

Damage to the macula occurs much faster in wet AMD, causing blurred or even lost central vision. Early symptoms of wet AMD include blurred central vision, straight lines appearing wavy, dark spots in the center of your vision, and even objects appearing to move or change shape or color.

As the disease progresses the blurred spot will get larger and darker. Because the cones (eye cells that detect color) are highly concentrated in the macula, color vision may also deteriorate. Wet AMD can lead to legal blindness.

# WHAT ARE THE RISK FACTORS FOR AMD?

## Age

Age is the greatest risk factor for AMD. People over age 60 are at greater risk than other age groups.

## Genes

Individuals who have one or more family members with AMD, especially immediate relatives such as a parent or sibling, are at increased risk.

## Gender and Race

Women may have a greater risk of developing AMD than men do, and Caucasians are more likely than Blacks to lose vision from AMD.

## Eye Color

AMD is more common in people with light colored eyes. While the reason for this is uncertain, it may be because of ethnicity or genetic predisposition, or because lighter eyes have less protective pigment to block sunlight.

## Diet and Nutrition

Nutrition can have a huge impact on your risk for AMD. A diet high in saturated fat and low in antioxidants can be harmful to your eyes.

## Sunlight Exposure

The cells of the macula are highly sensitive to sun light. Exposure may increase risk, and people with light colored eyes are more likely to get damage from the sun.

## Smoking

Smoking reduces the protective antioxidants in the eye and can increase the risk of AMD.

## Heart Disease

High blood pressure and other risk factors for heart disease raise the risk of AMD, possibly because of the impact on blood vessels supplying nutrition to the retina.

## Obesity

Research has found a link between obesity and the progression of early or intermediate stage AMD to late stage AMD. Being overweight or obese can also contribute to heart disease, which is harmful to your eyes.

# WHAT ROLE DOES NUTRITION PLAY IN PROTECTING MY EYESIGHT?

**Improving your diet plays a very important role in your vision health.** There is growing evidence that shows that the right diet may improve the health of your eyes, help prevent the onset of AMD, and even slow the rate of vision loss.

Free radicals—harmful molecules that can damage the fragile cells of the macula—occur naturally and are produced by environmental insults such as cigarette smoke, blue light, and harmful UV light. Antioxidants in foods help fight free radicals by neutralizing them and making them harmless. The antioxidants you are probably most familiar with are vitamin C, vitamin E, and beta-carotene. Many of these antioxidants are also plant pigments and give fruits and vegetables their vibrant colors.

The family of antioxidants that appear to be highly protective to your eyes is carotenoids. Two of these carotenoids—lutein and zeaxanthin (pronounced loo-teen and zeeah-zan-thin)—are pigments found in a variety of colorful fruits and vegetables. Researchers believe that they protect against AMD by collecting in the macula and blocking harmful light. A study sponsored by the National Institutes of Health (NIH) found that people who ate the highest amounts

of food rich in carotenoids, especially lutein and zeaxanthin, had a 43% lower risk of developing AMD than those who ate food with the least amounts.<sup>5</sup> These antioxidants can be found in egg yolks, green leafy vegetables, corn, oranges, squash, and many other fruits and vegetables.

Another NIH study, the Age-Related Eye Disease Study (AREDS), found a link between a certain combination of vitamins and minerals, and a lower risk of AMD. In the study, individuals who were at high risk of developing advanced stages of AMD took a supplement containing vitamin C, vitamin E, beta-carotene, zinc, and copper. These individuals reduced their risk of developing advanced AMD by up to 25%.<sup>6</sup> A second AREDS study is now underway and is looking at variations of the original vitamin-mineral formula, including the addition of lutein and omega-3 fatty acids.

Omega-3 fatty acids have also been found to reduce a person's risk of getting AMD. In at least two studies, people who ate 1-3 servings of fish per week were found to be less likely to develop AMD.<sup>7</sup> Foods that are high in omega-3 fatty acids include wild salmon and other oily fish, walnuts, and flaxseed.

Individuals with intermediate AMD in one or both eyes, or with advanced AMD in one eye, should consider the AREDS formula of antioxidants and zinc. Visit the National Eye Institute's website at [www.nei.nih.gov](http://www.nei.nih.gov) for more information on the formulation. However, before making any changes to your diet and supplements, be sure to discuss them with your eye care

professional to determine what is best for you. In addition to thinking about things you should add to your diet, you should also make sure you avoid saturated fats and drink only in moderation. Alcohol depletes the body of protective antioxidants and saturated fats can harm blood vessels and produce free radicals that can damage the macula.

## FOOD SOURCES FOR EYE-HEALTHY NUTRIENTS

There are many foods that are good for your eyes and a number of them are included in the table below. If you are unable to get enough nutrients directly from your food, you may want to talk to your eye care professional about taking supplements.

### ■ **Beta-carotene**

carrots, green leafy vegetables, sweet potatoes, cantaloupes

### ■ **Calcium\***

dairy products, green leafy vegetables, tofu

### ■ **Folic Acid**

green leafy vegetables, oranges, bananas, liver, dried beans, peas

### ■ **Iron\***

meat, poultry, fish, eggs, vegetables, tofu

### ■ **Lutein & Zeaxanthin**

green leafy vegetables, eggs, corn, oranges, mangos, carrots

### ■ **Lycopene**

tomatoes, watermelons, pink grapefruits, red grapes

### ■ **Selenium**

seafood, kidney, liver, meats

### ■ **Vitamin A\***

dairy products, egg yolks, margarine, fish oil

### ■ **Vitamin B<sub>6</sub>**

whole grains, poultry, fish, pork, dried beans, bananas, avocados

### ■ **Vitamin B<sub>12</sub>**

meat, dairy products, eggs, liver, fish

### ■ **Vitamin C\***

citrus fruits, melons, berries, bell peppers, potatoes, broccoli, tomatoes

### ■ **Vitamin D\***

egg yolks, saltwater fish, liver

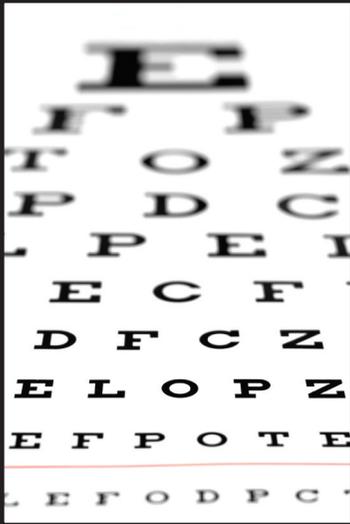
### ■ **Vitamin E**

whole grains, green leafy vegetables, nuts, vegetable oil, wheat germ

### ■ **Zinc\***

meat, liver, eggs, seafood

\*These nutrients can also be found in some fortified foods such as cereal and milk.



## WHAT CAN I DO TO PROTECT MY EYES?

While you can't change your age, your sex, or your family tree, there are a number of things you can do to help protect your eyes:

- Wear sunglasses or brimmed hats to shield your eyes from sunlight—contact lenses also offer a protective benefit
- Eat a diet full of fruits, vegetables, and other foods that contain vision protecting vitamins and minerals—see the earlier section for more information
- Talk to your eye care professional about taking supplements
- Limit your intake of saturated fats
- Don't smoke
- Exercise regularly and maintain an ideal weight
- Work with your health care professional to control high blood pressure and other cardiovascular risk factors
- Get regular eye exams—especially if you are at increased risk

# WHAT TESTS WILL DETECT AND MONITOR MY AMD?

It's very important for you to get regular eye exams because the earlier eye diseases like AMD are detected, the more treatment options are possible. The National Eye Institute recommends that people over the age of 50 get an eye exam every year—or as recommended by your eye care professional. You should also contact your eye care professional immediately if you notice any changes in your vision. Listed below are many of the tests that may be used to detect and monitor AMD.

## Risk Assessment

Your risk for AMD can be evaluated with the risk factors listed on page 3.

## Visual Field Test

A series of lights test your central and peripheral vision, detecting impaired areas of vision.

## Dilated Eye Exam

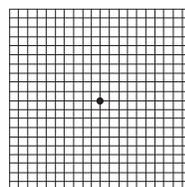
Enlarging your pupils with eye drops allows your eye care professional to examine your retina and the back of your eye, detecting any drusen deposits and fluid or blood accumulation.

## Visual Acuity / Function

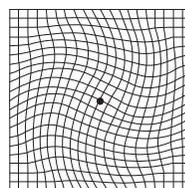
The common eye chart measures how well you see at various distances. Questions about your vision during tasks such as driving and reading can assess visual function.

## Amsler Grid

If you notice any distortions of the lines on this checkerboard-like grid (see back cover) it may be a sign of AMD. However, ONLY a trained professional should diagnose AMD and the grid should not substitute regular eye exams.



Normal Vision



As Viewed by Someone With AMD

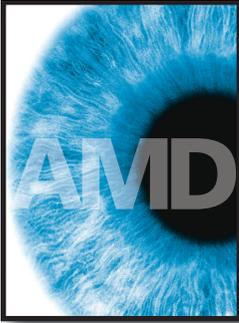
## Fluorescein Angiogram and ICG Angiography

Dye injected into your arm circulates through your bloodstream and into your retina, allowing a detailed picture to be taken and identifying any leaky blood vessels or other retinal changes.

## Optical Coherence Tomography (OCT)

In a similar way to how ultrasound uses sound, OCT uses light to create a clear picture of the macula and retina. A comparison of pictures over time can show disease progression.

# WHAT HELP IS AVAILABLE FOR PEOPLE WITH AMD?



Although there is no cure for either type of AMD, there are exciting new therapies for wet AMD that can slow its progression and even restore vision in some patients. These anti-VEGF drugs are injected into the eye and work by blocking a protein that promotes new blood vessel growth. One of these drugs—Lucentis—has been found to stabilize vision in most and restore vision in around 40% of patients.<sup>8</sup>

Avastin is another anti-VEGF that is similar to Lucentis but is not FDA-approved for treatment of wet AMD—it is approved for colorectal cancer. Many doctors use it for wet AMD anyhow—a practice called off-label use. Although it has not been through the FDA approval process, a recent clinical trial found Avastin to be as effective as Lucentis in treating wet AMD<sup>9</sup>; however, safety trials are still being conducted, and at the time this brochure was printed some Avastin patients were experiencing serious eye infections. Be sure to do your research if you are considering Avastin.

Whichever drug you and your physician decide to use, it's critical that you receive all of your scheduled injections. Wet AMD is chronic and progressive—like high blood pressure—and must be proactively treated. Once your vision stabilizes or improves, it may be tempting to skip a treatment or two—don't! Without regular treatments, any improvements to your vision will likely reverse and future vision loss will become more difficult to reverse.

There are new treatments expected soon that may require fewer injections and further reduce the burden of AMD. Also, although not used frequently, there are a small number of people with wet AMD that could benefit from laser photocoagulation.

There are no-FDA approved treatments for dry AMD yet, although nutritional intervention can play a role in slowing the disease. For those with severe dry AMD, low-vision aids such as magnifying devices and large-print reading materials can be used to help with everyday activities, and trained professionals can help you adapt to your vision loss.

# RESOURCES FOR MORE INFORMATION ON AMD AND LOW-VISION SERVICES

**Alliance for  
Aging Research**  
[www.agingresearch.org](http://www.agingresearch.org)  
202.293.2856

**AMD Alliance International**  
[www.amdalliance.org](http://www.amdalliance.org)  
877.AMD.7171

**American Academy  
of Ophthalmology**  
[www.aaopt.org](http://www.aaopt.org)  
415.561.8500

**American Foundation  
for the Blind**  
[www.afb.org](http://www.afb.org)  
800.AFB.LINE

**American Macular  
Degeneration Foundation**  
[www.macular.org](http://www.macular.org)  
888.MACULAR

**American Optometric  
Association**  
[www.aoa.org](http://www.aoa.org)  
800.365.2219

**American Retina  
Foundation**  
[www.americanretina.org](http://www.americanretina.org)  
904.998.0356

**Foundation  
Fighting Blindness**  
[www.blindness.org](http://www.blindness.org)  
800.683.5555

**Lighthouse International**  
[www.lighthouse.org](http://www.lighthouse.org)  
800.829.0500

**Macular Degeneration  
Partnership**  
[www.amd.org](http://www.amd.org)  
888.430.9898

**National Association for  
Visually Handicapped**  
[www.navh.org](http://www.navh.org)  
212.889.3141

**National Eye Institute**  
[www.nei.nih.gov](http://www.nei.nih.gov)  
301.496.5248



<sup>1</sup> National Eye Institute. 2006. *Progress in Eye and Vision Research: 1999-2006*.

<sup>2</sup> David S. Friedman, et al. 2004. Prevalence of Age-Related Macular Degeneration in the United States. *Arch Ophthalmol* 122(4):564-72.

<sup>3</sup> AMD Alliance International. Basic Facts About AMD. [www.amdalliance.org/information\\_overview\\_basic\\_facts.html](http://www.amdalliance.org/information_overview_basic_facts.html).

<sup>4</sup> Id.

<sup>5</sup> Johanna M. Seddon, et al. 1994. Dietary Carotenoids, Vitamins A, C, and E, and Advanced Age-Related Macular Degeneration. *JAMA* 272(18):1413-20.

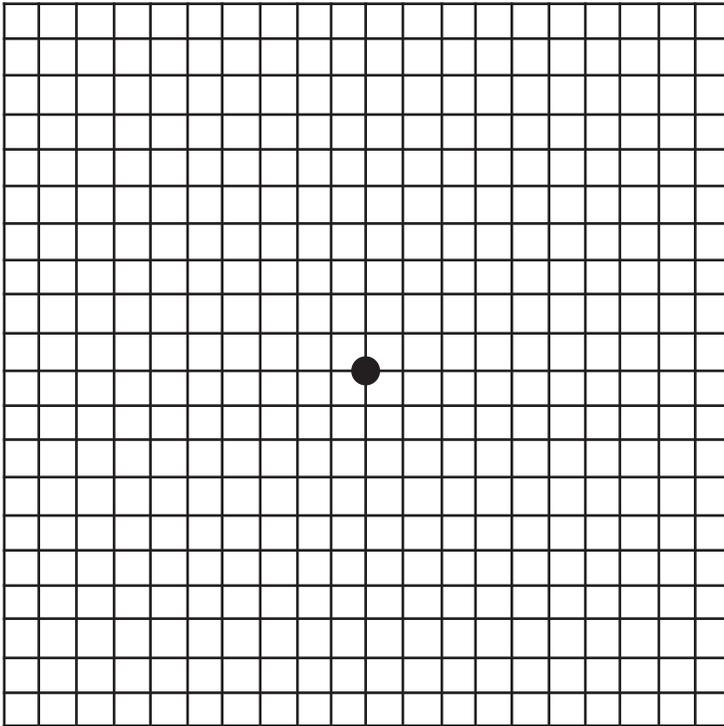
<sup>6</sup> Age-Related Eye Disease Study Research Group. 2001. AREDs report no. 8. *Arch Ophthalmol* 119(10):1417-36.

<sup>7</sup> *Arch Ophthalmol*. 2006. 124(7):938-1070.

<sup>8</sup> National Eye Institute. Press Release. [www.nei.nih.gov/news/pressreleases/042811.asp](http://www.nei.nih.gov/news/pressreleases/042811.asp)

<sup>9</sup> Rosenfeld et al. 2006. Ranibizumab for Neovascular Age-Related Macular Degeneration. *NEJM* 355:1419-31

# AMSLER GRID



## Directions for the Amsler Grid

Hold the grid at a comfortable reading distance (use glasses if needed). Cover one eye and look at the dot in the center of the grid. Note how the lines and squares appear. Do they look straight and even, or do any seem wavy or distorted? Are any of the pieces of the grid missing? Now cover your other eye and follow the same directions. If the lines do not appear straight and even, contact your eye care professional immediately.



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**Advancing Science. Enhancing Lives.**

Reviewed by National Eye Institute principal investigators.