

Age-Related Macular Degeneration



What **you** should know



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health
National Eye Institute

Age-Related Macular Degeneration: What you should know

This booklet is for people with age-related macular degeneration (AMD) and their families and friends. It provides information about AMD and answers questions about its causes and symptoms. Diagnosis and types of treatment are described.

The National Eye Institute (NEI) conducts and supports research that leads to sight-saving treatments and plays a key role in reducing visual impairment and blindness. The NEI is part of the National Institutes of Health (NIH), an agency of the U.S. Department of Health and Human Services.

For more information about the NEI, contact:

National Eye Institute
National Institutes of Health
2020 Vision Place
Bethesda, MD 20892–3655
Telephone: 301–496–5248
E-mail: 2020@nei.nih.gov
Website: www.nei.nih.gov

Contents

What is age-related macular degeneration?	1
Where is the macula?.....	1
Are there different forms of AMD?.....	2
What is wet AMD?	2
What is dry AMD?	2
Do drusen cause vision loss in advanced dry AMD?.....	4
The dry form has early and intermediate stages. Does the wet form have similar stages?	5
Can advanced AMD be either the dry or the wet form?.....	5
Which is more common—the dry form or the wet form?	5
Can the dry form turn into the wet form?	6
Who is at risk for AMD?.....	6
How is AMD detected?	7
How is dry AMD treated?	8
What is the dosage of the AREDS formulation?	8
Who should take the AREDS formulation?	9
Can people with early stage AMD take the AREDS formulation to help prevent the disease from progressing to the intermediate stage?	9

Can diet alone provide the same high levels of antioxidants and zinc as the AREDS formulation?	10
Can a daily multivitamin alone provide the same high levels of antioxidants and zinc as the AREDS formulation?	10
How is wet AMD treated?	10
What can I do if I already have lost some vision from AMD?	12
What research is being done?	12
What can I do to protect my vision?	13
Can my lifestyle make a difference?	15
What should I ask my eye care professional?	16
Where can I get more information?	19

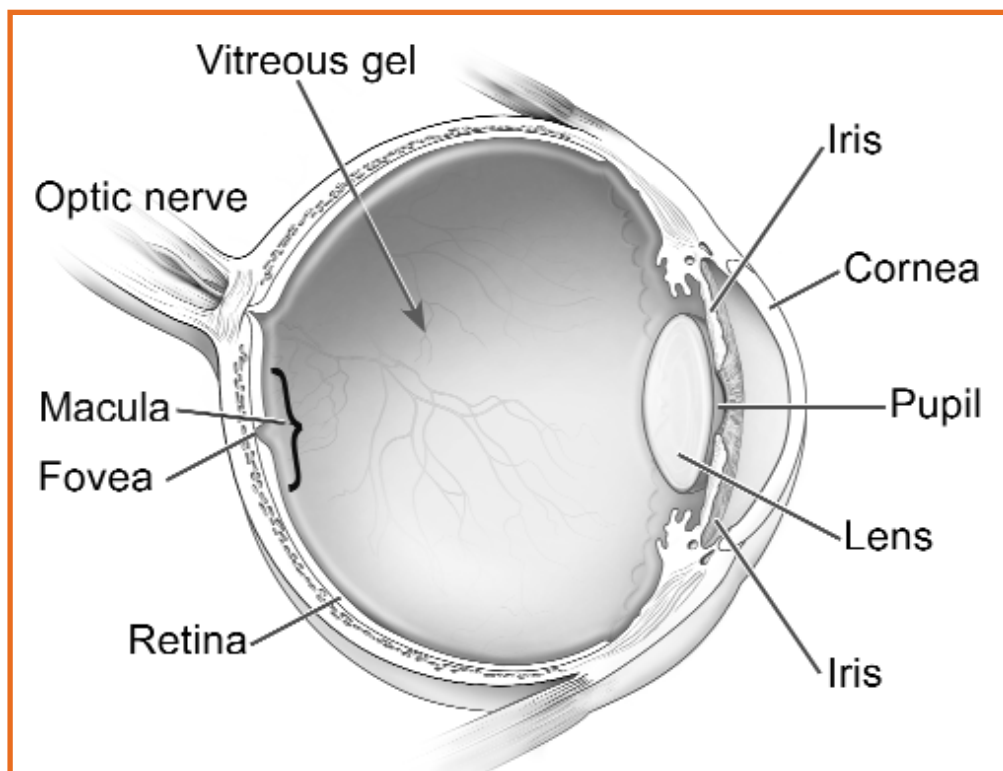
What is age-related macular degeneration?

Age-related macular degeneration (AMD) is a disease that blurs the sharp, central vision you need for “straight-ahead” activities such as reading, sewing, and driving. AMD affects the macula, the part of the eye that allows you to see fine detail. (See diagram below.) AMD causes no pain.

In some cases, AMD advances so slowly that people notice little change in their vision. In others, the disease progresses faster and may lead to a loss of vision in both eyes. AMD is a leading cause of vision loss in Americans 60 years of age and older.

Where is the macula?

The macula is located in the center of the **retina**, the light-sensitive tissue at the back of the eye. The retina instantly



converts light, or an image, into electrical impulses. The retina then sends these impulses, or nerve signals, to the brain.

Are there different forms of AMD?

AMD occurs in two forms: wet and dry.

What is wet AMD?

Wet AMD occurs when abnormal blood vessels behind the retina start to grow under the macula. These new blood vessels tend to be very fragile and often leak blood and fluid. The blood and fluid raise the macula from its normal place at the back of the eye. Damage to the macula occurs rapidly.

With *wet AMD*, loss of central vision can occur quickly. *Wet AMD* is considered to be *advanced AMD* and is more severe than the dry form.

An early symptom of *wet AMD* is that straight lines appear wavy. If you notice this condition or other changes to your vision, contact your eye care professional at once. You need a comprehensive dilated eye exam.

What is dry AMD?

Dry AMD occurs when the light-sensitive cells in the macula slowly break down, gradually blurring central vision in the affected eye. As *dry AMD* gets worse, you may see a blurred spot in the center of your vision. Over time, as less of the macula functions, central vision in the affected eye can be lost gradually.



Normal vision



The same scene as viewed by a person with age-related macular degeneration

The most common symptom of *dry AMD* is slightly blurred vision. You may have difficulty recognizing faces. You may need more light for reading and other tasks. *Dry AMD* generally affects both eyes, but vision can be lost in one eye while the other eye seems unaffected.

One of the most common early signs of *dry AMD* is drusen. Drusen are yellow deposits under the retina. They often are found in people over age 60. Your eye care professional can detect drusen during a comprehensive dilated eye exam.

Dry AMD has three stages, all of which may occur in one or both eyes:

1. **Early AMD.** People with *early AMD* have either several small drusen or a few medium-sized drusen. At this stage, there are no symptoms and no vision loss.

2. **Intermediate AMD.** People with *intermediate AMD* have either many medium-sized drusen or one or more large drusen. Some people see a blurred spot in the center of their vision. More light may be needed for reading and other tasks.
3. **Advanced Dry AMD.** In addition to drusen, people with *advanced dry AMD* have a breakdown of light-sensitive cells and supporting tissue in the central retinal area. This breakdown can cause a blurred spot in the center of your vision. Over time, the blurred spot may get bigger and darker, taking more of your central vision. You may have difficulty reading or recognizing faces until they are very close to you.

If you have vision loss from *dry AMD* in one eye only, you may not notice any changes in your overall vision. With the other eye seeing clearly, you still can drive, read, and see fine details. You may notice changes in your vision only if AMD affects both eyes. If blurriness occurs in your vision, see an eye care professional for a comprehensive dilated eye exam.

Do drusen cause vision loss in advanced dry AMD?

Drusen alone do not usually cause vision loss. In fact, scientists are unclear about the connection between drusen and AMD. They **do** know that an increase in the size or number of drusen raises a person's risk of developing either *advanced dry AMD* or *wet AMD*. These changes **can** cause serious vision loss.

The dry form has early and intermediate stages. Does the wet form have similar stages?

No. The *wet form* is considered *advanced AMD*.

Can advanced AMD be either the dry form or the wet form?

Yes. Both the *wet form* and the *advanced dry form* are considered *advanced AMD*. Vision loss occurs with either form. In most cases, only *advanced AMD* can cause vision loss.

People who have *advanced AMD* in one eye are at especially high risk of developing *advanced AMD* in the other eye.

Which is more common—the dry form or the wet form?

The *dry form* is much more common. More than 85 percent of all people with *intermediate* and *advanced AMD* combined have the *dry form*.

However, if only *advanced AMD* is considered, about two-thirds of patients have the *wet form*. Because almost all vision loss comes from *advanced AMD*, the *wet form* leads to significantly more vision loss than the *dry form*.

Can the dry form turn into the wet form?

Yes. All people who have the *wet form* had the *dry form* first.

The *dry form* can advance and cause vision loss without turning into the *wet form*. The *dry form* also can suddenly turn into the *wet form*, even during *early stage AMD*. There is no way to tell if or when the *dry form* will turn into the *wet form*.

Who is at risk for AMD?

AMD can occur during middle age. The risk increases with aging. Other risk factors include:

- Smoking.
- Obesity. Research studies suggest a link between obesity and the progression of early and intermediate stage AMD to advanced AMD.
- Race. Whites are much more likely to lose vision from AMD than African Americans.
- Family history. People with a family history of AMD are at higher risk of getting the disease.
- Gender. Women appear to be at greater risk than men.

How is AMD detected?

AMD is detected during a comprehensive eye exam that includes:

- **Visual acuity test.** This eye chart test measures how well you see at various distances.
- **Dilated eye exam.** Drops are placed in your eyes to widen, or dilate, the pupils. Your eye care professional uses a special magnifying lens to examine your retina and optic nerve for signs of AMD and other eye problems. After the exam, your close-up vision may remain blurred for several hours.
- **Tonometry.** An instrument measures the pressure inside the eye. Numbing drops may be applied to your eye for this test.

Your eye care professional also may do other tests to learn more about the structure and health of your eye.

During an eye exam, you may be asked to look at an **Amsler grid**. The pattern of the grid resembles a checkerboard. You will cover one eye and stare at a black dot in the center of the grid. While staring at the dot, you may notice that the straight lines in the pattern appear wavy. You may notice that some of the lines are missing. These may be signs of AMD. (See Amsler grid on page 14.)

If your eye care professional believes you need treatment for *wet AMD*, he or she may suggest a **fluorescein angiogram**. In this test, a special dye is injected into your arm. Pictures are taken as the dye passes through the blood vessels in your retina. The test

allows your eye care professional to identify any leaking blood vessels and recommend treatment.

How is dry AMD treated?

Once *dry AMD* reaches the advanced stage, no form of treatment can prevent vision loss. However, treatment can delay and possibly prevent *intermediate AMD* from progressing to the advanced stage, in which vision loss occurs. The National Eye Institute's Age-Related Eye Disease Study (AREDS) found that taking a specific high-dose formulation of antioxidants and zinc significantly reduces the risk of *advanced AMD* and its associated vision loss. Slowing AMD's progression from the intermediate stage to the advanced stage will save the vision of many people.

What is the dosage of the AREDS formulation?

The specific daily amounts of antioxidants and zinc used by the study researchers were 500 milligrams of vitamin C, 400 International Units of vitamin E, 15 milligrams of beta-carotene (often labeled as equivalent to 25,000 International Units of vitamin A), 80 milligrams of zinc as zinc oxide, and two milligrams of copper as cupric oxide. Copper was added to the AREDS formulation containing zinc to prevent copper deficiency anemia, a condition associated with high levels of zinc intake.

Who should take the AREDS formulation?

People who are at high risk for developing *advanced AMD* should consider taking the formulation. You are at high risk for developing *advanced AMD* if you have either:

1. *Intermediate AMD* in one or both eyes.

OR

2. *Advanced AMD* (dry or wet) in one eye but not the other eye.

Your eye care professional can tell you if you have AMD, its stage, and your risk for developing the advanced form.

The AREDS formulation is not a cure for AMD. It will not restore vision already lost from the disease. However, it may delay the onset of advanced AMD. It may help people who are at high risk for developing advanced AMD keep their vision.

Can people with early stage AMD take the AREDS formulation to help prevent the disease from progressing to the intermediate stage?

There is no apparent need for those diagnosed with *early stage AMD* to take the AREDS formulation. The study did not find that the formulation provided a benefit to those with *early stage AMD*. If you have *early stage AMD*, a comprehensive dilated eye exam every year can help determine if the disease is progressing. If *early stage AMD* progresses to the intermediate stage, discuss taking the formulation with your doctor.

Can diet alone provide the same high levels of antioxidants and zinc as the AREDS formulation?

No. The high levels of vitamins and minerals are difficult to achieve from diet alone. However, previous studies have suggested that people who have diets rich in green leafy vegetables have a lower risk of developing AMD.

Can a daily multivitamin alone provide the same high levels of antioxidants and zinc as the AREDS formulation?

No. The formulation's levels of antioxidants and zinc are considerably higher than the amounts in any daily multivitamin.

If you are already taking daily multivitamins and your doctor suggests you take the high-dose AREDS formulation, be sure to review all your vitamin supplements with your doctor before you begin. Because multivitamins contain many important vitamins not found in the AREDS formulation, you may want to take a multivitamin along with the AREDS formulation. For example, people with osteoporosis need to be particularly concerned about taking vitamin D, which is not in the AREDS formulation.

How is wet AMD treated?

There are two treatments for *wet AMD*: **laser surgery** and **photodynamic therapy**. Neither treatment is a cure for *wet AMD*. Each treatment may slow the rate of vision decline or stop further vision loss. The disease and loss of vision may progress despite treatment.

- **Laser surgery.** This procedure uses a laser to destroy the fragile, leaky blood vessels. A high energy beam of light is aimed directly onto the new blood vessels and destroys them, preventing further loss of vision. However, laser treatment also may destroy some surrounding healthy tissue and some vision. Only a small percentage of people with *wet AMD* can be treated with laser surgery. Laser surgery is more effective if the leaky blood vessels have developed away from the **fovea**, the central part of the macula. (See diagram on page 1.) Laser surgery is performed in a doctor's office or eye clinic.

The risk of new blood vessels developing after laser treatment is high. Repeated treatments may be necessary. In some cases, vision loss may progress despite repeated treatments.

- **Photodynamic therapy.** A drug called verteporfin is injected into your arm. It travels throughout the body, including the new blood vessels in your eye. The drug tends to “stick” to the surface of new blood vessels. Next, a light is shined into your eye for about 90 seconds. The light activates the drug. The activated drug destroys the new blood vessels and leads to a slower rate of vision decline. Unlike laser surgery, this drug does not destroy surrounding healthy tissue. Because the drug is activated by light, you must avoid exposing your skin or eyes to direct sunlight or bright indoor light for five days after treatment. Photodynamic therapy is relatively painless. It takes about 20 minutes and can be performed in a doctor's office.

Photodynamic therapy slows the rate of vision loss. It does not stop vision loss or restore vision in eyes already damaged by

advanced AMD. Treatment results often are temporary. You may need to be treated again.

What can I do if I already have lost some vision from AMD?

If you have lost some sight from AMD, don't be afraid to use your eyes for reading, watching TV, and other routine activities.

Normal use of your eyes will not cause further damage to your vision.

If you have lost some sight from AMD, ask your eye care professional about low vision services and devices that may help you make the most of your remaining vision. Ask for a referral to a specialist in low vision. Many community organizations and agencies offer information about low vision counseling, training, and other special services for people with visual impairments. A nearby school of medicine or optometry may provide low vision services.

What research is being done?

The National Eye Institute is conducting and supporting a number of studies to learn more about AMD.

For example, scientists are:

- Studying the possibility of transplanting healthy cells into a diseased retina.
- Evaluating families with a history of AMD to understand genetic and hereditary factors that may cause the disease.

- Looking at certain anti-inflammatory treatments for the *wet form* of AMD.

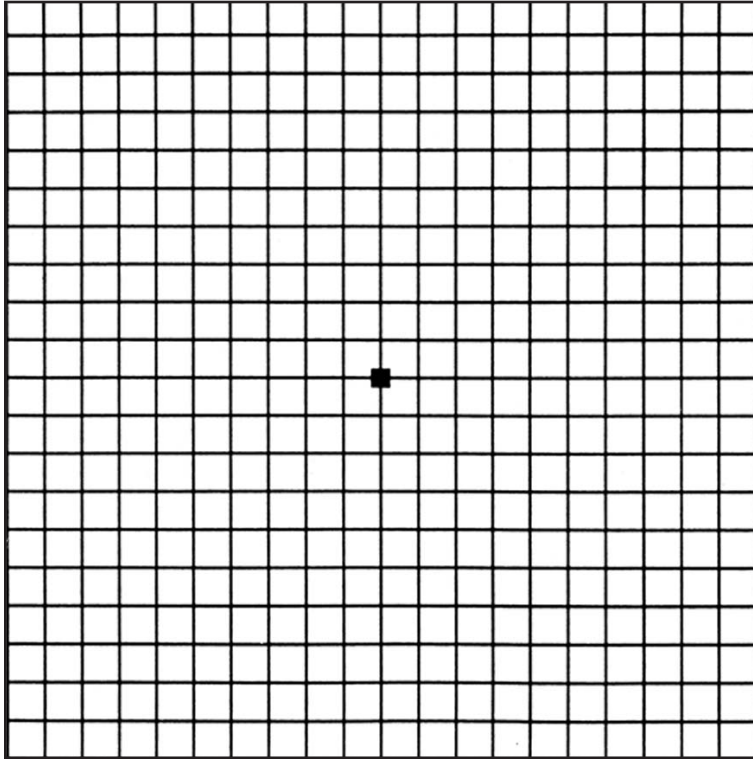
This research should provide better ways to detect, treat, and prevent vision loss in people with AMD.

What can I do to protect my vision?

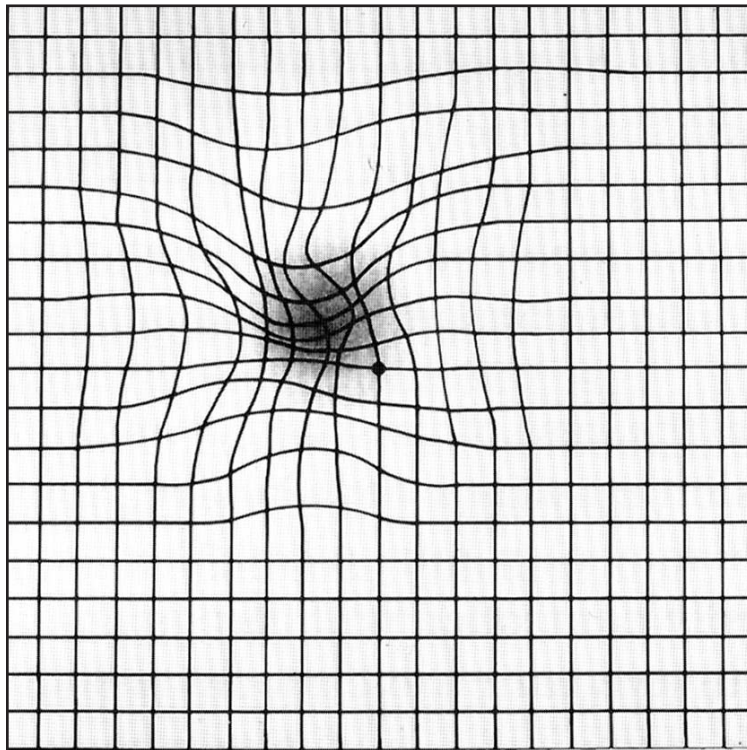
- **Dry AMD.** If you have *dry AMD*, you should have a comprehensive dilated eye exam at least once a year. Your eye care professional can monitor your condition and check for other eye diseases. Also, if you have *intermediate AMD* in one or both eyes, or *advanced AMD* in one eye only, your doctor may suggest that you take the AREDS formulation containing the high levels of antioxidants and zinc.

Because *dry AMD* can turn into *wet AMD* at any time, you should get an Amsler grid from your eye care professional or use the one on page 14. Use the grid every day to evaluate your vision for signs of *wet AMD*. This quick test works best for people who still have good central vision. Check each eye separately. Cover one eye and look at the grid. Then cover your other eye and look at the grid. If you detect any changes in the appearance of this grid or in your everyday vision while reading the newspaper or watching television, get a comprehensive dilated eye exam.

- **Wet AMD.** If you have *wet AMD* and your doctor advises treatment, do not wait. After laser surgery or photodynamic therapy, you will need frequent eye exams to detect any recurrence of leaking blood vessels. Studies show that people



Here is what an Amsler grid normally looks like.



This is what an Amsler grid might look to someone with AMD.

who smoke have a greater risk of recurrence than those who don't.

In addition, check your vision at home with the Amsler grid. If you detect any changes, schedule an eye exam immediately.

Can my lifestyle make a difference?

Your lifestyle can play a role in reducing your risk of developing AMD.

- Eat a healthy diet high in green leafy vegetables and fish.
- Don't smoke.
- Maintain normal blood pressure.
- Watch your weight.
- Exercise.

What should I ask my eye care professional?

You can protect yourself against vision loss by working in partnership with your eye care professional. Ask questions and get the information you need to take care of yourself and your family.

What are some questions to ask?

About my eye disease or disorder...

- What is my diagnosis?
- What caused my condition?
- Can my condition be treated?
- How will this condition affect my vision now and in the future?
- Should I watch for any particular symptoms and notify you if they occur?
- Should I make any lifestyle changes?

About my treatment...

- What is the treatment for my condition?
- When will the treatment start and how long will it last?
- What are the benefits of this treatment and how successful is it?
- What are the risks and side effects associated with this treatment?

- Are there foods, drugs, or activities I should avoid while I'm on this treatment?
- If my treatment includes taking medicine, what should I do if I miss a dose?
- Are other treatments available?

About my tests...

- What kinds of tests will I have?
- What can I expect to find out from these tests?
- When will I know the results?
- Do I have to do anything special to prepare for any of the tests?
- Do these tests have any side effects or risks?
- Will I need more tests later?

Other suggestions

- If you don't understand your eye care professional's responses, ask questions until you do understand.
- Take notes or get a friend or family member to take notes for you. Or, bring a tape recorder to help you remember the discussion.
- Ask your eye care professional to write down his or her instructions to you.

- Ask your eye care professional for printed material about your condition.
- If you still have trouble understanding your eye care professional's answers, ask where you can go for more information.
- Other members of your health care team, such as nurses and pharmacists, can be good sources of information. Talk to them, too.

Today, patients take an active role in their health care. Be an active patient about your eye care.

Where can I get more information?

For more information about age-related macular degeneration, you may wish to contact:

American Academy of Ophthalmology*

P.O. Box 7424

San Francisco, CA 94120–7424

415–561–8500

www.aao.org

American Optometric Association*

243 North Lindbergh Boulevard

St. Louis, MO 63141–7851

314–991–4100

www.aoa.org

Association for Macular Diseases

210 East 64th Street, 8th Floor

New York, NY 10021–7471

212–605–3719

www.macular.org

Foundation Fighting Blindness

Executive Plaza 1, Suite 800

11350 McCormick Road

Hunt Valley, MD 21031–1014

1–800–683–5555

410–785–1414

www.blindness.org

Macular Degeneration Partnership

8733 Beverly Boulevard, Suite 201
Los Angeles, CA 90048-1844
1-888-430-9898
310-423-6455
www.amd.org

National Eye Institute*

National Institutes of Health
2020 Vision Place
Bethesda, MD 20892-3655
301-496-5248
E-mail: 2020@nei.nih.gov
www.nei.nih.gov

Prevent Blindness America

500 East Remington Road
Schaumburg, IL 60173-4557
1-800-331-2020
847-843-2020
E-mail: info@preventblindness.org
www.preventblindness.org

*These organizations also provide information on low vision.

For more information about low vision services and programs, you may wish to contact:

American Foundation for the Blind

11 Penn Plaza, Suite 300
New York, NY 10011-2006
1-800-232-5463
212-502-7600
E-mail: afbinfo@afb.net
www.afb.org

Council of Citizens with Low Vision International

1-800-733-2258

Lighthouse International

111 East 59th Street
New York, NY 10022-1202
1-800-334-5497
1-800-829-0500
212-821-9200
212-821-9713 (TDD)
E-mail: info@lighthouse.org
www.lighthouse.org

National Association for Visually Handicapped

22 West 21st Street, 6th Floor
New York, NY 10010-6493
212-889-3141
www.navh.org

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

National Institutes of Health

National Eye Institute

NIH Publication No: 03-2294

Revised 9/03