Studies have shown that certain lifestyle choices we make can lower or raise risk for developing or accelerating the progression of age-related macular degeneration (AMD). Smoking, diet, exposure to the sun’s damaging blue light spectrum, exercise, body mass index and blood
pressure are all modifiable risk factors for AMD. The good news is that the benefits of making the healthy choice when it comes to each is cumulative. So not smoking (or stopping smoking) plus exercising reduces risk more than either alone, and maintaining your recommended body weight reduces risk even more, *et cetera*.

Out of all of these modifiable lifestyle choices, however, eating is the only one that we cannot live without, presenting us with opportunities every day.

A heart-healthy diet has most of the ingredients for healthy sight. Eating fresh fruits and vegetables, mono- and polyunsaturated fats, whole grains, fish, fowl, beans, and eggs, while limiting intake of saturated fats and refined flours and salt -- all contribute to eye health.

When it comes to AMD, research emphasizes specific elements of nutrition that can help reduce the risk of disease development and progression: maintaining a proper ratio of omega-3 fatty acids to omega-6 fatty acids; eating low glycemic impact carbs; and regularly consuming ample quantities of foods rich in certain antioxidants, known as carotenoids, especially lutein and zeaxanthin.

**Antioxidants**
Lutein and zeaxanthin are located in the macula or center of the retina. The body uses lutein and zeaxanthin to absorb high frequency blue light, which can damage eye tissue. Lutein also plays a role in regulating cell health. By performing both of these roles, one functional and one protective, these antioxidants reduce the risk of developing AMD, and also serve to slow its progression if the disease is already underway. Both of them need to be replenished regularly because the body does not make them out of other nutrients, and our bodies store less of them as we age.

High concentrations of lutein and zeaxanthin are found in dark, leafy green vegetables -- especially spinach, kale, turnip greens, collard greens, broccoli, and Brussels sprouts -- as well as in fruits, including oranges, papayas, tangerines and peaches, and orange/yellow vegetables such as
corn, tomatoes, pumpkins and carrots, and even egg yolks. Parsley also has some of these nutrients.

For a chart of the amounts of lutein and zeaxanthin found in fruits and vegetables click here.

Readings:
The Photobiology of Lutein and Zeaxanthin in the Eye

Dietary Carotenoids, Vitamins A, C, and E, and Advanced Age-Related Macular Degeneration

**Nutritional supplements**
Another way to obtain sufficient amounts of lutein and zeaxanthin is by taking a nutritional supplement. In a study sponsored by the National Eye Institute, a specific combination of nutritional supplements, known as the AREDS formula, was found to reduce AMD progression for those with intermediate dry AMD by about 25% over 5 years.

That formula contained:
- 400 international units of vitamin E
- 500 milligrams (mg) of vitamin C
- 15 mg beta-carotene (which the body converts into vitamin A)
- 80 mg zinc as zinc oxide
- 2 mg copper as cupric oxide (to avoid anemia with high zinc intake)

The vitamin A, in the form of beta-carotene, was determined to create a cancer risk for smokers and former smokers. In a subsequent formulation, called AREDS 2, beta-carotene was replaced by lutein (10 mg) and zeaxanthin (2 mg).

Currently, these nutritional supplements are the only recognized treatment for dry AMD. They are not without a degree of controversy, however, as some evidence exists that each component of the formula may be
beneficial only to those with a specific genetic makeup, while potentially accelerating AMD in those without that genetic profile. This is why some scientists are recommending genetic testing before a patient goes on a combination of supplements that may have to be tailored for his/her needs. If you have concerns, it is best to discuss this with your eye care specialist.

**On Vitamin A**  
Vitamin A should not be taken by patients with Stargardt’s disease, which is an inherited form of macular degeneration that affects people at a young age. Stargardt’s causes a buildup of toxic waste from the body’s processing of vitamin A, and taking vitamin A supplements can intensify that process.

While nutritional supplements are suggested as a way of reducing dry AMD progression, nutritionists consistently recommend whole foods as the best sources of those nutrients. Vitamin A is not related to AMD but remains crucial to eye health (it is involved in corneal maintenance, lubrication, night vision, and the visual cycle that transforms light into electrical impulses that are interpreted as vision by the brain), and should be obtained in one of two ways: from sources such as liver, fish oils, egg yolks and dairy products; and as a precursor to vitamin A, as the carotenoids beta-carotene or alpha-carotene, which are found in and lend the pigment to colorful fruits and vegetables like carrots, squash, broccoli, sweet potatoes, apricots and leafy greens.

There is evidence that beta-carotene obtained from whole food sources, as opposed to supplements, does not raise risk for lung cancer in smokers or former smokers, and may actually lower risk. Talk to your doctor and consider the list below as a starting point to getting the right amounts of eye-healthy nutrients.
# Eye-healthy Nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Found in</th>
<th>USDA Dietary Reference Intake</th>
<th>RDA for Ocular Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Sweet potatoes, carrots, Beef liver, fortifed milk, dried herbs, butternut squash, dried apricots</td>
<td>2,300 IU (women) 3,000 IU (men)</td>
<td>Varies</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Oranges, kiwi, red peppers, grapefruit juice, Strawberries, papayas.</td>
<td>75-90 mg</td>
<td>500 mg</td>
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<tr>
<td>Vitamin D*</td>
<td>Fortified milk, cod liver, Oil, salmon, herring, Mushrooms, beef liver, Eggs</td>
<td>600 IU (adults 19-70) 800 IU (71 and older)</td>
<td>1,000-2,000 IU</td>
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<tr>
<td>Vitamin E</td>
<td>Salad dressing, oils almonds, sunflower Seeds, wheat germ, peanut butter, avocados</td>
<td>22 IU</td>
<td>200-400 IU</td>
</tr>
<tr>
<td>Beta-carotene**</td>
<td>Carrots, spinach, Cantaloupe, pumpkins Turnip greens, winter Squash, cabbage</td>
<td>No recommended amount 15,000 ug (15 mg)</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>Fortified breakfast cereal, shellfish, beef, Cocoa powder, peanuts</td>
<td>8-11 mg</td>
<td>20-80 mg</td>
</tr>
<tr>
<td>Omega-3 Fatty Acids</td>
<td>Salmon, walnuts, canola oil, flaxseed, sardines, Mackerel</td>
<td>No recommended amount 1 g (1,000 mg)</td>
<td></td>
</tr>
<tr>
<td>Lutein/Zeaxanthin</td>
<td>Kale, spinach, collard greens, turnip greens, corn, green peas, broccoli, tomatoes, eggs</td>
<td>No recommended amount 6-10 mg / 2 mg</td>
<td></td>
</tr>
</tbody>
</table>
*Based on observational studies of eye disease.
** Current or past smokers should avoid taking nutritional supplements with beta-carotene.

**Good fat or bad fat**
When it comes to how we humans use fat, there is a lot to digest. To dispel one commonly held notion: there are no good or bad naturally-occurring fats. They all serve a purpose and play a role in our bodies. However, there is a health-promoting balance between the different kinds of fats that the body requires. An unbalanced intake of fats can lead to unhealthy outcomes. Omega-3 fatty acids, in particular, have been shown to play a protective role in the body by reducing damaging inflammation.

An ongoing, imbalanced intake of essential omega-6 and omega-3 fatty acids contributes to chronic illnesses, including AMD, by overstimulating the inflammation response that our immune system relies on to protect us from outside attack or injury.

In a study of the role of fat intake on eye health, Dr. Johanna Seddon, a highly regarded authority on the impact of diet on AMD, has written: “These findings support other evidence in the literature regarding the need to maintain a healthy ratio between omega-6 and omega-3 fatty acids. The ideal omega-6/omega-3 ratio is 3:1 to 4:1. However, the average American's diet has an omega-6/omega-3 ratio that ranges from 10:1 to 50:1. This imbalance is attributed to a diet rich in processed foods containing or cooked in vegetable oils, which we have previously shown to increase the risk of AMD. Our results suggest that when our diet is rich in these omega-6 fatty acids [...] the protective effect of omega-3 fatty acids is dampened.”

Some of the best sources of anti-inflammatory omega-3 fatty acids are cold water, fatty fish (such as salmon, tuna, mackerel and herring), and walnuts. Which is why non-fried fish is recommended, several times a week.
Pro-inflammatory omega-6 fatty acids can be found in many vegetable oils commonly used for baking and frying (which is why reducing intake of baked and fried foods is recommended) and in animal fat.

Avoid foods with artificial trans fats, which are liquid vegetable oils that have been made more solid with the addition of hydrogen to make them easier to use, especially in commercial baking. They have no nutritional value, are a known risk factor for coronary heart disease and were found to increase risk of AMD. They are also referred to as hydrogenated fats. Think: cakes, cookies and pies, shortening, microwave popcorn, frozen pizza, French fries, doughnuts, fried chicken, non-dairy coffee creamer, and stick margarine. Read a food’s package label to see if contains trans fats.

Readings:
How to Choose and Use Healthy Cooking Oils

The simplest rules of thumb for fat consumption, when it comes to eye health, is: more unfried fish, modest amounts of lean meat, less baked goods and very few fried foods.

Readings:
Dietary Omega-3 Fatty Acids, Other Fat Intake, Genetic Susceptibility, and Progression to Incident Geographic Atrophy

Cigarette Smoking, Fish Consumption, Omega-3 Fatty Acid Intake, and Associations With Age-Related Macular Degeneration

Association between dietary fats and age-related macular degeneration (AMD) in the Carotenoids in Age-Related Eye Disease Study (CAREDS), an ancillary study of the Women’s Health Initiative

Dietary fat and risk for advanced age-related macular degeneration
Progression of age-related macular degeneration: association with dietary fat, transunsaturated fat, nuts, and fish intake

Glycemic Impact and AMD
There’s another modifiable component of the human diet that can impact risk for developing AMD. Some studies have shown that consuming carbohydrates that the body easily breaks down into simple sugars, where they quickly raise blood sugar levels, might possibly increase risk for developing AMD. Low fiber starches and refined sugars have this kind of immediate effect, and are considered to be high on the Glycemic Index (GI).

On the flip side, science is also showing that eating fewer foods high on the Glycemic Index, and replacing them with lower GI foods, may reduce the risk of developing AMD and its progression. Example: instead of instant oatmeal, choose steel cut oats which are lower on the GI.

To get a handle on a food’s GI ranking, it’s best to look up its GI listing. In general, a GI ranking of 55 or below is considered low (beans, vegetables, most fruits, whole grains, nuts), 55-69 is moderate (boiled sweet potatoes but not white potatoes, unsweetened/whole grain breakfast cereals, corn).

However, sugar absorption can be lowered by the presence of other foods, like fats and proteins. Don’t assume that a “natural” food is low on the GI and that a commercially manufactured food is high. White potatoes rank in the 80s and 90s, watermelon comes in above 75, while ice cream is frequently ranked below 55.

Click here for a Glycemic Index reference tool.
Readings:

**Dietary Patterns, Carbohydrates, and Age-Related Eye Diseases**

**Association between dietary glycemic index and age-related macular degeneration in nondiabetic participants in the Age-Related Eye Disease Study**

**International Tables of Glycemic Index and Glycemic Load Values: 2008**

**The AMD Diet**

One way to combine all of these science-advised, eye-healthy eating practices is to follow the Mediterranean diet. Studies have shown that the Mediterranean diet not only reduces risk for heart disease, but may protect against the development of AMD.

Readings:

**Mediterranean Diet and Age-Related Macular Degeneration: Is It Time to Attempt Dietary Modification?**

**Mediterranean Diet and Incidence of Advanced Age-Related Macular Degeneration**

**Adherence to a Mediterranean diet, genetic susceptibility, and progression to advanced macular degeneration: a prospective cohort study**

**Adherence to the Mediterranean Diet and Progression to Late Age-Related Macular Degeneration in the Age-Related Eye Disease Studies 1 and 2**

**Genetic Susceptibility, Diet Quality, and Two-Step Progression in Drusen Size**
Recipes

Of course, you can find eye-healthy meals among cuisines around the world. The following recipes are examples of whole food sources for eye healthy nutrition. You can find many more at macular.org, and in the research-based cookbook “Eat Right For Your Sight.”

The book is co-authored by Johanna M. Seddon, MD, ScM, one of America’s leading experts in the field of AMD and the relationship between lifestyle choices and our genetic makeup, and journalist Jennifer Trainer Thompson, the author or coauthor of 18 books ranging in subject from nuclear power to cooking, including three James Beard Award nominations.
Hearty Winter Soup

1 tablespoon canola oil
½ pound sweet sausage
½ pound hot sausage
3 leeks, white, light green (washed, dried, sliced)
3 cloves garlic, minced
3 carrots, peeled and sliced
2 ribs of celery with leaves, sliced
4 cups shredded cabbage (½ medium head)
1 pound Roma tomatoes, chopped
2 cups butternut squash, diced medium
1 teaspoon dry thyme
1 teaspoon dry oregano
1 15-ounce can chickpeas, drained and rinsed
1 15-ounce can cannellini beans, drained and rinsed
6 cups chicken broth
4 cups water
½ teaspoon kosher salt
¼ teaspoon fresh ground pepper
2 cups cheese tortellini
¼ cup fresh parsley, chopped
2 tablespoons fresh basil chiffonade
½ cup shaved pecorino Romano cheese for garnish

Heat the canola oil in a large soup pot over medium heat. Add the sausage, leeks and garlic and cook 3-5 minutes. Add the carrots, celery, cabbage, tomatoes, squash, herbs, beans, broth, water, salt and pepper. Bring to a boil, then reduce heat to low and simmer for 30 minutes. Add the tortellini and cook 8 minutes (or according to package instructions). Stir in the parsley, and ladle into bowls, topped with basil chiffonade and Romano

Serves 6

Nutritional profile (per serving, including cheese garnish)

Calories: 585
Total fat: 23 g
Saturated fat: 7 g
Protein: 32 g
Carbohydrates: 66 g
Fiber: 14 g
Sugars: 13 g
Cholesterol: 60 mg
Sodium: 2,158 mg
Vitamin A: 11,728 IU
Vitamin C: 58 mg
Vitamin E: 3.5 IU
Zinc: 3.5 mg
Beta-carotene: 5,371 mcg
Lutein and zeaxanthin: 996 mcg
Omega-3 fatty acids: 0 g
Raw Beet Salad

1 large raw beet, peeled (2 cups)
½ head fennel bulb
1 large orange, peeled and chopped

Dressing:
2 tablespoons balsamic vinegar
6 tablespoons extra-virgin olive oil
½ teaspoon sea salt
¼ teaspoon freshly ground black pepper

Combine the beet and fennel in the bowl of a food processor with the metal blade and pulse until the beet is shredded, taking care not to purée. Scrape into a bowl and toss with the orange.

Combine dressing ingredients in a tightly sealed jar and shake vigorously until they emulsify. Toss the salad with dressing and serve.

Serves 4
Nutritional Profile (per serving)

Calories: 221
Total fat: 21 g
Saturated fat: 3 g
Protein: 1 g
Carbohydrates: 9 g
Fiber: 2 g
Sugars: 7 g
Cholesterol: 0 mg
Sodium: 328 mg
Vitamin A: 363 IU
Vitamin C: 22 mg
Vitamin E: 0 IU
Zinc: 0.2 mg
Beta-carotene: 196 mcg
Lutein and zeaxanthin: 220 mcg
Omega-3 fatty acids: 0 g
Green Smoothie

1 cup chopped kale
1 cup grapes
1 cup chopped mango (frozen is okay)
2 teaspoons fresh lime juice
2 tablespoons orange juice

Combine all the ingredients in a blender and whirl until smooth. Pour into a glass.

Serves: 1

Nutritional profile (per smoothie)
Calories: 210
Total fat: 2 g
Saturated fat: 0 g
Protein: 5 g
Carbohydrates: 50 g
Fiber: 6 g  
Sugars: 42 g  
Cholesterol: 0 g  
Sodium: 29 mg  
Vitamin A: 8,638 IU  
Vitamin C: 163 mg  
Vitamin E: 4 IU  
Zinc: 0.58 mg  
Beta-carotene: 5.095 mcg  
Lutein and zeaxanthin: 5,633 mcg  
Omega-3 fatty acids: 0 g

Carrot Soufflé Dessert

1 pound carrots, peeled, coarsely chopped and cooked until tender  
4 tablespoons butter, room temperature  
2 jumbo eggs
3 tablespoons all-purpose flour
1 teaspoon baking powder
1 teaspoon vanilla extract
½ teaspoon salt
¾ cup lightly packed brown sugar
½ teaspoon cinnamon
¼ teaspoon nutmeg
¼ cup pecans, chopped

Preheat the oven to 350 degrees. Grease a 2-quart casserole dish. In a bowl, mash the cooked carrots with butter, eggs, flour, baking powder, vanilla extract, salt, brown sugar, cinnamon and nutmeg. Spoon into the casserole dish and top with the pecans. Bake for 45 minutes. (Serve with whipped cream, if desired.)

Serves 8

Nutritional profile (per serving, without whipped cream)
Calories: 208
Total fat: 10 g
Saturated fat: 4 g
Protein: 3 g
Carbohydrates: 29 g
Fiber: 2 g
Sugars: 23 g
Cholesterol: 76 mg
Sodium: 252 mg
Vitamin A: 9,740 IU
Vitamin C: 3.4 mg
Vitamin E: 1.1 IU
Zinc: 0.5 mg
Beta-carotene: 4,710 mcg
Lutein and zeaxanthin: 228 mcg
Omega-3 fatty acids: 0.04 g
Grilled Salmon with Arugula Salad

6 cups arugula, washed and dried
½ small red onion, halved and thinly sliced
2 tablespoons sesame seeds
¼ cup olive oil
2 tablespoons sesame oil
4 tablespoons seasoned rice wine vinegar
1 teaspoon Tamari (or ½ teaspoon soy sauce)
1 teaspoon fresh minced ginger
1 teaspoon minced garlic
4 salmon fillets or steaks
1 teaspoon grape seed oil
Salt
Freshly ground black pepper
Place the arugula in a bowl with the red onion. In a hot, dry skillet, toast the sesame seeds by shaking them until fragrant, 1-2 minutes. Set the sesame seeds aside to cool.

To prepare the vinaigrette, whisk the olive and sesame oils, rice wine vinegar, tamari, ginger and garlic.

Prepare the girl. Lightly coat both sides of each fillet with grapeseed oil and season with salt and pepper. Grill skin side down until the skin is crisp, about 5 minutes. Flip and cook the second side 2 minutes, or until done. Toss the arugula with the sesame seeds and vinaigrette, and divide among 4 dinner plates. Top each salad with salmon and serve.

Serves 4

Nutritional Profile (per serving)

Calories: 484
Total fat: 35 g
Saturated fat: 5 g
Protein: 36 g
Carbohydrates: 5 g
Fiber: 1 g
Sugars: 3 g
Cholesterol: 94 mg
Sodium: 557 mg
Vitamin A: 784 IU
Vitamin C: 5.4 mg
Vitamin E: 4 IU
Zinc: 1.6 mg
Beta-carotene: 529 mcg
Lutein and zeaxanthin: 1,067 mcg
Omega-3 fatty acids: 2.93 g
Spinach Watercress Salad

½ pound fresh spinach (not baby), washed, stemmed and dried
2 cups lightly packed watercress, washed and stems removed

Toppings:
1 orange, peeled, segmented and cut into bite sizes
½ cup fresh blueberries
1 roasted, peeled beet, diced medium
½ cup toasted almonds

Dressing:
½ tablespoon orange zest
½ teaspoon fresh grated ginger
1 tablespoon orange juice
2 tablespoons rice wine vinegar
6 tablespoons canola oil
½ teaspoon kosher salt
Fresh ground pepper

Tear the spinach leaves into bite-sized pieces. Place in a large salad bowl, combine them with the watercress.

To prepare the dressing, combine the orange zest, ginger, orange juice, vinegar, canola oil, salt and pepper in a tightly fitting jar and shake until combined.

Pour over the salad greens and toss, adding more dressing if needed. Add orange slices, blueberries, beets and almonds and serve.

Serves 4

Nutritional Profile (per serving)

Calories: 288
Total fat: 26 g
Saturated fat: 5 g
Protein: 14 g
Carbohydrates: 14 g
Fiber: 4 g
Sugars: 8 g
Cholesterol: 0 mg
Sodium: 196 mg
Vitamin A: 5,971 IU
Vitamin C: 49 mg
Vitamin E: 5.3 IU
Zinc: 0.7 mg
Beta-carotene: 3.556 mcg
Lutein and zeaxanthin: 7,961 mcg
Omega-3 fatty acids: 0 g
Grilled Orange Peppers with Feta and Olives

3 orange bell peppers
1 teaspoon plus 3 tablespoons grapeseed oil (or other oil)
1 tablespoon lemon juice
¼ teaspoon smoked paprika
½ teaspoon finely minced garlic
¼ teaspoon freshly chopped oregano
Freshly ground black pepper
¼ cup crumbled feta cheese
¼ cup sliced kalamata olives

Preheat a grill to medium-high heat. Lightly brush the peppers with 1 teaspoon of grapeseed oil and place the peppers on the grill. Cover and cook until slightly charred, 3 to 5 minutes. Turn and cook an additional 5 minutes, until charred. Set aside in a bowl covered with plastic wrap.
To prepare the vinaigrette, whisk the remaining grapeseed oil, lemon juice, paprika, garlic, oregano and black pepper. Peel, seed and core the peppers and cut them into bite-sized portions. Toss peppers, feta cheese and olives with the vinaigrette and set aside for 10 minutes (if you have the time), then serve.

Serves 4

Nutritional Profile (per serving)

Calories: 178  
Total fat: 15 g  
Saturated fat: 3 g  
Protein: 3 g  
Carbohydrates: 10 g  
Fiber: 1 g  
Sugars: 0 g  
Cholesterol: 8 mg  
Sodium: 209 mg  
Vitamin A: 321 IU  
Vitamin C: 258 mg  
Vitamin E: 4.9 IU  
Zinc: 0.51 mg  
Beta-carotene: 168 mcg  
Lutein and zeaxanthin: 1.8 mcg  
Omega-3 fatty acids: 0 g
Kale-Quinoa Salad with Basil and Pistachios

3 large leaves of curly kale, stems removed and leaved julienned
3 tablespoons olive oil
1 tablespoon fresh lemon juice
¼ teaspoon sea salt
Freshly ground black pepper
1 cup cooked quinoa
1 avocado, pitted and cubed
1 cup packed arugula
¼ cup pistachios
2 tablespoons currants
1 tablespoon each of fresh chopped parsley and basil

In a bowl, toss the kale with the olive oil, lemon juice, salt and pepper. Set aside for 5 to 10 minutes to soften the kale. Add the quinoa, avocado, arugula, pistachios, currants, parsley and basil and toss.

Serves 4
Nutritional Profile (per serving)

Calories: 277  
Total fat: 22 g  
Saturated fat: 3 g  
Protein: 5 g  
Carbohydrates: 18 g  
Fiber: 6 g  
Sugars: 2 g  
Cholesterol: 0 mg  
Sodium: 148 mg  
Vitamin A: 602IU  
Vitamin C: 21 mg  
Vitamin E: 4.5 IU  
Zinc: 1.1 mg  
Beta-carotene: 192 mcg  
Lutein and zeaxanthin: 538 mcg  
Omega-3 fatty acids: 0.1 g

Further readings:
[Associations of smoking, body mass index, dietary lutein, and the LIPC genetic variant rs10468017 with advanced age-related macular degeneration]

The mission of the American Macular Degeneration Foundation is to work for the prevention, treatment and cure of macular degeneration by raising public awareness and knowledge about the increasing threat of macular degeneration, providing support and advocacy for those afflicted with the disease and their families, and supporting scientific research.