



NUTRITION, HEALTHY LIFESTYLES AND EYE HEALTH

Prepared By: Julie Mares, PhD and the Nutrition and Eye Health Research Team



DEPARTMENT OF
**Ophthalmology
and Visual Sciences**

UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH



UWHealth
Eye Clinics
World-Class Eye Care

RECOMMENDATIONS FOR DAILY LIVING

Evidence from research, including some conducted at the University of Wisconsin Department of Ophthalmology and Visual Sciences, suggests there are many choices to optimize eye health and well-being. Some may even help slow progression of chronic eye disease.

This evidence is mostly from studies conducted in the past 20 years and is most abundant for age-related macular degeneration and age-related cataracts. However, it is likely that the results would hold for other eye conditions that are influenced by the same biological processes that promote the degeneration of tissues and blood vessels as we age. These processes include oxidative stress and inflammation.

Age-related eye diseases, including age-related macular degeneration, age-related cataracts, diabetic retinopathy, glaucoma and dry eye, may all be affected by the food we eat and by our lifestyle choices. For optimal eye health, we encourage you to savor good food, move and breathe — especially outdoors — and quit smoking or don't start smoking. In addition, if you take supplements, do so in moderation.

HOW TO IMPLEMENT HEALTHY CHOICES INTO YOUR DAILY LIFESTYLE

SAVOR GOOD FOOD!

Eating food brings us more than nutrients. The sensory pleasures and connections we feel to our past, each other and nature are important, too. This is especially true when we lose sight. Take time enjoy the pleasures of food. Fresh food in season is especially easy to savor.

Consider buying/growing organic fruits and vegetables. For list of foods that are likely to be contaminated with pesticides, please visit: www.foodnews.org

Ways to add local fresh food to your diet:

- Garden! This also gives exposure to the sunshine vitamin and physical activity
- Shop at farmer's markets
- Buy Community Supported Agriculture (CSA) boxes

Community Supported Agriculture farms in the Madison area and around Wisconsin:

www.csacoalition.org

www.freshfoodwisconsin.org

CSAs and other locally grown/ produced foods in other regions of the state:

www.farmfreshatlas.org

For Milwaukee and surrounding areas:

www.growingpower.org

MAKE PLANT FOODS THE CENTER OF MEALS

Get 5 to 9 Servings a Day of Fruits and Vegetables

- 2-1/2 cups of vegetables
- 1-1/2 cups of fruit
- Eat a rainbow of colors
- Feed your healthy gut microbes by choosing whole fruits and vegetables over juices when possible
- Include dark leafy greens (nutritional powerhouses packed with lutein and zeaxanthin and many other vitamins, minerals and phytochemicals)
- Lutein and zeaxanthin are two plant pigments that accumulate in the eye. They:
 - Help protect against light damage
 - May lower development of cataracts and macular degeneration
 - May improve vision by reducing glare and enhancing the ability to detect contrasts

*If you are on blood thinners, there is no need to avoid dark, leafy greens. It is, however, important to keep your intake constant and let your doctor know if you plan to change your intake of dark leafy greens.

*If you are at high risk for kidney stones, there is no need to avoid them. Getting enough fluids and eating more plant foods than animal foods is more important in preventing kidney stones than avoiding the amount of oxalates from some leafy greens

Eat more whole grains (oatmeal, quinoa, whole grain bread and pasta) **than refined grains**

Frequently choose plant foods as a protein source

EAT A VARIETY OF PROTEIN SOURCES

The amount you need varies with your age, size and health. Most Americans get more protein than they need. To estimate the amount you need, simply use half your body weight in grams of protein (By this rough guideline, a 120-pound person needs about 60 grams of protein per day).

For variety and eye-healthy nutrients, consider the following protein sources, in addition to beef, pork, lamb and poultry:

- Plant sources of protein: beans, legumes, vegetables, grains, nuts
- Fish from cold waters (for example: salmon, lake trout, mackerel, sardines) once or twice per week:
 - 3-ounces of fish per week may reduce risk of age-related macular degeneration
 - Some of the ingredients of fish that may contribute to benefit:
 - Omega-3 fatty acids
 - Vitamin D
 - Selenium
 - Vitamin B₁₂

To reduce exposure to possible contaminants (Methylmercury, PCBs, toxiphenes) vary the types and sources of fish you eat and limit intake to two 3-ounce servings per week

- Eggs (but not egg substitutes) are an easy-to-absorb source of lutein, which is associated with better health of the lens and retina
- Low-fat or non-fat milk or yogurt, if you tolerate it
 - If you don't drink milk:
 - Eat more beans, legumes, and dark leafy greens for sources of calcium
 - Get adequate vitamin A from meat, eggs and/or dark yellow/orange/green fruits and vegetables
 - Get adequate vitamin B₁₂ from meat and/or eggs

HOW MUCH PROTEIN IS IN DIFFERENT FOODS?

Fish, Poultry, Meat
6-8 protein grams/ounce



Milk
8 protein grams/ounce



Peanut Butter
8 protein grams/teaspoon



Cooked Beans/Legumes
7 protein grams/half cup



Egg
6 protein grams/ounce



Nuts
4 protein grams/half cup



Brown Rice/Oatmeal
3 protein grams/half cup



Whole Wheat Bread
2.5 protein grams/slice



Cooked Vegetables
2 protein grams/half cup



LIMIT YOUR FAT INTAKE

Many studies indicate higher rates of age-related macular degeneration or cataract in people who consume high-fat diets.

Avoid excess:

- High-fat dairy products like whole milk, full-fat cheese, sour cream, cottage cheese, cream cheese, regular ice cream, butter
- High-fat desserts like candy and baked goods
- Salty snack foods like chips and cheese puffs
- Fried foods
- Meats, especially high-fat meats like bacon and sausage
- Corn oils

Do not eliminate fat. Small-to-moderate amounts help to increase absorption of lutein and zeaxanthin.

Try these eye-friendly options instead:

- Salad dressings (not much is needed)
- Nuts - also provide vitamin E, zinc, omega-3 fatty acids
- Avocados - contain lutein and zeaxanthin
- Increase olive oils, nut oils, canola and fish oils

AVOID EXCESSIVELY SUGARED AND PROCESSED FOODS

Highly processed foods with excess sugars are not rich in nutrients that healthy eyes need.

Processed foods are often:

- High in fat, sugar, refined grains and salt
- Low in fiber and protective natural nutrients, such as phytochemicals
- Expensive — the more processed a food is, the more expensive it will be to our pocketbooks and/or our environment

MOVE AND BREATHE, ESPECIALLY OUTDOORS

Being active has been linked to a lower likelihood of having early and advanced macular degeneration, lower blood pressure, inflammation and oxidative stress and lower rates of almost every chronic disease studied. Physical activity is also associated with maintaining better brain function as you age. Healthy brains can contribute to the ability to see well with the vision you have.

How active? We found that women who had at least 1-1/2 hours of low intensity exercise, an hour of moderate exercise, or 30-minutes of strenuous exercise each day had the lowest odds of having age-related macular degeneration.

Low intensity exercise

- Exercise you could sing during: yard work, house work, walking, or biking

Moderate intensity exercise

- Exercise you could talk during, but not sing: brisk walking

Strenuous exercise

- Exercise that it would be hard to talk during: jogging

Being outdoors

Exposure to sunlight (April through September in northern latitudes like Wisconsin) also helps your skin make vitamin D

- 15-30 minutes per day with at least 10 percent of skin exposed, without sunscreen
- Consider sunscreen, hats and eye protection, if in direct sun for an extended period (more than 30 minutes) in the middle of the day

Strengthening exercises

The Centers for Disease Control recommends strengthening exercises (for legs, hips, back, abdomen, chest, shoulders and arms) at least 2 times per week. Examples are:

- Heavy gardening (digging or shoveling)
- Push-ups and sit-ups
- Lifting weights
- Yoga

These may help prevent injuries. Moreover, new research demonstrates that exercising some muscles helps maintain muscle mass in other muscles.

START FROM WHERE YOU ARE

Improvements in eating and exercising are more likely to become permanent if we adopt them gradually. Even if you already have age-related macular degeneration, research suggests that to slow the progression and possibly to see better with the eyesight you have, making improvements in your diet and activity are likely to help. In addition, these are likely to bring you much enjoyment. **Start simply:**

Replace foods that are unhealthy with healthier versions:

- If you love a bowl of ice cream for a dessert, consider cutting the portion in half and replacing some of the ice cream with delicious seasonal fruit. **In a month, changes become habit.** Then, try another!
- Add salads or fiber-rich foods (kale, spinach, broccoli, sweet potatoes, brussels sprouts, cabbage) to two or more meals/day, may reduce your hunger for eating larger portions of foods that are less healthy.

If you do not currently exercise:

- Begin by mildly stretching and walking 10 minutes/day. A stroll after a meal helps the blood sugar get into our muscles and out of our blood. After a month, try increasing this to 30 minutes three times per week. Then, add other forms of exercise such as yoga, dancing, weight training, biking or swimming and increase the duration and intensity gradually.

It's not only about your eyes:

- Regular exercise helps control blood pressure, body weight, blood sugar and cholesterol levels. It conditions muscles, tendons, ligaments and bones to help fight osteoporosis, keep your body more limber, and stabilize your joints. It improves digestion, helps manage low-back pain, arthritis and diabetes. Regular exercise helps you maintain your independence.

PASS IT ON

Macular degeneration and other common eye conditions in aging tend to run in families. If you have age-related macular degeneration, what do you tell your children or grandchildren about preserving eye health?

“Breastfeed, if possible, for the first year of life.”

- There are many good reasons to breastfeed infants, among them, it provides lutein and zeaxanthin for eye health, which are not yet routinely added to infant formulas
- If pregnant/lactating mothers get lutein and zeaxanthin from the foods they eat, then they can pass these to their developing fetus during pregnancy and to their infants through breast milk
- Emerging evidence in two pilot studies conducted by our team, suggests that men and women who were breastfed as infants have higher levels of lutein and zeaxanthin in their retinas in middle and old age
- We speculate that getting lutein and zeaxanthin in early life might help maintain healthy vision over our lifetimes because:
 - The area of the retina that concentrates lutein and zeaxanthin develops rapidly in the first year of life
 - Monkey infants lacking lutein in their diets don't have lutein and zeaxanthin in their retina and also have fewer retinal cells that nourish rod and cone photoreceptors and clear waste - we have a fixed number of these cells after the first years of life, so when these cells die over time, new ones can't be made

“Take a walk with me!”

- Recent research suggests that being outdoors reduces a child's chances of becoming nearsighted/ needing to wear glasses to see at a distance and could lower chances of macular degeneration later

“Enjoy these tasty fresh greens with me!”

- In a recent Dutch Study, lutein from foods lowered the risk for getting age-related macular degeneration associated with having high risk gene variants. Dark leafy greens are the most concentrated source

“I made a new vegetable dish for dinner. See if you like it.”

- Healthy eating habits are easiest to form in childhood. Exposing children to a wide variety of healthy foods, without forcing them to eat them, increases their chances of trying them and liking them
- Having a minimum of unhealthy foods around (soda pop, candy, cookies) will increase their appetite for trying healthy foods. Treat them in other ways, like enjoying a fresh, chin-dripping peach together

DO SUPPLEMENTS HELP?

Things to remember about supplements:

- Some commercially available supplements have lower levels of vitamin E or zinc, which can be just as effective and pose less concern over side effects and safety over many years of use
- Research about optimal doses of vitamins and minerals is limited. Optimal doses may vary by individual
- In a Dutch Study:
 - ☞ Eating foods that contained all four of the major nutrients in the Age-Related Eye Disease Study clinical trial supplements (vitamins C and E, beta-carotene and zinc) at much lower levels, was associated with a decreased likelihood of developing age-related macular degeneration
 - ☞ Eating high levels of lutein/zeaxanthin, zinc, beta-carotene or long-chain omega-3 fatty acids lowered the risk for getting age-related macular degeneration associated with high risk gene variants

Cautions:

Avoid excess supplementation

- Take no other supplements that contain the same nutrients as the high-dose antioxidant supplement (although a multivitamin with levels we usually get in foods may be safe)
- Be wary of eating too many fortified foods, such as energy bars, energy drinks, and even fortified cereals if you are taking a multivitamin and/or a high dose antioxidant supplement
- High levels of vitamin E and A, beta-carotene, folate and zinc over many years may pose health risks in some

Get beta-carotene from food, not supplements

- In some studies, beta-carotene supplementation has been associated with an increased risk of cancer in people who smoke

If you have intermediate or advanced age-related macular degeneration, the American Academy of Ophthalmology and some physicians recommend:

High-Dose Antioxidants

- The Age-Related Eye Disease Study in 2001 demonstrated that taking a high-dose antioxidant was proven to modestly lower progression from intermediate to advanced AMD
- In 2013, results of the Second Age-Related Eye Disease Study supported replacing beta-carotene with lutein and zeaxanthin. Thus, many physicians recommend a supplement containing:
 - ☞ 400 IU Vitamin E
 - ☞ 12 mg Lutein and Zeaxanthin
 - ☞ 500 mg Vitamin C
 - ☞ 80 mg Zinc
 - ☞ 2 mg Copper

If you have a family history of age-related macular degeneration, but do not currently have the disease:

- Using high-dose antioxidant supplements, like those recommended for people with age-related macular degeneration, have not been proven to prevent getting age-related macular degeneration.
- However, results of several studies suggest that people with healthy diets have lower signs of early stages of age-related macular degeneration.

Other Supplements to Consider:

Lutein and Zeaxanthin

- Some research suggests that taking these, as a part of an antioxidant supplement, might improve health of the retina and lens and improve vision (in people who have macular degeneration or other retinal diseases and people who do not) under low light and glare conditions, reduce discomfort and help recover from bright lights (e.g. headlights when driving)
 - Average American intake of lutein and zeaxanthin: 2 mg/day
 - Levels tested in early research trials: 6-12 mg/day from foods
 - Do not take more than 20 mg/day as safety is currently unknown

Fish Oils

Population studies suggest that long-chain omega-3 fatty acids like, DHA (docosahexaenoic) and EPA (eicosapentaenoic), concentrate in the retina and may enhance health of the retina and brain. The evidence from clinical trials is conflicting, with some showing benefits and others not.

By the numbers:

- 🐟 Average American dietary intake of DHA/EPA: 0.1-0.2 gram/day
- 🐟 Levels currently commonly tested in research trials: 1 gram/day
- 🐟 DHA/EPA in 3 ounces of salmon: 2 g

To avoid potential contaminants (such as methylmercury, PCBs, toxiphenes) consider brands tested for contaminants and/or purified fish oil supplements. Also consider eating fish, rather than taking supplements because of the additional health benefits.

Vitamin D

- ⊗ Adequate vitamin D status may lower inflammation and risk for age-related macular degeneration
- ⊗ Moderate daily exposure to sun (15-30 minutes with face and hands exposed) permits vitamin D to be made in our skin and may provide adequate levels for most
- ⊗ In Wisconsin, sunlight is not strong enough from about October through March to make adequate levels of vitamin D in skin, so during winter months:
 - Eat natural sources (fatty fish from cold water, egg yolks, some mushrooms) and/or foods fortified with vitamin D (most milks and yogurts, some cereals and orange juice)
 - Vitamin D-containing supplements are recommended only if you do not eat natural or fortified sources:
 - Many multivitamins contain vitamin D
 - Vitamin D supplements (600 to 2000 IU/day are widely considered safe)

B Vitamins

- 🍷 In one US clinical trial, women who took a supplement containing vitamins B₁₂, B₆ and folate had a lower onset of age-related macular degeneration
- 🍷 **10 to 30 percent of persons over age 50 have low absorption of vitamin B₁₂**, so taking a B₁₂ supplement may be important if intake in foods from dairy, meat, fish or poultry are not consumed regularly
- 🍷 You can ask your doctor to evaluate your blood levels at routine exams

Supplements for slowing or preventing cataract:

- Multivitamins: The evidence is conflicting; benefit might be limited to people who have very poor diets
- High-dose supplements are not likely to help and might increase risk (high-dose vitamin C)

Supplements for slowing diabetic retinopathy:

- Antioxidants might help, but the evidence is conflicting.
- Prospective studies and trials needed

Supplements for slowing or preventing glaucoma:

- This has not been well-studied
- Results of one large trial suggest that selenium might increase risk

In summary, **enjoy a daily feast of real food for a safer and more reliable way to obtain nutrients and other beneficial plant substances that support good vision and good health!**

Tell your physician about any supplements you take.

RECIPES THAT PACK A NUTRITIONAL PUNCH FOR YOUR EYES

As a researcher at the University of Wisconsin School of Medicine and Public Health, Department of Ophthalmology and Visual Sciences, I not only study food, but also I enjoy growing, preparing and eating food. I have created/adapted several recipes that pack nutritional punch, and hope you enjoy them as much as I do!

KALE AND CABBAGE SLAW



Makes 4 servings: 1-3/4 cups each

Kale is loaded with lutein and zeaxanthin and many other nutrients. It is good steamed and baked. It is good simply raw, too. It can be added to cabbage in many recipes. Here is an example which is good for mid-summer to fall, when the cabbage just comes and the kale is coming fast and thick.

Ingredients

- 1 small head cabbage, sliced
- About 6-8 large leaves of kale*, inner stem removed and then sliced
- 4 carrots, grated
- 1/2 cup celery leaves*, chopped
- 3/4 cup peanuts (roast for extra flavor)

Dressing

- 1/2 cup yogurt
- 3 tablespoons olive oil
- 3 tablespoons honey
- 2 teaspoons cider vinegar
- Juice of one lemon
- Freshly ground pepper (about 1/4 teaspoon)
- 1/2 teaspoon salt
- 1/2 to 1 teaspoon celery seed

Directions

Combine dressing ingredients. Toss cabbage mixture with dressing.

*Note: Greens like spinach, lettuce, kale and celery are among the most likely to be contaminated with pesticides. Consider buying organic or growing them yourself. For more information, visit the Environmental Working Group at: www.ewg.org/foodnews/summary

GARLIC AND GINGER SALMON WITH GREENS



Makes 3-4 servings

Ingredients

- 1 pound salmon, lake trout fillet or salmon steak
- 2 cups lightly steamed green beans or kale (tough center removed, washed, coarsely ripped/chopped)
- Lemon, sliced (optional)

Sauce

- 1-2 tablespoons grated or finely chopped ginger
- 2 tablespoons finely chopped shallots OR onions
- 1 tablespoon chopped garlic
- 2-3 tablespoons maple syrup
- 1/4 cup garlic and bean paste (found in Asian foods section of most grocery stores)
- 1/2 cup rice wine (skip if you have used wine to poach the salmon and have about 1/2 cup left)
- 1 tablespoon soy sauce or wheat-free tamari

Optional - sometimes for a kick or a change

- 1/2 teaspoon hot chili sesame oil
- 1 teaspoon sesame oil
- 2 tablespoons toasted sesame seeds
- Substitute dark miso for garlic bean paste to boost your healthy gut microbes

Directions

Combine the ingredients in the sauce. Set aside.

1. Place a few tablespoons of a light olive oil in the bottom of a frying pan. Place a salmon fillet (*skin side down*) over the top. Add 1/2-cup white wine or rice wine and few slices of lemon over salmon (*optional*). Cover.
2. Bring liquid to simmer to poach salmon until it flakes (5-15 minutes depending on thickness and heat intensity).
3. When salmon flakes, pour sauce over salmon.
4. Remove salmon letting excess sauce drain back into the pan. Scrape up any sticking salmon skin and discard. Add the sauce to the poaching liquids and boil until it is thick and syrupy. Turn off heat.
5. Mix green beans in sauce to coat and remove. If using kale, cook about 3-5 minutes in poaching liquids after removing fish. (*Add miso at this point*)
6. Pour remaining sauce over salmon and serve green beans or kale alongside.

A baked sweet potato also goes well with this dish and also contains lutein! Have fun with the options and adjusting to your tastes.

GREEN GODDESS DRESSING

Makes about 1-1/4 cups

This tangy dressing is not only good on salads, but also it can also be used as a dipping sauce for cut vegetables such as red peppers, carrots and zucchini. Even try it over sliced tomatoes, hard-boiled eggs, or also on fish.

Ingredients

- 1 cup packed green leaves such as watercress, kale (ribs removed), spinach or arugula
- 1 cup (or more) plain yogurt (I like Greek Style)
- Fresh Herbs (herbs are tastiest when in-season):
 - 2 tablespoons (packed) chopped fresh dill
 - 2 tablespoons (packed) chopped fresh basil
 - 1 tablespoon (packed) chopped fresh mint
- 2 tablespoons chopped green onion or shallots
- 1 teaspoon of red wine vinegar, or 2 teaspoons of lemon juice



Optional Enhancements

- Grated lemon peel
- A pinch of cayenne pepper
- 1/4 teaspoon hot pepper sauce
- 2 teaspoons of white miso - contains healthy bacteria for your gut and tastes good, too

Directions

1. Cook greens in boiling water for 30 seconds. (2 minutes for tougher greens like kale). Drain. Pat greens dry with paper towels.
2. Blend greens in blender or food processor with remaining ingredients and puree until smooth, thinning with more yogurt or water, if desired.
3. Transfer dressing to bowl. Season dressing to taste with salt and pepper.

This can be stored in the refrigerator for up to 5 days.

AVOCADO BENEDICT

Makes about 2-4 servings

Ingredients

- Olive oil, unrefined, virgin
- 1 onion
- 1 (or more) clove garlic, chopped
- 1 large avocado (or 2 small)
- 1 lemon (organic, if possible, for the zest)
- 1/2 cup chopped parsley
- 1/2-1 bunch (about 6 cups ripped/coarsely chopped) mustard greens (organic, if possible; arugula, sorrel, spinach or other strongly flavored dark greens work, too)
- 4 eggs
- 4 slices whole grain toast or English muffin
(optional as it works simply over greens, too)



Directions

1. Make avocado salsa:
 - Sauté onion with a pinch of salt and pepper in a small splash of olive oil. When onions begin to become translucent, transfer them to the bowl with the avocado
 - Meanwhile, mash avocado in a bowl with fork
 - Add half of the minced garlic and lemon juice and grate the lemon zest into the bowl
 - Add parsley, a pinch of salt and dash of pepper
2. Cook greens in the same pan as the onions were sauteed in, steam the greens on a few tablespoons of water, until wilted. Add a bit of olive oil, salt and pepper, the other half of the minced garlic and cook for a minute more
3. Cook the eggs. I poach them or soft boil them in the same pan as the onions and greens
4. Assemble:
 - Cover each slice of bread with 1/4 of cooked greens
 - Top with 1/4 of the avocado salsa
 - Top with prepared-to-your-liking egg
 - Sprinkle with your favorite sea salt and pepper



DEPARTMENT OF

Ophthalmology and Visual Sciences

UNIVERSITY OF WISCONSIN

SCHOOL OF MEDICINE AND PUBLIC HEALTH

For more information on
eye health and age-related
macular degeneration,
please visit:
nutritionforeyes.opth.wisc.edu

UWHealth

Eye Clinics
World-Class Eye Care



McPherson
Eye Research Institute
UNIVERSITY OF WISCONSIN-MADISON