



Department of Ophthalmology  
and Visual Sciences

UNIVERSITY OF WISCONSIN  
SCHOOL OF MEDICINE AND PUBLIC HEALTH

# MACULAR DEGENERATION AND NUTRITION

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Professor

October 10, 2018

# Preserving Vision



## Things we cannot control:

- Our genes
- Our outside environment

# Preserving Vision



## Things we can do for ourselves:

- Get medical treatment
- Avoid excessive sunlight
- Don't smoke
- **Eat well**
- **Be active**
- **Consider supplements, if needed**

Based on research conducted by many, and supported by taxpayers and participants. **At UW:**

...and **collaborators at 8 Universities**



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McPherson  
Eye Research Institute  
UNIVERSITY OF WISCONSIN-MADISON



National  
Eye  
Institute

NATIONAL INSTITUTES OF HEALTH



Research to Prevent Blindness

# The Evidence: **Nutrition Matters**

- **Clinical trials prove nutritional interventions:**
  - Lower risk for chronic diseases that are promoted by processes that also promote poor eye health  
*(high blood pressure or blood sugar, oxidative stress, inflammation)*
  - Slow the progression of age-related macular degeneration (AMD): AREDS1 and AREDS2
  - Improve vision *(New, early research)*



# If you have AMD: The American Academy of Ophthalmology Recommends this supplement tested in the AREDS 2 Trial:

- Lutein (10 mg) and Zeaxanthin (2 mg) (replaces beta-carotene)
  - Vitamin C: 500 mg
  - Vitamin E: 400 IU
  - Zinc: 80 mg (with 2 mg copper)
- Talk with your doctor about whether this supplement or alternatives might be best for you.



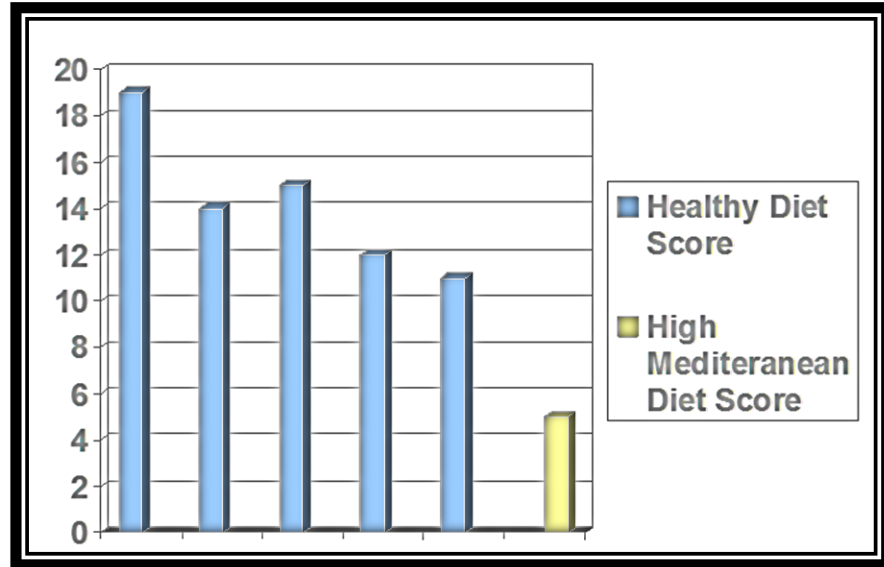
# The Evidence: **Nutrition Matters**

- **Population studies suggest that healthy diets:**
  - Lower chances of having early AMD
  - Work synergistically with physical activity and not smoking



# Healthy Diets Lowered Age-Related Macular Degeneration Presence 2 to 3 fold

**Percent with Intermediate Macular Degeneration in Women 50-74 years**

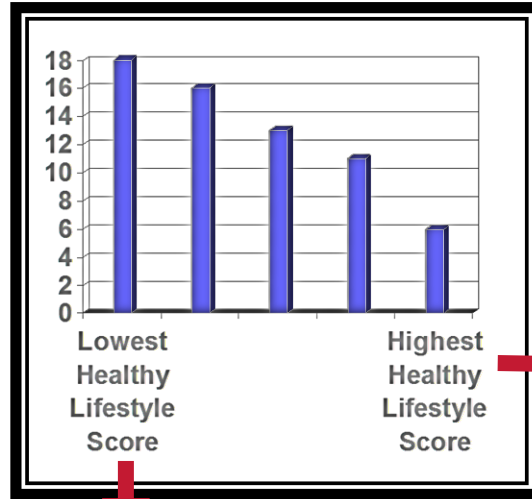


**Least Healthy Diets      Most Healthy Diets**



# A Combination of Healthy Lifestyles: Lowered Estimated Risk for AMD 3-Fold

**Percent with Intermediate Macular Degeneration Among Women 50 to 74 years**



CAREDS, Mares et al. 2011, Arch Ophthal

**Moderate Exercise: 8-10 hours per week**  
**Healthy Diet Scores: highest 20%**  
**Never Smoked**

**No Regular Exercise**

**Healthy Diet Scores: lowest 20%**

**Smoked (more than 8 years)**

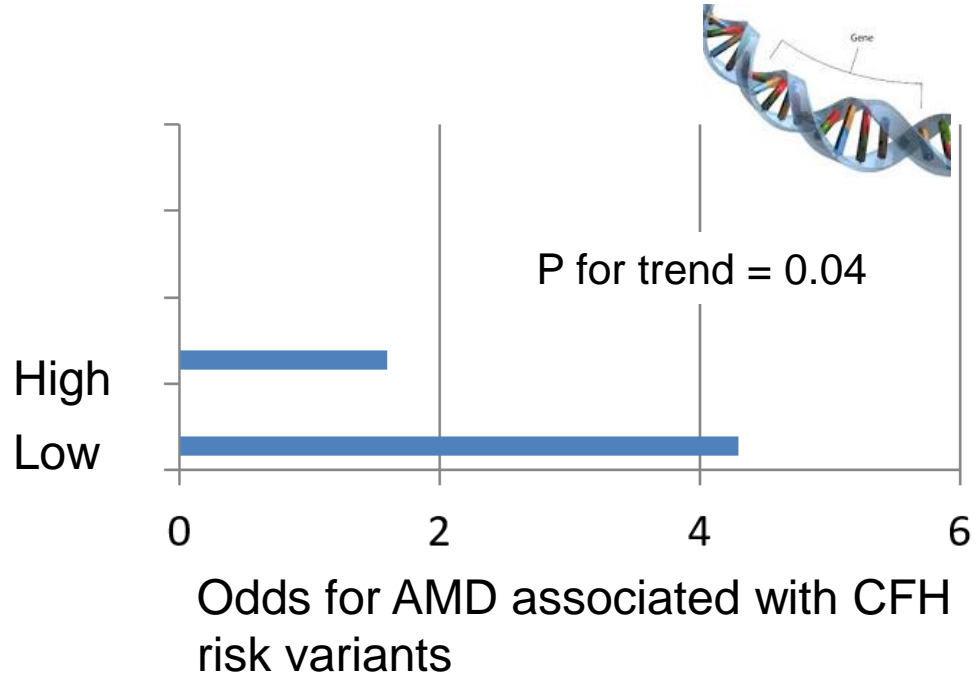


# Healthy diets and lifestyles lowered estimated risk for AMD associated with high genetic risk



## Healthy Life Style Score:

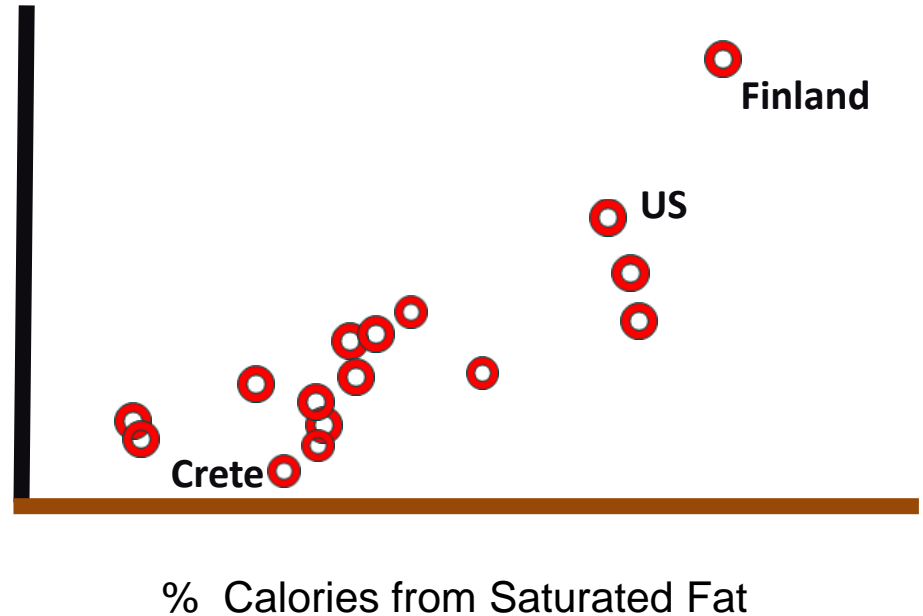
- Nutrient-Rich Diet
- Physical Activity
- Low Lifetime Smoking



# Healthy Diet Patterns

- Mediterranean
- Dietary Approach to Stopping Hypertension (DASH)
- US Dietary Guidelines

Heart  
Disease  
Deaths  
Per  
10,000  
People



# Healthy Diet Patterns

- Mediterranean
- Dietary Approach to Stopping Hypertension (DASH)
- US Dietary Guidelines
- Abundant in Fruits and Vegetables
  - Whole
  - 5 to 9 per day (1-3/meal)
- Contain
  - Whole Grains
  - A Daily Variety of Protein Sources
    - Plants (nuts, beans, legume)
    - White Meat, Fish, Eggs, Dairy (> 2/week)
    - Red and Processed meat <2/week

# What is a Healthy Diet?



**Varied, real food, and plant-food rich**

**<http://nutritionforeyes.Ophth.wisc.edu/>**



**Physical Activity, Sun (mornings)**

# Some differences in Mediterranean Diets with relevance for AMD

Emphasize higher intake of:  
**Omega-3 fatty acids**

Long-chain: Fish

Short-chain: walnuts,  
olive oil [less]

**Greens**

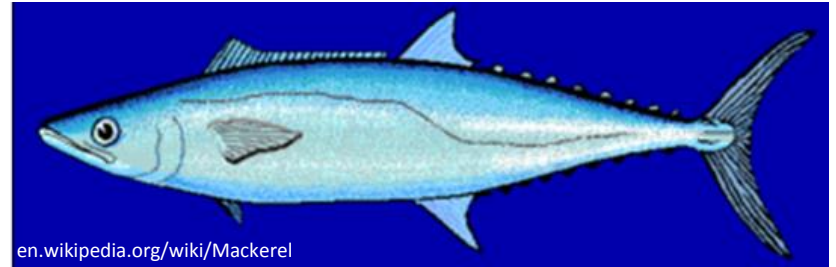


[en.wikipedia.org/wiki/Mackerel](https://en.wikipedia.org/wiki/Mackerel)

[en.wikipedia.org/wiki/Walnuts](https://en.wikipedia.org/wiki/Walnuts)

# Fish/Seafood also Provides other Nutrients related to Healthy Eyes and Lower AMD Risk

- Vitamin D
- B vitamins (especially B<sub>12</sub>)
- Minerals (selenium, zinc)





# Greens

- Salads, stewed
- Herbs
- Teas



# Lutein and Zeaxanthins

Macular Pigment:

In white and blue light

Light →

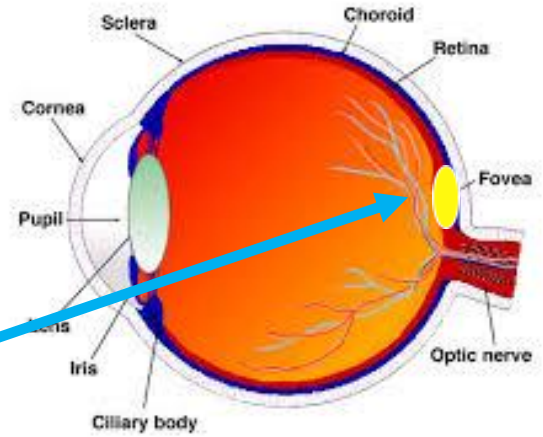
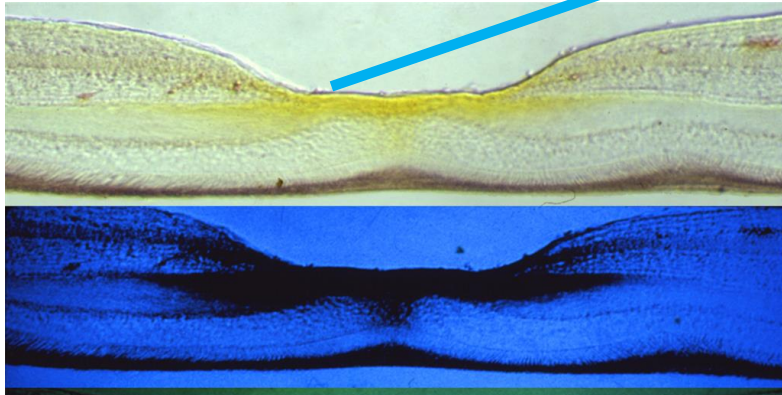


Fig. 8. Vertical sagittal section of the adult human eye.



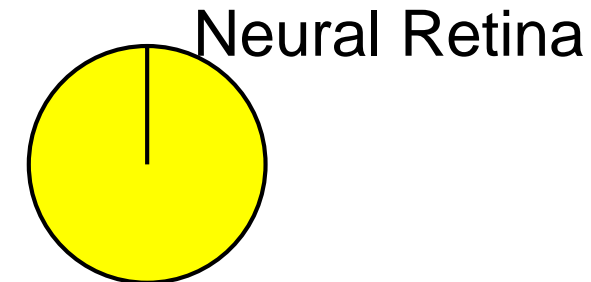
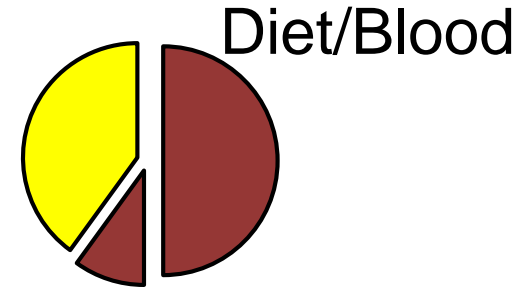
# Most Abundant Carotenoids



- Beta-carotene
- Alpha-carotene → Vitamin A
- Beta-cryptoxanthin
- Lycopene

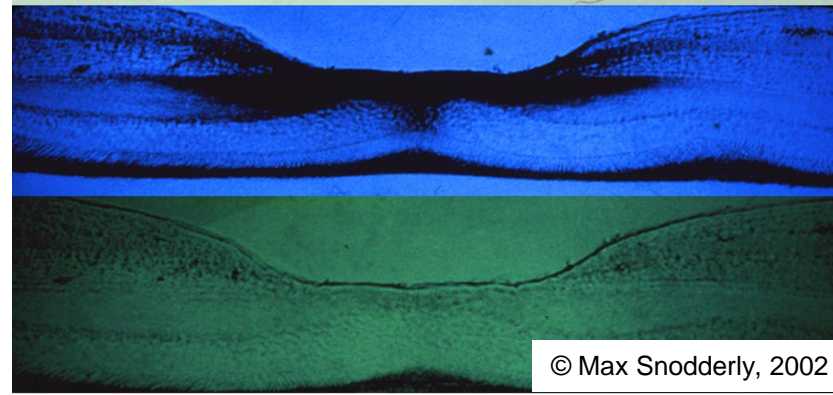


- Lutein/Zeaxanthin
- Mesozeaxanthin



# Measurement of Lutein and Zeaxanthin Pigments in the Back of the Eye

“Macular Pigment”  
-Simple, Non-Invasive





# The Carotenoids in Age-Related Eye Disease Study (CAREDS) of the Diet and Vision Study in women (53 to 86 years)



WHI  
1994-98  
Observational Study  
93,676 women

6 years

CAREDS  
2001-04  
2,005 women

15 years

CAREDS 2  
2016-2018  
674+ Women

- Diet, lifestyles and health histories
- Blood: For nutrient, lipid and genetic information

- Macular pigment density
- Intake: Diet, Supplements
- Photographs of retina and lens
- Vision function tests

- Macular pigment density
- Intake: Diet, Supplements
- More retina imaging
- New vision function tests

# 2001-2004: Macular pigment was higher in women who...

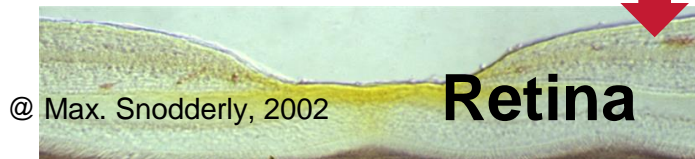


1. Had gene variants for proteins that help us take lutein
  - Into our body
  - Through our blood
  - Into our retina

## 2. Consumed Healthy Fats



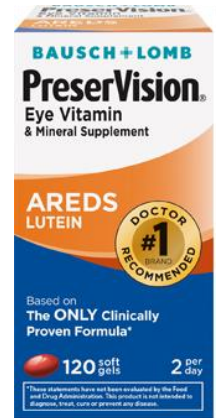
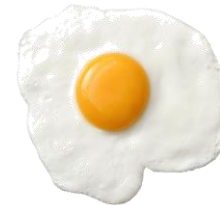
## 3. Had high Fiber Diets



## 2016 – 2018 Early Findings...

Fifteen year increases in macular pigment levels were more common in women who:

- Had low levels ~ fifteen years earlier
- Obtained lutein in AREDS2- type supplements (usually 10-12 mg/day)
- Ate eggs (~ 10 /week)



# New Research Findings and Direction:

Macular pigment was higher in women and men who report being breast fed (preliminary)

How much does breastfeeding matter to health of eye (and brain)?

- Infant formulas did not add lutein and zeaxanthin until ~ 2012.
- They are still not routinely added.





# RESOURCES

October 10, 2018

**Websites with additional information about diet and eye health:**

[www.opth.wisc.edu/dvs](http://www.opth.wisc.edu/dvs)

<http://maresgroup.opth.wisc.edu>

**For information about the content and quality of health and nutritional products, and independent testing of their content**

**<https://www.consumerlab.com>**

**Search for recent December 2018 update: Vision Supplements Review (with Lutein and Zeaxanthin)**