



# DIETARY PATTERNS AND SUPPLEMENTS TO SLOW AGE-RELATED EYE DISEASE, AND FOSTER VISION

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# The Carotenoids in Age-Related Eye Disease Studies



WHI  
“Baseline”  
1994-98  
Observational Study  
Women ages 50 to 79 years

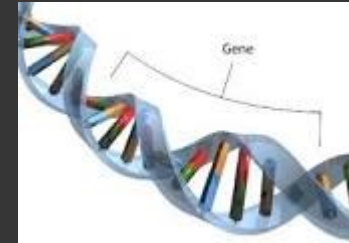
6 years

CAREDS1  
2001-04  
N=2,004

15 years

CAREDS 2  
2016-2019  
N=685

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

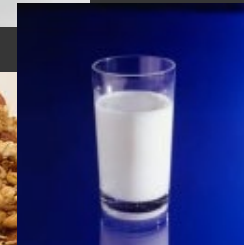


Healthy Life Style Score: High

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

\*In CAREDS1 women with stable diets from CAREDS, Meyers et al., 2015, Ophthalmology

# What is a Healthy Diet?





## Poll QUESTION 1:

1. Which Diet Patterns are the most **healthful**?
  - A. The DASH Diet
  - B. The United States Healthy Eating Index
  - C. The Mediterranean Diet
  - D. All of the Above



## Poll Question 1: Answer

### HEALTHY DIET PATTERNS ARE Similar:

- Mediterranean
- Dietary Approach to Stopping Hypertension (DASH)
- The US Healthy Eating Index
- Abundant in Fruits and Vegetables
  - Whole
  - 5 to 9 per day (1-2/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

# Some differences in Traditional Mediterranean Diets with relevance for AMD

Emphasize higher intake of:  
**Omega-3 fatty acids**  
(Fish, nuts, olive oil)

**Greens**





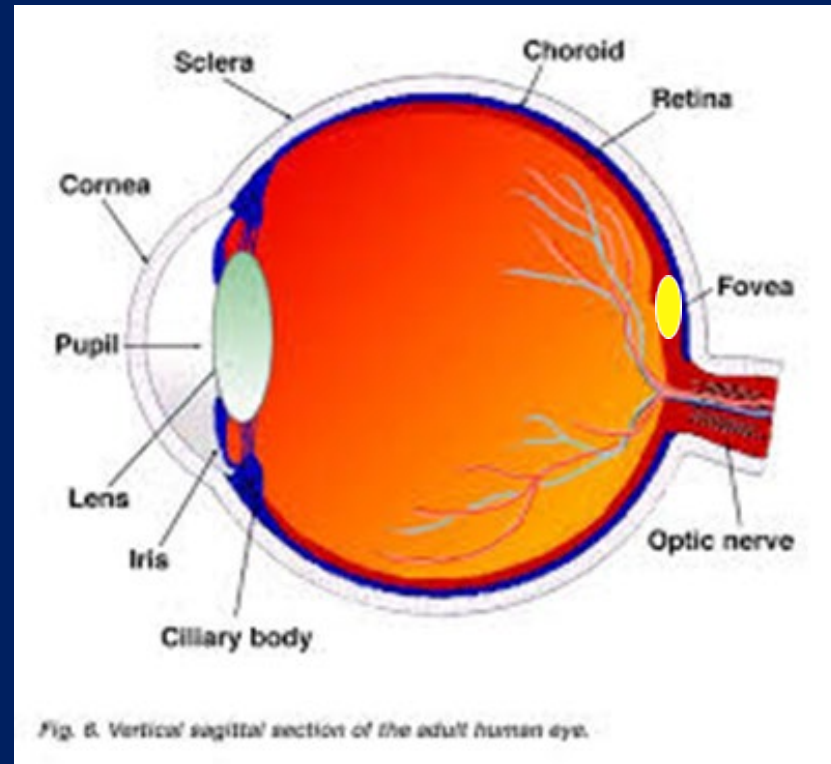
## Poll QUESTION 2

Which carotenoid plant pigment gives the center of the retina ( the macula) it's yellow color?



## Poll QUESTION 2

Answer: **Lutein** gives the center of the retina ( the macula) it's yellow color



Lutein is one of several carotenoids are in foods we eat which is taken up in the retina



- Beta-carotene
- Alpha-carotene
- Beta-cryptoxanthin

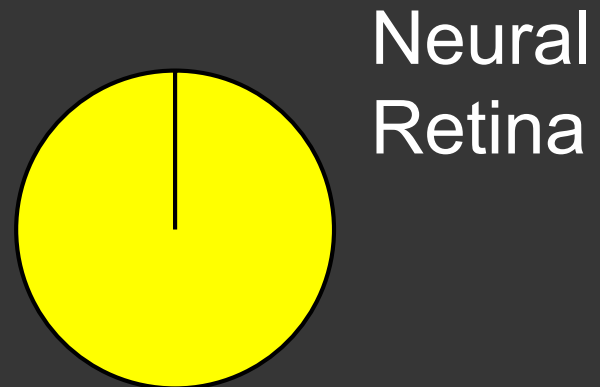
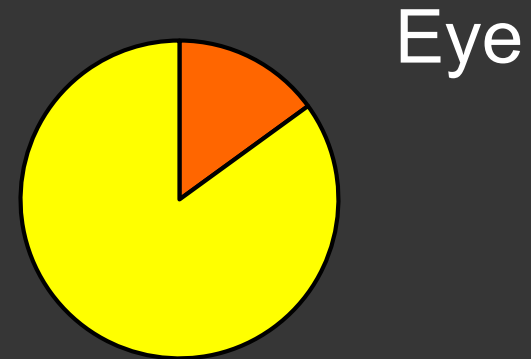
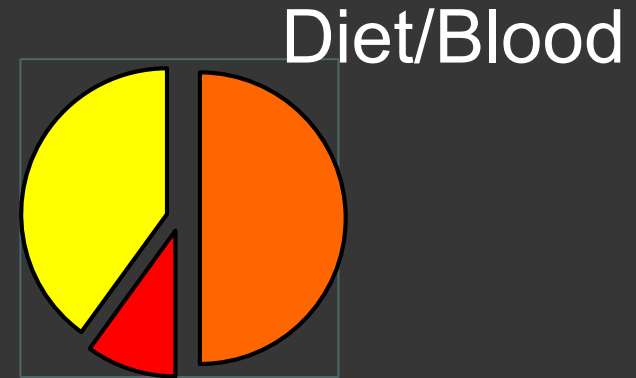


- Lycopene

2 Vitamin A



- Lutein (and Zeaxanthin)

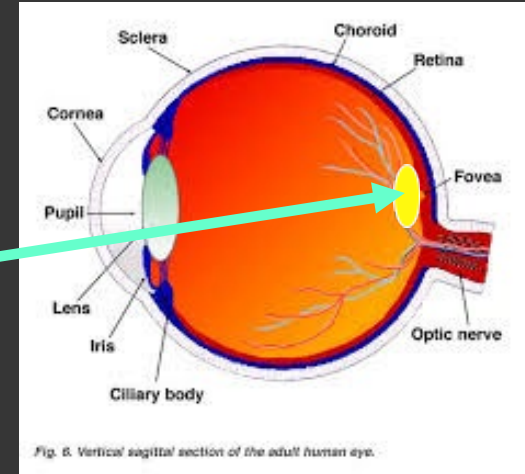


**Lutein and zeaxanthin can be measured simply and noninvasively in the center of the retina (the macula)**

**It is called 'Macular Pigment Density'**



# Lutein protects plants and our eyes from damage due to blue light



MACULAR PIGMENT

nei.nih.gov

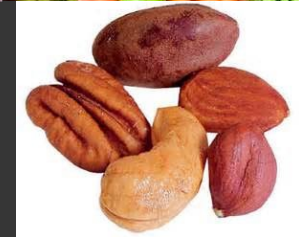


# In CAREDS1: Macular pigment density was higher in women who also...

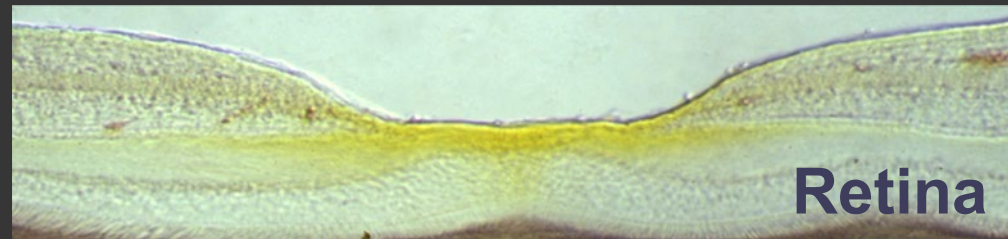
Consumed healthy fats



Had high fiber diets



1. Had gene variants for proteins that help us:
- absorb lutein
  - Carry in our blood
  - Take it into our retina



# CAREDS2: 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 (10-12 mg/day)

Ate eggs regularly: 5 to 6/week



# Stay tuned for more results of CAREDS2:

## Research Questions:

Were women with higher macular pigment density less likely to have developed age-related macular degeneration or to have glaucoma?

Did they have a thicker retina and other signs of a healthy retina?

Did they have better vision function?:

Early results: They had better visual acuity (sharpness) and ability to detect contrasts (useful in using stairs)



Question:

What question, asked of participants at WHI baseline, led our Carotenoids in Age-Related Eye Disease Research to a new area of lutein research?

Answer: Were you breastfed as an infant?



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



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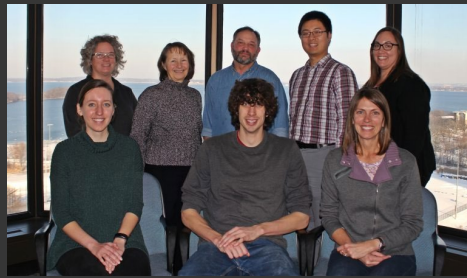
Other researchers found that lutein in breast milk is higher in mothers with higher lutein levels in blood., also suggests that pregnant and nursing women consider taking lutein supplements ( Review by Bernstein and Arunkumar, 2021;Journal of Lipid Research volume 62

Some Infant formulas did not add lutein until about 2012. They are still not routinely added.

# CAREDS 2 Research Team

## UW Coordinating Center Team

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Blomme, Lawler, Ewing, Mezhibovsky ( )



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Nolte, Kehoe, Sinkey



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Portland, OR  
Bailey, Klein



Iowa City, IA  
Gehrs



## WHI Epidemiologists/Clinicians

### Coordinating Center

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Tinker



Madison, WI  
Sarto



Portland, OR  
LeBlanc



Iowa City, IA  
Robinson Wallace



### UW Genetic Epidemiologist

#### Statistician

Gangnon



Engelman



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Millen



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Snodderly



Brown U  
Wooten



U Georgia  
Hammond



UW  
VerHoeve



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- Glaucoma Studies in CAREDS2 (Yao Liu, MD, PI)



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- University of Wisconsin, School of Medicine and Public Health Institute for Clinical and Translational Research
- Lions Eye Bank