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Cheatham Nutrition & Cognition Lab

Why do we eat applesauce with pork?

Whole foods and nutrient synergy.

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Cheatham Nutrition & Cognition Laboratory

- Developmental cognitive neuroscientist (developmental psychologist)
- Studying how nutrition affects cognition

- From preconception to birth to old age – nutrition is central to brain function.

Outline

- Food pairings – why do we eat certain foods together?
- Vitamin pairings – eat this with that for better nutritive value.
- Whole foods – why do certain nutrients always occur together?

Bacon with Collards?

Meat & Potatoes

- Mom: Balanced diet
- CLC: Because meat grows in Wyo
- Internet: bad to eat carbs with meat (e.g., althealthworks.com)
- Science: potato fiber with red meat may be good for the colon (Paturi et al., 2012)

Bacon with Collards

- Most common answer - “because it tastes good.”
- CLC: because the fat breaks down the fibrous leaves so you can eat them.
- Chefs: it is the salt in the ham hocks or bacon that tenderizes the leaves.
- Science – stay tuned

Mint with Lamb

- BFF: to hide the taste of the lamb
- Bible: Israelites the eve of Exodus
- QE1: passed a law
  - to increase wool exports
- Chefs: lamb is fatty, acid cuts the fat

Apples with Pork

- Historical – 1st known reference

Marcus Apicius
in Ancient Rome
(42 B.C.-37 A.D.)
wrote down a recipe
for diced pork
with apples.

Apples with Pork

- Folklore: apples kill trichinosis
- Chefs: sweet compliments savory; tartness cuts the fat
- Logistics: apples and pork harvested at the same time
- MIL: helps with digestion

Apples with Pork

- The science:
  - Apples do not kill salmonella on pork, but olive extract and cinnamon oil do. (Chen et al., 2013)
  - Apple-derived fiber cuts the fat in meat by 30% (Choi et al., 2016)
  - Apples prevent carcinogens from forming in overcooked meat (Sabally et al., 2016)
    - Pork is usually overcooked out of fear of trichinosis

Cheese with Wine

- “Many of the world's most beloved food combinations pair an astringent food, which causes the mouth to pucker up, with a fatty food, which makes the mouth feel slippery.”

https://www.livescience.com/23786-food-pairings-wine-cheese.html

Cheese with Wine

Science – eating lycopene (e.g., red wine)
with a fatty food results in
4.4X higher lycopene absorption into the body.

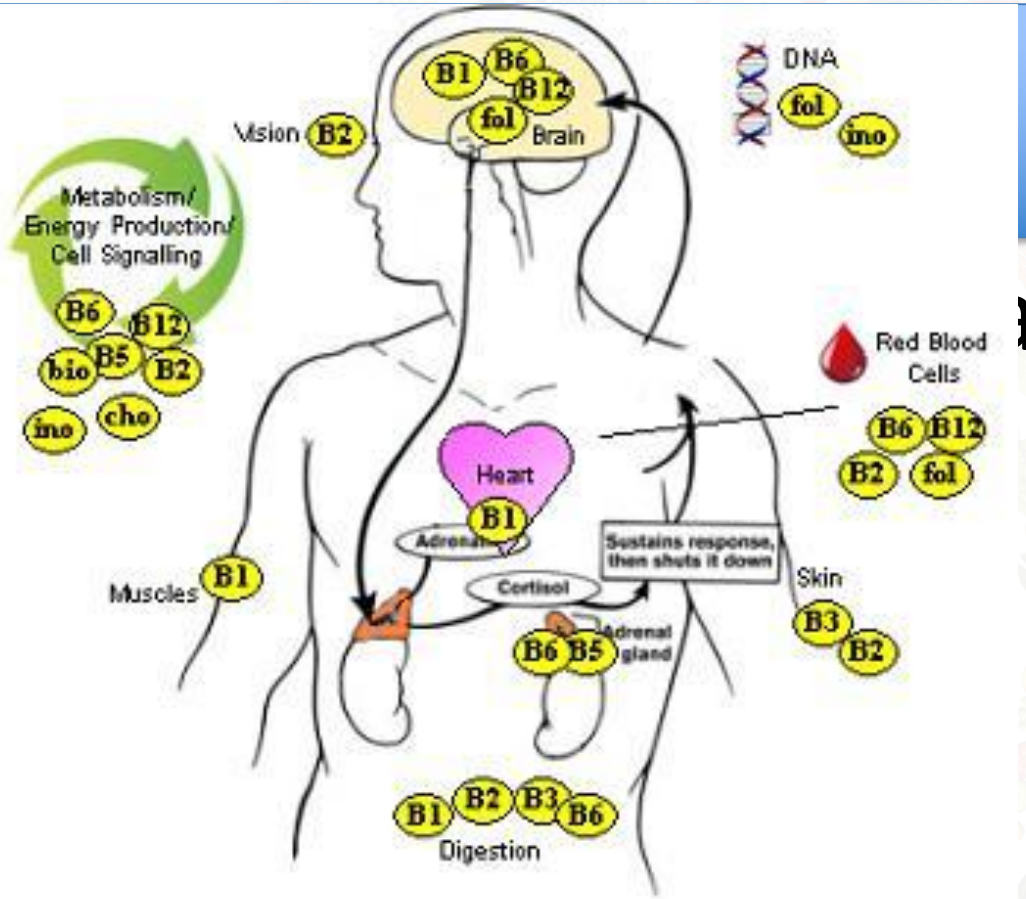
Food Pairings Recap

Vitamin D & Minerals

- Calcium, phosphorus, and magnesium
- Most useful when small quantities of the minerals are present.
- Unprotected sunshine = Vitamin D

B Vitamins

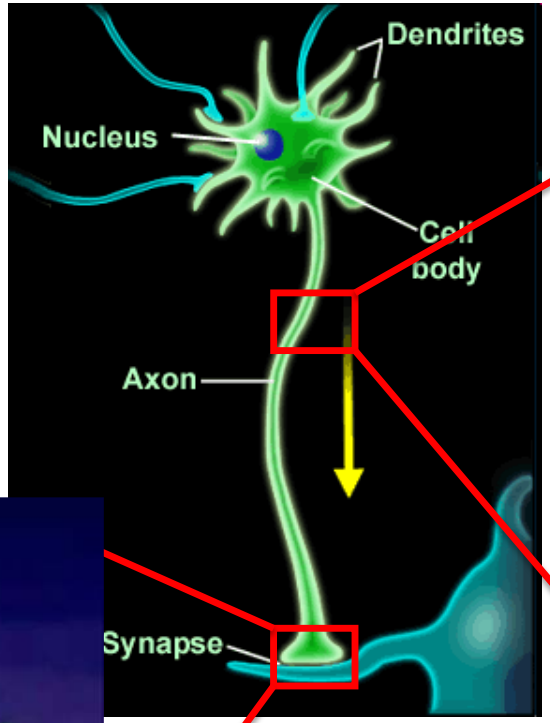
- B
- Once amin (sam
- Work
- Sad r ns

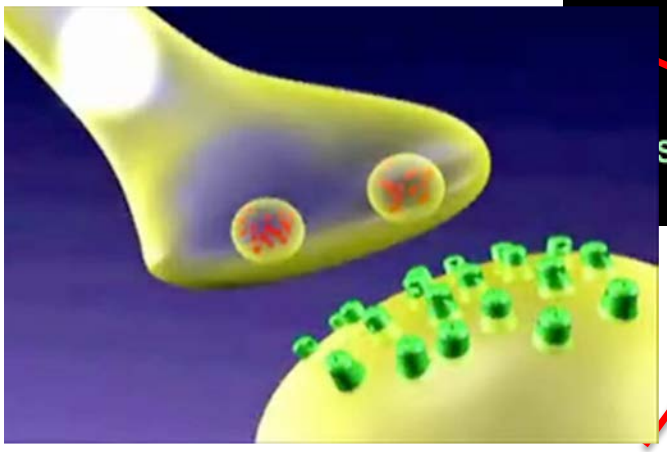


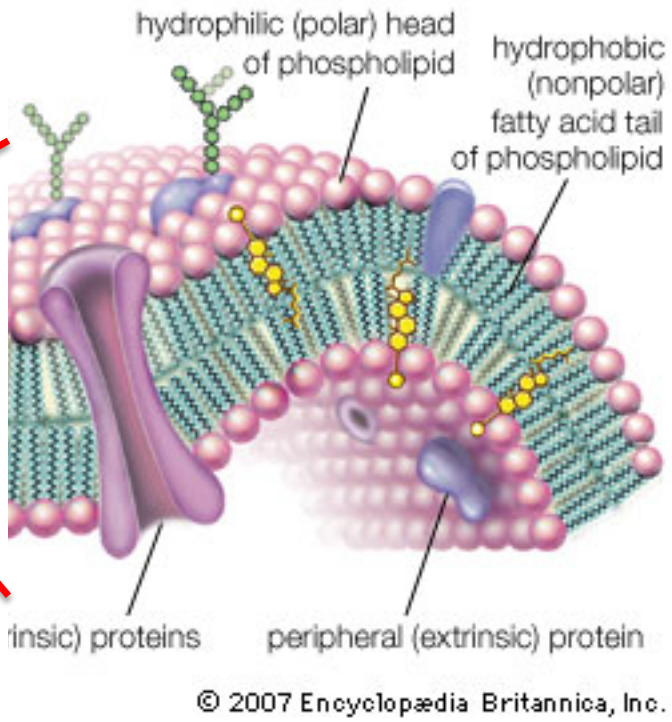
Fatty Acids & Antioxidants

- All cells in body contain fatty acids
- Fatty acids in the brain support cognition
- Fatty acids are stored in the liver.
- Transport requires choline.
- Oxidation is a problem.

DHA & Phospholipids (Choline)







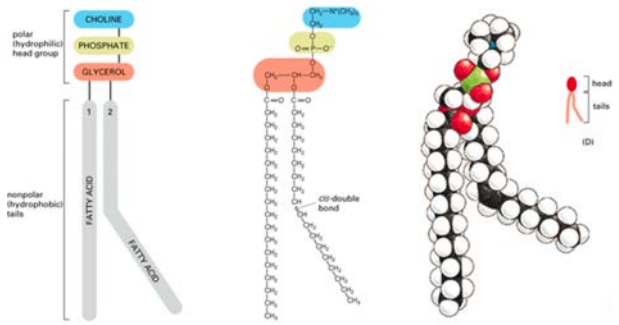
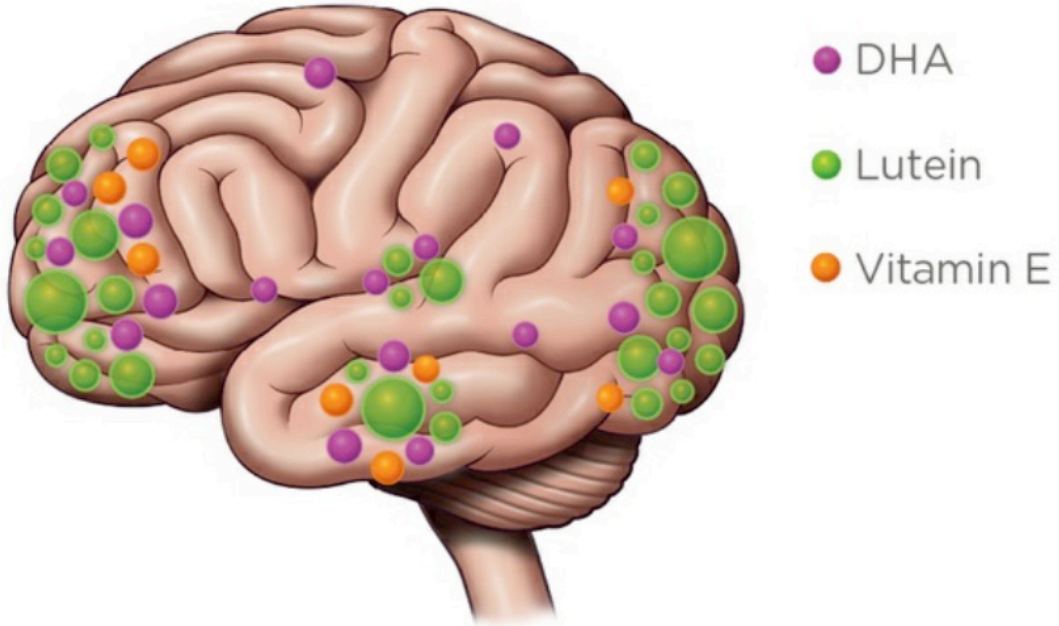


Figure 10-2 **The parts of a phospholipid molecule.**

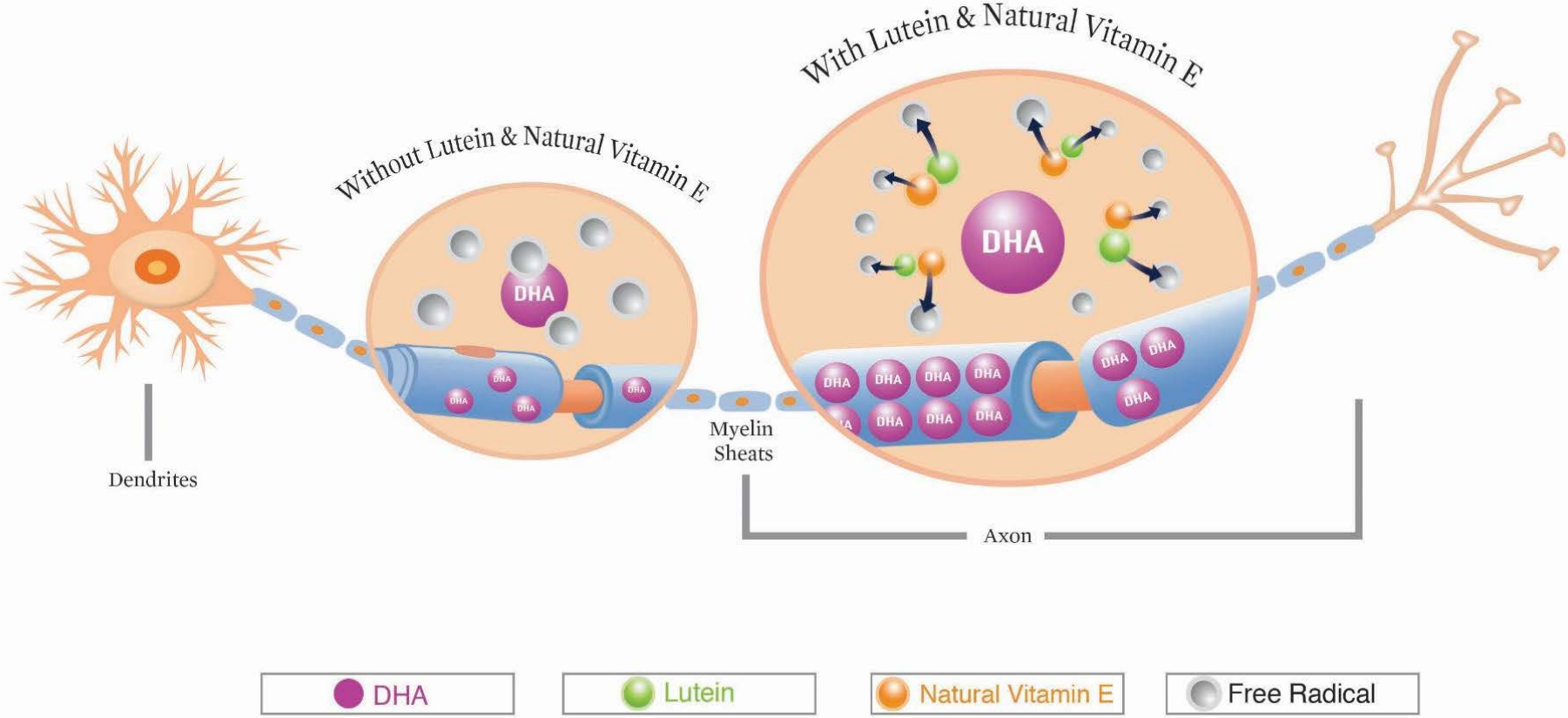
Co-localization of Nutrients



* In primate models.

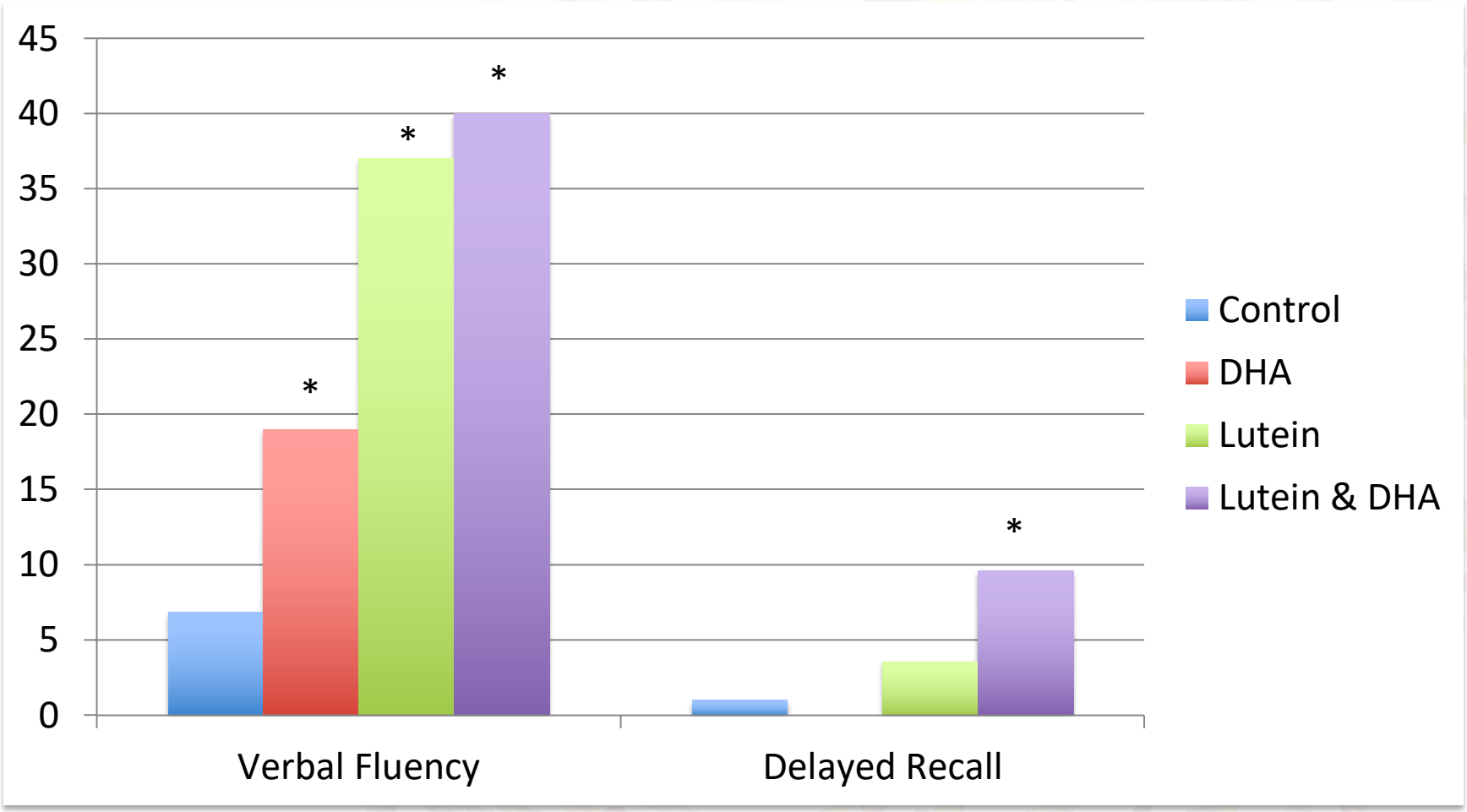
1. Johnson EJ, Mohn ES. Preferential accumulation of lutein, alpha-tocopherol and docosahexaenoic acid in subcellular membranes of primate brain. Abstract 2014. **2.** Lieblein-Boff J, Kuchan M, Jensen S, Johnson E. The naturally occurring alpha-tocopherol stereoisomer of vitamin E is predominant in infant brain. Abstract 2013. **3.** Wassall SR, et al. *Biochimica et Biophysica Acta Biomembranes.* 2009;1788:24-32. **4.** Vishwanathan R, et al. *J Pediatr Gastroenterol Nutr.* 2014. [Epub ahead of print]. **5.** Subczynski WK, Wisniewska A, Widomska J. Location of macular xanthophylls in the most vulnerable regions of photoreceptor outer-segment membranes. *Arch Biochem Biophys.* 2010;504:61-66.

Lutein and Natural Vitamin E Help Reduce DHA Oxidation



Vazhappily, 2013

Lutein & DHA Supplementation



Percent Change from Baseline, *$p < .05$

Johnson 2012

How Do I Know What to Eat?

- Taking good notes or read the next issue of Soundbites
  - Subscribe here: https://www.uncnri.org/index.php/soundbites/
- Instinct and taste
- Eat a variety of whole foods

Why Whole Foods?

Why Whole Foods?

Vitamin C? OR

Amounts per 1 cup, sliced (165g)

Calorie Information

Amounts Per Selected Serving		%DV
Calories	107 (448 kJ)	5%
From Carbohydrate	101 (423 kJ)	
From Fat	3.7 (15.5 kJ)	
From Protein	2.8 (11.7 kJ)	
From Alcohol	0.0 (0.0 kJ)	

Carbohydrates

Amounts Per Selected Serving		%DV
Total Carbohydrate	28.1 g	9%
Dietary Fiber	3.0 g	12%
Starch	~	
Sugars	24.4 g	

More details

Fats & Fatty Acids

Amounts Per Selected Serving		%DV
Total Fat	0.4 g	1%
Saturated Fat	0.1 g	1%
Monounsaturated Fat	0.2 g	
Polyunsaturated Fat	0.1 g	
Total trans fatty acids	~	
Total trans-monoenoic fatty acids	~	
Total trans-polyenoic fatty acids	~	
Total Omega-3 fatty acids	61.1 mg	
Total Omega-6 fatty acids	23.1 mg	

Learn more about these fatty acids and their equivalent names

More details

Other

Amounts Per Selected Serving		%DV
Alcohol	0.0 g	
Water	135 g	
Ash	0.8 g	
Caffeine	0.0 mg	
Theobromine	0.0 mg	

Protein & Amino Acids

Amounts Per Selected Serving		%DV
Protein	0.8 g	2%

More details

Vitamins

Amounts Per Selected Serving		%DV
Vitamin A	1262 IU	25%
Vitamin C	45.7 mg	76%
Vitamin D	~	~
Vitamin E (Alpha Tocopherol)	1.8 mg	9%
Vitamin K	6.9 mcg	9%
Thiamin	0.1 mg	6%
Riboflavin	0.1 mg	6%
Niacin	1.0 mg	5%
Vitamin B6	0.2 mg	11%
Folate	23.1 mcg	6%
Vitamin B12	0.0 mcg	0%
Pantothenic Acid	0.3 mg	3%
Choline	12.5 mg	
Betaine	~	

More details

Minerals

Amounts Per Selected Serving		%DV
Calcium	16.5 mg	2%
Iron	0.2 mg	1%
Magnesium	14.8 mg	4%
Phosphorus	18.2 mg	2%
Potassium	257 mg	7%
Sodium	3.3 mg	0%
Zinc	0.1 mg	0%
Copper	0.2 mg	9%
Manganese	0.0 mg	2%
Selenium	1.0 mcg	1%
Fluoride	~	

Sterols

Amounts Per Selected Serving		%DV
Cholesterol	0.0 mg	0%
Phytosterols	~	

http://nutritiondata.self.com/facts/fruits-and-fruit-juices/1952/2

Human Milk Nutrients

Vitamin (per 4 oz)	Milk
Niacin (mg)	0.4
Riboflavin (mg)	0.1
B12 (mcg)	0.1
Pantothenic Acid (mg)	0.5
Vitamin A (IU)	522
Thiamin (mg)	0.04
Pyridoxine (mg) aka B6	0.01
Vitamin E (mg)	0.2
Vitamin D (IU)	9.8
Folate (mcg)	18.8
Lutein (mcg)	2.16
Choline (mg)	39.4
Docosahexaenoic Acid (mg)	1.32

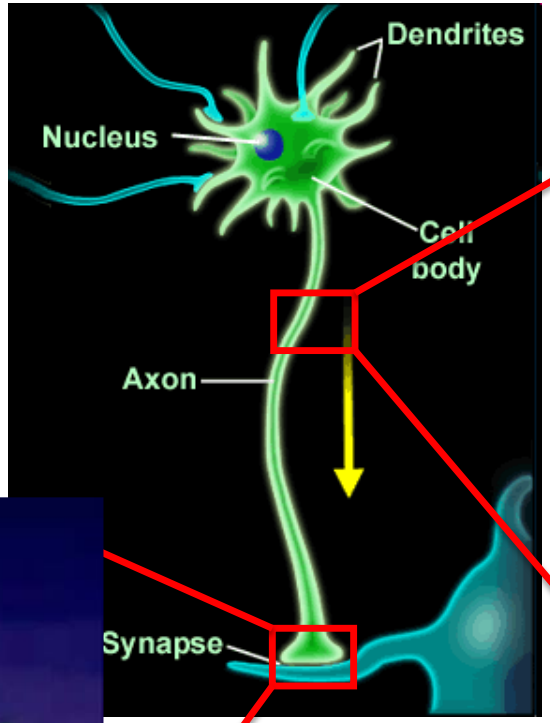
USDA National Nutrient Database for Standard Reference, R23 (2010)

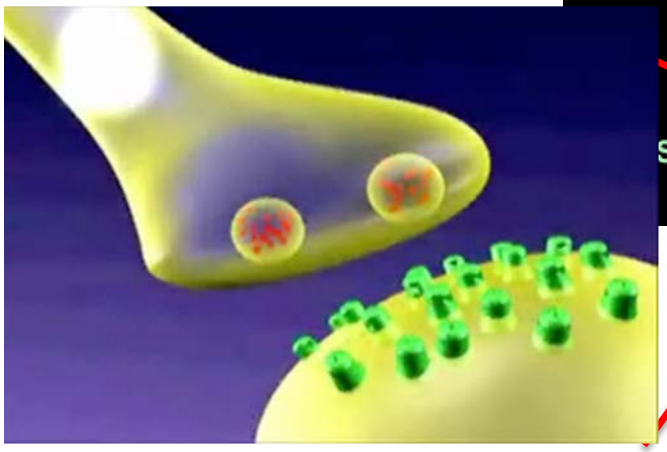
First Cheatham Lab Participant

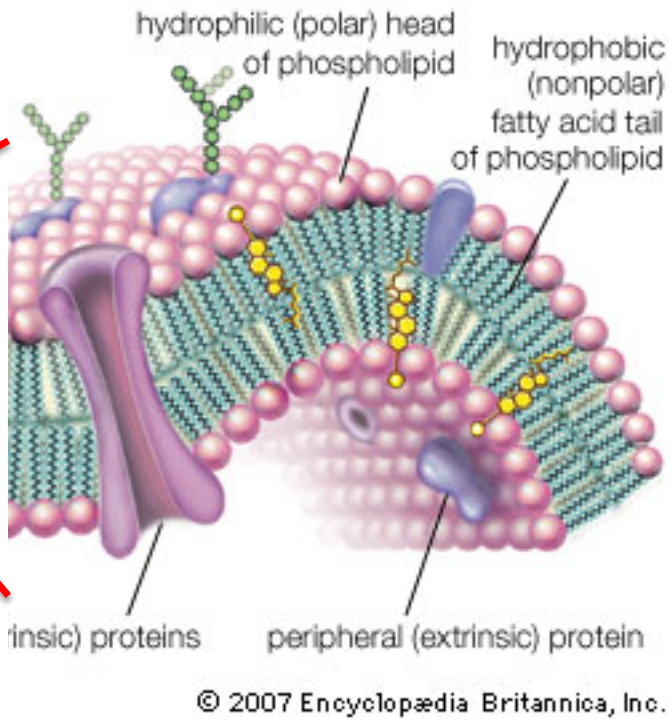
Photo courtesy of Salisbury Post 2/21/2010

Recognition Memory Oddball Paradigm

DHA & Phospholipids (Choline)







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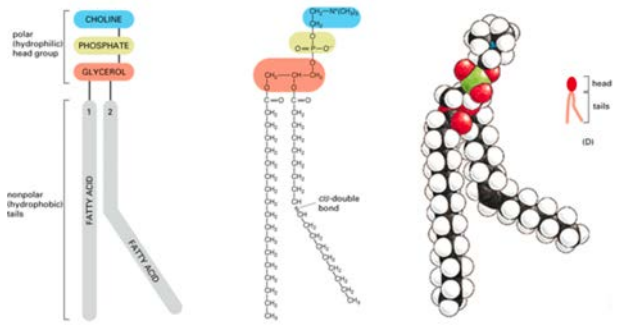
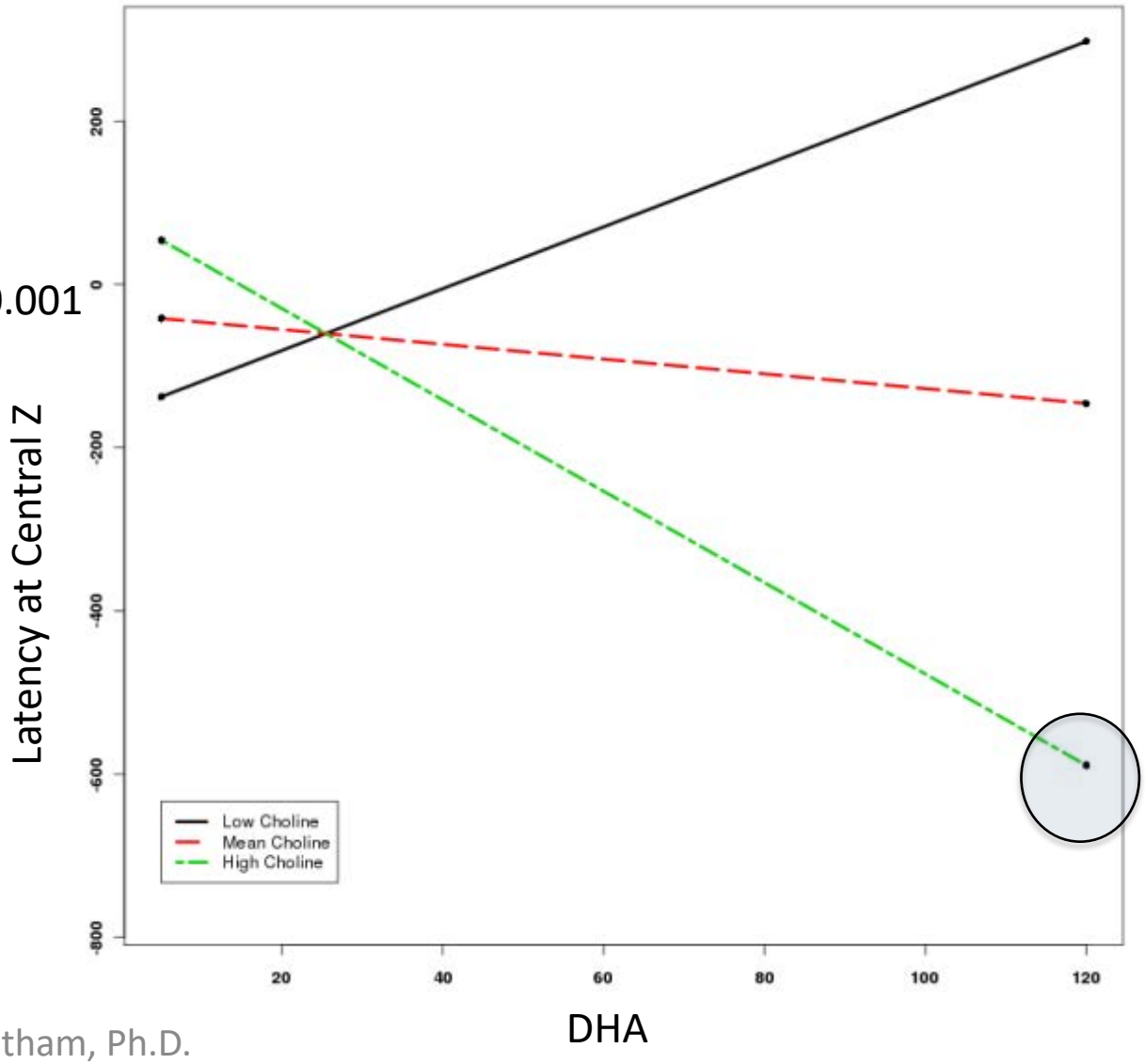


Figure 10-2 **The parts of a phospholipid molecule.**

DHA and Choline – Latency Central

DHA = $p<0.01$
Cho = $p<0.05$
DHA x Cho = $p<0.001$

Rsq = 0.21

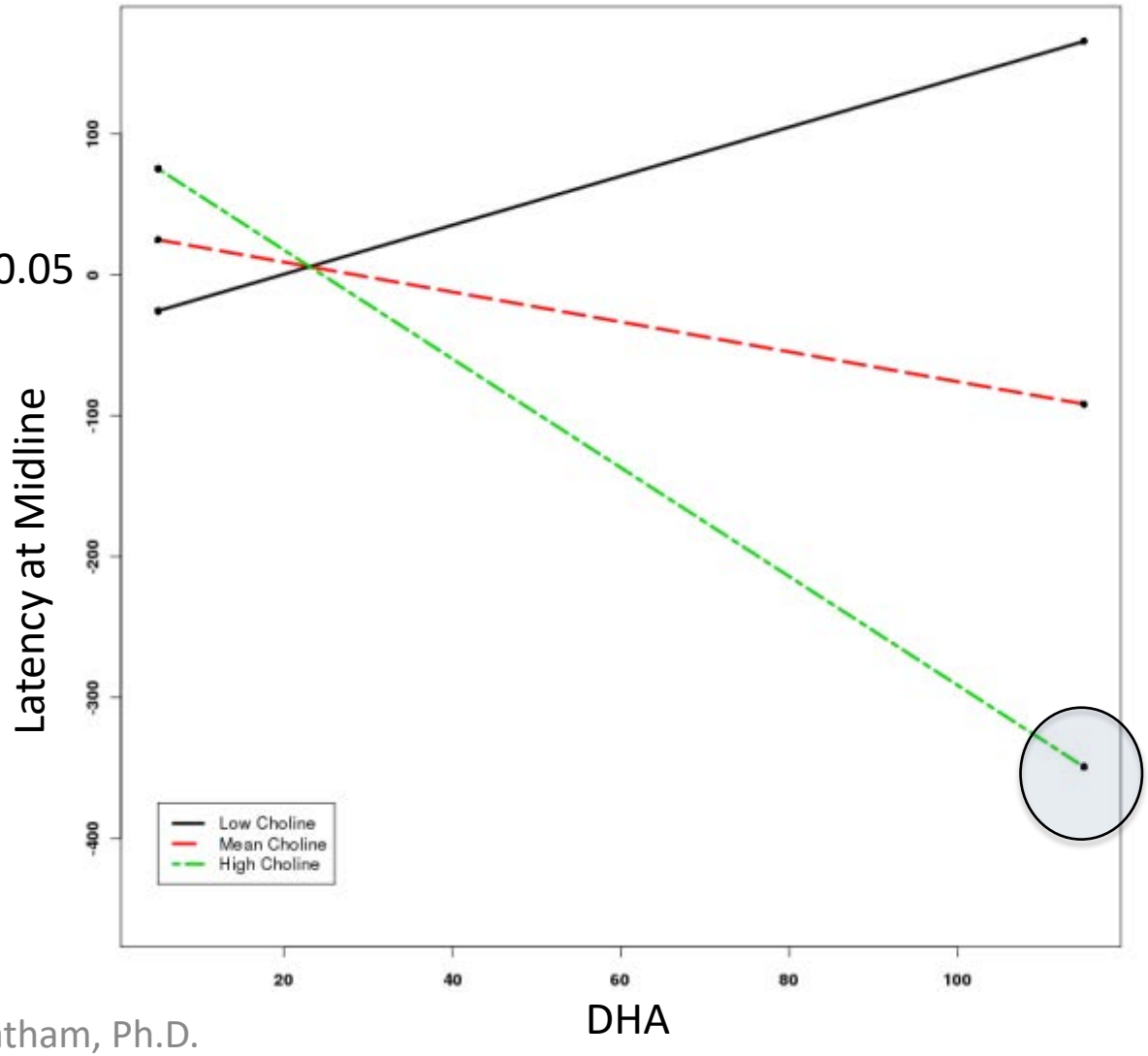


High DHA,
High Choline

DHA and Choline – Latency Midline

DHA = $p<0.10$
Choline ns
DHA x Cho = $p<0.05$

Rsq = 0.17

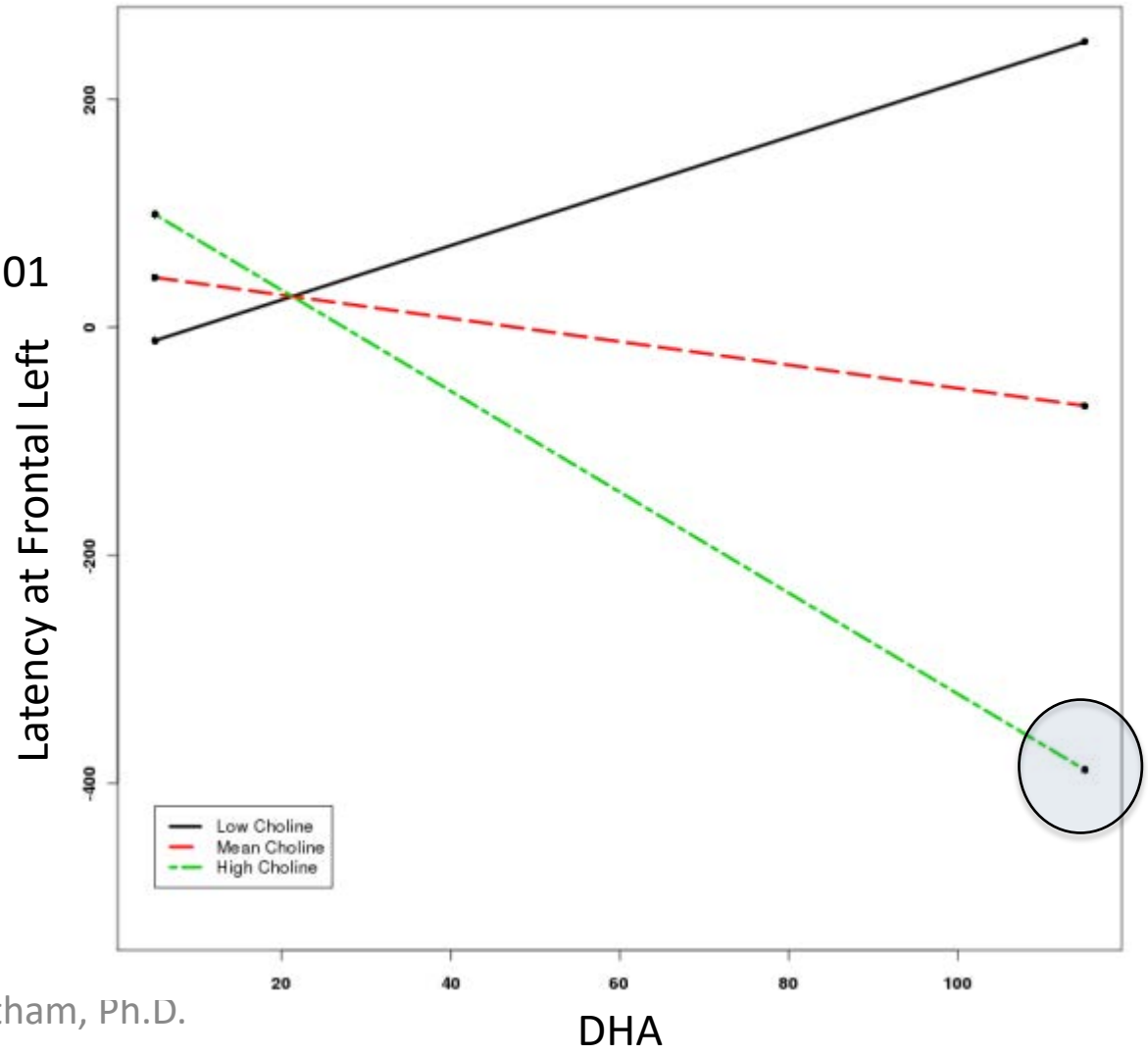


High DHA,
High Choline

DHA and Choline – Latency Frontal

DHA = $p<0.05$
Cho = $p<0.10$
DHA x Cho = $p<0.01$

Rsq = 0.21

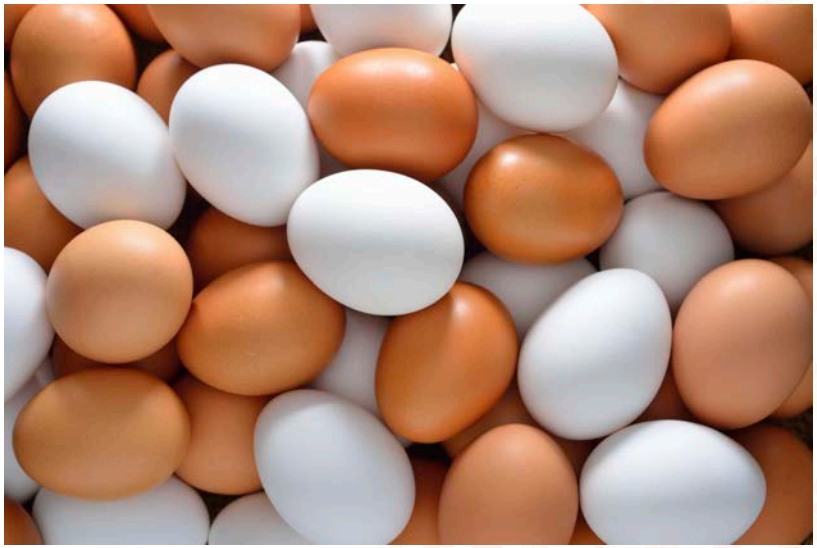


High DHA,
High Choline

DHA Relies on Synergy

- DHA needs choline, natural E, and lutein to optimize brain activity.
- How do we know it is important?
- They often appear together in nature in some combination.
- OR in popular food combos!

Examples of DHA “Team”



Back to Collards…

- Traber et al. 2015

In sum…

Thank you.

- All families that participate in research around the world

  - Stevie Ray Wunder
  - Patricia J. Bauer, Ph.D.
  - Megan R. Gunnar, Ph.D.
  - Michael K. Georgieff, M.D., Ph.D.
  - Charles A. Nelson, Ph.D.
  - Sandra Wiebe, Ph.D.
  - Steven Zeisel, M.D., Ph.D.
  - J. Steven Reznick, Ph.D.
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The Cheatham Nutrition & Cognition Team

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