

MIND YOUR EGGS & VEGGIES

Nutrition for Cognitive Health



Presented by Taylor C. Wallace, PhD, CFS, FACN
And Chef Abbie Gellman, MS, RD, CDN



**PRODUCE FOR[®]
BETTER HEALTH**
FOUNDATION

Spread the Fruit and Veggie Love

#haveaplant

 @fruits_veggies

 @fruitsandveggies

 @fruitsandveggies



A smiling woman with long dark hair is holding a silver tray with a plate of food and several glasses of smoothies. In the background, a man with a beard is also visible. The scene is set outdoors at a wooden table.

Our Purpose

The Produce for Better Health Foundation (PBH), a 501(c)3, is the only national non-profit organization committed to helping people live happier, healthier lives by eating more fruits and vegetables in all their glorious forms every day.

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Our Movement

Research shows, rather than a prescriptive recommendation to eat a certain amount of fruits and vegetables each day, consumers (particularly Gen Z and Millennials) want actionable, realistic and FUN approaches that make eating fruits and vegetables easy, helping them feel confident, happy and healthy.

That's where PBH's Have A Plant® movement comes in. It's a way to tap into the emotional connection consumers have to the fruit and vegetable eating experience while inspiring long-term, sustainable behavior change. And it does so with a no-nonsense approach that's simple, understandable, and, importantly for this audience, non-prescriptive.





Moderator

Wendy Reinhardt Kapsak, MS, RDN

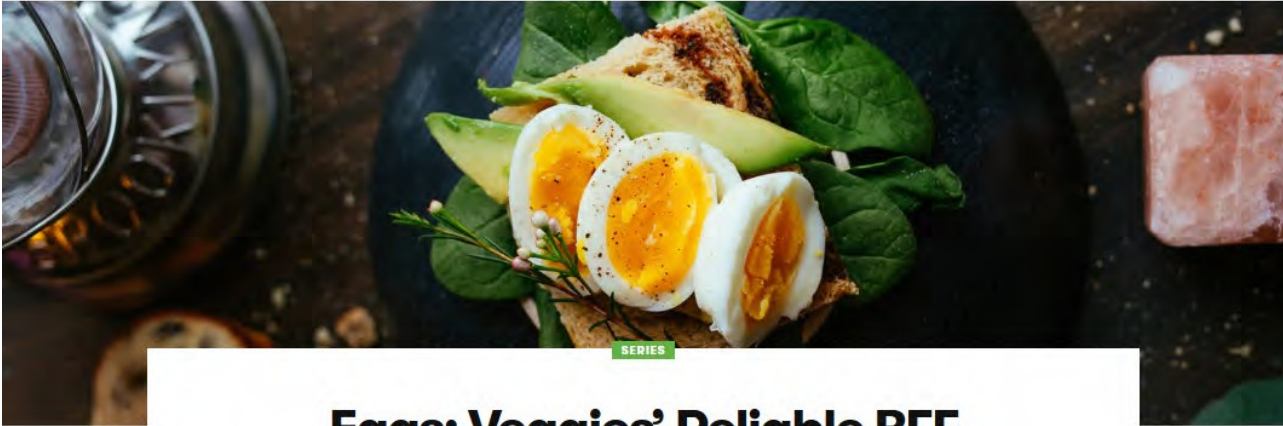
Content Series:

Eggs: Veggies' Reliable BFF

have a plant FRUITS & VEGGIES FOR BETTER HEALTH

Fruits & Veggies Stories Recipes Series Expert Advice Join Us

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Eggs: Veggies' Reliable BFF

Eggs are a Sensible, Versatile and Delicious Companion for Veggies

IN PARTNERSHIP WITH THE EGG NUTRITION CENTER



Get the Most Out of Your Veggies: Put an Egg on It!

Looking to get the most nutritional bang out of your vegetables? You may want to consider adding an egg, and you may be surprised to hear why.



Pear Spinach And Egg Flatbread

Easy enough to whip up as a weeknight dinner and elegant enough to make your family feel special with a runny yolk that doubles as performance art upon slicing.

Adding Eggs to Enhance the Benefits of Produce

Taylor C. Wallace, PhD, CFS, FACN
Think Healthy Group, Inc.
George Mason University



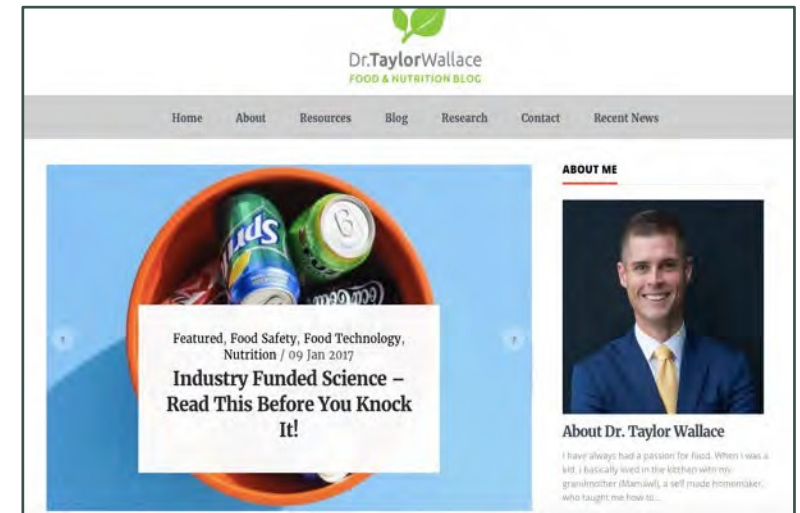
Disclosures

- Think Healthy Group, Inc.
- George Mason University
- The Dr. Oz Show and NBC4 Washington
- Atkins Nutritionals and Biocell Collagen Spokesperson
- The Vitamin Shoppe – Scientific Advisory Board
- **Produce for Better Health Foundation** and **Egg Nutrition Center**
- All conflicts of interest can be found at www.drtylawallace.com



A Little About Me...

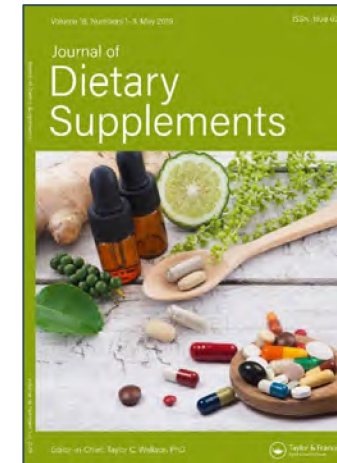
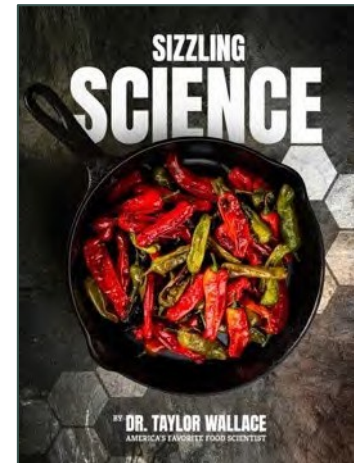
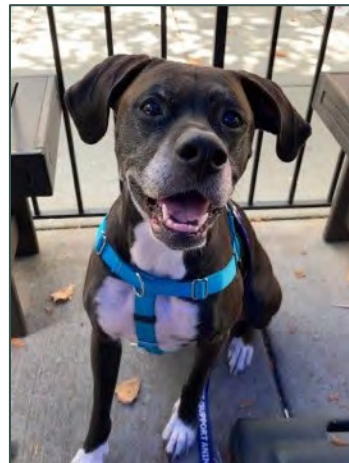
Dr. Taylor
AMERICA'S FAVORITE
FOOD SCIENTIST



Risky Behavior

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Outline

- Choline and Betaine: Friends with Benefits!
- Eggs, Choline, and Cognition
- Produce, Betaine, and Cognition
- Pairing Eggs and Produce Enhances Nutrition
- Opportunities for Future Research



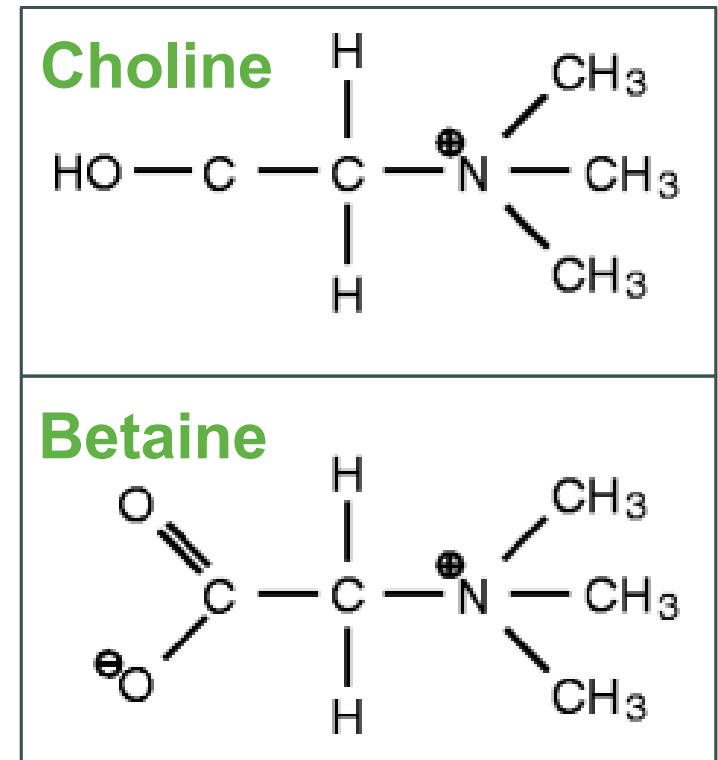
Choline + Betaine: Friends with Benefits!

Choline is an essential nutrient produced by de novo synthesis but is also present in food sources.

- Important for:
 - Liver function
 - Muscle function
 - Brain function
 - Lipid metabolism
 - Cellular composition/repair
 - Precursor to acetylcholine

Choline is oxidized to **betaine** but is also present in food.

- Betaine performs the role of:
 - Osmoregulator
 - Substrate for one-carbon metabolism



Eggs, Choline, and Cognition



Choline: An Underconsumed Nutrient

- 90% of American and 92% of pregnant women fail to meet the AI.
- Deficiency during pregnancy increases risk of neural tube defects.
- Eggs are a primary source of choline.



Choline Requirements Elevated in Pregnancy and Lactation

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months	125 mg/d	125 mg/d		
7 – 12 months	150 mg/d	150 mg/d		
1 – 3 years	200 mg/d	200 mg/d		
4 – 8 years	250 mg/d	250 mg/d		
9 – 13 years	375 mg/d	375 mg/d		
14 – 18 years	550 mg/d	400 mg/d	450 mg/d	550 mg/d
19+ years	550 mg/d	425 mg/d	450 mg/d	550 mg/d

Eggs Among Highest Sources of Choline

Choline containing foods include:

Food Source	Serving Size	Choline (mg)
Liver	3 oz	247
Salmon	3 oz	187
Egg	1 large	147
Beef Round	3 oz	117
Soybeans	0.5 cup	107
Chicken Breast	3 oz	72
Potato	1 large	57
Beans	0.5 cup	45
Milk	1 cup	43

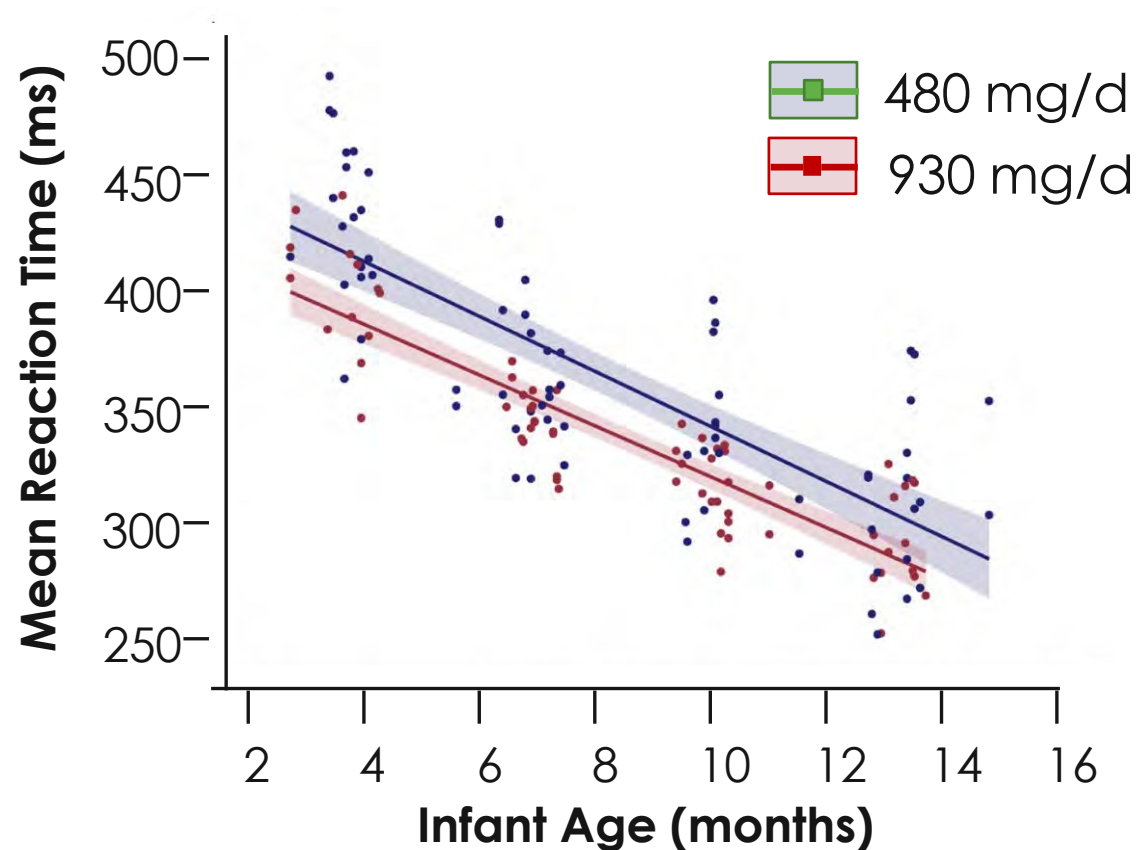


Nutrition During The First 1,000 Days Effects Neurocognition

- Maternal prenatal nutrition and the child's nutrition in the first 2 years of life (1,000 days) are crucial factors in a neurodevelopment and lifelong mental health.
- Calories are essential for growth but are not alone sufficient for normal brain development.
- Failure to provide key nutrients during this critical period may result in lifelong deficits in brain function despite subsequent nutrition repletion.



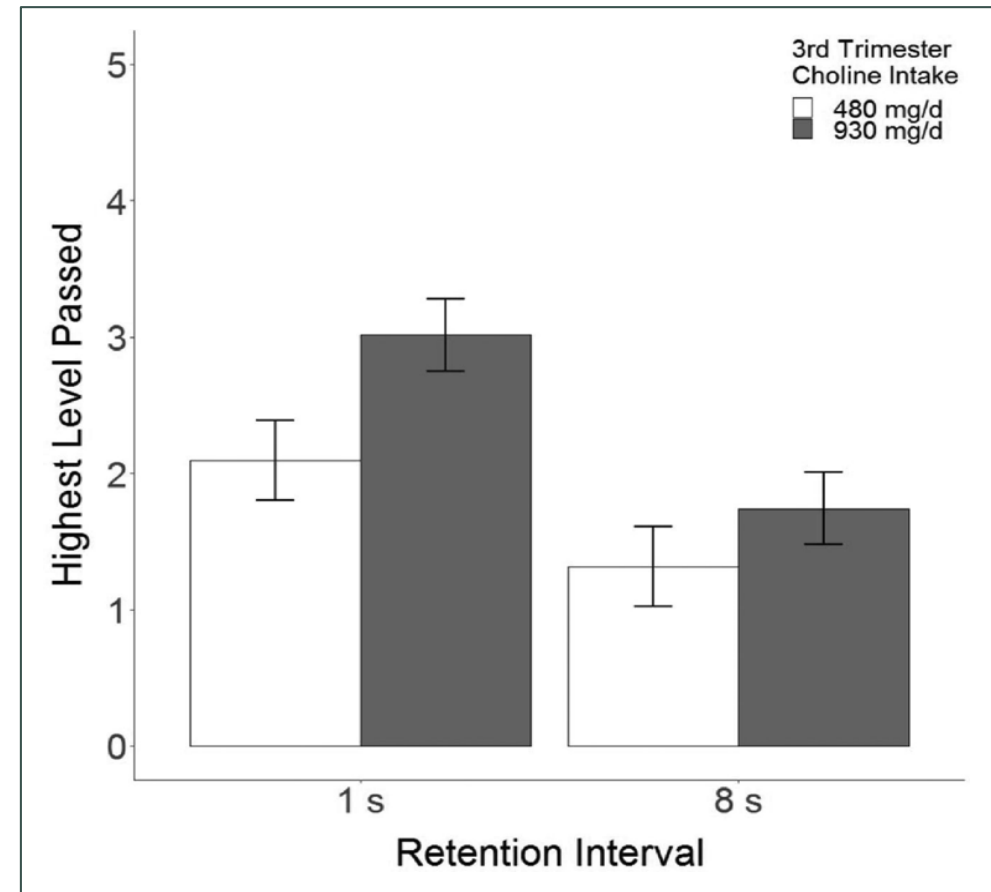
Maternal Choline Improves Infant Neurocognition



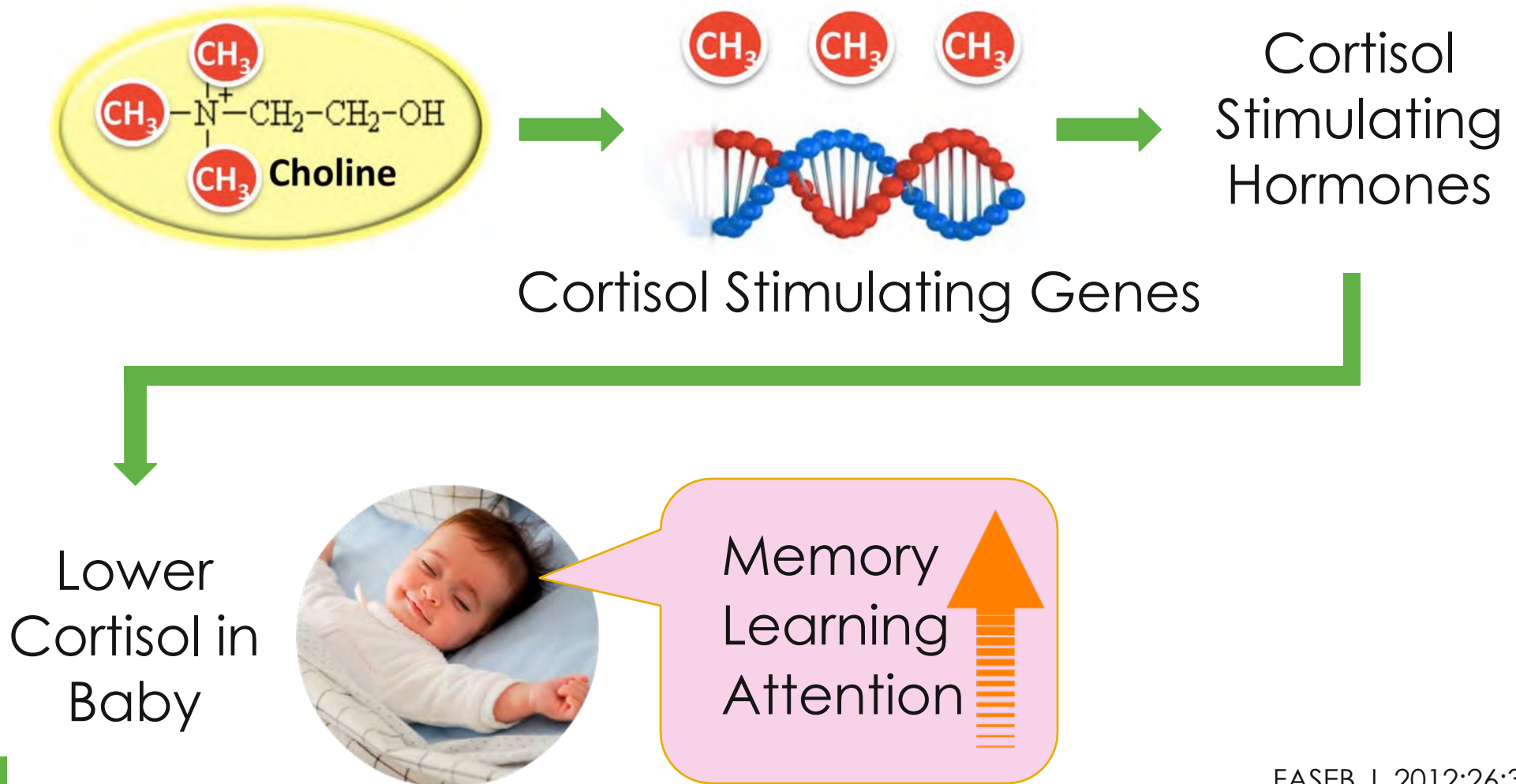
Higher maternal choline intake (930 vs. 480 mg) during the 3rd trimester **improves infant information processing speed.**

Maternal Choline has Lasting Effects on Children

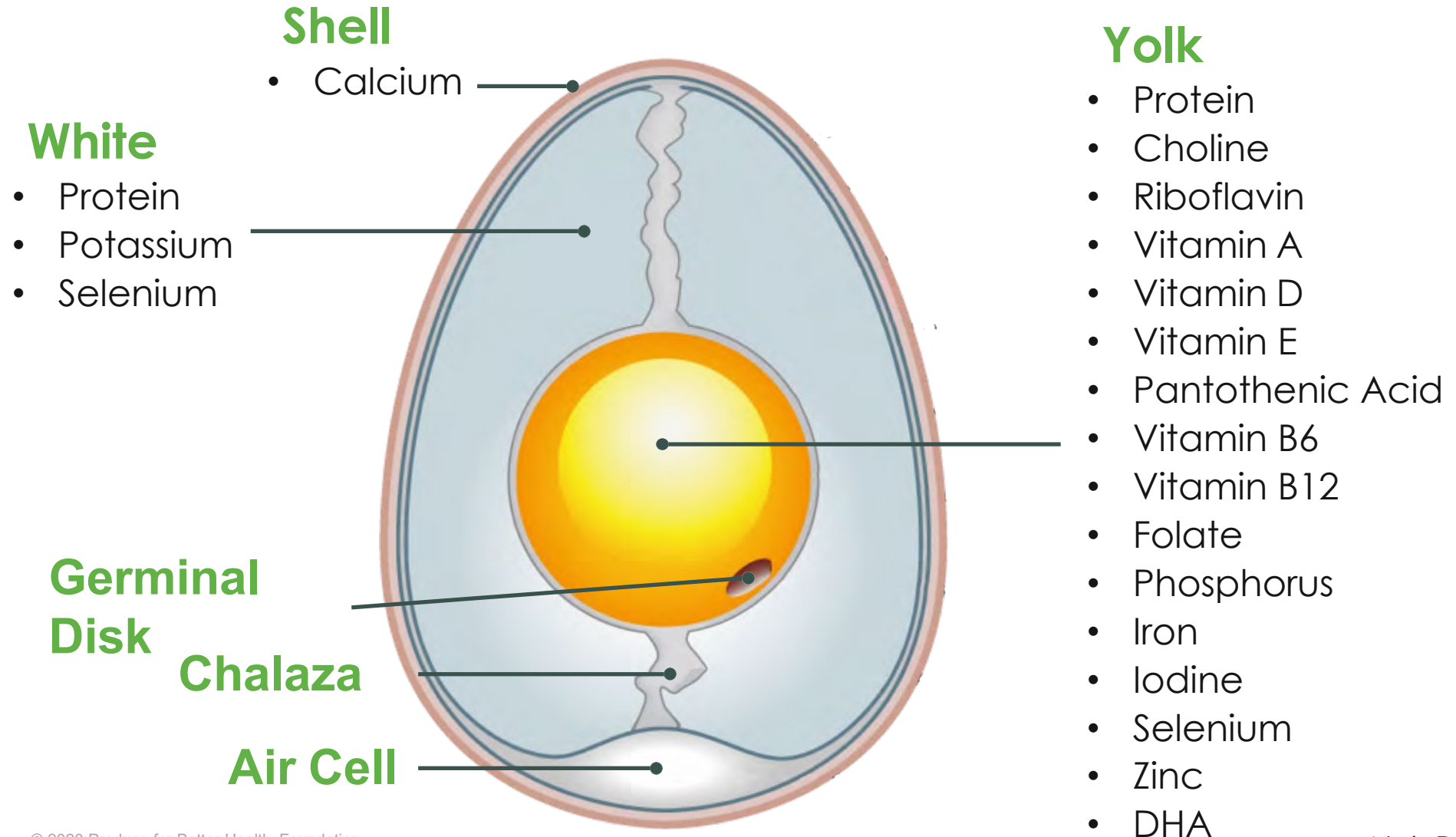
Children whose mothers consumed 930 (vs. 480) mg of choline per day in the third trimester **performed significantly better on a task of color-location memory at age 7 years** suggesting a long-term benefit.



Maternal Choline ↓ Cortisol Levels in Healthy Infants



An Egg's Nutrients

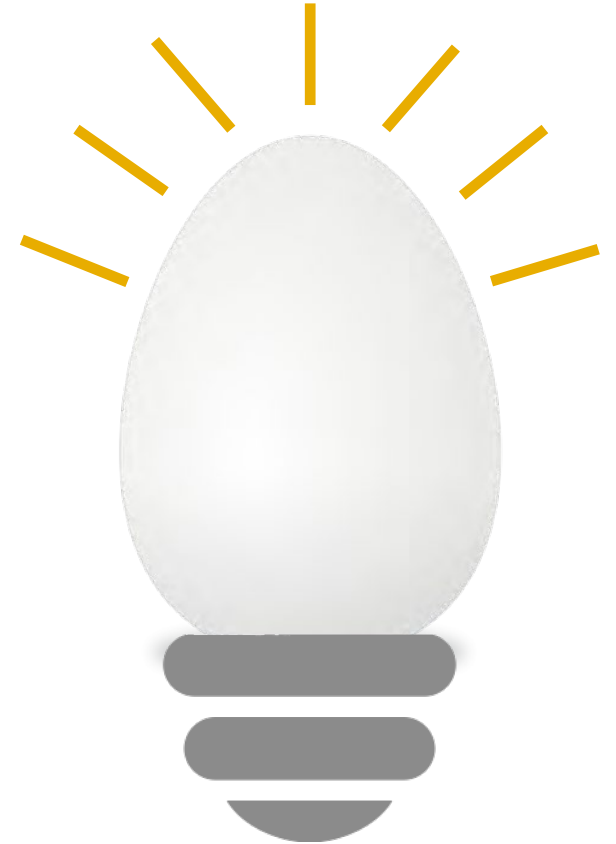


Eggs Offer Key Nutrients to Support Neurodevelopment

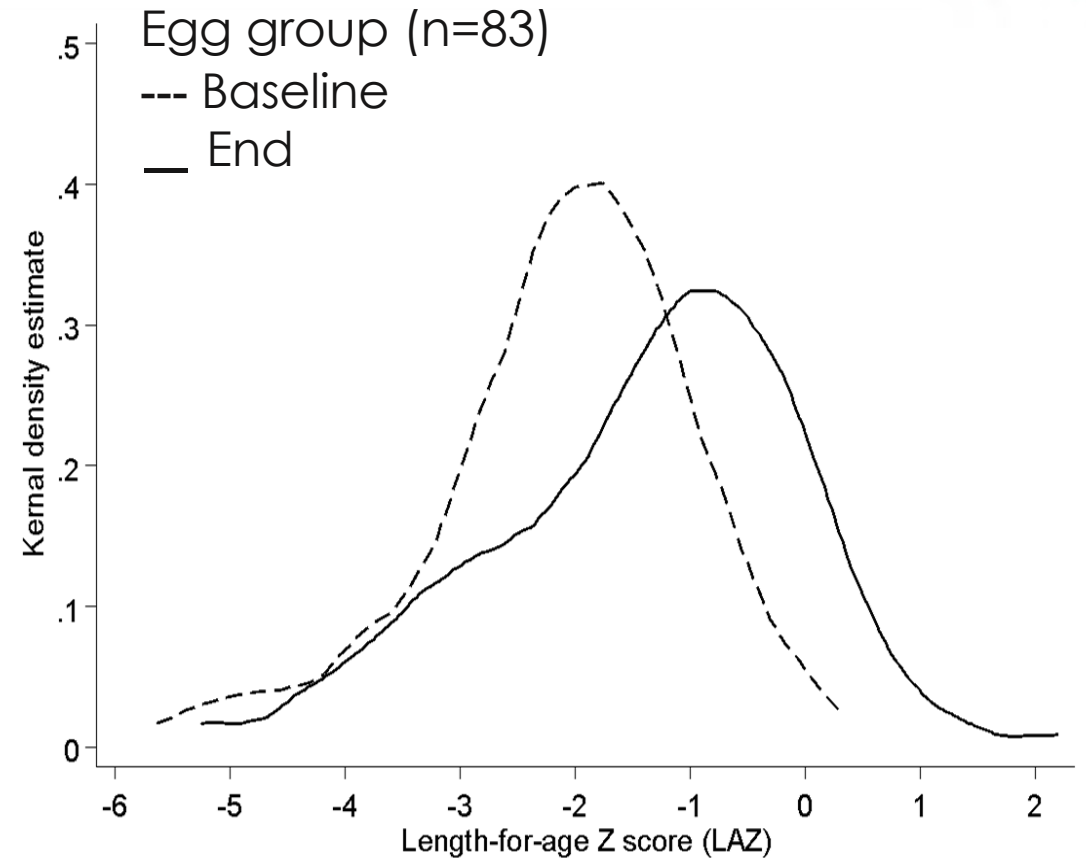
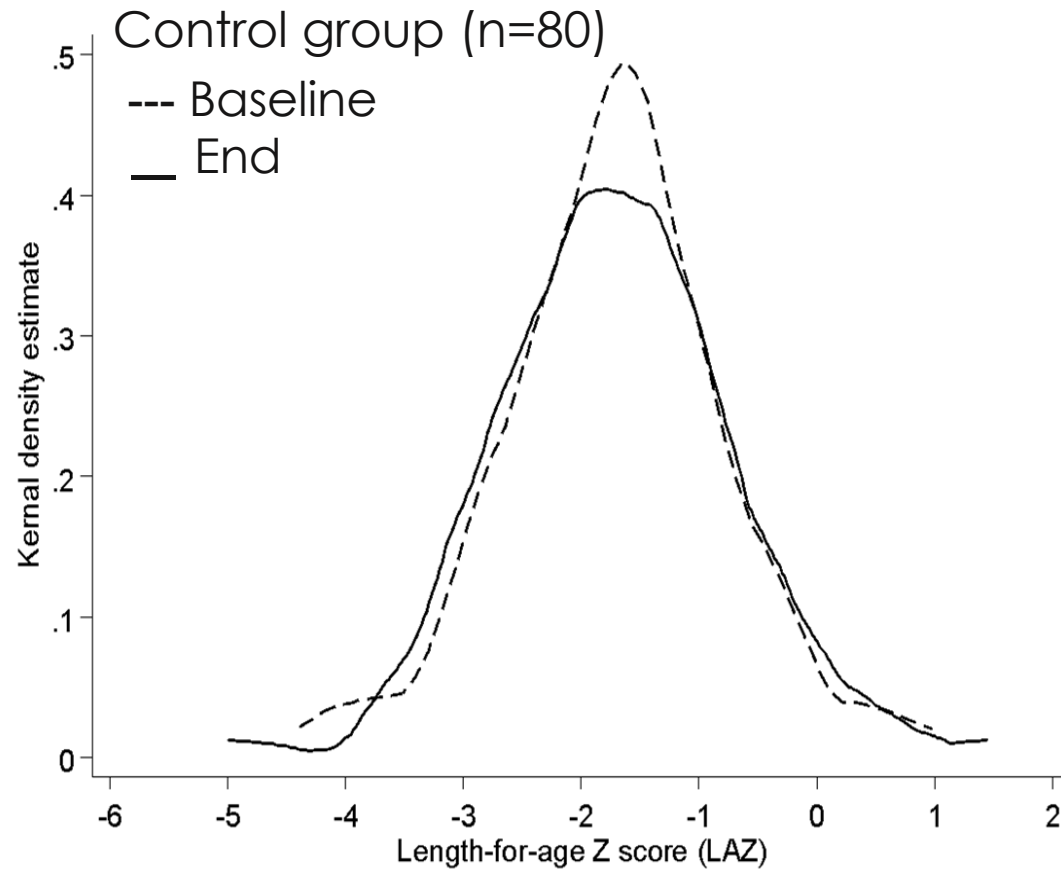
- ✓ Protein
- ✓ Zinc
- ✓ Iron
- ✓ Choline
- ✓ Folate
- ✓ Iodine
- ✓ Vitamin A
- ✓ Vitamin D
- ✓ Vitamin B6
- ✓ Vitamin B12
- ✓ Long-chain PUFAs

“Although all nutrients are necessary for brain growth, the AAP has defined key nutrients that support neurodevelopment.”

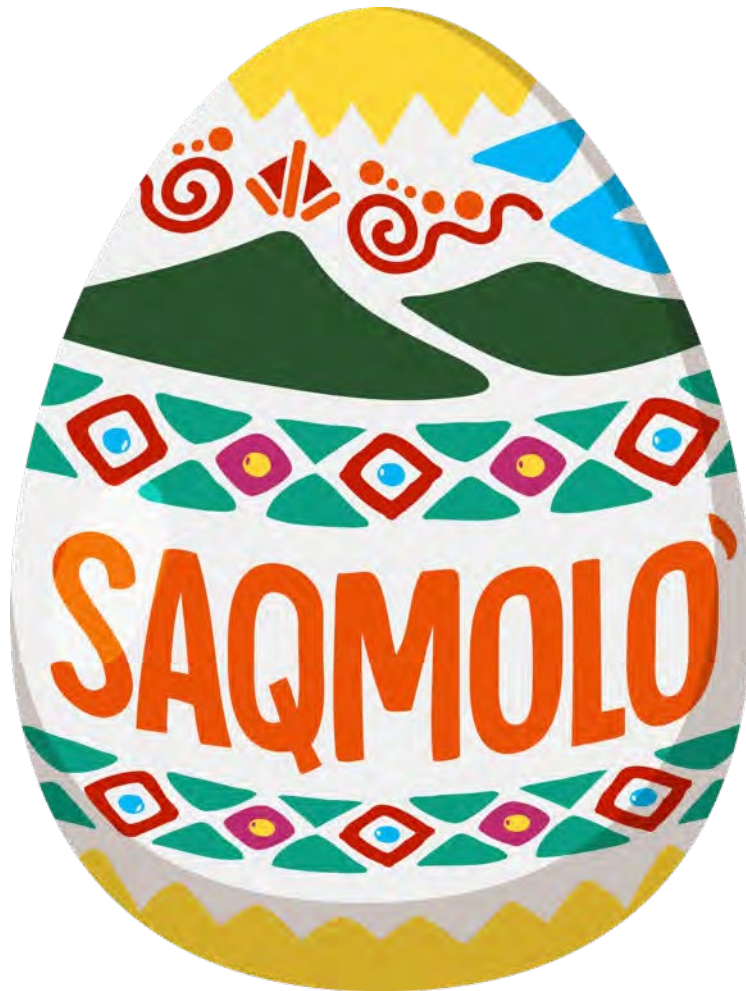
-- **AAP 2018**



Eggs Reduced Stunting by 47%



The Saqmoló Study



Chimaltenango and Sololá, Guatemala

- Guatemala is home to some of the poorest communities in the Western hemisphere.
- Proliferation of non-traditional agriculture exports and commoditized foods have contributed to malnutrition.
- Guatemalan children suffer the highest rate of chronic malnutrition and stunting (~50%) in the entire world.
- A woman in Guatemala is 10 times more likely than a woman in the United States to die during childbirth.



The Saqmoló Study

- A randomized, controlled, parallel trial (N=1200)
- Intervention: eggs, standard of nutrition care, and maternal nutrition education for 6 months
- Primary outcome measures:
 - Difference between groups in child global development scores (GMCD, CREDI)



CREDI Domains

Motor

- Fine Motor
- Gross Motor

Language

- Receptive
- Expressive

Cognition

- Executive Function
- Problem Solving & Reasoning
- Preacademic Knowledge

Social-Emotional

- Emotional & Behavioral Self-Regulation
- Emotion Knowledge
- Social competence

Mental Health

- Internalizing
- Externalizing

Choline Plays a Role in Cognitive Function in Older Adults

- Loss of cholinergic neurons is associated with impaired cognitive function, particularly memory loss and Alzheimer's disease.
- Higher choline intake is associated with **better cognitive performance** and **increased brain white matter hyperintensity** in older adults.
- Patients with Alzheimer's disease have lower levels of eight choline-containing phospholipid species (and two non-choline-containing species).
- These have been validated to **predict mild cognitive impairment or Alzheimer's disease within a 2- to 3-year timeframe and with greater than 90% accuracy.**



Produce, Betaine, and Cognition



Betaine Status is Inadequate for the Majority of the Population

- Several studies have pointed out that the **betaine status of the general population is inadequate** and have suggested nutritional strategies to improve dietary intake of betaine.
- Cereal-based food has been implicated as the major source of betaine in the Western diet.



Greens and Grains Among Highest Sources of Betaine

Food Source	Betaine (mg) per 100g
Wheat bran	1339
Wheat germ	1240
Amaranth	720
Quinoa	630
Spinach	600
Canned shrimp	219
Beets	114
Wheat Bread	201
Pasta/rice	90



Betaine Spares Some of Choline's Action

- The actions of choline can be partially replaced by betaine. In animal models, a minimum 50% of choline requirement is still needed, but the remaining can be **spared by betaine**.
- This is critical for **vegetarian** and **vegan** populations, who struggle consume sufficient choline.
- While betaine is not an essential nutrient, a growing body of evidence shows that it is important for prevention of chronic disease.



Infant Cognitive-Boosting Potential of Produce



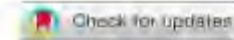
Produce's Role in Curving Age-Related Cognitive Decline

CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION
<https://doi.org/10.1080/10408398.2019.1632258>





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REVIEW



Fruits, vegetables, and health: A comprehensive narrative, umbrella review of the science and recommendations for enhanced public policy to improve intake

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Produce Intake Associated with Better Cognitive and Mental Health Outcomes

- Research shows that increased produce intakes is related to a **13% decrease in cognitive impairment and dementia risk**.
- People with higher fruit and vegetable intake **perform better on cognitive tests** and are less likely to exhibit cognitive decline.
- Higher fruit and veggie intakes are inversely associated with mental health, mood, and anxiety disorders.
- **Diet quality is strongly associated with better cognitive and mental health outcomes.**



Pairing Eggs and Produce Enhances Nutrition



Choline and Betaine-Rich Foods Are Nutrient Dense

Nutrient	DV ≤ 12 mo.	Egg (1 large)	Spinach (1 cup)	Wheat Bread (1 slice)	% DV ≤ 12 mo.
Protein	11 g	6.28 g	0.858 g	4.48 g	105.6%
Vitamin A	500 mcg	8 mcg	141 mcg	0 mcg	29.8%
Vitamin D	10 mcg	1 mcg	0 mcg	0 mcg	10.0%
Vitamin B6	0.3 mg	0.085 mg	0.058 mg	0.077 mg	73.3%
Folate	80 mcg	24 mcg	58.2 mcg	15.1 mcg	121.6%
Vitamin B12	0.5 mcg	0.45 mcg	0 mcg	0 mcg	90.0%
Iodine	130 mcg	28 mcg	3.6 mcg	12.6 mcg	34.0%
Zinc	3 mg	0.65 mg	0.159 mg	0.637 mg	48.2%
Iron	11 mg	0.88 mg	0.813 mg	0.889 mg	23.5%
Choline	150 mg	147 mg	5.79 mg	9.79 mg	108.4%
PUFA	ND	0.956 g	0.049 g	0.573 g	--

Eggs Increase Nutrient Absorption of Veggies

- A study that looked at the nutritional impact of combining **eggs with vegetables** increased the absorption of certain nutrients compared to consuming vegetables alone.
- The results of the study showed that consuming three large eggs with a mixed-vegetable salad **increased the absorption of the vitamin E** (an under-consumed nutrient) and **carotenoids** present in the vegetables.



Concluding Thoughts and Future Research

- Choline and fruit/vegetable intakes are suboptimal in the U.S. It is difficult to achieve recommended choline and postulated betaine intakes alone.
- Studies assessing dietary patterns characterized by adequate egg, fruit, vegetable, legume, and whole grain intakes on cognition warrant further study.
- A depletion-repletion study that considers both dietary intakes of choline, betaine and other methyl donors.



Thank you!

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Egg-ceptional Produce Pairings for All Ages

Chef Abbie Gellman, MS, RD, CDN



Disclosures

- American Dairy Association – Northeast
- California Cling Peaches
- Egg Nutrition Center
- Mission Avocados
- National Cattlemen's Beef Association
- Produce for Better Health
- Quaker Oats Company
- Watermelon Board
- The Wonderful Company



A Little About Abbie

Abbie Gellman, MS, RD, CDN has been a Registered Dietitian for more than a decade, and a chef for twice as long. Abbie works with a wide variety of clients as a spokesperson, recipe and product developer, teacher/educator, and private chef.



Outline

- Cooking with choline- and betaine-rich foods
- Examples for different life stages
- Video:
 - Ideas for eggs and veggies
 - Life stages
 - Recipe Demo: Veggie Hash with Fried or Poached Egg



Cooking with Choline-Rich Foods



- New research is exploring how choline throughout life may have lasting effects on cognition and prevention of cognitive decline.
- Eggs are among the best sources of dietary choline.

Food-Focused Goal

Try cooking eggs scrambled, fried, over easy, poached, etc. to find your favorite cooking method!

Cooking with Betaine-Rich Foods



- New research is exploring betaine and its relationship with memory and cognition.
- Betaine is found in a variety of foods, including quinoa, spinach, and beets.

Food-Focused Goal

Try roasting different varieties of beets and keeping them in the fridge to add to a variety of dishes.

Lifestage: Toddlers/Young Kids

Kid-friendly flavors and textures | Easy to chew | Handheld options | Stealth health



- Veggie pancakes
- Scrambled eggs + grated veggies
- Egg salad: Hard-boiled eggs + mayo/ yogurt + grated veggies
- Avocado egg salad muffin tin "frittatas"
- Oatmeal with egg + fruit mixed in
- Baked fruit custard

Lifestage: Teens/Older Kids

“Familiar” choices | Fun twists on familiar favorites | Get them cooking | Stealth health

- Veggie pita pizza
- Egg veggie tacos
- Baked pasta (with egg + veggies)
- Savory oatmeal (with egg + veggies)
- Baked oatmeal
- Baked French toast
- Egg "baked in a hole" with fruit
- Add grated veggies to muffins



Lifestage: Adults

Easy to batch/prep ahead | Stealth health | Not "just another salad" | Simple



- Veggie/grain salad topped with hardboiled/fried/poached egg
- Veggie hash with egg
- Savory strata
- Add grated veggies to meatballs/meatloaf
- Veggie fritters
- Soft-boiled (jammy) eggs + veggies

Lifestage: Seniors

Easy for 1-2 servings | Easy to batch/meal prep/freeze | Uses pantry staples

- Individual frittata
- Hard boil eggs and use them for: breakfast/snack paired with veggies
- Egg Salad with chopped vegetables, add to salad
- Mix egg and fruit or sautéed veggies into oatmeal
- Use frozen/canned produce





Thank you!

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Join the Movement



**SEPTEMBER IS NATIONAL
FRUITS & VEGGIES
MONTH**
#HAVEAPLANTPLEDGE
#HAVEAPLANT #NFVM2020

Show your support by taking and sharing the [Have A Plant® pledge](https://fruitsandveggies.org) at fruitsandveggies.org. While you're there, check out the useful resources to equip you with the tools you need to enhance your nutrition knowledge and empower consumers to enjoy more fruits and vegetables every day.

September is National Fruits & Veggies Month™. Take a moment to promote and enjoy all forms of the fruits and veggies that you know and love – fresh, frozen, canned, dried and 100% juice – that taste great and also support your health and happiness!

Follow PBH's social channels to keep up to date on all the insights and inspiration. #haveaplant



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[Produce for Better Health Foundation](https://www.linkedin.com/company/Produce-for-Better-Health-Foundation)



Q & A

A catalog of PBH's past webinars is available at fruitsandveggies.org/expert-professionals/webinars.

Continuing professional education units (CPEU) are available for live and pre-recorded webinars.



Additional Resources

Egg Food Safety

<https://www.incredibleegg.org/egg-nutrition/safe-food-handling-tips/>

Egg Allergies

Egg Nutrition Center Blog:

<https://www.eggnutritioncenter.org/articles/early-introduction-of-eggs-may-reduce-the-risk-of-food-allergy-to-egg/>

Upcoming Webinar: LEAPing Past Food Allergies: How and When to Introduce Potential Allergens

https://zoom.us/webinar/register/WN_03J7eltsTp6tUlnb5dQFpw

Nutrient Content for Eggs

U.S. Department of Agriculture: FoodData Central

<https://fdc.nal.usda.gov/>

Egg Nutrition Center Content Series

[Eggs: Veggies' Reliable BFF](#)

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Egg Nutrition Center

EggNutritionCenter.org

Visit us for more on eggs and cognition and general egg nutrition information!



Egg Nutrition Toolkits



Inside you'll find a dozen topics that provide key information, research findings and examples of how eggs can be a practical nutrition solution.

#EggEnthusiast

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THANK YOU