LUTEIN – THE EYE’S AND BRAIN’S BEST FRIEND

by JIRAYU TANPRASERTSUK, MS & EMILY MOHN, PHD

Autumn is the perfect time to observe carotenoids in nature. Carotenoids are a group of plant pigments that are responsible for the beautiful yellow, orange, and red foliage during this season.

We also find carotenoids in many of the colorful fruits and vegetables we eat. Although there are more than 600 naturally occurring carotenoids, only six of them are common in the American diet. Most of us are familiar with beta-carotene, responsible for the orange color of carrots and sweet potatoes, and lycopene, responsible for the red color of tomatoes. Lutein is a carotenoid found mostly in green leafy vegetables like kale and spinach, but is also found in eggs and avocados. The amount of lutein in selected food sources is provided in Table 1.

Because carotenoids are fat-soluble, the intestine absorbs them better when they are consumed with fat. For example, adding avocado or oil to a salad significantly increases lutein absorption. Another good example is egg yolk. Because of its fat content, egg yolk is a highly bioavailable source of lutein.

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HEALTHY, SUSTAINABLE EATING PATTERNS AND THE IMPORTANCE OF THE BIG PICTURE

by MICKEY RUBIN, PHD

Increasingly, the conversation among health professionals in nutrition includes not only human health and well-being, but also the intersection of food, nutrition and agriculture. This intersection is commonly referred to as sustainable nutrition, and it is a way of looking at the contribution of foods and diet patterns in terms of not only health benefits, but economic, social and environmental outcomes as well.

A new study published in the journal Lancet Planet Health aimed to quantify measures of sustainability in recommended diet patterns by assessing their environmental impact. The authors examined the environmental impact of the three recommended dietary patterns from the 2015-2020 Dietary Guidelines for Americans, which includes the Healthy U.S. pattern, the Healthy Mediterranean pattern, and the Healthy Vegetarian pattern that includes eggs and dairy foods – as the DGA states that most self-identified vegetarians consume eggs and dairy. This analysis required incorporating results from environmental science research that utilizes life cycle assessments to understand the environmental impact of producing the foods that make up the diet patterns. The researchers examined several environmental categories for each pattern, including greenhouse gas emissions, land use, water use, water eutrophication and air particle pollution.

The results of this study indicate that the Healthy Vegetarian pattern from the Dietary Guidelines for Americans had between 42-84% lower environmental burden than the Healthy U.S. and the Healthy Mediterranean patterns. The researchers report that this was due in part to the use of eggs, as well as plant-based protein sources, in the vegetarian pattern versus other sources of protein that have a comparatively higher environmental footprint.

This study clearly illustrates that the environmental impact of food production is not solely about greenhouse gases. There are a host of other important environmental factors we must understand, such as water use and land use, that contribute to a holistic understanding of the interaction of food, nutrition and the environment. We must evaluate all of these factors if we want to continue making strides to improve efficiencies in our food production system. Consider the environmental footprint of egg production as an example, in which life cycle assessment research has shown that from 1960 to 2010, one kilogram of egg production has reduced greenhouse gas emissions by 71% and water use by 32%, all while producing more eggs with fewer hens that are healthier and living longer.

It is also important to consider factors not included in this study for a comprehensive evaluation. Sustainable diets are about more than just environmental impact. In fact, the Food and Agriculture Organization (FAO) of the United Nations has a broad definition of sustainable diets that is inclusive of not only nutrition and the environment, but also economics and society. These factors are known as the four domains of sustainable diets, and together they underscore that sustainable food patterns must not only be nutritionally adequate, but also economically affordable, socially acceptable, all while sparing of ecosystems and biodiversity.

Perhaps there is no better example of a contribution to nutritionally adequate and societal aspects of sustainable diets than in a recent randomized controlled trial known as the Lulun Project. Conducted in Cotopaxi Province, Ecuador, the Lulun Project was a randomized controlled trial in which children ages 6 to 9 months received...
1 egg per day for 6 months compared to a control with no intervention. The results indicated that early introduction of eggs significantly improved growth in young children while reducing prevalence of stunting by 47%. With undernutrition remaining a significant problem in many parts of the world, this study provides evidence that eggs can be a nutrient-rich, affordable and culturally acceptable part of the solution.

As we continue to make strides in understanding the interaction of the nutritional and environmental components of sustainable nutrition we must not lose sight of the societal and economic components of the definition. Foods may be nutrient-rich and with a low environmental burden, but must be affordable, have a positive impact on the community and be culturally acceptable for people to consume them.

REFERENCES

RESEARCH HOT OFF THE PRESS

The relationship between dietary cholesterol from whole eggs and blood cholesterol continues to be an active area of research. Previous studies have shown that eggs elicit a highly variable impact on blood cholesterol levels, with approximately two-thirds of the population having minor or no response. A new study from Purdue University published in Nutrients examined the relationship between dietary cholesterol from eggs and blood cholesterol levels by measuring how cholesterol is absorbed immediately after a meal.

To understand how cholesterol is absorbed after a meal, the researchers measured changes in cholesterol concentrations in triacylglycerol-rich lipoproteins (TRL). Cholesterol in TRLs are a better indicator of recently absorbed cholesterol than standard blood cholesterol measures performed while fasted.

The researchers assessed a group of men and women who ate vegetable-based meals that contained either varying amounts of cooked whole egg or no eggs. TRL fractions were measured after each meal for ten hours.

Whole egg consumption did not acutely impact cholesterol in TRL’s or plasma compared to no egg consumption, leading the authors to conclude that dietary cholesterol in whole eggs is not well absorbed. These findings are consistent with previous research that have shown minimal impact of egg consumption on blood cholesterol in most people. The authors suggest that compounds in egg yolk and egg white protein may work together to limit cholesterol absorption.

REFERENCE
1. Kim JE, Campbell WW. Dietary Cholesterol Contained in Whole Eggs is Not Well Absorbed and Does Not Acutely Affect Plasma Total Cholesterol Concentration in Men and Women: Results from 2 Randomized Controlled Crossover Studies. Nutrients. 2018 Sep 9;10(9).
LUTEIN – THE EYE’S AND BRAIN’S BEST FRIEND

by JIRAYU TANPRASERTSUK, MS & EMILY MOHN, PHD

KEY MESSAGES

• Green leafy vegetables and eggs are sources of lutein (Table 1). The eye and brain selectively accumulate lutein from the diet.
• In the eye, lutein is a major component of the macular pigment, which blocks harmful blue light and reduces damage. Lutein intakes ≥ 6 mg/d are related to better eye health. Americans consume only 1-2 mg/d on average.
• Older adults with higher lutein levels in the brain have better cognition. Consuming lutein-rich foods or supplements prevents or delays age-related cognitive decline in the elderly.

Table 1. Lutein/zeaxanthin content in selected food sources (data from

<table>
<thead>
<tr>
<th>Food</th>
<th>Amount (mg)/serving unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avocado, raw</td>
<td>0.3/half fruit</td>
</tr>
<tr>
<td>Broccoli, cooked</td>
<td>1.7/half cup</td>
</tr>
<tr>
<td>Egg, hard-boiled</td>
<td>0.2/one large</td>
</tr>
<tr>
<td>Spinach, cooked</td>
<td>6.7/half cup</td>
</tr>
<tr>
<td>Spinach, raw</td>
<td>4.5/half cup</td>
</tr>
<tr>
<td>Kale, cooked</td>
<td>10.3/half cup</td>
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Among all major dietary carotenoids, lutein and zeaxanthin (found in the same food sources but in about 1/5 the amount as lutein) are uniquely important for visual health. Only these two carotenoids are selectively taken up into the macula – the central area at the back of the eye – where they comprise macular pigment (MP). MP provides the sharp central vision we need for activities like reading and driving.

Figure 1. Section through macular of rhesus monkey. Macular pigment is yellow under white light (top). Macular pigment appears dark under blue light because its yellow color absorbs blue light well (bottom). Photo credit: Max Snodderly

MP is often viewed as an intrinsic pair of sunglasses that screens out damaging blue light from the sun and electronic devices. Just like UV rays damage the skin, blue light exposure over a lifetime causes damage to the macula and may lead to age-related macular degeneration (AMD) and blindness in older individuals. The density of MP reflects the amount of lutein (and zeaxanthin) in the macula. MP density can be measured simply, quickly, and non-invasively in humans. Many studies that have measured MP density have found that adults with higher MP density have a lower risk for AMD. For younger individuals (18-40 years old), increased MP density improves contrast sensitivity, reduces glare, and enhances visual performance during activities in low ambient illumination, like driving at night.

While lutein’s role in vision has been investigated for decades, an additional role beyond the eye has emerged in more recent years. In 2008, a clinical trial studying lutein and visual health surprisingly found that adults (60-80 years old) supplemented with lutein (with or without DHA – a fatty acid found in fatty fish like salmon) improved their
cognitive performance by the end of the trial. This finding sparked a wave of investigations into lutein’s novel role in cognition.

Analysis of post-mortem brain samples from older adults found that lutein is the most predominant carotenoid in the brain, despite being consumed less than other carotenoids. This suggests that, like the macula, the brain preferentially takes up lutein from the diet, presumably for a specific purpose. Moreover, older individuals who are more cognitively intact tend to have higher brain lutein levels.

Since the eyes are anatomically an extended system of the brain, researchers wondered whether MP density may be a biomarker of brain lutein levels. Indeed, an investigation into matched macula and brain tissues found that MP density was related to brain lutein concentrations. Many studies have since demonstrated that older individuals with higher MP density, which reflects higher brain lutein content, have better cognition across different domains like memory, language, and learning.

Why is lutein important for cognition? The answer remains unclear, but may be related to the anti-oxidative and anti-inflammatory properties of lutein. Current studies investigating where lutein localizes in the brain may shed additional light on its mechanism of action.

Since 2008, several intervention studies using lutein-rich foods or supplements have yielded promising results for preventing or delaying cognitive decline in the elderly. An unofficial recommended intake for lutein, based on evidences regarding visual function, is currently set at 6 mg/d. However, the averaged US intake is only 1-2 mg/d.

Advanced age is a major risk factor for both AMD and age-related cognitive impairment. As the American population ages, lutein may play a critical role in preventing both diseases at a national scale. Given that lutein can only be obtained through consumption, it is important to incorporate various sources of lutein in our diet to keep our eyes and brain healthy as we age.

REFERENCES


Lutein is an important nutrient for both brain and eye health. Visit us at FNCE® booth #2214 to check your lutein status! We’ll be doing macular pigment optical density (MPOD) testing, which is a non-invasive way to know the lutein and zeaxanthin levels in your eyes.
BABY-LED WEANING: A FRESH APPROACH TO STARTING SOLIDS

by DIANA K. RICE, RD, LD

KEY MESSAGES

- Baby-led weaning is growing in popularity due to its many benefits so consumers and healthcare providers should be educated on the feeding method.
- Introducing babies to eggs early in the weaning process provides nutrients critical to infant brain development and reduces egg allergy prevalence and may help children develop a preference for this nutritious food.
- Offering eggs via baby-led weaning may offer benefits over doing so via conventional purees.

What infants eat in their first few months of life is critical. Around six months old, breast milk and formula are no longer sufficient to meet an infant’s increasing nutritional needs. In particular, the nutrients needed for cognitive development including iron, zinc, choline and docosahexaenoic acid (DHA) must start to come from solid foods. We also now know that early exposure to common allergens including eggs and peanuts can actually help decrease the development of problematic food allergies.

Although pediatricians once recommended starting with infant cereal at four months old, the World Health Organization and the American Academy of Pediatrics now recommend introducing complimentary foods around six months old. And infant cereal has fallen out of fashion, too. A method of starting solids called baby-led weaning, in which infants are encouraged to self-feed pieces of whole foods, is rapidly rising in popularity.

The term “baby-led weaning” was coined by British author Gill Rapley, who published a book about letting infants self-feed titled “Baby-Led Weaning” in 2008. The feeding method quickly became popular in Europe and is now catching on in the United States. Parents are drawn to the approach because it prioritizes the consumption of freshly prepared, nutritious foods, encourages autonomy and is convenient.

Still, some worry that foregoing that iron-fortified infant cereal in favor of whole foods like scrambled eggs, avocados and sweet potatoes could result in nutrient deficiencies, or that allowing infants to self-feed could increase their risk of choking. A 2017 study, called The Baby-Led Introduction to SolidS (BLISS) trial, examined these concerns. It found that so long as parents were advised to frequently offer high-iron foods such as meat and egg yolks, the baby-led approach did not increase the risk of either iron or zinc deficiency. Reassuringly, the study also found that infants in the baby-led group consumed a similar amount of total energy and were no more likely to exhibit growth faltering or experience choking episodes.

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When the right foods are offered, the baby-led approach can easily lead to a more nutritious diet than the traditional spoon feeding method. Commercially prepared baby purees often contain produce and meat, but rarely feature eggs, fish and nuts. Another 2017 study showed that infants given eggs starting at six months old had higher blood concentrations of choline and DHA. Waiting to regularly incorporate eggs and other nutritious whole foods into a baby’s diet until he or she is beyond the puree stage could impact the child’s cognitive development and lead to missing a critical window for early allergen exposure. Certainly, parents can prepare their own purees featuring eggs and other nutritious foods, but as the growing popularity and demonstrated safety of baby-led weaning suggests, why bother?

The BLISS study also found that infants in the baby-led group exhibited less food fussiness at age two, which builds on past research demonstrating that regularly providing children with tactile food experiences helps them accept and enjoy new foods. So while a puree made with avocado, carrots and egg yolks may be nutritious, it is not a food that a baby is likely to encounter later in life. Offering babies recognizable, nutritious foods in their whole forms early on encourages food acceptance and, importantly, is also convenient for caregivers.

The current research on baby-led weaning shows that the method is indeed safe and effective, but parents and infants will benefit from expert guidance about the process. For instance, parents should be advised to minimize the amount of sodium in the foods they offer and that the first foods should be large and soft so they are easy for the infant to grasp and chew. Perfect examples are slices of a simply prepared omelet, cooked vegetables, ripe fruit and soft meat and fish. To promote iron absorption, parents should also know that iron-rich foods should be offered with a source of vitamin C, which can be as simple as meatballs served in tomato sauce or cooked egg yolks offered alongside kiwi slices.

With baby-led weaning only growing in popularity, healthcare practitioners need to be informed about the method so they can point interested parents toward credible resources, including Rapley’s pioneering book and “Born to Eat” by dietitians Leslie Shilling and Wendy Jo Peterson. Parents will also certainly benefit from a referral to a local practitioner trained in baby-led weaning instruction, such as a member of the International Network of Baby-Led Weaning Dietitians founded by dietitian Jessica Coll (jessicacoll.com/BLW_network.html).

And as for suggestions of the ideal food to start with? Look no further than the nutritious, convenient, soft and squishy little egg.

**REFERENCES**