Egg consumption improves carotenoid absorption

By Jung Eun Kim, PhD, RD and Wayne W. Campbell, PhD

The 2010 Dietary Guidelines for Americans emphasizes consumption of 4.5 cups of fruits and vegetables daily. However, the average intake of fruits and vegetables in U.S. adults is only 2.6 cups.1 This low consumption of fruits and vegetables may result in the limited availability of fat soluble, health-promoting phytochemicals such as carotenoids from these foods. Dietary carotenoids have biological properties, including antioxidant and anti-inflammatory effects, which may help protect against certain chronic diseases, including cardiovascular diseases, age-related macular degeneration, and some types of cancer.2 The bioavailability of carotenoids from a meal can be affected by several factors, such as food matrix, type of food processing, nutritional status, interactions with other dietary compounds during digestion and absorption, and gut status.3 However, co-consumption of carotenoid-rich foods with dietary lipids may be one of the most effective stimulators of the absorption of carotenoids.4

Eggs contain highly bioavailable carotenoids, specifically lutein and zeaxanthin. The dietary lipid and phospholipids in egg yolk are known to enhance the intestinal absorption of these carotenoids. The highly bioavailable nature of carotenoids from eggs suggest that the dietary lipid and phospholipids contained in egg yolk may also help increase the bioavailability of carotenoids found in co-consumed fruits and vegetables. While promising, very limited data exist on the impact of co-consuming whole egg with carotenoid-rich foods and whether overall carotenoid absorption may increase via lipid rich egg yolk.

Recent research conducted with 16 healthy young males showed that the absorption of carotenoids contained in a carotenoid-rich meal was effectively enhanced by co-consuming cooked whole eggs.5 Subjects consumed a raw mixed-vegetable salad including tomatoes, shredded carrots, baby spinach, lettuce, and Chinese wolfberry as sources of carotenoids with no egg; with 1½ eggs of scrambled whole egg; and with 3 eggs of scrambled whole egg (randomized, crossover design). The total carotenoids and total lipid contents in raw mixed-vegetable salad with no egg, with 1½ eggs, and with 3 eggs were 23mg, 23.4mg (0.4mg from eggs), and 23.8mg (0.8mg eggs); and 3g, 10.5g (7.5g from eggs), and 18g (15g from eggs), respectively. The absorption of total and individual carotenoid, including lutein, zeaxanthin, α-carotene, β-carotene, and lycopene was 3 to 8-fold higher when the raw mixed-vegetable salad included 3 eggs compared to no eggs.

These results are consistent with previous findings that healthy young adults had approximately 12.5, 40, and 3-fold increases in post-prandial α-carotene, β-carotene, and lycopene absorption, respectively, when they consumed a salad with full-fat salad dressing (28g) versus fat-free salad dressing.6 Also, an acute feeding study

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One of the latest buzzwords in nutrition seems to be “plant-based diets.” A Google search of that and similar terms produces more than 600,000 listings, with nearly the same number of descriptions as to what constitutes a plant-based diet. In some cases, the term plant-based is used interchangeably with vegetarian or vegan. But I’m sure we all know self-described “vegetarians” that get through the day on a diet of processed carbohydrates that are a far cry from the native plants from which they were derived.

Other definitions of “plant-based diets” include animal foods, typically favoring dairy, eggs, poultry, and fish over other sources of protein. Where there is agreement across different interpretations of a plant-based diet is the emphasis on minimally processed foods, including vegetables, fruits, beans, peas, lentils, seeds, nuts, and whole grains.

Numerous studies have linked diets rich in plant foods with health outcomes ranging from optimal body weight to chronic disease risk reduction (i.e., cardiovascular disease, type 2 diabetes, cancer). Plant foods have also been linked to bone health and cognitive function, although the data is still emerging in these areas. Recent recommendations from the American Heart Association/American College of Cardiology and the Dietary Guidelines Advisory Committee reflect this evidence, encouraging dietary patterns such as the Mediterranean-Style Diet and others that are based on unprocessed or minimally processed sources of fruits, vegetables, whole grains, etc.

In fact, there has definitely been a shift in nutrition guidance in recent years. Dietary patterns are in, single nutrients are out. And it’s about time! Nutrition professionals have long been professing that people eat food, not nutrients. However, until recently, most dietary guidance was centered around a list of limits with very little emphasis on the specific types of foods that are the foundation of a healthy diet.

But there is also ample evidence that dietary protein, and specifically high-quality protein, serves a critical role throughout the lifespan. In fact, a recent supplement in The American Journal of Clinical Nutrition comprehensively reviewed the evidence on dietary protein and concluded that intakes of 0.8 to 1.6 g/kg/day (but staying within the Acceptable Macronutrient Distribution Range of 10-35% of calories) can contribute to reaching nutrient targets, and may be especially important for select populations, such as middle-aged and older adults as well as those on calorie-restricted diets. Additionally, spreading protein intake evenly throughout the day with an emphasis on ~20 to 30 g at breakfast, the meal most likely to be far lower in protein, may optimize protein’s benefits.

Independent of the benefits of protein, certain protein-containing foods may also augment other aspects of the diet. For example, research from the laboratory of Dr. Wayne Campbell at Purdue University showed greater absorption of carotenoids when eggs were co-consumed with a vegetable-based salad. The increase was a function of the fat present in eggs (avocado and fat-based salad dressings have shown similar effects on increasing absorption of fat-soluble antioxidants), but also the presence of lutein and zeaxanthin within the egg yolk. While this was an acute study, it is reasonable to hypothesize that sustaining a dietary pattern that pairs plant foods with sources of healthy fats at the same meal could lead to greater concentrations of circulating antioxidants.

Other articles in this issue of Close-Up also focus on whole foods, meals, and overall dietary patterns. And for the first time, a suggested wine pairing for eggs! Also in this issue, we are excited to share our latest educational tool, Protein & Plant Pairings (on page 7). Being it’s the heat of the summer with access to fresh fruits and vegetables across the country, it feels like the perfect time to enjoy as many plants as possible, and we hope this infographic inspires some new and unique combinations.

Tia Rains, PhD, is Senior Director, Nutrition Research & Communications at the Egg Nutrition Center.
The World Health Organization lists coronary heart disease (CHD) as the leading cause of death, globally. It is no surprise that policymakers, academicians, health professionals and health-conscious consumers are interested in ways to decrease the burden of CHD on society. For years, attention has been focused on decreasing saturated fat intake as a means to decrease the incidence of CHD. Recently, however, the tide has turned. The purpose of this article is to summarize the current knowledge on the link between saturated fat and CHD and to correct misperceptions that surround the topic.

CHD is the narrowing and hardening of the coronary arteries that supply oxygen-rich blood to the heart. It is a multifaceted disease caused by damage to the endothelial lining of the coronary arteries. When the endothelial lining is compromised as a result of smoking, high blood pressure, diabetes, oxidized small dense low-density lipoprotein cholesterol (LDL-C), or other factors, the inflammatory cascade that repairs the lining of the vessel can eventually become a site of plaque build-up and ultimately plaque rupture; causing heart attack.

Saturated fatty acids contain no double bonds between the carbon atoms of the fatty acid chain, which means that carbon atoms are “saturated” with hydrogen. Sources of saturated fat include foods of animal origin, such as poultry, beef, lamb, pork, lard, and dairy products made from whole or 2% milk, as well as some plant-based oils, such as palm and coconut oil. Because baked and fried foods are made with fats and oils, these foods can also contain saturated fat.

Elevated LDL-C in the blood is associated with increased risk of CHD. Consuming saturated fatty acids tends to increase LDL-C levels in the blood. It is not surprising that for many years it was hypothesized that because saturated fats raised LDL-C, and because LDL-C was associated with CHD, that consuming saturated fatty acids caused heart disease. This hypothesis, however, is far too simplistic. Observational and clinical trials have since enhanced what we know about saturated fat consumption and risk of CHD. Fatty acids come in different chain lengths, and this makes a difference in how they are metabolized. For instance, stearic acid, C18:0, the most abundant fatty acid in milk, tends not to raise LDL-C to the extent that other saturated fatty acids do. Also, not all food sources of saturated fat are equal. Whole-milk dairy foods such as cheese and yogurt have been associated with a decreased risk of CHD in observational studies. Further, not all LDL-C is created equal. LDL-C comes in different sizes, with oxidizable small-dense LDL potentially being more atherogenic than large buoyant LDL. If these factors were not enough to poke holes in the saturated fat — LDL-C — CHD hypothesis, a recent and highly publicized meta-analysis of observational and clinical studies indicated that saturated fat consumption was not associated with elevated risk of CHD.

Word has gotten out that saturated fats, in the collective sense, are not to blame for the leading cause of death among men and women in America. Time magazine recently published a cover story featuring a picture of butter under the headline “Eat butter. Scientists labeled fat the enemy. Why they were wrong.” Whereas Time got the message that the science around saturated fats and heart disease has evolved, the message that we eat foods (a diet), and not nutrients, was lost in the article. Whereas cheese and yogurt have been associated with a reduced risk of heart disease, the implication to eat butter is not based on any study that this author is aware of. Herein lies the issue of looking at the effect on CHD of a macronutrient, such as fat, and projecting it to the effect from food.

The PREDIMED study, designed to test the effect of a total diet on CHD, showed that among persons at risk for CHD, a Mediterranean Diet with extra-virgin olive oil or nuts reduced the incidence of major cardiovascular events compared to a control diet in which participants were advised only to reduce fat. The Mediterranean Diet used in PREDIMED contained saturated fat. It is an excellent example of a diet and disease trial that emphasized that saturated fat alone cannot be considered the culprit in the burden of heart disease.

Beth H. Rice Bradley, PhD, founder of Foodsense, LLC, develops strategies for clients to advance food and nutrition research, outreach and education in the marketplace.

**References**

Can we become addicted to some types of foods?

By Neva Cochran, MS, RDN, LD

The concept of “food addiction” has become popular in the lay press as well as among some health professionals. But can food actually be addictive in the same sense as drugs or alcohol? In March 2009, The Journal of Nutrition featured this topic in “Symposium—Food Addiction: Fact or Fiction?” Rebecca Corwin, PhD, RDN, LDN, a researcher and Professor of Nutritional Neuroscience at The Pennsylvania State University, was co-chair of the symposium. I spoke with Dr. Corwin to further explore this subject.

Question: Based on your research and that of others, can foods be addictive in the same way as drugs and alcohol?

People definitely struggle with food-related issues in today's extremely challenging food environment, but that does not mean they are addicted to the food. There are several reasons why food cannot be as addictive as drugs or alcohol.

First, while food and drugs act on the same areas of the brain, drugs have much stronger effects because they go directly to the brain. Food doesn't do this so its effects are much more subtle, which makes it very difficult to become “addicted.”

Second, currently there is no “official” way to diagnose food addiction. The term “food addiction” is not included in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V). In addition, the main research tool that has been used to assess food addiction (the Yale Food Addiction Scale) is exactly that: a research tool. It has not yet been confirmed as a clinical diagnostic tool.

Third, there is very little evidence that substances in food, like sugar or fat, are addictive in humans. If people were truly addicted to sugar, any sugary substance (e.g. milk, fruit, juice, honey, or table sugar, etc.) would satisfy the craving. But people usually crave specific foods, not specific substances. For instance, eating a cupcake might satisfy the craving for cake, but eating something with a similar fat and sugar content, like a cookie or ice cream, will not.

Finally, treatment of drug or alcohol addiction is different from that recommended for food. With drug or alcohol addiction, complete abstinence is usually recommended. This doesn’t work very well for people struggling with food. If the favorite food is removed from the diet, desire for that food can increase and bingeing on it may occur at some point. One successful treatment for food-related eating disorders requires that the craved food not be eliminated but added back to the person’s diet in a controlled and rational manner. Treating food the same way as drugs or alcohol may actually make matters worse.

Q: What particular foods have been implicated as “addictive” and why?

Foods rich in fat, sugar, and salt, such as cookies, cakes, candy, ice cream, chips, and dips, are the usual suspects. The evidence for fat and salt addiction, even in animal studies, is very weak. But foods containing fat and salt have great appeal to humans and are often eaten to excess; therefore, they may be considered “addictive.” Sugary foods have been implicated, not only because of their innate appeal to humans (even as infants, we really like sweets), but also because animal research has found some signs of addiction in rats consuming sugar solutions. However, even these studies clearly showed that the manner in which the sugar was consumed was far more important than the amount. Specifically, rats needed to binge on the sugar to show addiction-like symptoms. If rats just sipped the sugar throughout the day, no evidence for addiction was shown, even if the total amount consumed was quite large.

Dairy products, especially cheese, have been implicated as addictive, because of morphine-like compounds they contain. But the concentration of these is so low that thousands of pounds of cheese would have to be consumed to get enough of the morphine-like compound to have an effect.

Q: The headlines often suggest the results of rat addiction studies can be applied to humans. What are some of the concerns with doing this?

Rats are great models and can teach us much, but results of rat studies may not apply to humans. Rat research is generally very well controlled so a single factor at a time can be tested. People live in a far more complex environment with many factors influencing behavior that are difficult to control.

Q: Are there unintended consequences of implicating a single food or ingredient as addictive?

Eliminating a single ingredient from the diet (e.g. gluten) often means removing an entire food group (e.g. wheat products). As a result, intake of an essential nutrient like folate can

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Uncracking the ‘Incredible Edible Egg’
By Lisa Katic, RD, CSW

Beaten, scrambled, over-easy, fried, baked, hard-boiled or just plain raw, everyone has a preference for how they like their eggs. No matter how they are prepared, eggs are one of the most nutritious foods available with six grams of high-quality protein, B vitamins, iron, and zinc. They are also inexpensive, convenient, versatile and a tasty choice for any meal or snack. How many other foods can you name with so many glowing characteristics?

It is unfortunate that with so many accolades under its shell, eggs have taken a nutrition beating for decades. When scientists decades ago linked dietary cholesterol intake to heart disease, egg yolks were one of the first targets, as the yolk contains about 200 milligrams of cholesterol. Most of us growing up came to learn about eggs in terms of their cholesterol-containing yolks and not for their nutritious attributes. It is a shame we were so hesitant to eat a single egg, but instead loaded up on pasta, rice, bread and other carbohydrate-containing foods, in part because they didn’t contain cholesterol or fat. The dysfunctional diet pendulum began to swing and still swings to this day.

Scientific guidance is sunny side up

Jointly published every five years by the U.S. Department of Health and Human Services and the Department of Agriculture, Dietary Guidelines for Americans provides advice for making food choices that promote good health and prevent disease for Americans ages 2 years of age and older. Recommendations are based on rigorous review of scientific evidence and form the basis of federal nutrition policy, education, and food assistance programs used by consumers, industry, nutrition educators, and health professionals.

Recommendations for dietary cholesterol found in eggs and other animal products have been established since the Dietary Guidelines were first published in 1980. Experts from the American Heart Association and the American College of Cardiology, who looked at the issue in 2013, said there was simply not enough evidence of harm to call for restricting cholesterol in diets. These scientists say that eating cholesterol-laden foods does not necessarily lead to higher levels of cholesterol in the blood. In fact, most of the cholesterol in your blood comes not from what you eat but from what your liver produces.

This and other scientific evidence led the current Dietary Guidelines Advisory Committee (DGAC) to issue new recommendations, saying that dietary cholesterol is not considered a nutrient of concern. New research suggests that eating cholesterol-rich foods doesn’t necessarily lead to higher cholesterol levels.

If taste is king, moderation is queen

With so much media attention on nutrition do’s and mostly don’ts, taste continues to be absent from food and nutrition reporting. We know that taste remains the number one reason consumers buy and eat certain foods; yet we continue to talk about them only in terms of nutrients. Many examples exist where foods have been demonized for containing a single nutrient that may be considered unhealthy or “bad” while the whole food may in fact be nutritious. Cholesterol in eggs is a perfect example of this conundrum. Carbohydrates in potatoes, gluten in bread, fat in red meat, and even sugar in fruits are examples of nutritious foods that can be included in the diet but are vilified for containing one perceived fatal flaw.

Incredible and even more edible

Eggs are often referred to as symbols of new beginnings and birth. There is no time like the present to honor this tradition and celebrate the egg, given its renewed green light. They are not only a great option for breakfast or brunch but also an easy and delicious choice for dinner. Eggs are often synonymous with coffee in the morning, but have you ever considered pairing your egg dishes with wines for dinner? Well, let’s consider our options. This egg recipe paired with a sparkling wine will enhance your next dinner and provide a whole new reason to add eggs to your repertoire. In doing so, we can learn to enjoy our food and enhance our health without all the angst brought on with restrictive guidelines and dietary recommendations.

Broccoli & cheddar frittata with sparkling rose

The quintessential wine pair with eggs is often champagne or sparkling wines. I chose a sparkling rose for this particular recipe because it will complement the sharpness of the cheddar cheese and also stand up to the hearty taste of the broccoli without overpowering the entire dish. When looking for a rose sparkler to pair with

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Eggs aid carotenoid absorption

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designed to examine the impact of both amount and source of dietary lipid on the absorption of carotenoids from a mixed-vegetable salad showed that the amount of co-consumed lipid is a primary potentiator of carotenoid absorption rather than the source.7

Over the past 10 years, low-fat or fat-free versions of food products typically co-consumed with vegetables (e.g. salad dressings) are readily available.8 Recent studies strongly suggest that dietary lipid is necessary to absorb those fat soluble, health-promoting phytochemicals, and co-consuming cooked whole eggs with carotenoid-rich foods such as raw mixed-vegetable salads is an effective dietary strategy to enhance the absorption of carotenoids. Also, this research highlights that eggs, a nutrient-rich food containing dietary protein, unsaturated fatty acids, and vitamins and minerals, may be used to enhance the nutritive value of other carotenoid-rich foods.

References


Uncracking the egg

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this recipe, ask for one that is dry but with enough fruit on the palate to complement all the ingredients. Wines that are more pink in color with notes of strawberry or ripe berries will please your palate and enhance this frittata nicely.

True “Champagne” comes only from the Champagne region of France. Any wine that is sparkling in nature but uses grapes from anywhere other than Champagne is termed a “sparkling wine.” True Champagne is made from only three types of grapes: chardonnay, pinot noir, and pinot meunier.

Lisa D. Katie, RD, CSW, is a registered dietician and wine educator. She is President of K Consulting and hosts a blog, “Katie’s Korner, where Food+Wine=Health.” Lisa’s blog pairs simple, healthy recipes with favorite wines to maximize enjoyment of both.

Addicted to food?

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become inadequate, with consequences for the individual or an unborn child if a woman is pregnant. When foods must be eliminated, care should be taken to ensure the nutrients they contain are obtained from other foods or supplements.

Eliminating sugar may inadvertently lead to increased cravings and binge-type eating. Therefore, reducing the sugar intake, rather than eliminating it, is probably a better approach.

Q: What do you think about a recent journal article9 that suggests the term “eating addiction” is preferable to “food addiction” to emphasize the behavioral aspect of the problem?

Even if “eating addiction” were to become a new diagnostic category similar to gambling disorder, how would it be treated? People still must deal with the struggles they have with food.

Perhaps one benefit of viewing the behavior, rather than the food, as addictive is that attention is focused on an individual’s behavior. Then treatment strategies can address changes in behavior. This is what cognitive behavioral therapy already does with a fair amount of success. I am not sure how labeling eating as an “addiction” would help those who are struggling. The bottom line is that these struggles are difficult and working with a behavioral therapist and a registered dietitian nutritionist specializing in eating disorders can help.

Neva Cochran, MS, RD, LD, is a nutrition communications consultant, appearing regularly in national and local media to discuss current nutrition topics.

References


Messages

- Recent studies strongly suggest that dietary lipid is necessary to absorb fat soluble, health-promoting phytochemicals.
- The highly bioavailable nature of carotenoids from eggs suggest that the dietary lipid and phospholipids contained in egg yolk may help increase the bioavailability of carotenoids found in co-consumed fruits and vegetables.
- The absorption of total and individual carotenoid, including lutein, zeaxanthin, α-carotene, β-carotene, and lycopene, was 3 to 8-fold higher when the raw mixed-vegetable salad included 3 eggs compared to no eggs.

Summer 2015
Uncracking the egg

Lisa D. Katic, RD, CSW, is a registered dietitian and wine educator. She specializes in wine and nutrition to enhance enjoyment of both. Wine is made from grapes by fermentation, and its color, flavor, and aroma are influenced by the grape variety, the soil and climate of the vineyard, and the winemaking process. Therefore, no two wines are exactly the same.

While there’s no strict definition for what constitutes “a plant-based diet,” unprocessed fruits and vegetables, legumes, nuts, seeds and whole grains serve as the basic foundation. But “plant-based” does not mean only plants.

In fact, at each meal, pairing plants with 20–30 grams of high-quality protein such as eggs, fish, chicken, lean meat, and low-fat dairy can help meet daily protein needs to support healthy muscles and strong bones and satisfy the appetite.

Protein & Plant Pairings
A PLANT-BASED DIET DOESN’T MEAN ONLY PLANTS

Following a plant-based diet can be good for you and the planet.

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Plant-based diets that pair plants with lean proteins

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What does the science say?

A plant-based diet can reduce the risk of:

- Heart disease and stroke
- Type 2 diabetes
- Obesity
- Bone abnormalities
- Some types of cancers, such as colon and breast
- Age-related cognitive impairment, dementia and Alzheimer’s disease

Proteins & Plants: Powerhouse Pairings

Plants can be combined with high-quality protein sources in nearly endless varieties to help create a stronger you. Many healthy eating patterns supported by public health experts and health organizations include both plants and lean proteins. Which option is best for you? It’s the eating pattern that fits your lifestyle and you can stick with!

Here are some protein and plant pairings to help inspire you.

How do you pair proteins and plants in your own diet? Let us know! @EggNutrition #plantandprotein
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ENC 2015 Fall Calendar

Health Professional Events

Food and Nutrition Conference & Expo (FNCE)
October 3-6, Nashville, TN

Osteopathic Medical Conference & Expo (OMED)
October 17-21, Orlando, FL
“Changing Perspectives on Dietary Fat, Cholesterol, and Health: It’s Taken a Village,”
Monday, Oct. 19 12:30 - 1:00 pm
Presenter: Tia Rains, PhD, Egg Nutrition Center

American Heart Association Scientific Sessions 2015
Nov. 7-11, Orlando, FL

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