Egg Nutrition Center
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Nutrition Close-Up

What's inside…

SPECIAL FEATURE

Lutein: Protection from the Eye to the Brain

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Lutein is a yellow pigment commonly found in fruits, vegetables, and egg yolk.[1] Particularly rich sources include green, leafy vegetables such as spinach and kale. Lutein belongs to a class of compounds called carotenoids. Lutein, along with a similar compound, zeaxanthin, selectively accumulate in the macula of the retina, where they may protect against the development of age-related macular degeneration (AMD).[2] In the macula, lutein and zeaxanthin are referred to as macular pigment. Increased levels of macular pigment have been shown to be related to a decreased risk of AMD.[3] Studies have shown that it is possible to increase macular pigment with lutein-rich foods.[4, 5] Lutein may also have a role in age-related cataracts. The majority of the epidemiological data suggests that dietary carotenoids function in cataract prevention.[6] Among the carotenoids, lutein and zeaxanthin are the only ones to be found in the lens.[7] The mechanisms by which lutein and zeaxanthin are thought to provide protection to the eye are through their roles as visible light filters and as antioxidants.[2] The presence of lutein and zeaxanthin in human blood and tissues is a result of the ingestion of food sources or supplements of these carotenoids. Of the two, lutein predominates in foods by approximately five-fold.[1] Recent findings suggest that lutein

> *"Recent findings suggest that lutein may also be important in cognitive function in the elderly."*

may also be important in cognitive function in the elderly. Similar to the eye, lutein is also among the dominant carotenoids in the human brain tissue.[8] Consumption of vegetables, particularly the green leafy variety that are rich sources of lutein, was associated with slower rates of age-related cognitive decline in two large population studies.[9, 10] Blood levels of antioxidants, including lutein, have also been reported to be related to improved cognitive function in healthy older adults[11] and are depleted in individuals with mild cognitive impairment and those with Alzheimer's disease.[12] Furthermore, the benefits of increased intake of lutein to cognitive function was observed in a four-month, double-blinded intervention trial involving older women (60-80 yrs) who were randomized to receive a placebo, the omega-3 fatty acid, docosahexaenoic acid (DHA) alone, lutein alone, or a combination of DHA + lutein.[13] Participants underwent cognitive tests measuring verbal fluency, memory, processing speed and accuracy, and self-reports of mood at the beginning and end of the trial. Following supplementation, verbal fluency scores improved significantly in the DHA, lutein, and combined treatment groups. Memory scores and rate of learning improved significantly in the combined treatment group, who also displayed a trend toward more efficient learning. DHA has long been associated with cognitive function. This benefit of lutein is a relatively new finding. These results suggest that DHA and lutein supplementation may work together in an

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Protein Intake: The Key to Healthy Aging

By Paul Katami

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It's natural to lose muscle mass, strength, and function as you age, a condition which is known as sarcopenia. However, you can reduce age-related muscle loss through training and proper nutrition, specifically high quality protein intake, post-exercise.

Efforts to halt muscle loss are critical to health and wellness in adults fifty plus years of age. So maintaining healthy exercise and diet regimens becomes even more important as you age. Further, according to the American College of Sports Medicine there is growing evidence that regular physical activity and proper nutrition reduces the risk of developing numerous chronic conditions and diseases including cardiovascular disease, stroke, hypertension, type 2 diabetes mellitus, osteoporosis, obesity, colon cancer, breast cancer, cognitive impairment, anxiety, and depression.[1]

> *"Ingesting too much protein at only one meal can be counteractive to achieving a daily required goal, as it may lead to energy storage in your body's fat tissue."*

Protein Intake Recommendations:

It is essential that adequate energy and protein be provided from exogenous sources so that muscle tissue and other supportive body components can be retained and restored. Chernoff suggests that older adults require more grams of protein per kilogram of body weight compared to younger adults. For most young adults, the recommended daily amount of protein is 0.8 grams per kilogram of body weight. This increases to 1.0 gram/kilogram of body weight for older adults.[2]

To convert body weight in pounds to kilograms, simply divide body weight in pounds by 2.2. To estimate protein needs, multiply weight in kilograms by 1.0 gram protein. So, if one weighs 150 pounds, their weight in kilograms is 68 (150/2.2). The protein recommendation for an older adult is; 68 kilograms times 1.0 gram, or 68 grams of protein per day.

Peter Lemon suggested in the Journal of the American College of Nutrition that with more frequency of higher intensity exercise, whether cardiovascular or resistance training, there is an increased need for protein intake pre and post workout. This is based on the protein demands during the exercise routine. Dr. Lemon's studies show that for physically active individuals, daily protein intake needs could be as high as 1.6 to 1.8 grams/kilograms (almost twice the recommended daily intake).[3] In addition to protein quantity, it's important to provide dietary protein intake throughout the day. Ingesting too much protein at only one meal can be counteractive to achieving a daily required goal, as it may lead to energy storage in your body's fat tissue. Also, when choosing a protein source, it's best to choose sources of protein like fish, lean meats, chicken, eggs, and dairy. Since proteins vary in the amount and type of amino acids they contain, it's best to choose a food containing all the essential amino acids in the amounts needed to support body function and preserve muscle tissue. The egg is an excellent source of high quality protein because it contains all the amino acids needed in the right amounts. One large egg (with yolk) has about 6 grams of protein. An egg white has approximately 3.5 grams. A simple combination of 3 egg whites and 2 full eggs can yield a total of around 22.5 grams of protein. In addition, eggs offer a convenient, inexpensive, and easy to prepare source of high quality protein.

Resistance Training

Developing and maintaining lean muscle mass can be achieved by resistance training programs that encourage muscle hypertrophy (muscle growth). Muscle tissue may be positively affected by training exercises that build strength. Regular exercise will stimulate protein tissue turnover and maintain muscle mass.

The best way to combat muscle and strength loss with aging is higher intensity resistance training. Further, strength and resistance training coupled with an increase in high quality protein intake has been shown to promote a higher rate of continued muscle growth and strength gains in older adults.[4] These positive results should encourage the adoption of a diet and exercise program by all adults; of course, any program should conform to established safety guidelines, and should be approved by a physician.

A general guideline for resistance training follows the basic fitness outline of Frequency, Intensity, and Duration.

- Frequency: Studies with the elderly subjects have indicated a range of two to four days per week to be effective for improving muscle density and overall strength.
- Intensity: Intensity refers to the amount of weight being lifted, and is a critical component of the resistance-training program, considered by many fitness professionals to be the most important training-related variable for inducing improvements in muscle strength and function.

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Lutein, Protection from the Eye to the Brain

additive/synergistic manner to improve cognitive functions in older adults.

Dietary surveys indicate that average intake of lutein in the U.S may be below levels that are associated with age-related disease prevention.[14] Therefore, increased intakes of food sources of lutein may be warranted. Compared to many fruits and vegetables (particularly green leafy vegetables like kale and spinach) eggs contain far less lutein per serving. That said, research has indicated that the lutein from eggs may be more bioavailable than that found in most fruits and vegetables, possibly because of the presence of constituents such as lecithin in the egg yolk. So, despite having a relatively low amount of lutein per serving, many health experts have designated eggs as a viable way to get more lutein via the diet allowing for more efficient delivery to tissues, i.e. the lens, macula or brain. Several studies have shown that the consumption of one egg (186mg of dietary cholesterol) does not increase the risk of coronary heart disease.[15] This fact, along with its high nutrient density, makes the egg a valuable dietary intervention for older adults. •

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Messages

- Lutein, along with a similar compound, zeaxanthin, selectively accumulate in the macula of the retina, where they may protect against the development of age-related macular degeneration (AMD).
- Results suggest that DHA and lutein supplementation may work together in an additive/synergistic manner to improve cognitive functions in older adults.
- Dietary surveys indicate that average intake of lutein in the U.S may be below levels that are associated with age-related disease prevention.

HDL Function is an Important Indicator of Cardiovascular Disease Risk

By Catherine Andersen, M.S.

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HDL–cholesterol (HDL-C) has long served as a valuable and readily accessible clinical biomarker to assess cardiovascular disease (CVD) risk. However, while high serum HDL-C levels are often associated with a reduced risk of developing CVD, newer research suggests that analysis of HDL particles beyond their cholesterol content may provide greater insight into the degree of atheroprotection that HDL can confer.[1,2]

> *"While various HDL components have been targeted to improve particle function, therapies that modulate lipid composition represent a promising approach that may be achievable through diet."*

Measures of HDL function and CVD beyond HDL-C

HDL represents a heterogeneous group of lipoprotein particles that are diverse in size, structure, proteins components, and lipid composition. Together, these factors affect the ability of HDL to participate in reverse cholesterol transport (RCT) – the primary atheroprotective function of HDL. In the crucial first step of RCT, HDL acts as an acceptor of cellular lipids, including cholesterol from lipid-laden macrophage foam cells in atherosclerotic plaques.[2] The ability of HDL particles to accept cellular cholesterol can be tested experimentally using controlled cell culture systems that contain patient serum. Since HDL is present in serum, the capacity of patient serum [HDL] to accept radiolabeled cholesterol from macrophage foam cells can be measured, thus representing HDL function in an atherosclerotic environment in the human body. Using this model, researchers have demonstrated that increasing the cholesterol-accepting capacity of human serum is associated with reductions in CVD risk and severity, and that these observations do not necessarily correspond to changes in HDL-C.[1] These findings suggest that improving HDL function beyond increasing HDL-C should be a primary goal for diet therapy, and that measuring HDL function may provide greater insight into the efficacy of dietary treatments on CVD outcomes.

HDL lipid composition as a determinant of HDL function

While various HDL components have been targeted to improve particle function, therapies that modulate lipid composition represent a promising approach that may be achievable through diet. HDL particles are approximately 50% lipid by weight, with phospholipids and cholesterol representing the majority of HDL lipid in nearly equal quantities.[2] The predominant phospholipid species in HDL is phosphatidylcholine (PC; ~85%), followed by sphingomyelin (~10%), phosphatidylethanolamine (PE; ~3%), and trace amounts of lysophosphatidylcholine and phosphatidylinositiol (~1% each).[3] Enrichment of HDL particles with PC and PE has been associated with higher plasma HDL-C and a greater lipid-accepting capacity of HDL.[4,5] Therefore, it possible that beneficial redistribution of HDL lipid components and improvements in HDL function may be achieved through consumption of foods that are rich sources of these phospholipids.

Altering HDL lipid composition through diet

A recent study conducted by Fernandez et al. demonstrated that eggs may serve as a functional food to increase HDL-C and improve HDL function in individuals with metabolic syndrome – potentially through modulating HDL lipid composition. Patients with metabolic syndrome often present with low HDL-C and impaired HDL function.[6] Eggs are an abundant source of phospholipids, the majority of which are found in the yolk. Further, the most predominant phospholipids in egg are PC (~78%) and PE (18%) [7] – the two phospholipid species that have been most associated with increasing the cholesterol-accepting capacity of HDL.[4,5]

To test whether egg intake could alter HDL lipid composition and function, men and women classified with metabolic syndrome were asked to consume either 3 whole eggs or the equivalent amount of egg yolk-free egg substitute per day as part of a 12-week moderate carbohydrate-restricted diet. The whole egg provided a much greater amount of dietary phospholipids and cholesterol compared to the egg substitute due to the presence of the yolk. After 12 weeks, subjects consuming the whole eggs experienced greater increases in HDL-C when compared to the subjects consuming the egg substitute, and these beneficial changes were observed without increases in total or LDL-cholesterol. [8] Further analysis of the HDL particles revealed that HDL from subjects consuming the whole eggs became more enriched in phospholipids, whereas HDL from the subjects consuming the egg substitute became relatively depleted of phospholipids. We found that whole egg consumption increased the cholesterol-accepting capacity of subject's serum from cholesterol-loaded macrophage foam cells, indicating that HDL function had been improved by egg intake in a population at high risk for CVD.

Overall, the information presented reinforces the importance of investigating HDL function in addition to HDL-C to more accurately assess the cardioprotective effects of diet therapy. By utilizing this approach, research has revealed the potential benefit in modulating HDL lipid components, which we have shown to be achievable through daily egg intake. Our findings further suggest that this is an efficacious dietary strategy for improving HDL function in patients with metabolic syndrome. •

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Messages

- Newer research suggests that analysis of HDL particles beyond their cholesterol content may provide greater insight into the degree of atheroprotection that HDL can confer.
- Findings suggest that improving HDL function beyond increasing HDL-C should be a primary goal for diet therapy, and that measuring HDL function may provide greater insight into the efficacy of dietary treatments on CVD outcomes.
- Whole egg consumption increased the cholesterol-accepting capacity of subject's serum from cholesterol-loaded macrophage foam cells, indicating that HDL function

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Protein Intake: The Key to Healthy Aging

Intensity is determined by current strength level and will adapt and increase with strength gains but needs to be at a level for challenge and growth and not accommodation.

- Duration is the length of each exercise session. Older adults should avoid lengthy training sessions, because they may increase the risk of injury, manifested by extreme fatigue. Present guidelines for resistance training in older adults recommend a range of approximately 20-45 minutes per session. In other words, one should attempt to train for at least 20 but no longer than 45 minutes. This range suggests an approximate average duration of 30 minutes per session.[5]
- For aging adults the benefits of a balanced nutrition plan, that takes into consideration advanced protein needs along with a resistance training exercise routine, often includes weight loss and a leaner more aesthetically defined body. Training and eating right really does start the change from within and results are not only felt but can be seen as well. It really is possible to turn back time, by making simple changes as we age. •

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Messages

- Evidence suggests that older adults require more grams of protein per kilogram of body weight compared to younger adults.
- Developing and maintaining lean muscle mass can be achieved by resistance training programs that encourage muscle hypertrophy.
- A general guideline for resistance training follows the basic fitness outline of Frequency, Intensity, and Duration.

Encouraging Delicious Gluten-Free Menu Planning

By Serena Ball MS, RD

A culinary dietitian, freelance writer and owner of Teaspoon Communications in Chicago.

A fluffy egg breakfast scrambler loaded with veggies, tuna quinoa salad for lunch, lemon roasted chicken thighs with roasted potatoes and decadent dark chocolate yogurt for dinner; it doesn't sound like a diet of deprivation. But it's a gluten-free diet – and it can be delicious. The key to gluten-free menu planning is to get patients enthusiastic about the foods they can eat instead of those of which they must deprive themselves.

Since diet is the only treatment for those suffering from celiac disease or gluten intolerance[1] it's essential to help patients enjoy their 'diet' food in order to remain compliant. This article will review foods which can help correct deficiencies found in those with celiac disease. Most importantly, menu planning tips will be included, along with suggestions for encouraging folks to cook more at home – the only way to practically guarantee a gluten-free meal.

> *"Consuming high-quality protein at meals aids in rebuilding digestive tissue and for building muscle."*

Nutrient Deficiencies and Foods for Healing Deficiency Symptoms

Damaged intestines, peripheral neuropathy, osteopenia, fatigue, and cell damage are some of the outcomes of nutrient deficiencies experienced by people with celiac disease.[2,3] These conditions generally result from nutrient malabsorption in the disease-damaged gut; they include:

- Iron & vitamin B12
- Beef, poultry, fish and seafood are sources of vitamin B12 and easily-absorbed heme iron. Sources of less-absorbable non-heme iron include beans, tofu, spinach and molasses are also important. Eggs, milk, yogurt, cheese, and fortified grains are also key sources for vitamin B12.

Folate

- Folate is found in beans and lentils; leafy greens like spinach and kale; and fortified whole grains.

Calcium & vitamin D

- Calcium and vitamin D are both found in dairy foods; but patients with celiac disease may secondarily experience lactose intolerance. Thus it's important to educate these patients on the importance of incorporating dairy into the diet slowly – ¼ cup with meals and then slowly increasing the amount. Probiotic-containing yogurt can improve lactose intolerance as well as reduce disease-induced inflammation in the gut.[2]Vitamin D is also found in fatty fish, nuts and eggs; omega-3-enriched eggs and fatty fish can also be important sources of omega-3 fatty acids to help reduce inflammation.

Magnesium & phosphorus

- Good magnesium sources include spinach, avocados, brown rice, millet, nuts and seeds. Animal sources such as meat, poultry, fish, eggs and dairy foods are more available than plant sources such as whole grains, lentils and dried fruit.

Vitamins E & K

- Fat-soluble vitamins E is found in vegetable oils, nuts (especially almonds), gluten-free whole grains and leafy green vegetables. Vitamin K is found include dairy foods, broccoli, and soybean oil.

Meal Planning

The foundation of a gluten-free diet should be lean proteins, gluten-free whole grains, fruits and vegetables.[2] Many cooks begin their meal planning with the protein, but since grains are often the most unfamiliar part of preparing a glutenfree meal, start with the bounty of whole grains available: Amaranth, rice (brown and wild), buckwheat, corn, millet, quinoa, sorghum, and teff; almond meal flour, coconut flour, pea flour, potato flour, and soy flour are also gluten-free.[4] Resources for cooking and preparing these grains include: *WholeGrainsCouncil.org and BobsRedMill.com*

Consuming high-quality protein at meals aids in building muscle and rebuilding digestive tissue. Some research indicates up to 30 grams of protein is needed especially at breakfast and lunch to stimulate the body's muscle-building mechanisms.[5] Eggs, Greek yogurt, and lean cuts of meat and fish are nutrient-rich foods to help meet high-protein needs.

Processed packaged gluten-free foods are notoriously low in fiber, thus higher fiber fruits and vegetables are important to include in meals. These include: berries; apples and pears with skin; oranges; dried figs and plums; artichokes; broccoli; peas; cooked dried beans and lentils; and potatoes with skin.

Quick Cooking at Home

Home cooking tends to contain more fruits, vegetables and whole grains and less fat, sugar and calories. Cooking at home is much easier on the budget and most importantly is much easier to make gluten-free than restaurant fare.

To start cooking more at home, encourage folks to:

Plan – Make a menu plan and grocery list at the beginning of the week.

Stock the pantry – Quick meal makers include: Canned beans, canned tomatoes, tuna, olives, and whole grains.

Stock the freezer – Frozen berries and frozen veggies need not be washed or chopped. Cook a pot of dried beans or whole grains (quinoa, brown rice or buckwheat) over the weekend then freeze in individual containers.

Become inspired by the excellent gluten-free blogs and cooking resources: GlutenFreeGirl.com, EAStewart.com, Kumquatblog.com, LivingWithout.com •

Messages

- Since diet is the only treatment for those suffering from celiac disease or gluten intolerance, it's essential to help patients enjoy their 'diet' food.
- The foundation of a gluten-free diet should be lean proteins, gluten-free whole grains, fruits and vegetables.

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RESEARCH CORNER

Consumer Attitudes About Protein

The International Food Information Council released their 2012 Food & Health Survey: Consumer Attitudes toward Food Safety, Nutrition, and Health, which is the seventh annual national quantitative study designed to gain insights from Americans on important food safety, nutrition and health-related topics. Interesting findings from the report include:

- Nearly six out of 10 Americans consider protein when making a decision about buying packaged food or beverages, and most people report they are trying to consume more. More consumers (47 percent) try to eat protein during an evening meal than during other meals or snacks; however, more than half (52 percent) of Americans simply try to get enough protein over the course of the day or week than focus too much on specific meal times.
- Nearly nine out of 10 Americans recognize that protein helps build muscle and 69 percent agree that protein helps people feel full. Additionally, 60 percent agree that high protein diets can help with weight loss, which is up from 34 percent in 2011.
- About one in four Americans believes protein foods are too expensive, but 84 percent also say it is easy to incorporate protein into the diet.
- When asked about specific protein sources, 87 percent of respondents said they were trying to consume protein by eating eggs.
- While 88 percent of respondents believe athletes benefit from consuming higher amounts of protein, only 46 percent believe older adults benefit from higher-protein intake, and 22 percent specifically believe older adults do not benefit from eating more protein.
- Nine out of 10 Americans describe their health as good or better, a significant increase from previous years. The majority (60 percent) report their health is either excellent or very good, and only nine percent report they are in fair or poor health.

For more information about the 2012 Food and Health Survey and to read the entire survey go to: http://www.foodinsight.org/foodandhealth2012.aspx •

HAPPENING AT ENC

ENC's website is launching a fresh new look in August

New improved features on the refreshed Egg Nutrition Center website are the Nutrition News and Hot Topics areas located on the homepage that will be updated regularly with new research studies and items of interest. You're one click away from seeing what is current in nutrition research!

You'll be able to easily navigate the site and find your favorite items such as egg facts, nutrition research, CPE opportunities, patient/client materials, recipes, and so much more. Researchers can check out our ENC Grant Program page for relevant information.

Visit the website and our blog Nutrition Unscrambled often for great nutrition updates. • www.eggnutritioncenter.org

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2012 Coming Events

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Food and Nutrition Conference and Exhibit
October 6-9, 2012 • Philadelphia, PA

AAFP

American Academy of Family Physicians
October 17-20, 2012 • Philadelphia, PA

ENC Mission Statement:

ENC is a credible source of nutrition and health science information and the acknowledged leader in research and education related to eggs.

Nutrition Close-Up is a quarterly publication written and produced by the Egg Nutrition Center. **Nutrition Close-Up** presents up-to-date reviews, summaries and commentaries focused on the role of diet in health promotion and disease prevention, including the contributions of eggs to a nutritious and healthful diet.

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