

Nutrition Close-Up

Egg Nutrition Center



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PROTEIN

Muscle quality: what does it mean to your health?

By Christian Wright, Doctoral Student, Purdue University

"Bigger is better" for most Americans when it comes to skeletal muscle. One only needs to look at the latest cover of health magazines for headlines such as "build muscle fast" and "supersize your legs" to know this to be true. After all, a larger muscle is generally a stronger muscle, which is important for overall health. In fact, muscular strength is often used as a surrogate for one's physical health as it is independently associated with not only mobility, but also the development of chronic disease.

Maintaining muscular strength is particularly important in older adults, where age-related decreases in muscular strength greatly reduces quality of life and increases risk of all-cause mortality.¹ However, while a larger muscle may appear stronger and suggest optimal health, recent evidence suggests a disconnect from this long-standing relationship due to a progressive mismatch between loss of muscle mass and loss of muscular strength.

Data indicates that decreases in muscular strength occur long before reductions in muscle mass,² illustrating that muscle quality, not muscle quantity, predicts overall muscular strength. Muscle quality, often calculated as simply a ratio of muscle strength to muscle mass, describes the amount of force a muscle produces relative to its size. This ratio of muscle force to size and its influence on overall physical health is highly regulated by the composition of the muscle. Changes in muscle fiber concentrations

and increases in muscle fat are common examples of how alterations in muscle composition can degrade overall muscle quality.³ These alterations of muscle composition represent the disconnect between muscle size and strength and are considered important clinical targets for preserving muscle quality. Changes in muscle fat concentrations have recently gained critical attention, as they are not only associated with decreases in physical function, but also the development of several metabolic and inflammatory disorders.^{4,5}

"Changes in muscle fat concentrations have recently gained critical attention, as they are not only associated with decreases in physical function, but also the development of several metabolic and inflammatory disorders."

As the two images in Figure 1 illustrate, increases in muscle fat cause a "marbling" of muscle, where fat is accumulated between the individual muscle bundles, muscle fibers, and even within individual muscle cells. This ectopic fat, which is fat stored in a non-traditional site of fat stor-



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Industry-funded nutrition science needn't wear a scarlet letter

By Mitch Kanter, PhD



A few recent articles that appeared in technical journals and the lay press seemed to collectively make the following arguments: 1) *methods employed to conduct nutrition research are often flawed, leading to erroneous conclusions*, and 2) *nutrition studies funded by industry sources are really, really flawed, thus leading to biased, invalid results*. As one who has spent the better part of the past quarter century facilitating industry-sponsored nutrition research, I will submit that there may be a kernel of truth in both of these statements. That said I bristle at the notion that they are absolutely true; that nutrition research in general, and studies funded by industry in particular, should somehow be made to wear a scarlet letter.

Are some nutrition studies inherently flawed? Peter Whoriskey recently addressed this in a *Washington Post* article, pointing out that “relying on observational studies has drawn fierce criticism from many in the field, particularly statisticians.”¹ This is because, as Whoriskey points out, the overwhelming majority of observational studies fail to be replicated by randomized controlled trials. And, to be frank, Whoriskey has a point. The unfortunate fact is that human nutrition research is very difficult to do well. It is impossible to control every aspect of people’s lives, such as the amount of sleep they get, how much they exercise, stress levels, food consumption, and so on.² Further, it’s difficult (and prohibitively expensive) to get enough human subjects who will allow themselves to live under highly controlled conditions for long periods of time. As a result, many experimental nutrition trials are underpowered and not well controlled, making definitive conclusions difficult.² The alternative is observational trials, and the means by which nutrition information is collected from subjects in observational databases is marginal at best. Therefore, it is incumbent upon health professionals, the media, and others who utilize nutritional research for various purposes to be aware of the shortcomings of different study designs in nutrition science, to read studies carefully, and to temper hyperbolic headlines based on weak or preliminary data.³

With respect to the role industry plays in contributing to nutrition research, I can only address experiences I have had sponsoring industry-funded studies at the companies in which I have worked. Some contend that industry research is agenda driven, but this doesn’t suggest that most industry-funded studies aren’t well done or transparent. At every company that I have worked, the industry source and the university jointly signed a contract giving assurances that the researchers may publish their data regardless of study outcome. In fact, the Egg Nutrition Center (ENC) strongly encourages researchers with whom we work to publish their data, whether the results favor

our product or not. It is our strong belief that the preponderance of evidence on any issue will ultimately carry the day. If a food or nutrient truly has a biological impact—good or bad—no single study is going to definitively prove the point.

As a rule, ENC seeks out quality researchers, folks with a track record in their field, with whom to work. We currently have ongoing studies with researchers at more than 30 U.S. universities, large and small. And we select the studies we fund with the aid of a Scientific Advisory Panel made up of six highly respected nutrition research experts. At times I am dismayed when I read articles challenging the integrity of the latest nutrition findings because “*the study was done with industry money, so how much of it can we really believe?*” This “guilt by association” assessment not only denigrates the safeguards that responsible industry partners enact in an effort to ensure research quality but, more importantly, it impugns the credibility of university scientists with whom we work. Suggesting that a study funded by industry is inherently flawed implies that those who carried out the study have somehow compromised their integrity.

In the future, when reviewing nutrition research, I would hope that the reader would not simply reject “the worth” of a trial because it is funded by an industry source, but instead think about a number of issues: are the study methods appropriate; does the researcher have a track record; were appropriate statistics applied; do the data corroborate or refute prior similar studies; are the conclusions novel; do they go against conventional wisdom?

There are scores of factors that make a study valid or not.² It is our hope that the peer review process would address many of these points as a study winds its way through the publication process. But once a study appears in the public domain, it is ultimately up to the reader to place stock in the results or not. Blowing out of proportion the results of a small animal trial or an underpowered human study is counterproductive and only adds to confusion about nutrition. But so too does rejecting good science based solely on the funding source. When it comes to interpreting the results of nutrition research, an open mind and the ability to decipher good from bad science are the best tools that a health professional can possess.

Mitch Kanter, PhD, is Executive Director of The Egg Nutrition Center.

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Feeding struggles, moderation, and eggs

By Richard Kahn, PhD, RD

Feeding struggles between children and parents are common. There are two common causes. One cause is labeling foods as either “good” or “bad” and then striving to have the child eat the “good” food in expected portions. Eggs have been the victim of the “good/bad” struggle over the past 50 years. For example, many people still think that eggs fall into the “bad” category. Health care professionals, like me, are still telling people that one egg a day is safe. Another cause is lack of more detailed knowledge of an individual food. Eggs, some parents need to know, provide important micronutrients such as lutein, a carotenoid antioxidant usually linked to kale, a vegetable. Alerting worried parents to this simple fact may decrease the urge to push vegetables on their vegetable resistant child. Many a child may dislike vegetables. Those same children may like foods that have eggs as an ingredient. Such foods include whole grain muffins and pancakes as well as French toast made with wholegrain bread. Antioxidants survive cooking.

Pressuring children to eat is another cause of struggles. Pressuring parents may need a savvy clinician familiar with the decades of research into prevention and resolution of feeding. All that effort is summed up in a simple rhyme: *The parents provide and the children decide.*

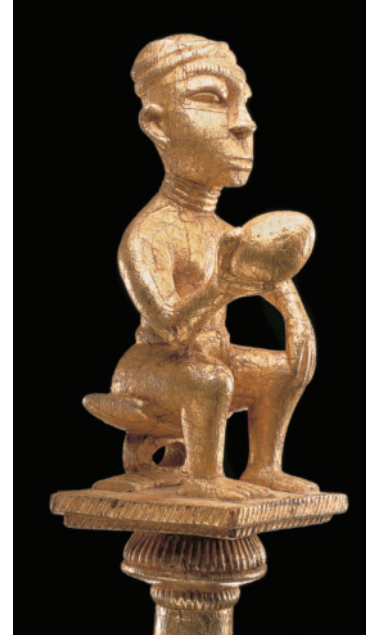
Parents are advised to offer the most nutritious foods possible, and then take it easy on their children and themselves. Research into what is called *responsive feeding* supports a waiting game when it comes to family foods that children do not like. In the meantime, one basic strategy is to quietly model the behavior yourself. That is, parents should eat the foods we want our kids to eat while being patient in the process.

Teaching moderation and patience underlying responsive feeding can be hard for some parents. Some parents like learning about responsive feeding from the point of view research on attachment theory or child development, the concepts which underlie responsive feeding. Most of us, though, like more entertaining ways of learning. Fun, parent-friendly educational tools exist that suit all levels of literacy. To teach patience, I want to offer this reminder of a fairytale and to present an iconic image.

The fairytale, *The Goose that Laid the Golden Egg*, links the yellow, carotene-rich yolk to the precious metal. The story tells of a magic goose that lays one valuable egg of gold a day echoing current dietary guidelines. In the tale, the greedy protagonists kill the goose to get more than one egg a day. The characters are trying to force the process. Parents

who express worry about the negative health effects of eggs might benefit from reading to their child a short, illustrated version of the tale. Using books to help people manage emotional issues is called bibliotherapy.

Iconic statues of Ghana’s traditional Ashanti kings show the rulers holding one egg in an open hand on an upright



arm. The egg represents his domain. If the ruler is too strict and holds his symbolic egg too firmly, he will crack his domain. A lackadaisical sovereign that grips the egg too loosely is likely to have the egg fall and break. Good kings and good parents balance the firm and the relaxed. Often, the king’s head is in the shape of the egg, representing the relation between actions and thoughts. I’ve found that the Ashanti image gets the point across and invites parents to talk

especially in multicultural settings.

Conversations about too strict and too loose parenting around food raises common parenting concerns that lie behind parents’ desires to teach children healthy eating habits. Many parents wonder about being too hard or too soft about “bad” and “good” foods. Setting opposites aside creates space to talk about the family’s particular nutritional needs. Feeding challenges are better met when parents and professionals learn to balance the nutrition and psychological facts that support long-term, balanced nutrition at the table.

When professionals listen first and offer knowledge after the client has a problem or question, we, ourselves, model the balance we promote. The client can begin to grasp the meaning of “just right.” And that helps ensure everyone lives happily ever after.

Richard Kahn, PhD, RD, is a dietitian specializing in transdisciplinary treatment of feeding, growth and nutrition problems. His doctorate is in Social Welfare and his dissertation topic explored the way allied health professionals, nurses and physicians learned to blend their physical training in infant mental health at the Institute for Infants, Children and Families at Jewish Board Family and Children’s Services in New York City.

Does skipping breakfast lead to faster fat loss?

By Pamela Hernandez, CPT



The National Weight Control Registry (NWCR) reports that 78% of its participants eat breakfast daily.¹ With a sample size of over 10,000 individuals who have each lost 30 pounds or more, why is the behavior of eating breakfast still a question as it relates to fat loss and fitness? Even fitness professionals vigorously debate the topic, particularly when it comes to eating before a morning workout.

One long-held belief is that exercising on an empty stomach increases fat oxidation, thereby facilitating faster weight loss. It is true that when a body is depleted of readily available glucose, the Krebs Cycle will turn to fat and protein to produce ATP to supply the body's energy needs. However, there are two key issues to consider when recommending "fasted" morning workouts to a client for weight loss.

- Unpredictability of individual biology
- Impact on mood, performance and appetite through the remainder of the day

A 2009 study in the journal *Metabolism*² pointed out the impact and importance of individual biology to exercise performed in a fasted state. Findings showed that everyone is different: what works for one person who chooses to fast before a morning workout may work for others but does not work for all. In this study, 55 premenopausal women participated in a seven-week endurance-type exercise program. Results found an average loss of 2.6% body fat. However, measurements in individual participants ranged from a body fat loss of 5.3 kg to a gain of 2.1 kg. While there is some allowance for participants' adherence to their overall nutrition program during the study, other factors appear to have been involved for such a wide variance.

While the study did not determine a direct cause, it was apparent that many biological factors determine the success or failure of using fasted cardio as a weight loss method. Instead of prescribing fasted cardio for all clients who wish to lose body fat, fitness professionals may wish to focus on three factors to encourage adherence and yield better outcomes: body type (endomorph, mesomorph and ectomorph); carbohydrate tolerance; and variability of exercise intensity.³

Advising a client to skip breakfast for enhanced fat loss may also be shortsighted. A recent study published in the journal *Nutrients* looked at the impact of skipping breakfast on mood, cognitive performance, and appetite later in the day.⁴ This study of 24 women showed a positive correlation between a pre-workout breakfast and appetite control prior to lunch. When trying to achieve an overall caloric deficit for fat loss, it may be counterproductive to try to burn a few more calories of fat by skipping breakfast if it leads to overconsumption due to hunger later in the day. My own observations find this phenomenon to be true. I've often witnessed women who eat too little during the day and are consequently overwhelmed with hunger and cravings at dinner and before bed. Not only does this increase feelings of failure, it diminishes performance in the gym. She may not be able to work with as much intensity as someone who has "broken the fast" and may therefore burn fewer calories as a result.

The better strategy is to follow a plan that prescribes a small breakfast before morning workouts to fuel longer or higher-intensity exercise to increase excess post-exercise oxygen consumption (EPOC). Strength training with supersets or as a circuit will provide an additional metabolic boost during workouts and afterward during the muscle rebuilding process. Cardio in the form of high intensity interval training (HIIT) can also provide a longer caloric afterburn.

There may be highly specific situations, such as training for a bodybuilding competition, where fasted cardio workouts may be appropriate. For the general population however, eating breakfast before a workout seems to be most beneficial for overall health and long term results. Remember that the National Weight Control Registry tracks both weight loss and weight maintenance. The majority of NWCR participants who eat breakfast have maintained their weight loss for an average of five years, which convinces me that breakfast is the way to go for sustainable fat loss.

Pamela Hernandez is an ACSM Certified Personal Trainer and ACE Health Coach. She runs Thrive Personal Fitness in Springfield, MO and is the author of the book "The 4 Keys to Real Fitness." Her goal is to empower women with fitness and help them take control of their lives by taking control of their health.

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MESSAGES

- Skipping breakfast may enable some individuals to more effectively burn body fat during a morning workout, but evidence suggests that a pre-workout meal may help fuel a more efficient workout that will help lose and sustain body fat loss over the long term.
- Breakfast appears to offer the added benefits of improved cognitive performance, better mood, and better appetite control over the course of the day.



Macro and micronutrient needs of bariatric surgery patients

By Meagan Moyer, MPH, RDN, LD

Bariatric surgical procedures for the treatment of morbid obesity are becoming increasingly prevalent since their inception in the 1970s. According to a survey by the International Federation for the Surgery of Obesity and Metabolic Diseases (IFSO), 468,609 bariatric procedures were performed in 2013, up 37% from 2011. In 2013, more cases were performed in the United States and Canada (154,276) than any other region of the world. The IFSO predicts that the number of bariatric surgical procedures will continue to rise.¹

The most common bariatric surgical procedure performed in 2013 was the Roux-en-Y gastric bypass (RYGB) at 45% of all cases. This was followed by the sleeve gastrectomy (SG) procedure at 37% and the adjustable gastric band (AGB) at 10% of all cases worldwide. Given the rise in popularity of bariatric surgery, it is likely health professionals will encounter these individuals as a patient or client. This article serves as a review of the most common nutritional concerns in individuals who have had RYGB or SG.

Macro and micronutrient needs

All bariatric surgeries restrict the amount of food a person can eat at one time, which helps promote weight loss. RYGB and SG also affect the secretion of gut hormones that lead to decreased hunger and increased satiety. The gastric manipulation involved with RYGB and SG also result in micronutrient malabsorption.² Therefore, the restrictive and malabsorptive nature of RYGB and SG procedures place patients at a relatively high risk for nutritional deficiencies, both immediately post-op and long-term.

Protein

Protein malnutrition is not commonly seen in RYGB and SG patients unless oral intake is poor. The goal for protein recommendations after surgery is to preserve lean body mass and minimize muscle loss. Exact protein recommendations have not been defined, but most bariatric physicians and dietitians agree on a protein goal of 60-80 grams per day or 1-1.5 grams per kilogram of ideal body weight per day.³

It is not necessary for bariatric surgery patients to consume more protein than the recommended amounts. Due to decreased stomach volume, consuming too much protein will likely limit their intake of needed carbohydrates, fat, and micronutrients. Nutrition counseling should therefore encourage a balanced diet of all macronutrients once protein needs are met.³

Common Nutrient Needs in Roux-en-Y Gastric Bypass and Sleeve Gastrectomy

Protein
60 - 80 grams per day
Consume through meals and snacks and use protein supplements as needed
Vitamin B-12
350 mcg per day sublingually <i>or</i>
500 mcg per week intranasally <i>or</i>
1000 mcg per month intramuscularly
Calcium Citrate
1,200 mg per day for men and premenopausal women
1,500 mg per day for postmenopausal women
Vitamin D₃
3,000 IU per day through multivitamins and calcium with vitamin D supplements
Iron
Two iron-containing multivitamins likely sufficient (36 mg per day)
Additional iron may be needed for premenopausal women

Vitamin B-12

Bariatric surgery patients absorb less vitamin B-12 from dietary protein due to a reduction in gastric acids needed to cleave the vitamin from the protein source. Vitamin B-12 needs are especially increased in RYGB patients because the section of the duodenum where B-12 attaches to intrinsic factor (IF) for absorption is bypassed. Vitamin B-12 should be supplemented with 350 micrograms sublingually once a day, 500 micrograms intranasally once a week or 1000 micrograms intramuscularly once a month.²

Vitamin B-12 is stored in the body for up to two years and deficiencies are often not seen until long after bariatric surgery. Therefore, patients who do not adhere to supplementation recommendations and/or are not routinely monitored by healthcare professionals are at the greatest risk for vitamin B-12 deficiency.²

Calcium and Vitamin D₃

Calcium and vitamin D requirements are slightly higher for RYGB and SG patients than the general population due to decreased dietary absorption. After bariatric surgery, the calcium requirement for men and premenopausal women is 1,200 mg per day and 1,500 mg per day for postmenopausal women. Calcium citrate is the preferred form of

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Muscle quality: what does it mean to your health?

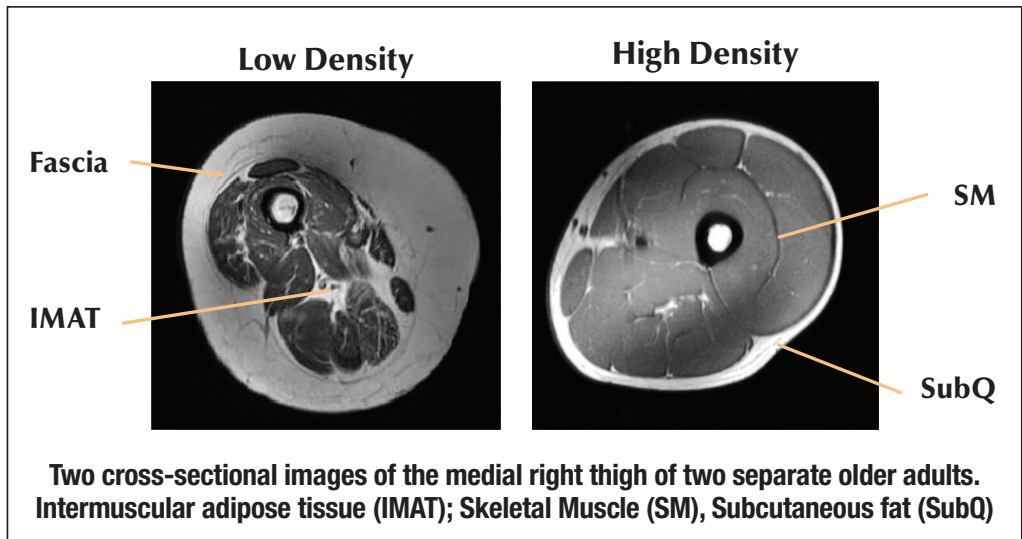
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age (i.e. visceral fat), is broadly defined as intermuscular adipose tissue (IMAT) and refers to any fat stored underneath the deep fascia of the muscle. IMAT accumulation was long considered an unavoidable consequence of aging, but has recently been shown to be largely a product of illness, disuse, or inactivity. The exact mechanism behind IMAT accumulation is still unknown, but evidence supports the increased exposure of muscle to non-esterified fatty acids and/or pro-inflammatory cytokines as the two major contributing factors. These impair beta-oxidation, leading to fat accumulation, and potentially influence early muscle cells to become fat cells. As IMAT begins to accumulate, insulin signaling is impaired and mitochondrial function deteriorates. The resulting aftermath is an increased risk for physical impairments, type 2 diabetes, chronic inflammation, and hyperlipidemia.⁶

Weight loss and increased physical activity have long shown to decrease IMAT accumulation and improve muscle quality, which can be further facilitated by a higher protein diet. Given that IMAT accumulation is largely considered the product of illness, disuse, or inactivity, common interventions include exercise training and/or diet-induced weight loss. Though the combination of vigorous exercise training and diet-induced weight loss appears to elicit the greatest response, data suggest that intentional weight loss is the indispensable component to successfully decrease IMAT concentrations.⁶

However, composition of this diet-induced weight loss program also plays a pivotal role in improving overall muscle quality. A higher protein (1.2 g/kg BW/d) diet versus a normal protein (0.8 g/kg BW /d) weight loss regimen shows greater reductions in fat mass and a preservation of lean mass, strength, and physical performance.^{7,8} A practi-

Figure 1



cal and cost-effective approach to increasing intakes of dietary protein is the consumption of protein-rich foods, which not only provide dietary protein but also a wide variety of distinct amino acids and functional nutrients. For example, increasing low-fat dairy consumption (3-4 servings/d) not only provides dietary protein but vitamin D and calcium. And in addition to being the most bioavailable source of dietary protein, whole eggs provide antioxidants like lutein and zeaxanthin, which may help regulate inflammation.

Alterations in muscle quality, such as increases in IMAT, not only impair muscle function but increase risk of metabolic disease. Weight loss, exercise training, and increased intakes of dietary protein provide viable and important clinical strategies for improving muscle quality.

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MESSAGES

- Intentional weight loss is the indispensable component to successfully mitigate the effects of fat stored underneath the deep fascia of the muscle.
- A higher protein diet can help facilitate greater reductions in fat mass and better preserve lean muscle mass, strength, and physical performance.

Macro and micronutrient needs

Continued from page 5.

supplemental calcium because it does not require a highly acidic environment for absorption.²

Vitamin D₃ should be taken with calcium to aid in absorption of both micronutrients. Studies have shown an intake of less than 2,000 IU of vitamin D₃ per day may lead to deficiency. It is recommended RYGB and SG patients take 3,000 IU per day of vitamin D₃. This can be achieved through multivitamin/mineral and calcium with vitamin D₃ supplementation.²

Iron

As with calcium, iron needs are higher after RYGB and SG due to decreased stomach acid needed for absorption. After RYGB, the major sites of iron absorption (duodenum and proximal jejunum) are bypassed. If patients are taking two multivitamins per day with at least 18 mg of iron in each tablet (36 mg per day total), iron supplementation is likely sufficient. However, pre-menopausal women may require an additional 50 to 100 mg of elemental iron per day. It is important for patients to separate intake of iron-containing supplements and calcium supplements by at least two hours for maximum absorption.²

Conclusion

The nutrition needs of individuals who have bariatric surgery are unique. Short-term and long-term monitoring of nutrition-related labs is essential to preventing deficiencies.

The restrictive and malabsorptive nature of RYGB and SG require life-long micronutrient supplementation for optimal health and weight loss outcomes.

Meagan Moyer, MPH, RDN, LD, is the Coordinator of Nutrition Services at Emory Bariatric Center based at Emory University Hospital in Atlanta, Georgia.

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MESSAGES

- Rates of bariatric surgery procedures for the treatment of morbid obesity are rising in the United States and worldwide.
- Protein plays a crucial role in healing and in the preservation of lean body mass after bariatric surgery.
- Due to alterations of the gastrointestinal tract in bariatric surgery, patients will require lifelong micronutrient monitoring and supplementation.

ENC'S NEW Website has hatched!

It's here! We are delighted to share with you our newly redesigned website, with a bold new look and enhanced navigation experience. Our goal is to deliver quality, up-to-date nutrition information & resources to health professionals.

We invite you to start exploring:

- Nutrition Research Synopses
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March 29-April 1 – Orlando, FL

Experimental Biology 2016
April 2-6 – San Diego, CA

Preventive Cardiovascular Nurse's Association Annual Symposium
April 14-17 – Orlando, FL

We welcome your ideas!

Please send topic and
author suggestions to
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*ENC is a credible source of nutrition
and health science information and
the acknowledged leader in research
and education related to eggs.*

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presents up-to-date reviews, summaries and
commentaries on nutrition for health promotion
and disease prevention, including the role of
eggs as part of a nutritious and healthful diet.

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