

This edition of the Nutrition Research Update focuses on recent publications pertaining to risk factors for chronic diseases.

In this issue, Dr. Mark Kern, Professor at the School of Exercise and Nutritional Sciences, San Diego State University, shares research results from his laboratory on the impact of daily egg-based breakfasts on cardiovascular risk markers. The Egg Nutrition Center's activities at The Food and Nutrition Conference and Expo (FNCE) of the Academy of Nutrition and Dietetics held in Atlanta, GA, and ObesityWeek 2014, The Obesity Society's Annual Scientific Meeting, in Boston, MA, are also highlighted.

We are committed to featuring new and exciting research findings in the Nutrition Research Update on topics relevant to optimal health and disease prevention, and hope the findings of the research presented here will continue to facilitate further research and development in health and nutrition. If any questions, concerns or comments arise regarding the content in this edition of the Nutrition Research Update, please feel free to contact us at info@eggnutrition.org.

Regards,



Tia M. Rains, PhD
Senior Director of Nutrition Research and Communications
Egg Nutrition Center

ENC Research Program

The Egg Nutrition Center (ENC) administers an annual research program with over \$2 million dollars provided by America's egg farmers through the USDA and the American Egg Board.

Information regarding the 2015 grant program will be posted January 1, with pre-proposals due by January 23. Additional information is available at the ENC [website](#).



SPECIAL FEATURE

Daily Egg Consumption Does Not Promote Adverse Effects on Heart Disease Risk Factors in Resistance Trained Adults

Eggs are often perceived negatively by consumers, as well as practitioners, due to their high cholesterol content (186 mg per large egg). Common recommendations are to limit cholesterol intake to less than 300 mg/day (1). However, research has not established a connection between the daily consumption of dietary cholesterol from eggs and CVD or associated risk factors (2-9). In fact, researchers have demonstrated that overweight men who ate carbohydrate-restricted diets for 12 weeks...[read full article](#).

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In its second year, in collaboration with The Obesity Society (TOS), ENC was proud to support a one year research grant award for a TOS member. The Obesity Society is the leading scientific society dedicated to the study of obesity. Since 1982, TOS has been committed to encouraging research on the causes and treatment of obesity, and to keeping the medical community and public informed of new advances...[read full article](#).

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In 2013, ENC sponsored and organized a satellite symposium "The Controversial Role of Dietary Protein in Diabetes and Related Disorders" chaired by Mitch Kanter, PhD, Executive Director, ENC, held in conjunction with the American Society for Nutrition's 2013 *Advances and Controversies in Clinical Nutrition* Conference (December 5-7, 2013) in Washington, DC...[read full article](#).

WHAT WE'RE READING

Research We're Reading

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- **Dietary Protein Intake and Coronary Heart Disease in a Large Community Based Cohort: Results from the Atherosclerosis Risk in Communities (ARIC) Study"**
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- **Cardiometabolic Health**
"Associations of plant and animal protein intake with 5-year changes in blood pressure: The Zutphen Elderly Study" (Tielemans et al. *Nutr Metab Cardiovas Dis.* 2014; 24:1228-1233)
- **"A Very Low-Carbohydrate, Low-Saturated Fat Diet for Type 2 Diabetes Management: A Randomized Trial"**
(Tay et al. *Diab Care.* 2014; 37:2909-2918)

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SPECIAL FEATURE

Daily egg consumption does not promote adverse effects on heart disease risk factors in resistance trained adults



[Mark Kern, PhD, RD, CSSD](#)

Professor
School of Exercise and Nutritional Sciences
San Diego State University

Eggs are often perceived negatively by consumers, as well as practitioners, due to their high cholesterol content (186 mg per large egg). Common recommendations are to limit cholesterol intake to less than 300 mg/day (1). However, research has not established a connection between the daily consumption of dietary cholesterol from eggs and CVD or associated risk factors (2-9). In fact, researchers have demonstrated that overweight men who ate carbohydrate-restricted diets for 12 weeks and consumed 3 eggs per day (roughly 600 mg/day of additional dietary cholesterol) had higher HDL cholesterol levels than individuals who consumed an equivalent amount of egg substitute containing no additional dietary cholesterol (6). Furthermore, a 6-week, well-controlled feeding study demonstrated improved lipid profiles in healthy, previously untrained individuals consuming 12 eggs/week and engaging in endurance exercise training, thus indicating that the regular consumption of eggs does not negate the beneficial effects on cardiovascular health promoted by aerobic exercise (9).

Eggs are a concentrated source of high quality protein (6.3 g per large egg). Protein may regulate food intake by promoting satiety (10). Individuals who ate whole eggs or egg yolks with a standardized breakfast displayed delayed stomach emptying and a lower glycemic response than individuals who consumed egg whites or no eggs indicating that eggs may help prevent hunger and sustain feelings of fullness (11). Researchers have also demonstrated that compared with an isoenergetic, high carbohydrate bagel-based breakfast, an egg-based breakfast results in greater satiety and reduced energy intake throughout the day (12, 13). Moreover, after 2 months, overweight and obese participants on a weight reduction diet who consumed an egg-based breakfast regularly (>5 times per week) lost more weight than participants who ate an isocaloric, higher carbohydrate bagel-based breakfast (8).

The consumption of protein combined with resistance exercise training has been shown to enhance muscle mass gains (14-17). The effect of whey protein supplementation in combination with a resistance exercise program on body composition has received a great deal of research attention, and as little as 10 grams of whey protein following exercise has been found to stimulate muscle synthesis (18). Whey is commonly touted as a superior protein for building muscle mass and is the most widely used protein in sports nutrition supplements (19). The promotion of whey protein as a muscle mass builder is mainly due to its high content of essential amino acids, particularly branched-chained amino acids (26mg per 100mg of protein) (19-21). However, eggs also provide high quality protein and are a rich source of branched-chained amino acids (21mg per 100mg of protein) (22). Therefore, the regular consumption of eggs in combination with a resistance exercise program is likely to promote lean body mass accretion in a manner that is similar that of whey protein. Moreover, eggs are a low-cost whole food source of high quality protein as well as other key nutrients such as choline, iron, zinc, and other nutrients.

My lab group examined the impacts of daily consumption of isoenergetic (400 kcal) breakfasts that were either egg-based (including two eggs per day) or bagel-based combined with resistance training prior to breakfast three times per week, on risk factors for heart disease and body composition in 25 untrained men and women (18-35 years of age) over a twelve week period (23). We detected a significant reduction in plasma triglycerides (TG) during consumption of the egg-based breakfast with no adverse effects on other lipid parameters (total cholesterol, high density lipoprotein- cholesterol or low density lipoprotein cholesterol), insulin sensitivity or blood pressure. Conversely, insulin sensitivity was transiently reduced after the first six weeks for those consuming the bagel-based breakfast. While we hypothesized that consuming eggs as a post-training meal would promote greater muscle accretion, no difference in body composition or strength were detected between the two breakfast trials, and gains in strength were similar between the groups. Overall, our results suggest that daily egg consumption does not promote adverse effects on heart disease risk factors and may even reduce plasma triglycerides in resistance trained adults.

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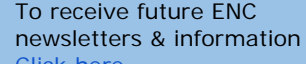
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Dr. Dhurandhar provided an overview of a series of studies that have tested the satiating properties of a number of different protein sources under acute conditions, and suggested that high quality protein sources like eggs may uniquely promote body weight management. Some key takeaways from his presentation include:

1. Obesity is not caused by just eating one big meal, nor is it combatted by just one small meal; long term voluntary control of food intake to treat or prevent obesity is highly challenging for most individuals.
2. A higher protein to carbohydrate ratio has been shown to have positive effects on body composition, blood lipids, glucose homeostasis and satiety during weight loss (1, 2)
3. For high protein diets to succeed in the long term, the key meal to correct may be breakfast. A higher protein breakfast (containing 35g of protein from eggs and beef) was found to induce beneficial alterations in the appetitive (perceived fullness), hormonal [hunger-stimulating ghrelin and satiety-stimulating peptide YY (PYY)], and neural signals that control food intake regulation. (3)
4. While the satiating properties of a number of different protein sources have been tested under acute conditions, current evidence suggests that the quality of protein is important. Including a higher quality protein source like eggs (versus a cereal-based breakfast) was found to prolong satiety and decrease energy intake (by 400 calories) throughout the day (4), and when coupled with a weight loss diet, reduce waist circumference and percent body fat (5). The egg breakfast also beneficially altered the satiety hormones, PYY and ghrelin, revealing a potential mechanism whereby eggs may influence appetite (6).
5. Supporting the above findings, results from additional studies that examined the effect of protein on postprandial satiety and energy intake throughout the day, suggest that meals higher in protein decreased postprandial ghrelin concentrations and reduced gastric emptying, probably through increased secretion of cholecystokinin, glucagon-like peptide 1 (GLP-1) and peptide YY (PYY) (7, 8). It was also noted that increasing the quantity of protein did not induce uniform effects. However, consuming eggs for breakfast was found to induce less variation of plasma glucose and insulin, a suppressed ghrelin response, and reduced energy intake (9).

Thus, current evidence suggests that that the satiating effect of proteins may be maximized by including protein as part of a reduced energy diet for weight loss, particularly when consumed at breakfast, and use of higher quality protein such as eggs may decrease the need for greater amounts of dietary protein.

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[Nick Bellissimo, PhD](#), Assistant Professor and Director, Food Intake Regulation & Satiety Testing Lab, at Ryerson University, Toronto, Canada, was the first award recipient for his proposal, *Role of Dietary Protein in a Familiar Breakfast Meal on Subjective Satiety, Food Intake and Thermic Effect of Food in Normal Weight and Overweight/Obese Children*.



Drs. Mitch Kanter and [Nikhil Dhurandhar](#), Professor at Pennington Biomedical Research (now Chairman of the Department of Nutritional Sciences at Texas Tech University) and President-Elect of The Obesity Society, teamed up at a breakfast event and networking opportunity in Boston during Obesity Week 2014, November 2-7, to showcase the ENC research grant program and ENC-funded research. Dr. Dhurandhar's work on "Strategic Use of Protein Quality and Quantity to Enhance Satiety and Weight Management" has been supported in part, by the ENC Research Grant Program, which administers over \$2 million annually in research grants and student fellowships to extend the understanding of nutrition for optimal health.



Drs. Kanter and Dhurandhar also acknowledged the 2014 winner of TOS-ENC Research Grant, [Dexi Liu, PhD](#). Dr. Liu, Panoz Professor of Pharmacy and Head,

Department of Pharmaceutical and Biomedical Sciences at the University of Georgia College of Pharmacy, was selected by The Obesity Society's Scientific Review Committee (SRC) to receive the 2014 grant for his proposal titled *Reversing Obesity-related Nonalcoholic Fatty Liver Disease by Protein-enriched Diet*.

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The program featured presentations which provided an overview of the available evidence on macronutrient composition and specifically, dietary protein, in the prevention and management of diabetes and diabetes-related risk factors. Coordinated by Tia Rains, PhD, Senior Director, Nutrition Research & Communications, ENC, proceedings were recently published in a supplement within *Journal of Nutrition* titled: *The Controversial Role of Macronutrient Composition in Diabetes and Related Disorders* of the *Journal of Nutrition*.

- [Kevin C Maki and Alyssa K Phillips. *Dietary Substitutions for Refined Carbohydrate That Show Promise for Reducing Risk of Type 2 Diabetes in Men and Women.*](#)
- [Amy P Campbell and Tia M Rains. *Dietary Protein Is Important in the Practical Management of Prediabetes and Type 2 Diabetes.*](#)
- [Theresa A Nicklas, Carol E O'Neil, and Victor L Fulgoni III. *Differing Statistical Approaches Affect the Relation between Egg Consumption, Adiposity, and Cardiovascular Risk Factors in Adults.*](#)
- [Barbara A Gower and Amy M Goss. *A Lower-Carbohydrate, Higher-Fat Diet Reduces Abdominal and Intermuscular Fat and Increases Insulin Sensitivity in Adults at Risk of Type 2 Diabetes.*](#)

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 (Haring et al. *PLoS One.* 2014;9(10):e109552)
- ["Effects of high-protein vs. high- fat snacks on appetite control, satiety, and eating initiation in healthy women"](#)
 (Ortinau et al. *Nutr J.* 2014;13:97)
- ["A brief review of higher dietary protein diets in weight loss: a focus on athletes"](#)
 (Phillips. *Sports Med.* 2014;44 Suppl 2:149-53)
- ["Weight loss maintenance in overweight subjects on ad libitum diets with high or low protein content and glycemic index: the DIOGENES trial 12-month results"](#)
 (Aller et al. *Int J Obes.* 2014;38:1511-17)
- Cardiometabolic Health**
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 (Tay et al. *Diab Care.* 2014;37:2909-2918)
- ["The potential of a high protein-low carbohydrate diet to preserve intrahepatic triglyceride content in healthy humans"](#)
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- ["Dietary Intake of Saturated Fat Is Not Associated with Risk of Coronary Events or Mortality in Patients with Established Coronary Artery Disease"](#)
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- ["Randomization to a low-carbohydrate diet advice improves health related quality of life compared with a low-fat diet at similar weight-loss in Type 2 diabetes mellitus"](#)
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- Breakfast**
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 (Nicholl et al. *Br J Nutr.* 2014; E-pub ahead of print)
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 (O'Neil et al. *J Acad Nutr Diet.* 2014;114:S27-S43)
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["Meta-analysis of all-cause mortality according to serum 25-hydroxyvitamin D"](#)
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- ["The role of vitamin D3 in inflammatory bowel diseases"](#)
 (Kosmowska-Miskow. *Adv Clin Exp Med.* 2014;23:497-504)
- ["Role of lutein and zeaxanthin in visual and cognitive function throughout the lifespan"](#)
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- Other**
["Dietary patterns differently associate with inflammation and gut microbiota in overweight and obese subjects"](#)
 (Kong et al. *PLoS One.* 2014; 9(10):e109434)
- ["Microbiota-dependent metabolite trimethylamine-N-oxide is associated with disease severity and survival of patients with chronic heart failure"](#)
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March 31 - April 3, 2015, Phoenix, AZ
 ENC-sponsored preconference symposium by Mitch Kanter, PhD; Laura Kruskall, PhD, RDN; Kara Mohr, PhD; Amy Bidwell, PhD on Tuesday, March 31, 8:30 am – 2:30 pm, "Energy Balance and Weight Management"

31st Annual Sports, Cardiovascular, and Wellness Nutrition (SCAN) Symposium: Nutritional Dogma versus Data

May 1 - 3, 2015, Colorado Springs, CO
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