This edition of the Nutrition Research Update focuses on recent publications pertaining to macronutrient composition and various indices of health and disease.

In this issue, Dr. Barbara Groat, Professor at the University of Alabama-Knoxville and co-editor of the recently published, Dietary carbohydrate restriction as a potential treatment for diabetes: A systematic review and meta-analysis. Critical review and evidence base, shares key findings from this paper on the management of diabetes. In particular, the paper provides evidence to support that low-carbohydrate diets are an effective approach for reducing blood glucose levels in those with diabetes, and that replacement of carbohydrates with protein is generally beneficial in this regard.

As always, we are committed to advancing new research findings and hope you find these topics thought provoking and relevant to your professional work. If you have any questions, concerns or comments regarding the content in this edition of the Nutrition Research Update, please do not hesitate to contact us at info@eggnutrition.org.

Regrets,

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

**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 United Egg Producers. Additional information is available at the ENC website.

**SCENE FEATURE**

Low Carbohydrate Diets for Treatment of Diabetes

Type 1 and type 2 diabetes are both diseases of carbohydrate (CHO) intolerance. People with type 1 do not produce insulin, the hormone that controls blood glucose, while people with type 2 respond poorly to the insulin they produce ("insulin resistance"), and lose the ability to produce sufficient insulin to compensate. Hyperglycemia (high blood sugar) is the obvious feature of both forms of diabetes causing sugar) is the obvious feature of both forms of diabetes causing

"Effects of dietary supplementation with Gynura procumbens (Merr.) on egg yolk cholesterol, excreta microflora and laying hen performance (van der Made et al. J Nutr. 2014; E-pub ahead of print)

"Dietary Protein Intake in Elderly Women: Association With Muscle and Bone Mass with Early Signs of Age (Lokhande et al. Br Poult Sci. 2014; E-pub ahead of print)

"Effects of dietary supplementation with Gynura procumbens (Merr.) on egg yolk cholesterol, excreta microflora and laying hen performance (van der Made et al. J Nutr. 2014; E-pub ahead of print)

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Partnerships in Nutrition: Nutrition Research at AAPA and NNPS 2014

The Egg Nutrition Center continues to be actively engaged in the support of key partnerships in nutrition. Specifically this summer, ENC team members had the opportunity to share credible science and valuable patient nutrition solutions with health professionals at two national conferences. In May, ENC sponsored a Product Theater at the American Academy of Physician Assistants (AAPA) Conference in Boston, Massachusetts. The product theatre included—read full article.

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Sports, Cardiovascular and Wellness Nutrition Dietetic Practice Group (SCAN DPG) ENC-Sponsored Webinar

According to the nutrition and athletic performance position statement published in 2009 in Medicine and Science in Sports and Exercices, "It is the position of the American Dietetic Association...the American Council of Sports Medicine that physical activity, athletic performance and recovery from exercise are enhanced by optimal nutrition." However, with ongoing scientific findings related to training—read full article.

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- "Effects of dietary supplementation with Gynura procumbens (Merr.) on egg yolk cholesterol, excreta microflora and laying hen performance (van der Made et al. J Nutr. 2014; E-pub ahead of print)
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Nutrition, presents the following twelve points of evidence to support the use of low-carbohydrate diets (LCDs) in the treatment of diabetes:

1. Hyperglycemia is the most salient feature of diabetes. Dietary carbohydrate restriction has the greatest effect on decreasing blood glucose levels.

2. During the epidemics of obesity and type 2 diabetes, caloric restriction has been due almost entirely to increased carbohydrate.


4. LCDs have fewer through weight loss. LCDs restrict more carbohydrate in type 2 diabetes than in type 1 diabetes, in glycemic control (HbA1c).

5. Dietary carbohydrate restriction is the most effective method (other than starvation) of reducing serum triglycerides and increasing high-density lipoprotein (HDL).

6. Patients with type 2 diabetes on carbohydrate-restricted diets reduce and frequently eliminate medications. People with type 1 usually require lower insulin.

7. Intensive glucose lowering by dietary carbohydrate restriction has no side effects comparable to the effects of intensive pharmacologic treatment.

8. Plasma saturated fatty acids are controlled by dietary carbohydrate restriction in type 2 diabetes. LCD, when paired with LDL, reduces the most atherogenic fraction of LDL-C (Point 9).

9. Although fat intake increases with LCDs, LC-3 (low carb, high LC) reduces the most atherogenic fraction of LDL-C (Point 10). LCDs, when paired head-to-head with low-fat diets, have other benefits. Conversely to expectations, LCDs do not lead to any increase in macronutrients and abnormal cholesterol and cardiovascular disease (CVD) that low-carbohydrate diets have. LCDs have been found to reduce both plasma glucose and lipids (Point 10). LCDs do not, however, reduce plasma triglycerides (Point 10).

10. Therefore, LCs reduce circulating saturated fatty acids (Point 9).

11. Diet-induced diabetes has been shown to reduce and frequently eliminate medications, including insulin (Point 11). Drug therapy, however, remains the standard of care for diabetes. Lifestyle changes frequently emphasize weight loss.

12. The article is notable because the twelve points are not particularly radical and, in some ways, are common sense. Reducing dietary sugar and other carbohydrate intake is to return to the ancestral diet that included minimal CHO, and mostly fibrous and low in dietary fat. Current nutrition guidelines recommend higher CHO, but humans are still better adapted to an LCD. LCDs contain butter, olive oil, or coconut oil, considered avocados, olives, nuts, meat, fowl, fish, salads, and non-starchy vegetables prepared with fat. Butter, olive oil, or coconut oil, considered avocados, olives, nuts, meat, fowl, fish, salads, and non-starchy vegetables prepared with fat. Butter, olive oil, or coconut oil, considered avocados, olives, nuts, meat, fowl, fish, salads, and non-starchy vegetables prepared with fat. Butter, olive oil, or coconut oil, considered avocados, olives, nuts, meat, fowl, fish, salads, and non-starchy vegetables prepared with fat. Butter, olive oil, or coconut oil, considered avocados, olives, nuts, meat, fowl, fish, salads, and non-starchy vegetables prepared with fat.

LCDs are more palatable than conventional low-fat diets, and are easier to follow (Point 5). In LCDs, CHO is commonly replaced with fat, and, to a lesser extent, protein. Although protein must be limited to ~100g/day to minimize hepatic glucogenic capacity, inclusion of adequate protein has beneficial effects (Point 6). Protein is superior to lean body mass and increased satiety (Point 7). Protein intake on LCD include eggs, cheese avocado, olives, nuts, tofu, fish, salami, and non-starchy vegetables prepared with fat. Butter, olive oil, or coconut oil, considered considered “healthy fats”, are emphasized, further contributing to satiety, reduced hunger, and enhanced energy. Current nutrition guidelines recommend higher CHO, but humans are still better adapted to an LCD that includes minimal dietary fat.

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In May, ENC sponsored a Product Theater breakfast at the American Academy of Physician Assistants (AAPA) Conference in Rhode Island, Massachusetts. The product theater included an educational session, New Directions in Macronutrient Intake & Weight Management, which was co-presented, Changing Paradigms Regarding Macronutrient Intake and Health: Trashing and Rebuilding the Meaningful Protein Message. Through this presentation, Drs. Karter and Harris discussed the latest research about how protein intake relates to weight management, defined common carbohydrate-restrictive diets' consequent effects on health, and implemented appropriate intervention messages to impact change with patients. They referenced key research studies to show how protein intake relates to weight management, satiety, sustained energy, the preservation of lean body mass and how patients can recognize these benefits by consuming a nutritious diet.

Some key takeaways from both presentations include:

- On current dietary patterns, average protein intakes in the U.S. at breakfast and lunch are inadequate to stimulate maximal protein synthesis, a growing body of evidence suggests that at least 25% of high quality protein per meal is necessary to stimulate whole body protein synthesis in both young and older individuals (1).

- Although protein consumption in many countries exceeds minimum recommended intakes for health, the majority of daily protein is often consumed at an evening meal, whereas breakfast is typically dominated by carbohydrates and low in protein. The consumption of a moderate amount of protein at each meal can stimulate a 25% increase in 24-h muscle protein synthesis versus skewing protein intake toward the evening meal (2).

- Higher protein consumed at breakfast may induce initial and sustained feelings of fullness, leading to significant improvements in daily hunger and satiety hormone levels, reduced food cravings prior to dinner and result in consumption of fewer high-fat evening snacks than skipping breakfast (3).

- Eating an egg breakfast, as part of a moderate-calorie diet may enhance weight loss and lower BMI in overweight and obese patients, thus offering a nutritious supplement to enhance weight loss (4).

References:
5. Vaidya VA, Gupta A, Khosla P, Dhurandhar NV. Egg breakfast enhances appetite, hormonal, and neural signals controlling energy intake regulation in overweight/obese "breakfast-skipping" late-adolescent girls, in which Dr. Tia Rains summarized the relationship between carbohydrate-restrictive diets and macronutrient intake, and subsequent health outcomes, and discussed the impact of the quality and timing of protein consumption on appetite control and satiety. In addition, Dr. Rains discussed recent findings on physiological and neural-driven eating behavior, and provided recommendations to help individuals build healthy meals reflective of new evidence on macronutrient distribution. In support, Dr. Rains presented several research studies that dispel the myth that American adults consume more protein than necessary and demonstrate the importance of protein in adult weight management.

ENC also sponsored an educational session and dinner in July at the National Nurse Practitioner Symposia (NPS) in Keystone, Colorado. Tia Rains, american diabetes association, co-presented, Challenging Nutrition Dogma: New Research on Dietary Protein and Health: Dogma: New Research on Dietary Protein and Health. In this presentation, Dr. Rains discussed recent findings on physiological and neural-driven eating behavior, and provided recommendations to help individuals build healthy meals reflective of new evidence on macronutrient distribution. In support, Dr. Rains presented several research studies that dispel the myth that American adults consume more protein than necessary and demonstrate the importance of protein in adult weight management.

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Sports, Cardiovascular and Wellness

Nutrition Dietetic Practice Group (SCAN DPG) ENC-Sponsored Webinar

According to the nutrition and athletic performance position statement published in 2009 in Medicine and Science in Sports and Exercise, "...it is the position of the American College of Sports Medicine that physical activity, athletic performance and recovery from exercise are enhanced by optimal nutrition." Furthermore, with ongoing scientific findings related to training regimens, dietary composition and timing of intake, and habitual supplement intake, the description of the term 'optimal' continues to evolve.

Dr. Philip Kritchevsky of the Department of Kinesiology at Wake Forest University, highlighted the role of protein in an 'optimal diet' in relation to exercise and intake of other nutrients and provided an overview of the influence of protein type and varied meal timing on satiety and muscle growth and maintenance. Specifically, Dr. Phillips discussed the importance of protein in meal comparison to optimize muscle protein synthesis, explained the importance of protein type and timing and how it can impact intake during the rest of the day, and detailed how to make up-to-date and evidence-based 'optimal diet' recommendations for physically active individuals.

Key highlights of Dr. Phillip's presentation include:

- The risk for developing sarcopenia increases with age and has been shown to lower quality of life in the elderly. Preventative measures for sarcopenia include adequate physical activity (resistance training, in particular) and adequate (spaced and timed) high-quality protein in the diet. In addition, emerging data shows that the greater strength/muscle mass may be protective against premature mortality from all causes or cancer, especially in individuals over the age of 60.

- Older adults may need more protein than current recommendations, 0.8-1.2 g/kg/d to maintain muscle mass. Aging is associated with reduced lean body mass, exposing individuals to protein-energy undernutrition.

- Protein ingestion and loading impacts variations in muscle protein synthesis and affects muscle mass. A study by Moore DE et al. showed that a dose of 40g of protein maximally stimulates muscle protein synthesis after resistance exercise in young men and women. It was demonstrated that 40g of protein after sleep improves post-exercise overnight recovery. Furthermore, Yang et al. demonstrated that high protein stimulates muscle protein synthesis after resistance exercise in elderly men.

- It is recommended that athletes consume four equally spaced protein-containing meals/day: 0.25-0.3 g protein/kg meal and one pre-sleep meal containing 0.5 g protein/kg. Timing and meal spacing is important for optimal protein synthesis and muscle recovery.

- Protein quality is also key. Nutrient-rich protein-containing foods of high biological value, particularly those containing high levels of leucine, promote a greater increase in both lean tissue mass. In addition, emerging data shows that the greater strength/muscle mass may be protective against premature mortality from all causes or cancer, especially in individuals over the age of 60.

References:

Obesity Week 2014
November 2-7, 2014, Dallas, TX
Egg Nutrition Center’s 2014 Academy of Nutrition and Dietetics Fellowship Program
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References:
Research We're Reading

- **Eggs**
  - "Effects of dietary supplementation with Gyrus ovostramineus v. trifasciata egg yolk on muscle strength and function in elderly people with sarcopenia. (Kaye et al. J Am Coll Nutr. 2014;33:368-77)"
  - "Consuming a Buttermilk Drink Containing Lutein Enriched Egg Yolk Decreased Plasma Lutein but Did Not Affect Serum Lipid or Lipoprotein Concentrations in Healthy Adults. (van der Made et al. J Nutr. 2014; 144:1556-60)"
  - "Protein/Macronutrient Composition of Breakfast in People With Type 2 Diabetes. (Rao et al. J Nutr. 2014; 144:1602-6)"
  - "Increasing Omelet Nutrient Concentrations in Boiled Potatoes and Butterfly Peppers, and Maple Syrup Does Not Affect Appetite or Weight Loss in Healthy Men. (Reid et al. J Nutr. 2014;144:1603-6)"
  - "The influence of Mary Leahey on Caroline Symonds and "Nutrition dogma: New research on "At Arab Health World Congress & Exhibition, 2015, 6:30-8:00 am, Tuesday, November 4, 2014, 6:30-8:00 am, looking for presentations by USF Karen, Jim and College, Boston, MA)"

- **Cardiovascular Health**
  - "The type of fat ingested at breakfast influences the plasma lipid profile of postmenopausal women. (Spaeth et al. Metabolism. 2014;63:115-24)"

- **Psychosocial, behavioral, pedagogical, and nutritional aspects about how to encourage eating a healthy breakfast. (Hawke et al. J Am Coll Nutr. 2014;33:368-77)"

- **Nutritional Diversity and Nutrient Density**

- **Obesity**

- **Appetite control and biomarkers of satiety with breakfast. (Yannakoulia et al. Int J Food Sci Nutr. 2014;E-pub ahead of print)"

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Next Article >> Research Program
ENC Research Program

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Look for ENC at these upcoming health professional events:

2014 Academy of Nutrition and Dietary Food & Nutrition Conference & Expo
October 20-22, 2014, Atlanta, GA
Weight Management Dietetic Practice Group Breakfast (Registration required)

2014 Osteopathic Medical Conference & Exposition (OMED)
October 26-29, 2014, Atlanta, GA
ENC-sponsored presentation by Tia M. Rains, PhD on Sunday, October 26, 2014, 12:15–1:00 pm, “Challenging Nutrition Dogma: New Research on Dietary Protein and Health”

 Obesity Week 2014
November 2–7, 2014, Boston, MA
Egg Nutrition Center’s Award Reception and Networking Breakfast on Tuesday, November 4, 2014, 6:30-8:00 am, featuring presentations by Mitch Kanter, PhD and Nikhil Dhurandhar, PhD (By invitation only)

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