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Protective Effects of Dried Plum on Bone: A Summary

by Kara Zimmerman and Shirin Hooshmand, PhD

Osteoporosis is defined as a skeletal disorder characterized by compromised bone strength that increases the risk of fracture.¹ Bone strength predominantly reflects a combination of bone density and quality.¹ Bone diseases, like osteoporosis, are very common in the United States, but regrettably they do not get as much attention as heart disease, cancer, and other chronic diseases. Osteoporosis is the leading underlying cause of fractures, especially among the elderly, with the most commonly affected sites being the wrists, hips, and spine.

Projected estimates indicate that by 2020, 50% of women and 25% of men over age 50 will experience an osteoporotic fracture during their lifetime.² In the United States alone, osteoporotic fractures are responsible for approximately 500,000 hospitalizations, 800,000 emergency room visits, 2.6 million physician visits, and 180,000 nursing home placements each year.² These costs are projected to double or triple over the next few decades, in parallel with the increasing prevalence of osteoporosis and aging population.²

Osteoporosis is characterized by bone loss and changes in bone struc-

ture.¹ The process of bone loss and formation occurs at the cellular level where old bone tissue is broken down by specialist cells called osteoclasts and rebuilt by bone-building cells called osteoblasts.³ In young healthy women, the balance between these two processes is maintained; however, the balance shifts toward more resorption after the age of 35 as part of the normal aging process, and it shifts even more severely after menopause due to sharp decreases in sex hormone levels.³ In addition, women are at higher risk for fractures due to osteoporosis because they tend to have smaller bones than men and, in general, live longer.³

Dried Plum and Bone Health

A balanced diet, adequate calories, and appropriate nutrients contribute to the development and maintenance of all tissues, including bone. Proper nutrition may reduce one's risk of developing osteoporosis. It is widely known that calcium and vitamin D intake modulates age-related increases in bone resorption.⁴ However, the U.S. Preventive Services Task Force notes that current evidence for calcium and vitamin D supplementation to prevent fractures in adults is insufficient for recommending such

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supplementation for primary prevention of fractures.⁵

Recently, other nutrients have been explored in the prevention and treatment of osteoporosis. Dried plums, which have a high phenolic content and oxygen radical absorbance capacity (ORAC), have been shown to protect against and even reverse bone loss in male and female animal models of osteoporosis and human studies.^{6,7} Furthermore, dried plum contains vital nutrients including zinc, magnesium, manganese, copper, phosphorous, boron, potassium, and vitamin K in addition to polyphenols, all of which are beneficial for bone health.⁷ Studies in animals and humans with dried plum have consistently demonstrated that dried plum improves bone mineral density (BMD), trabecular bone microarchitecture, and biomechanical properties of bone.⁷

Animal Studies

The effects of dried plum on bone markers related to osteoporosis have been examined extensively in animal models. Deyhim and colleagues⁸ demonstrated that dried plum doses, as low as 5%, were effective in restoring femoral and tibial bone density. Dried plum significantly increased lumbar bone density in a high dose group coupled by a trend of increased bone density in low and medium dose groups. Dried plum increased lumbar bone density as well, with the high dose group achieving a statistical significance. Bu and colleagues⁹ also verified that dried plum had compelling effects on bone in terms of bone mass, microarchitecture, and strength in osteopenic male rats by comparing a 25% dried plum diet with parathyroid hormone (PTH) treatments. The rats on a 25% dried plum diet exhibited similarities in bone mineral density (BMD) repair compared with the PTH group.

Following evidence of the protective effects of dried plum, an animal study was designed to identify the mechanism of action by which dried plum prevents bone weakening. The results

of the study demonstrated that the protective effects may be due in part to the decrease in osteoclast creation via the downregulation of gene expression for receptor activator of NF- κ B ligand (RANKL) and an increase in bone formation by elevating serum insulin-like growth factor (IGF-1).¹⁰ More recently, Smith and colleagues¹¹ found that dietary supplementation of dried plum in an osteopenic animal model improved bone mass and microarchitecture initially at 4 weeks by suppressing bone turnover, which was then followed by normalization of bone remodeling at both the vertebral and distal femoral sites after 12 weeks, providing additional understanding of the mechanisms of action.

Human Studies

Three studies have measured the incorporation of dried plum into the diet of postmenopausal women to observe the effects on bone health. In 2002, Arjmandi and colleagues¹² found that dried plum supplementation (100 g/d, ~12 dried plums per day) for 3 months significantly increased serum levels of insulin-like growth factor 1 (IGF-1) and bone-specific alkaline phosphatase (BSAP) activity when compared with baseline values. Higher levels of both serum IGF-1 and BSAP are associated with greater rates of bone formation^{13,14}; however, the investigators noted that a longer-term study is necessary to measure the direct effect of dried plum on bone density.

Following this study, the same group of researchers explored the consumption of dried plum along with 500 mg calcium and 400 IU vitamin D for 1 year in osteopenic postmenopausal women. Results revealed greater BMD at the forearm and spine relative to those consuming dried apple in the active control group and a likely suppression of bone turnover based on serum biomarkers compared with baseline.¹⁵ As in the animal models, the mechanism of action related to protective effects of dried plum was still uncertain. Further exploration was performed by

From The Editor

It's a Wonderful Issue

by Mark Kern, PhD, RD, Editor-in-Chief

My all-time favorite movie, *It's a Wonderful Life*, was released 70 years ago this winter. It doesn't have a strong nutrition connection; however, in one line George Bailey says "In the whole vast configuration of things, I'd say you were nothing but a scurvy little spider!" I'm guessing most people never realize that vitamin C deficiency was a part of the movie.

But anyway, on the cover of this wonderful issue, you'll find an article from Kara Zimmerman and Shirin Hooshmand, PhD describing the latest research that is accumulating on the benefits of prunes for the development of healthy bones. Our free CPE article discusses a timely issue as many of your clients make New Year's resolutions to spend more time in the gym. In it, Timothy Baghurst, PhD provides a comprehensive understanding of the signs and symptoms of muscle dysmorphia. Other articles in this issue include one from Robert Morton, CSCS and Stuart Phillips, PhD that addresses the potential value, as well as limitations, of protein intake for development of fitness and leanness. You can also read an article by Nicole Cornelious, RD, CSO that explains how heart failure and dietary intake and nutritional status of micronutrients may be connected.

There are plenty of other wonderful items for you to look over throughout the issue, so be sure not to miss any of them. On a final note, thinking about this movie as I write this column for *PULSE* makes me ponder a bit, and I've concluded, much like the movie, that each SCAN dietitian's life touches so many other lives that if she or he weren't around, it would leave an awful hole.

Hooshmand and colleagues,¹⁶ who measured serum levels of RANKL, osteoprotegerin (OPG), and sclerostin in the same osteopenic postmenopausal women consuming either 100 g dried plum/day or 75 g dried apple/day along with 500 mg calcium and 400 IU vitamin D for 1 year. Similarly, in two studies performed in hormone-deficient animal models, suppression of RANKL production was realized as was the promotion of OPG and the inhibition of sclerostin, all of which positively affect BMD.

One of the factors affecting the practicality of the aforementioned studies was the ease at which 100 g dried plum could be consumed daily. Addressing this concern, a similar subject base was recruited by Hooshmand and colleagues¹⁷ and assigned to one of three groups who consumed 50 g dried plum/day, 100 g dried plum/day, or 0 g dried plum (control group) for 6 months. The study found that both doses of dried plum prevented total body BMD loss versus the 0 g group, indicating that a more practical dose of dried plum may be adequate for the treatment and prevention of bone weakening.

The results of these studies support the prior observations seen in animal models demonstrating that incorporation of dried plum into the diet in postmenopausal women has positive effects on bone.

Conclusions and Future Research

These findings strongly suggest that dried plum has a noteworthy effect on bone health from both a prevention and disease management perspective. The clinical evidence demonstrates positive changes in serum biomarkers related to bone strength complemented by significant increases in BMD or prevention of its loss. Recent research supports a practical application of dried plum use in prevention and treatment, because a more reasonable amount of dried plum (50 g) can be consumed without affecting the efficacy of the dried plum on bone protection.¹⁷

It is established that dried plum contains nutritive vitamins, minerals, and phytochemicals, but more research is needed to identify whether a specific compound or the constituents working together as a whole is responsi-

ble for the positive effects on bone. In addition, ambiguity still remains as to whether the dried plum yields a promotion of bone formation, an inhibition of bone resorption, or a simultaneous effect of both on the ratio of formation to resorption. Several *in vitro* studies¹⁸⁻²⁰ have demonstrated the anti-inflammatory and antioxidant properties of dried plum polyphenols, but further research is needed for specific mechanism identification. Overall, clinical studies should be performed with longer durations and larger sample sizes, and they should explore the effects of dried plum in osteopenic men in the future.

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References

1. Peck W, Burckhardt P, Christiansen C, et al. Consensus Development Conference - Diagnosis, Prophylaxis, and Treatment of Osteoporosis. *Am J Med.* 1993; 94:646-650.
2. U.S. Department of Health and Human Services. Bone health and osteoporosis: a report of the Surgeon General. U.S. Department of Health and Human Services, Office of the Surgeon General, Rockville, MD; 2004.
3. Gass M, Dawson-Hughes B. Preventing osteoporosis-related fractures: an overview. *Amer J Med.* 2006;119:35-11S.
4. Kanis JA. Diagnosis of osteoporosis and assessment of fracture risk. *Lancet.* 2002;359:1929-1936.
5. Moyer VA. Vitamin D and calcium supplementation to prevent fractures in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med.* 2013;158:691-696.
6. Rendina E, Hembree KD, Davis MR, et al. Dried plum's unique capacity to reverse bone loss and alter bone metabolism in postmenopausal osteoporosis model. *PLoS One.* 2013;8.
7. Stacewicz-Sapuntzakis M. Dried plums and their products: composition and health effects: an updated review. *Crit Rev Food Sci Nutr.* 2013;53:1277-1302.
8. Deyhim F, Stoecker BJ, Brusewitz GH, et al. Dried plum reverses bone loss in an osteopenic rat model of osteoporosis. *Menopause.* 2005;12:755-762.
9. Bu SY, Lucas EA, Franklin M, et al. Comparison of dried plum supplementation and intermittent PTH in restoring bone in osteopenic orchidectomized rats. *Osteoporos Int.* 2007;18: 931-942.
10. Franklin M, Bu SY, Lerner MR, et al. Dried plum prevents bone loss in a male osteoporosis model via IGF-I and the RANK pathway. *Bone.* 2006;39:1331-1342.
11. Smith BJ, Graef JL, Wronski TJ, et al. Effects of dried plum supplementation on bone metabolism in adult C57BL/6 male mice. *Calcif Tissue Int.* 2014;94:442-453.
12. Arjmandi BH, Khalil DA, Lucas EA, et al. Dried plums improve indices of bone formation in postmenopausal women. *J Womens Health Gend Based Med.* 2002;11:61-68.
13. Sugimoto T, Nishiyama K, Kuribayashi F, et al. Serum levels of insulin-like growth factor (IGF) I, IGF-binding protein (IGFBP)-2, and IGFBP-3 in osteoporotic patients with and without spinal fractures. *J Bone Miner Res.* 1997;12:1272-1279.
14. Garnero P, Delmas PD. Assessment of the serum levels of bone alkaline phosphatase with a new immunoradiometric assay in patients with metabolic bone disease. *J Clin Endocrinol Metab.* 1993;77:1046-1053.
15. Hooshmand S, Chai SC, Saadat RL, et al. Comparative effects of dried plum and dried apple on bone in postmenopausal women. *Br J Nutr.* 2011;106:923-930.
16. Hooshmand S, Brisco JRY, Arjmandi BH. The effect of dried plum on serum levels of receptor activator of NF-kappa B ligand, osteoprotegerin and sclerostin in osteopenic postmenopausal women: a randomized controlled trial. *Br J Nutr.* 2014;112:55-60.
17. Hooshmand S, Kern M, Metti D, et al. The effect of two doses of dried plum on bone density and bone biomarkers in osteopenic postmenopausal women: a randomized, controlled trial. *Osteoporos Int.* 2016.
18. Bu SY, Lerner M, Stoecker BJ, et al. Dried plum polyphenols inhibit osteoclastogenesis by downregulating NFATc1 and inflammatory mediators. *Calcif Tissue Int.* 2008;82:475-488.
19. Bu SY, Hunt TS, Smith BJ. Dried plum polyphenols attenuate the detrimental effects of TNF-alpha on osteoblast function coincident with up-regulation of Runx2, Osterix and IGF-I. *J Nutr Biochem.* 2009;20:35-44.
20. Hooshmand S, Kumar A, Zhang JY, et al. Evidence for anti-inflammatory and antioxidative properties of dried plum polyphenols in macrophage RAW 264.7 cells. *Food Funct.* 2015;6:1719-1725.

“... ambiguity still remains as to whether the dried plum yields a promotion of bone formation, an inhibition of bone resorption, or a simultaneous effect of both on the ratio of formation to resorption.”

Muscle Dysmorphia and Male Body Image: Signs and Symptoms

by Timothy Baghurst, PhD

This article is approved by the Academy of Nutrition and Dietetics, an accredited Provider with the Commission on Dietetic Registration (CDR), for 1 continuing professional education unit (CPEU), level 1. To apply for **free** CPE credit, take the quiz on SCAN's Web site (www.scandpg.org/nutrition-info/pulse-newsletters/). Upon successful completion of the quiz, a Certificate of Completion will appear in your My Profile (under the heading, My History). The certificate may be downloaded or printed for your records.

Learning Objectives

After you have read this article, you will be able to:

- List several potential deleterious consequences of muscle dysmorphia, and discuss possible reasons for the increasing dissatisfaction among men regarding their appearance.
- Discuss various diet-related behaviors that may be signs of muscle dysmorphia.
- Describe behaviors relating to exercise and workouts that may indicate the presence of muscle dysmorphia.

Interest is increasing in male body image disorders,¹ and this may be in part due to the increasing dissatisfaction that men report about their appearance. This dissatisfaction appears to be primarily physique-based, with leanness and muscularity the primary concerns.^{2,3} Some have suggested that this change reflects a cultural shift in the male role. In the past, males found their identity in their occupation, but with greater equality in the workplace, men now seek a physical means to accentuate their iden-

tity as male.^{4,5} Others have suggested that cultural expectations through parents and peers⁶ and even through children's toys^{7,8} promote a muscular, lean male as ideal.⁹ Consequently, if cultural expectations do not equate to personal perceptions, a distorted view of self develops.¹⁰ This in turn can lead to dangerous behaviors and attitudes associated with personal physique.¹¹

“A key in this definition of muscle dysmorphia is the degree to which an individual pursues this goal.”

Muscle dysmorphia is one such condition referenced in the *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5)*, but it is yet to be considered a clinical disorder.¹² Although muscle dysmorphia has had several names and its exact characteristics remain unclear,¹⁰ it can be considered a condition most evident in males who have a body image disturbance that causes a pathological perceived insufficiency with personal muscularity and leanness.² As a consequence, those with characteristics of muscle dysmorphia are driven beyond normal values to reduce body fat and simultaneously increase muscle mass to appear increasingly lean and muscular.¹³

A key in this definition of muscle dysmorphia is the degree to which an individual pursues this goal. It is unfortunate that for many this condition results in behaviors that negatively impact personal well-being.² The deleterious consequences of muscle dysmorphia are significant and include psychological, environmental, and biological risks^{13,14} as well as a variety of attitudes and behaviors associated with an extreme desire to gain body mass.¹⁵ Examples include but are not limited to heart failure, illegal substance use, extreme dieting, exercise addiction/dependence, depression, neuroticism, and social physique anxiety.^{9,16-19}

Recognizing Muscle Dysmorphia in Clients

With such serious consequences associated with male body image disorders, it is important for health professionals to be cognizant of these conditions and understand how to detect them. This is particularly difficult when working with exercising and athletic men. How can muscle dysmorphia be recognized in a wrestler who is extremely concerned about making weight, or in a long-distance runner who must frequently train for several hours a day? How can muscle dysmorphia be detected in a bodybuilder who strictly controls his diet and has the primary purpose of building muscle mass and losing body fat for competitive purposes?^{20,21}

Presented in this article are several suggestions that may help registered dietitian nutritionists (RDNs) in recognizing muscle dysmorphia in clients. While these suggestions have some empirical support, RDNs and other

health professionals must appreciate that muscle dysmorphia remains unclearly defined and its characteristics remain subjective.^{2,11} In addition, some of the examples presented are commonly evidenced in many individuals who train; therefore, it may require multiple indicators to develop a holistic picture of the individual's true goals. Additional details on indicators are provided in two references cited in this article.^{2,22}

Behaviors and Other Possible Signs of Body Dysmorphia

Exercise dependence is likely to exist in the presence of muscle dysmorphia. Although many athletes will exercise to extreme levels, the important identifier in this situation lies in recognizing why the individual is exercising obsessively. The RDN needs to identify whether the plan has been set forth by a coach or expert or whether it is a self-imposed plan. Individuals who exercise beyond prescribed plans should be asked what the purpose is of the additional training. Physical reasons given may be an indicator of muscle dysmorphia, but also keep in mind that the individual may not always be providing the truth.

In muscle dysmorphia, work-life-leisure time is probably not in balance. Exercise is likely to be the priority, and while this may be true for any professional athlete, it is important to consider that the reasons for this lack of balance in muscle dysmorphia are not performance-based (e.g., "I want to beat my opponent"). Instead, the individual will make references to physique (e.g., "I'm not big enough yet"). Furthermore, the workout activities are likely to interfere with daily activities such as work and personal relationships.

It is not uncommon for individuals with muscle dysmorphia to edit their prescribed diets or workout regimens. Diets and exercise programs are set for specific purposes, but if the individual perceives something else to be more important, he may change the prescribed recommenda-

tion. RDNs should be particularly aware of the client's continual references to protein, muscle growth, and fat content.

When working with athletes, RDNs need to be aware of any dietary changes that require tapering for an important sporting event. For example, the male with body image concerns may struggle to eat more fatty foods that may be prescribed. In addition, tapering often requires changing exercise routines and resting more, and this will be resisted by the male with muscle dysmorphia.

It can be expected that the male with muscle dysmorphia will also resist changing dietary and exercise routines when injured. While this may be true of anyone, ignoring the advice of an RDN to change a diet may be a possible indicator of body image issues.

"RDNs should be particularly aware of the client's continual references to protein, muscle growth, and fat content."

Individuals with body dysmorphia are also likely to use supplements that are not recommended by an RDN. These could include diuretics, muscle gainers, steroids, and other designer supplements. The individual may ask the RDN for advice, and it can be useful to inquire about what the individual wants the supplement to provide. It is important to note that the individual does not have to be a steroid user to have body image issues.^{10,11}

Practitioners may find it helpful to observe the individual in front of a mirror. The person with muscle dysmorphia may ask for comments, seeking reassurance about his physique. Mirror checking has not yet been established as an indicator of muscle dysmorphia, but it certainly is a possi-

bility given that most males' interest in the physique involves the exposed body parts (e.g., arms).²

Physique protection may be evident in muscle dysmorphia. The individual may cover up body parts to hide them from evaluation. Conversely, he may expose certain body parts that he is proud of (e.g., arms) but cover up embarrassing areas (e.g., abs). Baghurst and colleagues²³ have suggested that physique protection is not the appropriate term; rather, "fat protection" might be more fitting.

Conclusion

Male body image issues appear to be on the rise, and the reticence of males to seek help places a burden on health professionals to identify and assist those in need. Muscle dysmorphia is one such condition that manifests in a variety of negative out-

comes that can be hidden to the detriment of the individual. Therefore, RDNs and other health professionals need to be knowledgeable in the signs and symptoms that individually may not indicate a problem but collectively may provide clues to the client's struggle with muscle dysmorphia. Understanding and recognizing these signs may be the first step in providing the assistance the client needs to live a fuller, more balanced life.

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References

1. Hale BD, Roth AD, DeLong RE, et al. Exercise dependence and the drive for muscularity in male bodybuilders, power lifters, and fitness lifters. *Body Image*. 2010;7:234-239.

2. Baghurst T. Body issues and the male athlete. *The Playing Field*. A publication of the United States Anti-

“RDNs and other health professionals need to be knowledgeable in the signs and symptoms that individually may not indicate a problem but collectively may provide clues to the client’s struggle with muscle dysmorphia.”

Doping Agency; 2014. Retrieved from <http://truesport.org/articles/parents/body-image-issues-male-athlete/>. Accessed July 24, 2016.

3. Tylka T. Refinement of the tripartite influence model for men: dual body image pathways to body change behaviors. *Body Image*. 2011;8:199-207.

4. Klein AM. Of muscles and men. *The Sciences*. 1993;32-37.

5. Peoples JG. The cultural construction of gender and manhood. In T. Cohen, ed. *Men and Masculinity*. Stamford, CT: Thomson Learning. 2001;9-19.

6. Baghurst T. Muscle dysmorphia and male body image: a personal account. *New Male Studies*. 2012;1:3.

7. Baghurst T, Carlston D, Wood J, et al. Preadolescent male perceptions of action figure physiques. *J Adolesc Health*. 2007;41:613-615.

8. Baghurst T, Hollander DB, Nardella B, et al. Changes in sociocultural ideal male physique: an examination of past and present action figures. *Body Image*. 2006;3:87-91.

9. Lantz CD, Rhea DJ, Mayhew JL. The drive for size: a psycho-behavioral model of muscle dysmorphia. *Int J Sports*. 2001;5:71-86.

10. Baghurst T, Lirgg C. Characteristics of muscle dysmorphia in male football, weight training, and competitive natural and non-natural bodybuilding samples. *Body Image*. 2009;6:221-227.

11. Baghurst T, Kissinger DB. Perspectives on muscle dysmorphia. *Int J Men’s Health*. 2009;8:82-89.

12. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing; 2013.

13. Cafri G, Thompson JK, Ricciardelli L, et al. Pursuit of the muscular ideal: physical and psychological consequences and putative risk factors. *Clin Psychol Rev*. 2005;25:215-239.

14. McCreary DR, Sasse DK. An exploration of the drive for muscularity in adolescent boys and girls. *J Am Coll Health*. 2000;48:297-304.

15. Grieve FG. A conceptual model of factors contributing to the development of muscle dysmorphia. *Eating Disorders*. 2007;15:63-80.

16. Olivardia R. Mirror, mirror on the wall, who’s the largest of them all? The features and phenomenology of muscle dysmorphia. *Harv Rev Psychiatry*. 2001;9:254-259.

17. McCreary DR, Sasse DK. Gender differences in high school students’ dieting behavior and their correlates. *Int J Men’s Health*. 2002;1:195-213.

18. Pope HG, Phillips KA, Olivardia R. *The Adonis Complex: The secret crisis of male body obsession*. New York, NY: The Free Press; 2000.

19. Olivardia R, Pope HG, Borowiecki JJ, et al. Biceps and body image: the relationship between muscularity and self-esteem, depression, and eating disorder symptoms. *Psychol Men and Masculinity*. 2004;5:112-120.

20. Parish A, Baghurst T, Turner R. Becoming competitive amateur bodybuilders: identification of contributors. *Psychology of Men & Masculinity*. 2010;12:152-159.

21. Baghurst T, Parish A, Denny G. Why women become competitive amateur bodybuilders. *Women Sports & Physical Activity Jour*. 2014;22:5-9.

22. Murray S, Baghurst T. Revisiting the diagnostic criteria for muscle dysmorphia. *Strength Cond J*. 2013;35:69-74.

23. Baghurst T, Mwavita M, Volberding J, et al. Reevaluation of physique protection as a characteristic of muscle dysmorphia. *N Am J Psych*. 2014;16:565-576.

Protein Ingestion, Muscle Growth, and Getting Fit and Lean Fast

by Robert Morton, BSc, CSCS and Stuart Phillips, PhD, FACSM, FACN

Muscle mass is regulated, in part, by a balance between muscle protein synthesis (MPS) and muscle protein breakdown (MPB).¹ Prolonged and frequent periods of a positive net muscle protein balance in which MPS exceeds MPB yields muscle growth (i.e., hypertrophy). Conversely, prolonged and frequent periods of negative net muscle protein balance (MPS < MPB) results in a reduction in muscle mass (i.e., atrophy). Not surprisingly, in a fasted state at rest, MPB exceeds MPS and thus muscle is in a negative net protein balance²; however, performing a bout of resistance exercise and consuming protein stimulates MPS to rates greater than that of MPB and renders muscle in a positive net muscle protein balance.³

There has been a plethora of research in both young and elderly populations targeting resistance exercise and protein supplementation as a means of developing and/or maintaining skeletal muscle structure and function. The aim of this article is to provide a concise overview of recent research relating to protein ingestion, resistance exercise, and muscle growth. For a more comprehensive overview, readers are referred to two recent review articles on the same topics.^{4,5}

Protein Supplementation

Protein supplementation refers to the dietary addition of extra protein-rich foods or, more commonly, to the addition of protein to the diet through an adjunctive protein source (e.g., whey, casein, soy) to increase one's daily protein intake. To say that something is "necessary" implies that without it, the target or goal cannot be achieved— but is that really true? The current Recommended Dietary Allowance (RDA) in the United States and Canada for protein ingestion is

0.8 g of protein/kg of body mass per day,⁶ which many Americans meet. For an 80-kg male (~175 lb), the RDA of 0.8 g/kg/day equates to 65 g/day, which would amount to only about two eggs and toast for breakfast, toast with peanut butter and a glass of milk for lunch, and a chicken breast with white rice for dinner.

We have argued that the RDA of 0.8 g/kg/day, while likely sufficient to cover needs, it is not "optimal" for healthy aging, weight management, or athlete performance.⁵ Thus, while protein supplementation is not *necessary* to see resistance training-induced hypertrophy when one is already consuming the RDA for pro-

gree of effort are far more important than protein supplementation alone.⁴

What, When, and How Much?

With the caveat that the benefit of protein supplementation, via either a meal or isolated protein ingestion, on training-induced adaptations is relatively small, the average gym goer need not be fanatical about the dose, timing, or source of protein ingestion. However, for registered dietitians, the following information may be useful to augment an already well-planned diet. For example, elderly individuals benefit (i.e., exhibit a greater acute MPS response) from higher protein doses (0.4 g/kg of body mass/meal)

"...elderly individuals benefit from higher protein doses than young ..."11,12

tein, it may augment the adaptations. Acute changes in net muscle protein balance^{2,3,7,8} suggest that one may benefit from ingesting greater amounts of protein to augment muscle growth induced by resistance exercise. Indeed, a recent meta-analysis revealed that protein supplementation augments resistance training-induced improvements in skeletal muscle mass and strength; however, only three of the 16 studies showed a statistically significant difference between the supplemented and non-supplemented groups.⁹ As pointed out in a recent review,⁴ the anabolic effect of protein supplementation is much less than the anabolic effect of the resistance exercise itself. To be clear, protein supplementation may augment resistance training-induced adaptations,⁹ but it is likely that the regular performance of resistance exercise and training with a high de-

than young (0.25 g/kg/meal),¹⁰ likely because they are "anabolically resistant."^{11,12} Not surprisingly, recent reports have also expressed recommendations, especially for the aging population, to increase the RDA for protein consumption (~1.2–1.6 g/kg/day).^{5,13} Regarding protein distribution, it is evident that large boluses (>0.25 or 0.4 g/kg/meal for young and old, respectively) result in the oxidation or excretion of nitrogen from unused amino acids that are not used for protein synthesis.^{14,15} Accordingly, both acute¹⁶⁻¹⁸ and chronic¹⁹ studies suggest that ingesting moderate and frequent (approximately every 4 h) meals of protein is best for augmenting and/or maintaining skeletal muscle mass and function. Although performing resistance exercise before ingesting amino acids may augment MPS,³ skeletal muscle is still "sensitive" to amino

acids even 24 to 48 hours post-exercise;²⁰ thus, any post-exercise “anabolic window” is much longer and less relevant than believed.²¹ Despite the lack of a narrow post-exercise anabolic window, it is still pragmatic advice to tell athletes to practice the “3Rs” of recovery: rehydration, refuel (carbohydrates for glycogen restoration), and repair (protein to support protein synthesis) in the hours following exercise and/or competition.

The amino acid composition differs between protein sources,²² which may determine both the magnitude and duration of the anabolic effect. Short, acute measures of MPS suggest that whey is greater than soy and greater than casein following a bout of resistance exercise²² or during periods of weight loss,⁸ although casein may be ideal to ingest pre-sleep^{23,24} because it is digested slower than whey and soy.¹ Among the different protein sources (whey, casein, and soy), whey has the highest concentration of leucine²² and it appears that leucine may be the most important amino acid for augmenting MPS.²⁵ For this reason, optimal protein recommendations must acknowledge protein source (whey>casein>soy), protein dose (at least 0.25 and 0.4 g/kg/meal for younger and older, respectively) and protein distribution (moderate and at least 3 times daily) as important variables to enhance skeletal muscle adaptations.

Protein and Weight Loss

A recent study by Longland et al²⁶ investigated the question of whether it was possible to gain lean mass and lose fat mass at the same time. The authors had participants undergo a large battery of tests (body composition testing, strength tests, muscle biopsies, blood work, etc.) before and after 4 weeks of diet-controlled energy restriction (~40% reduction of their estimated energy requirements) and exercise training. The participants were divided into two groups: a higher protein (HP, 2.4 g/kg/day) group and a lower protein (LP, 1.2 g/kg/day) group. For the exercise in-

tervention, participants underwent six training sessions per week in the laboratory while they were in the state of energy deficit. The sessions included two full-body resistance exercise circuits, a high-intensity bike training session, a sprint-interval bike training session, a bike time trial, and a plyometric body mass circuit.

“...any post-exercise ‘anabolic window’ is much longer and less relevant than believed.”²¹

At the end of the 4 weeks of training there were improvements in most performance tests, with no differences between groups, and both groups demonstrated a reduction in total body mass (~3.5 kg).²⁶ The LP group (50% higher than the RDA⁶) group was able to maintain lean body mass (i.e., all mass lost was from fat mass); however, the HP group increased their lean body mass after the training. Indeed, the HP group lost a greater amount of fat mass relative to the LP group.²⁶ It is clear that, especially during energy restriction, higher protein diets (at least 1.2 g/kg/day) are necessary to combat the approximate 20% to 30% of weight that is lost commonly from lean mass.²⁷ This study also noted that it is possible to augment lean body mass while ablating the loss of fat mass, although this requires even higher protein diets (~2.4 g/kg/day) along with a high training volume (6 workouts per week). Although this relatively rapid (4 weeks) change in phenotype is encouraging, it likely does not offer a sustainable training paradigm for most individuals. Nonetheless, there are many implications of this research in a variety of settings that require rapid changes in

physique or necessitate caloric restriction.

Conclusion

Skeletal muscle size can be investigated acutely by quantifying rates of muscle protein turnover over periods of time by both indirect (body composition) and direct (fibre cross sectional area) measures of skeletal muscle cells. Protein supplementation may not be necessary to augment lean mass, but higher doses of protein are beneficial for those trying to maximize training-induced adaptations, for the elderly (as reviewed by Phillips et al⁵), and certainly during periods of caloric restriction. Protein timing, distribution, source, and dose are all important variables to consider when trying to “optimize” recommendations. It is apparent that the provision of protein is an important variable to consider for health and exercise-induced skeletal muscle adaptation.

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References

1. Phillips SM. Protein requirements and supplementation in strength sports. *Nutrition*. 2004;20:689-695.
2. Biolo G, Maggi SP, Williams BD, et al. Increased rates of muscle protein turnover and amino acid transport after resistance exercise in humans.

- Am J Physiol.* 1995;268(3 Pt 1):E514-E20.
3. Biolo G, Tipton K, Klein S, et al. An abundant supply of amino acids enhances the metabolic effect of exercise on muscle protein. *Am J Physiol.* 1997;273(1 Pt 1):E122-E29.
 4. Morton RW, McGlory C, Phillips SM. Nutritional interventions to augment resistance training-induced skeletal muscle hypertrophy. *Front Physiol.* 2015;6:245.
 5. Phillips SM, Chevalier S, Leidy HJ. Protein "requirements" beyond the RDA: implications for optimizing health. *Appl Physiol Nutr Metab.* 2016;41:565-572.
 6. Garza C, Russell RM, Stallings VA, et al. *Dietary Reference Intakes for Energy, Carbohydrate, Fibre, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids.* Washington, D C: Institute of Medicine, 2005:1357.
 7. Phillips SM, Tipton KD, Aarsland A, et al. Mixed muscle protein synthesis and breakdown after resistance exercise in humans. *Am J Physiol.* 1997;273(1 Pt 1):E99-E107.
 8. Hector AJ, Marcotte GR, Churchward-Venne TA, et al. Whey protein supplementation preserves postprandial myofibrillar protein synthesis during short-term energy restriction in overweight and obese adults. *J Nutr.* 2015;145:246-52.
 9. Cermak NM, Res PT, de Groot LC, et al. Protein supplementation augments the adaptive response of skeletal muscle to resistance-type exercise training: a meta-analysis. *Am J Clin Nutr.* 2012;96:1454-64.
 10. Moore DR, Churchward-Venne TA, Witard O, et al. Protein ingestion to stimulate myofibrillar protein synthesis requires greater relative protein intakes in healthy older versus younger men. *J Gerontol A Biol Sci Med Sci.* 2015;70:57-62.
 11. Cuthbertson D, Smith K, Babraj JA, et al. Anabolic signaling deficits underlie amino acid resistance of wasting, aging muscle. *FASEB J.* 2005;19:422-424.
 12. Witard OC, McGlory C, Hamilton DL, et al. Growing older with health and vitality: a nexus of physical activity, exercise and nutrition. *Biogerontology.* 2016; 17:529-546.
 13. Deutz NE, Bauer JM, Barazzoni R, et al. Protein intake and exercise for optimal muscle function with aging: recommendations from the ESPEN Expert Group. *Clin Nutr.* 2014;33:929-936.
 14. Moore DR, Tang JE, Burd NA, et al. Differential stimulation of myofibrillar and sarcoplasmic protein synthesis with protein ingestion at rest and after resistance exercise. *J Physiol.* 2009;587(Pt 4):897-904.
 15. Witard OC, Jackman SR, Breen L, et al. Myofibrillar muscle protein synthesis rates subsequent to a meal in response to increasing doses of whey protein at rest and after resistance exercise. *Am J Clin Nutr.* 2014;99:86-95.
 16. Areta JL, Burke LM, Ross ML, et al. Timing and distribution of protein ingestion during prolonged recovery from resistance exercise alters myofibrillar protein synthesis. *J Physiol.* 2013;591(Pt 9):2319-2331.
 17. Murphy CH, Churchward-Venne TA, Mitchell CJ, et al. Hypoenergetic diet-induced reductions in myofibrillar protein synthesis are restored with resistance training and balanced daily protein ingestion in older men. *Am J Physiol Endocrinol Metab.* 2015;308:E734-43.
 18. Mamerow MM, Mettler JA, English KL, et al. Dietary protein distribution positively influences 24-h muscle protein synthesis in healthy adults. *J Nutr.* 2014;144:876-880.
 19. Loenneke JP, Loprinzi PD, Murphy CH, et al. Per meal dose and frequency of protein consumption is associated with lean mass and muscle performance. *Clin Nutr.* 2016;Apr7 [Epub ahead of print].
 20. Burd NA, West DW, Moore DR, et al. Enhanced amino acid sensitivity of myofibrillar protein synthesis persists for up to 24 h after resistance exercise in young men. *J Nutr.* 2011;141:568-573.
 21. Schoenfeld BJ, Aragon AA, Krieger JW. The effect of protein timing on muscle strength and hypertrophy: a meta-analysis. *J Int Soc Sports Nutr.* 2013;10:53.
 22. Tang JE, Moore DR, Kujbida GW, et al. Ingestion of whey hydrolysate, casein, or soy protein isolate: effects on mixed muscle protein synthesis at rest and following resistance exercise in young men. *J Appl Physiol.* 2009;107:987-992.
 23. Res PT, Groen B, Pennings B, et al. Protein ingestion before sleep improves postexercise overnight recovery. *Med Sci Sports Exerc.* 2012;44:1560-1569.
 24. Snijders T, Res PT, Smeets JS, et al. Protein ingestion before sleep increases muscle mass and strength gains during prolonged resistance-type exercise training in healthy young men. *J Nutr.* 2015;145:1178-1184.
 25. Churchward-Venne TA, Breen L, Di Donato DM, et al. Leucine supplementation of a low-protein mixed macronutrient beverage enhances myofibrillar protein synthesis in young men: a double-blind, randomized trial. *Am J Clin Nutr.* 2014;99:276-286.
 26. Longland TM, Oikawa SY, Mitchell CJ, et al. Higher compared with lower dietary protein during an energy deficit combined with intense exercise promotes greater lean mass gain and fat mass loss: a randomized trial. *Am J Clin Nutr.* 2016;103:738-746.
 27. Weinheimer EM, Sands LP, Campbell WW. A systematic review of the separate and combined effects of energy restriction and exercise on fat-free mass in middle-aged and older adults: implications for sarcopenic obesity. *Nutr Rev.* 2010;68:375-388.

Micronutrient Considerations in the Heart Failure Population

By Nicole Cornelious RD, CSO

Heart failure (HF) is a complex clinical syndrome involving an impairment of the structural or functional ventricular filling or ejection of blood.¹ Difficult or labored breathing is a cardinal symptom of HF. In addition to potentially restricting exercise tolerance, this symptom may be associated with fluid retention and may lead to pulmonary congestion and/or peripheral edema.¹ According to the World Health Organization, cardiovascular disease is the number one cause of death in the world, comprising 31% of total deaths in 2012.² The European Society of Cardiology states that within 4 years of diagnosis, half of all HF patients will die and within 1 year half will die with severe HF.³ There are approximately 670,000 new cases of HF identified each year.³

Risk factors for acquiring this disease include hypertension, diabetes mellitus, obesity, renal failure, anemia, excessive alcohol intake, thyroid dysfunction, and family history of dilated cardiomyopathy. Potential etiologies for HF include ischemic heart disease, dilated cardiomyopathy, valvular disease, hypertension, and congenital heart disease.³ Approximately 68% of patients with HF are malnourished.³ Reasons for malnutrition include anorexia, increased resting metabolic rate, and hypercatabolism.³ Growing evidence supports the importance of diet on the progression and outcomes of HF.³

Impact of Heart Failure on Nutritional Status

There are many factors that cause decreased nutrient intake and increase the risk of nutritional deficiencies in HF patients. Among these factors are anorexia, malnutrition, elderly age, frequent hospitalizations, early satiety, and severity of disease.³ The recommended daily allowance (RDA) for healthy people may not meet the re-

quirements for patients with HF, because their needs are not based on a normal physiologic state.³ The adequate flow of nutrients is dependent on normal myocardial energy production.

“Approximately 68% of patients with HF are malnourished.”³

In patients with congestive heart failure (CHF), several important cofactors necessary to assist in aerobic metabolism have been found to be lacking.⁴ These include two B vitamins that will be addressed later in this article.⁴

Challenges Affecting Nutritional Status

Diuretic medications are commonly prescribed for HF patients, leading to urinary losses of electrolytes and micronutrients.¹ Another challenge to the nutritional status of HF patients is the occurrence of cardiac cachexia. The three mechanisms thought to be responsible for cardiac cachexia include a) malabsorption and metabolic dysfunction, b) dietary deficiency, and, c) loss of nutrients via the urinary and digestive tracts.⁵ Myocardial dysfunction is linked to an elevated level of free radicals. Free radical production is stimulated by increased concentration of catecholamines and cytokines as well as by tissue hypoxia/ischemia in HF. Many micronutrients can also scavenge oxygen free radicals. This increase in free radicals has been linked to a gradual progression of myocardial dysfunction.⁵

Sodium

The average American consumes 4 g to 6 g of sodium per day.⁶ Approximately 5.1% of this intake comes from cooking and 6.2% from salt added at the dinner table.⁷ Sodium restriction is warranted in HF because two common symptoms are edema and diminished kidney function as a result of poor blood flow. The kidneys secrete aldosterone, which promotes sodium resorption, and antidiuretic hormone, which promotes water conservation. As a result, sodium and fluid build up in the body's tissues.

The American College of Cardiology Foundation and American Heart Association recommend a sodium restriction of 1 g/day to 2 g/day for stage A and B heart failure and <3 g/day for stage C and D heart failure. However, putting this practice into place is easier said than done. Sodium restriction poses as a challenge for HF patients because it limits eating out at restaurants and eating convenience foods; furthermore, patients must be competent in reading food labels. Other practical matters that must be considered are the time and effort required for food preparation and the patient's educational level.⁶ Dietary education provided by a registered dietitian (RD) can significantly improve the patient's knowledge and understanding of sodium in foods.

Consumption of the following foods should be limited, as they are highest in sodium: smoked, processed, cured meats (i.e., ham, bacon, cold cuts, sausage); meat extracts; bouillon cubes; salted snacks (i.e., chips, pretzels, nuts, popcorn); condiments such as soy sauce, salsa, and salad dressing; canned soup; processed cheese and cheese spreads; and any food that is pickled. Non-diet sources of sodium should also be considered, in-

cluding mouthwash and medications such as barbiturates and laxatives. For example, a chewable antacid taken for ulcers and gastric distress can contain 1,200 mg to 7,000 mg of sodium.⁶

The RD plays an important role in helping patients comply with sodium restrictions. Time spent with patients should include teaching them how to read food labels; among other teaching points, this involves identifying additives that contain sodium and interpreting food label claims (i.e., “sodium free” or “reduced sodium”). Moreover, to help with meal planning, the RD should advise patients on the use of sodium-free seasonings to help enhance the flavor of food, such as lemon juice, vinegar, and fragrant herbs (e.g., cumin seeds).⁶

Potassium

Diuretic use is associated with the depletion of electrolytes.⁸ The deficiency of potassium is a primary concern because potassium is an essential cation for maintaining normal heart rhythm and function.⁸ Low serum potassium is a concern in HF, as it has been shown to increase disease progression and increase all-cause mortality.⁸ Potassium deficiency can occur from poor diet, anorexia, hyperaldosteronism, or use of loop or thiazide diuretics, which can cause potassium to be excreted in the urine.⁹

Lemon et al⁹ demonstrated that overall the intake of dietary potassium in individuals with HF is low and intake does not differ according to diuretic use. Another study revealed outcomes of urinary losses of magnesium, calcium, and phosphate occurring with use of loop diuretics.⁹ This electrolyte depletion is related to ventricular proarrhythmia and sudden cardiac death. Cardiac surgery patients receiving <160 mg/day of furosemide can use dietary sources of potassium for supplementation as a validated approach.⁸ Examples of high-potassium foods are bananas, tomato juice, and potatoes.⁸ However, it is important to consider the patient’s overall medical condition,

as the supplementation of potassium from dietary sources may not be warranted. For example, a high-potassium diet is contraindicated in patients with renal failure and those taking potassium-sparing diuretics, which can cause hyperkalemia. Salt substitutes are contraindicated in renal failure, because 1 teaspoon can provide between 500 mg to 2,000 mg of potassium.

Magnesium

Like hypokalemia, hypomagnesemia has been associated with adverse cardiac events.⁸ Reduced magnesium intake has been shown to have a statistical relationship with cardiovascular disease in animal and human studies.¹⁰ Chronic magnesium deficiency is associated with multifocal cellular necrosis, accumulation of intracellular calcium, increased platelet aggregation, coronary vasoconstriction,

atherogenesis, and cardiac arrhythmia.

Magnesium has an important role in the regulation of vascular tone, heart rhythm, and platelet activated thrombosis. It has been shown to improve endothelial function in laboratory experiments.¹⁰ Magnesium is a cofactor for more than 300 enzymatic reactions, many of which are central to cellular homeostasis.

Magnesium supplementation may reduce mortality after myocardial ischemia-reperfusion injury. In a study by Booth et al, patients with magnesium levels <1.8 mmol/L during the first 8 days after surgery were twice as likely to have a myocardial infarction (MI) or die within the first year than patients who had normal magnesium levels.¹⁰ In addition, low magnesium levels were a significant

predictor of death or MI at 1 year as a result of the logistic regression analysis. However, serum magnesium levels unfortunately do not provide adequate data about total body magnesium levels. For greater accuracy, the best way to assess magnesium body stores may be to collect urine magnesium levels for 24 hours.¹⁰

Poor nutritional intake would result in total body magnesium depletion. However, this may not be the case in acute myocardial infarction (AMI).

Monitoring Potassium and Magnesium

Daily monitoring of serum potassium and magnesium is recommended in HF patients who are acutely ill. Likewise, in the ambulatory setting, potassium and magnesium requirements will vary once diuretic therapy is changed. Clinicians should learn to

“Magnesium is a cofactor for more than 300 enzymatic reactions, many of which are central to cellular homeostasis.”

anticipate supplement requirements as diuretic medications change.⁸

B-Vitamins

Thiamin (B1)

Thiamin is a water soluble vitamin found in meat (pork is a particularly good source), legumes, sunflower seeds, vegetables, whole and enriched grains, and yeast.¹¹ Enriching refined flours allows the nutrition quality to be returned to original levels.¹ The absorption of thiamin from food is high but can be destroyed in alkaline environments (pH >8) or high temperatures. Also, there are several foods that contain anti-thiamin factors, which can impair absorption. These foods include raw fish, coffee, tea, and blueberries, to name a few. Malnutrition and alcohol consumption can also reduce ab-

sorption. Other factors contributing to thiamin deficiency (TD) are advanced age and HF severity.

According to the Institute of Medicine, there is no tolerable upper intake level of thiamin. Typically thiamin supplements are manufactured in 50 mg or 100 mg doses, although the recommended dietary intake (RDI) is much lower.¹² Patients with unexplained HF are at risk for TD. Thiamin deficiency in HF patients can range from 21% to 98%.¹¹ The prevalence of TD is higher in those taking diuretics as a result of thiamin being excreted in the urine. Wet beriberi can manifest itself as CHF. Wet beriberi is a syndrome of TD characterized by sodium restriction, peripheral vasodilation, and biventricular HF. Therefore, clinicians should rule out TD among HF patients.

In examining the effects of TD treatment using thiamin, Shimon et al reported on a double-blind study in which 30 hospitalized patients diagnosed with diuretic-induced TD were randomized to receive either intravenous (IV) thiamin at 200 mg/day or placebo for 1 week. Ejection fraction (EF) improved in all 27 participants who completed the study. No significant changes in EF were observed in participants receiving placebo.¹³ However, Frank states that a recent review of the literature is inconclusive and more evidence is needed from large prospective studies and randomized controlled trials.¹¹

Riboflavin (B2)

Riboflavin is a coenzyme in a variety of energy-producing reactions, and it is vital to the metabolism of proteins and glucose. Riboflavin is also required for the metabolism of homocysteine. Riboflavin deficiency is caused by malabsorption and insufficient intake. This deficiency can manifest itself by the presence of cheilosis, dermatitis, peripheral neuropathy, and burning and itching eyes.

In a study by Keith et al, the prevalence of riboflavin deficiency had no significant difference of non-supple-

mented patients compared with those who received supplements via a multivitamin or B-complex vitamin.¹⁴ Thus, the authors concluded that a B-complex vitamin may not be sufficient to correct riboflavin deficiency. In addition, the authors noted that while 88% of participants had intakes exceeding the estimated average requirement (EAR), they nevertheless showed deficiency evidenced by biochemical markers. The risk of riboflavin deficiency on HF cannot currently be determined due to insufficient evidence.³

Conclusion

The results from the study by Lemon et al⁹ suggest that the diet quality of patients with HF is poor, and this can have a detrimental effect on disease progression and underlying conditions. Tools such as food recalls continue to be the gold standard for obtaining information on the nutritional status and challenges that HF patients face. Improvement of the nutritional status in this patient population will be ongoing. Although there will be challenges along the way, the outcomes will be much improved when nutrition is considered.

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References

1. Yancy C, Jessup M, Bozkurt B, et al. ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2013;128:1810-1852.
2. Global status report on noncommunicable disease 2014. World Health Organization; 2015.
3. Azizi-Namini P, Ahmed M, Yan AT, et al. The role of B vitamins in the management of heart failure. *Nutr Clin Pract*. 2012;27:363-374.

4. Allard M, Jeejeebhoy K, Sole M. The management of conditioned nutritional requirements in heart failure. *Heart Fail Rev*. 2006;11:75-82.

5. Steinborn W, Anker S. Cardiac cachexia: pathophysiology and clinical implications. *Basic Appl Myol*. 2013;4:191-196.

6. Krummel D. Medical nutrition therapy for heart failure and transplant. In: Escott-Stump L, Mahan K, eds. *Krause's Food, Nutrition, & Diet Therapy*, 11th ed. Philadelphia, PA: Saunders; 2004:919-934.

7. Mattes RD, Donnelly D. Relative contributions of dietary sodium sources. *J Am Coll Nutr*. 1991;10:383-393.

8. Dunn S, Bleske B, Dorsch M, et al. Nutrition and heart failure: impact of drug therapies and management strategies. *Nutr Clin Pract*. 2009;24:60-75.

9. Lemon S, Olendzki B, Magner R, et al. The dietary quality of persons with heart failure in NHANES 1999-2006. *J Gen Intern Med*. 2009;25:135-140.

10. Booth JV, Phillips-Bute B, McCants CB, et al. Low serum magnesium level predicts major adverse cardiac events after coronary artery bypass graft surgery. *Am Heart J*. 2003;30:145:1108-1113.

11. Frank L. Thiamin in clinical practice. *JPEN*. 2015;39:503-520.

12. Wooley, JA. Characteristics of thiamin and its relevance to the management of heart failure. *Nutr Clin Pract*. 2008;23:487-493.

13. Shimon H, Almog S, Vered Z, et al. Improved left ventricular function after thiamine supplementation in patients with congestive heart failure receiving long-term furosemide therapy. *Am J Med*. 1995;98:485-940.

14. Keith ME, Walsh NA, Darling PB, et al. B-vitamin deficiency in hospitalized patients with heart failure. *J Am Diet Assoc*. 2009;109:1406-1410.

We Have the Power to Address Food and Nutrition Insecurity: Will You Take Action to End Hunger, Reduce Food Waste, and Enhance Lives Now?

by Monique Richard, MS, RDN, LDN

As one of the wealthiest nations in the world, it is disturbing that families across the U.S. are going to bed hungry, struggling to find their next meal, and devastated when vital school meal service stops for the summer or is closed for a snow day. Approximately 48 million individuals, or 1 in 7 households, battle food and nutrition insecurity.¹ As dietetics professionals we understand the profound impact that adequate nutrition has on not only health, performance, and cognitive and physical development, but also on mood, behavior, psychological well-being, and overall quality of life. It is imperative that we empower our communities, patients, clients, and each other to lead our country into new territory to solve this problem.

It is appropriate to simultaneously address food waste, environment, and accessibility when discussing food insecurity. The United States has long had a sufficient supply of food, but continues to struggle with distribution and resource management. According to the U.S. Environmental Protection Agency and Food Waste Reduction Alliance, approximately 25% to 40% of food grown, processed, and transported in the U.S. will never be consumed, equating to 70 billion pounds of wasted food each year. The environmental impact of this waste is significant. As it decomposes in landfills it becomes methane, the potent greenhouse gas that has 21 times the global warming potential of carbon dioxide.² Many organizations are coming together to address this issue. One example is ReFED, a collaboration of 30 businesses that provides a data-driven guide for businesses, government, funders, and nonprofits to collectively reduce food waste at scale.

ReFED has proposed a plan, or roadmap, to reduce waste by 20%. They project that *“Food recovery can increase by 1.8 billion meals annually, nearly doubling the amount of meals rescued today and diverting 1.1 million tons of waste.”*³ Simply put, if we decreased food waste, we could increase food security.

“Start by doing what’s necessary; then do what’s possible; and suddenly you are doing the impossible.”

—Francis of Assisi

However, we understand it is anything but simple. It is a debilitating and complex issue and we need your help and support. We need all hands and heads on deck. Solutions for an end to hunger are possible. Over the next several months, a Committee for Public Health and Nutrition Task Force is implementing an Academy-wide action plan based on the House of Delegates (HOD) Food and Nutrition Security Action Plan. The main goal is to engage and mobilize members in their communities to take action on food and nutrition security.

How can RDNs influence food insecurity right now? We can:

- Teach others how to grow food, garden, farm, compost, and practice permaculture, which is defined as the development of more sustainable and self-sufficient agricultural ecosystems

- Educate, counsel, collaborate, and communicate in local health departments, Women, Infant and Child (WIC) clinics, and private clinics or health care facilities

- Be the catalyst for healthy additions, changes, and preparation of unfamiliar items in public-private programs such as Double Up Food

Bucks, which allows the value of Supplemental Nutrition Assistance Program (SNAP) benefits to increase when used to purchase produce at farmers’ markets, another example of a way the community is taking action to support those participating in the SNAP program

- Educate and advocate for public policy and legislation related to programs such as SNAP, WIC, the Child Nutrition Reauthorization Act, and the Older Americans Act that help fund such programs as Meals on Wheels, both locally and nationally

- Provide testimony to Congress, or within local government, regarding health outcomes and consequences of food-insecure populations

- Participate in Academy action alerts to ensure that federal nutrition safety net and nutrition assistance programs such as SNAP, WIC, and

child nutrition programs are adequately funded and include nutrition education

- Write a blog, article, or column, or speak, present, or lead nutrition communication efforts regarding food bank donations, food insecurity, food waste, and meal preparation, and bridge gaps between community resources and needs in local papers, radio, TV, or community programs

- Contribute best practices, research, recipes, and ideas to resource hubs such as Feeding America/Academy of Nutrition and Dietetics, Kids Eat Right, and the Academy of Nutrition and Dietetics Foundation

- Provide grocery store tours, farmers' market tours, or local facility tours not only to share economical solutions and availability of nutritious meals and options, but also to influence the community to become aware of food insecurity in the area

- Provide educational presentations and information to elementary and high schools; challenge schools and churches to collaborate to address community needs

Furthermore, we must make outreach, education, and networking priorities for the populations we serve and the environment we share. A research brief in the *Journal of Hunger and Environmental Nutrition* posits that low-income households spend a disproportionate amount of their income on meat versus fruits and vegetables, yet those foods are precisely what is needed to promote and protect health. The authors state that up to 50% of total food costs are devoted to meat. "Educating food insecure individuals on the preparation of meals that do not contain meat has the potential to extend their limited dollars for groceries. Furthermore, vegetarian meals are healthier than meals made with animal products due to their higher phytonutrient content."⁴

RDNs are poised to extend their knowledge, creativity, and expertise

with a hands-on approach to educate, inform, demonstrate, and influence change not only in the area of food and nutrition security, but also in food waste.

How can RDNs address food waste right now? We can:

- Demonstrate and teach about cooking methods to reduce waste, spoilage, repurposing leftovers, and food safety

"Educating food insecure individuals on the preparation of meals that do not contain meat has the potential to extend their limited dollars for groceries."

- Teach about gleaning-gathering leftovers from harvests, ways to repurpose surplus, unused, or discarded harvests, turning food waste into rescued, nutritious, delicious consumables

- Educate on the variety, benefits, and preparation of a plant-rich diet while demonstrating that food bank patrons can save money when adopting a vegetarian diet

- Collaborate, communicate, and showcase the importance of supporting local food systems from farmers' markets to local industry, grocery stores to food banks, and restaurants to hospital kitchens

- Develop recipes and meal plans, and offer additional ways to enhance and extend ingredients and product

- Host reading groups or book clubs related to these topics at your local library

References

1. Feeding America [\[america/impact-of-hunger/\]\(http://www.feedingamerica.org/hunger-in-america/impact-of-hunger/\); Accessed June 9, 2016.](http://www.feedingamerica.org/hunger-in-</p></div><div data-bbox=)

2. Feeding America <http://www.feedingamerica.org/about-us/how-we-work/securing-meals/reducing-food-waste.html>; Accessed June 9, 2016.

3. ReFED https://www.refed.com/downloads/ReFED_Report_2016.pdf; Accessed June 9, 2016.

4. Flynn MM, Schiff A. Research Brief: Food insecurity is decreased by adopting a plant-based, olive oil diet. *J Hunger Environ Nutr.* 2011;6:506-512.

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Are You Sailing in Blue Oceans or Red? Let SCAN Help You Steer to Success

by Karen Collins, MS, RDN, CDN, FAND

How are the waters you're sailing in, professionally speaking?

When SCAN leaders developed the strategic plan that forms the foundation for our efforts to meet member needs, our discussion was informed by what you told us in surveys (Yes, it really matters when you respond!) and considered partly in light of the book, *Blue Ocean Strategy: How to Create Uncontested Market Space and Make Competition Irrelevant*. In this text, authors W. Chan Kim and Renée Mauborgne posit that a key for business success can be to avoid confining yourself to "red oceans" (red from all the blood spilled by predators). In contrast, "blue oceans" offer untapped market space not crowded with competitors.

Many of you are working—and thriving—in red oceans. Top-level expertise and solid professional relationships contribute to your success. SCAN's plan focuses on helping you navigate those waters through a network of supportive colleagues and a variety of webinars, newsletters, fact sheets, and learning opportunities to keep your knowledge base on the cutting edge.

Without using these exact words, many of you note the importance of heading into blue oceans. Maybe you see that clients and work opportunities have been taken by other professionals, credentialed and non-credentialed. Maybe you feel the need to grow and invigorate your career by stepping into untried areas.

SCAN's focus on the intersection of sports, cardiovascular, wellness, and disordered eating nutrition provides the perfect companion for your blue ocean sails. Current and future programs of all types will address such opportunities. Here's how you can stand out:

It's one thing to know sports nutrition, but what about addressing cardiovascular risk factors in athletes? Also, being able to recognize and respond to eating disorders in people who come to you seeking improved athletic performance is another skill intersection that gives you a distinct advantage.

Stepping beyond traditional athlete populations, many others need to know about nutrition that supports physical performance. You stand out when you're prepared to address unique concerns of first responders, military personnel, baby boomers emerging as athletes, and people in various types of physical rehabilitation.

Wellness is a wide open field, but specialty skill sets are needed to excel. Thanks to those of you who responded to

our wellness-focused survey, we are fine-tuning our educational offerings to what you've said you need to support your success.

Disordered eating comes in tandem with lots of other health issues, and SCAN can help you stand out by being adept at recognizing and responding to those patterns while delivering solid overall nutrition help.

Cardiovascular nutrition expertise today includes a broader array of factors comprising heart-healthy eating, and requires grounding to address media controversies. Cardiac rehab programs will increasingly be looking for RDs with expertise to raise the quality of nutrition care. SCAN is working to support our members through education and efforts to improve reimbursement. We've added volunteer leader positions in these areas to help us drive forward.

Relationships with allied professionals can help, and SCAN has implemented new measures to optimize our relationships with organizations of professionals in the sports, eating disorder, cardiovascular and wellness arenas. This is creating wider recognition of our expertise and the placement of "Find a SCAN RD" links on these organizations' websites.

What You Can Do

- To benefit from our expanded network relationships, make sure your SCAN profile is updated and set to allow you to be "found" in "Find a SCAN RD" searches.
- Sign up as a member of one or more of our electronic mailing lists (EMLs). These provide a valuable opportunity to connect with colleagues from across the country and pose questions about resources and approaches they use in various situations.
- Use the resources SCAN provides for you free-of-charge. CPE webinars are free to SCAN members the first month. If you don't have time to view immediately, download them to your media collection on the SCAN site and they'll remain there for you as needed. Fact sheets are free to SCAN members, saving you time developing handouts. Free access to the Natural Standard Database, an expensive tool for a single professional, allows you to be the expert when clients or colleagues ask about supplements.
- Mark your calendar for SCAN's Symposium in Charlotte, NC, March 31 to April 2. It's hard to imagine finding a more concentrated collection of national and international experts to help you "up" your game, whether that game has you sailing in oceans that are red or blue. See you there!

Conference Highlights

American College of Sports Medicine Annual Meeting (Part II)

June 1-4, 2016

Boston, MA

The Fall issue of *SCAN'S PULSE* reported information presented in symposia and tutorial lectures at the 62nd Annual Meeting of the American College of Sports Medicine (ACSM). This article highlights some of the new, yet-to-be-published research being introduced via poster sessions and free communications. The number in parenthesis indicates the number of the abstract, available at www.acsmannualmeeting.org/past-meetings/2016-boston/

Performance Enhancers

■ Nutrition is one way to enhance performance; training respiratory muscles is another tactic. Within 3 weeks of training respiratory muscles, collegiate basketball players improved the endurance capacity of those muscles, and that helped to improve their sports performance (3282).

■ Black currants, like tart cherries, contain compounds (anthocyanins) that help relax blood vessels. Research with trained cyclists who consumed black currant powder for 7 days showed enhanced blood flow at rest, which could potentially enhance recovery (0866).

■ Generation UCAN is a cornstarch supplement that has a low glycemic index. Its manufacturers tout this product as increasing fat burning and providing steady energy. In a study with seven trained male cyclists (aged 28) who consumed either Generation UCAN or glucose before and during 1 hour of cycling followed by intervals and then sprints, the UCAN product increased fat oxidation and was well tolerated, but it offered no performance benefits (3527).

■ Peppermint oil has traditionally been used for its analgesic, anti-inflammatory, antispasmodic, antioxidant, and vasoconstrictor effects. Can it also enhance performance? Yes, according to a study with resistance-trained men who drank either peppermint oil or a peppermint-flavored placebo 15 minutes before a three-repetition max test. The participants increased their back squat from 268 lb to 284 lb and increased their upper body strength from 218 lb to 246 lb (0872).

In another study, inhaling peppermint odor immediately before an exercise test did not increase an athlete's vertical leap or broad jump experience. No significant differences were seen in 10 Division-1 college football players who inhaled peppermint oil, lavender oil (which is supposed to promote relaxation), or no scent (3745).

Muscle and Protein

■ As we age, we tend to lose muscle. Consuming protein prior to sleep is a nutritional strategy that helps curb muscle loss by increasing the overnight rate of muscle protein synthesis. When healthy 71-year-old men added resistance exercise in the evening and then consumed 40 g casein at bedtime, the overnight muscle-building response increased 31% compared with doing no evening exercise (0085).

■ Do young male athletes really need 40 g casein at bedtime to optimize their rate of muscle protein synthesis during the night? Apparently yes. A study examining the effects of 30 g casein protein with or without additional free leucine showed there was no increase in muscle protein synthesis rates during overnight recovery from strenuous exercise (0088).

■ Soldiers with a high intake of protein (1.5-2 g/kg/d) experienced negative nitrogen balance when they were underfed during 4 days of Arctic military training. These data reinforce the importance of consuming sufficient calories to curb muscle loss during periods of high energy expenditure (1610).

Weight

■ Is it true that the more you exercise, the more weight you lose? No. Middle-age adults (body mass index [BMI]: 32) who participated in a 12-month study saw no additional weight loss when they did 250 minutes instead of 150 minutes of moderate-to-vigorous physical activity per week. This suggests a compensatory response in factors that influence energy balance, and warrants further investigation (0602).

■ Do you burn many more calories by standing instead of sitting at your desk? Not unless you swap periods of sitting or standing with walking. Just standing increases energy expenditure by less than 10 kcal per hour (0608).

■ Sedentary desk workers might be less likely to gain weight if they could burn an additional 100 kcal a day. Ways to do that include standing for half of the time while at your desk and being sure to include brief 2-minute walks every 30 minutes. For example, workers could walk to a printer down the hall, or take stairs to use the bathroom on another level (1723).

■ Hockey Fans in Training (Hockey-FIT) is a 12-week, 90-minute, male-friendly weight management program that includes training, nutrition education, and healthy lifestyle tips. Overfat hockey fans (who don't play hockey) who participated in this program boosted their physical activity, lost weight, and lowered their

BMI. Similar to the highly effective Football Fans in Training (FFIT; www.ffit.org.uk), this HockeyFIT program has the potential to help overweight and obese men improve their health (2140).

■ In weight-class sports, athletes commonly attempt to gain a competitive advantage by losing weight. A survey of 17 experienced Jiu-Jitsu athletes who competed in the Lightweight (167 lb; 76 kg) category indicates they lost on average 6 lb in about 9 days. Weight loss techniques included calorie restriction (100% of the athletes), exercising more than usual (82%), decreasing fluid intake (65%), laxatives (24%), and diuretics (24%). The negative symptoms included dizziness (12%), moments of excessive heat (12%), and sickness (12%) (3205).

Women

■ Women with polycystic ovary syndrome (PCOS) commonly have excess body fat and insulin resistance, two factors that can limit athletic performance. They also have higher-than-usual levels of androgens (male sex hormones), which could be an advantage in terms of increased muscle strength and performance. Results from a pilot study involving 8 sedentary but normal-weight women with PCOS and 10 controls (matched for BMI and activity level) suggest that women with PCOS may indeed have increased muscle strength (1471).

■ Female athletes who under-eat commonly experience amenorrhea and a simultaneous reduction in resting metabolic rate (RMR). The drop in RMR is likely not due to loss of metabolically active tissues (such as muscle and organs) but rather to metabolic adaptations at the tissue level that are indicative of energy conservation (3858).

■ Does psychological stress cause amenorrhea? It certainly can contribute to the problem. The best predictor of menstrual disturbances is an

energy deficit (due to exercise expenditure and calorie restriction). Add in some stress, and the likelihood of a woman not ovulating can increase (3855).

■ Problems with self-esteem, depression, eating disorders, and muscle dysmorphia commonly arise when a person is not able to match his or her body to the idealized physiques presented by today's society. Weightlifting can create a strong positive effect on body image, particularly for men. Aerobic training also has a positive impact on body image, particularly for women who want to be thin. Perhaps being toned and muscular is a preferable goal to being thin (2512)?

■ A survey of 272 girls (grades 6 to 8) in the Southeastern United States suggests that girls with strong self-esteem are more likely to participate in sports than their peers with lower self-esteem. We need to figure out how to boost self-esteem in adolescent girls so they can increase their enjoyment of physical activity and gain the associated health benefits (2531).

Sleep

■ When people go "on a diet," they generally focus on eating less and exercising more. Maybe they should pay more attention to sleep? Inadequate sleep reduces the desire to be physically active and eat healthfully (0107).

■ The hulky body valued among football linemen may predispose them to sleep apnea or other types of sleep-disordered breathing (and the associated risks of cardiovascular and metabolic disease). Incorporating sleep assessments into the screening process of collegiate athletes could help identify the football players at risk so they could take steps to resolve that issue (3813).

Activity/Exercise

■ Do women exercise primarily for weight control benefits—or do they

value the psychological and physiological benefits of regular physical activity? A survey of 250 college-age women reported they valued feeling strong, energized, more powerful, determined, balanced, content, inspired, and unstoppable. Yes, there are many benefits of regular physical activity beyond burning off calories (2520)!

■ How accurate are activity trackers? FitBit Charge overestimated energy expenditure during four 5-minute stages on a treadmill (at each stage, the incline and speed got higher); FitBit One underestimated energy expenditure. Devices worn on the hip seem to be more accurate than devices worn on the wrist. The bottom line: Do not replace calories according to what a tracker says. Your body is actually your best calorie regulator (2763).

Importance of Sports RDs

■ Collegiate athletes face multiple nutritional challenges, including meeting body weight and body composition standards, having limited time to eat, and enduring frequent travel. They can certainly benefit from nutrition education programs. Athletes who participated in a program focused on nutrition for performance increased their likelihood of obtaining nutrition information from a qualified sports dietitian instead of from other sources such as family, friends, or popular media. SCAN members: Be ready to step up to the plate (3202)!

Summarized by "Conference Highlights" editor and sports dietitian Nancy Clark, MS, RD, CSSD, who has a private practice in the Boston area and is author of the best-selling Nancy Clark's Sports Nutrition Guidebook. For more information go to www.NancyClarkRD.com.

Reviews

Motivational Interviewing for Nutrition and Fitness

Dawn Clifford, PhD, RD and Laura Curtis, MS, RD
The Guilford Press, 370 Seventh Avenue, New York, NY 10001
www.guilford.com
2015, softcover; 249 pp, \$25.50
ISBN 9788-1-4625-2418

Counseling is commonly used in various professions, particularly nutrition and fitness. Powerful execution during counseling is key to being able to provide the most effective and beneficial sessions for individuals. *Motivational Interviewing for Nutrition and Fitness* explains motivational interviewing, how to use the technique, and its effectiveness in nutrition and fitness counseling.

The book is organized into five parts. Part I introduces motivational interviewing basics. Part II examines the

four processes of motivational interviewing: engaging, focusing, evoking, and planning for change. Part III centers on how to master particular skills using the acronym OARS: open-ended questions, affirmations, reflections, and summaries. Part IV provides more information and advice beyond the basics to better help, presenting specific scenarios that may occur. Lastly, Part V goes into more detail to explain motivational interviewing and its significance in nutrition and fitness counseling.

The authors take the reader through the process of motivational interviewing and provide excellent examples of how to guide conversations during a session. The objective is to receive honest and realistic answers from clients, while motivating them to achieve their goals or encouraging them to set a goal. Food, exercise, and emotions may be conflicting when it comes to weight loss or trying to de-

velop healthier patterns. Therefore, setting realistic and positive goals help clients plan for change and sustain their desired health goal. Although interviewing clients during a session will vary and be personalized, this book is useful in that it provides in-depth explanations and tips on how to best prepare for the ideal session.

Dawn Clifford, PhD, RD is an associate professor and director of the didactic program in dietetics at California State University, Chico. She is also an accomplished speaker and publisher. Laura Curtis, MS, RD is director of nutritional services at Glenn Medical Center in Willows, CA. She is also a lecturer at California State University, Chico and serves as a preceptor to undergraduate dietetic students.

Reviewed by Tasnim El Mezain, RDN for Sharp Healthcare, San Diego, CA.

Research Digest

Effects of Nondairy and Dairy Chocolate Beverages on Cycling Time Trial Performance

Upshaw A, Wong T, Bandegan A, et al. Cycling time trial performance 4 hours after glycogen lowering exercise is similarly enhanced by recovery nondairy chocolate beverages versus chocolate milk. *Int J Sport Nut. Exerc Metab.* 2016;26:65-70.

Immediate post-exercise consumption of carbohydrate (CHO) effectively restores glycogen levels. However, studies have demonstrated that a CHO-protein (PRO) supplement may be more effective than a CHO-only supplement at restoring glycogen levels. The purpose of this study was to determine whether a

nondairy chocolate beverage was as effective as a dairy chocolate beverage on cycling performance following glycogen depletion and whether the CHO:PRO ratio, type of PRO (animal or plant source), or total energy in a recovery drink impacted performance in a cycling time trial after a glycogen depleting activity. Eight exercise-trained male cyclists participated in a 5-week, double-blind, crossover, counterbalanced, repeated measures trial. Participants arrived at the laboratory after an 8-hour overnight fast and were given a standardized breakfast no less than 1 hour before all exercise testing. Participants completed five separate exercise trials. Each trial began with a VO_2 max cycling test followed by a glycogen-depleting cycling exercise

about consisting of multiple high-intensity cycling intervals. Water was ingested *ad libitum*. Immediately post-exercise and every 30 minutes through 2 hours, participants ingested recovery drinks with CHO:PRO ratios as follows: chocolate milk (4:1), 1% milk (1.5:1), soy chocolate milk (4:1), hemp chocolate milk (6:1), or a low-calorie CHO placebo. Following an additional 2-hour recovery, participants completed a simulated 20-km cycling time trial. All recovery drinks were isoenergetic (2,107kJ) except the placebo (247 kJ). All recovery drinks enhanced performance on the time trial compared with the placebo ($P=.019$). There was no significant difference in performance between conditions based on CHO:PRO ratio or type of protein. The investigators

concluded that after performing glycogen-lowering exercise, consumption of a recovery beverage with adequate calories and CHO (1 g/kg per hour) will improve performance during a cycling time trial regardless of the CHO-PRO ratio of the beverage or regardless of whether the beverage's protein source is plant- or animal-based. It is unknown from this study whether an isoenergetic CHO-only beverage would produce similar results. Based on the results of this study, athletes may benefit similarly from plant- or dairy-based recovery beverages.

Summarized by Bronwyn Knaebe, graduate student, Department of Nutrition and Integrative Physiology, Coordinated Master's Program Sports Nutrition Concentration, University of Utah, Salt Lake City, UT.

Effects of High-Intensity Interval Versus Moderate-Intensity Continuous Training on Body Composition and Fitness

Matins C, Kazakova L, Mehus I, et al. High-intensity interval training and isocaloric moderate-intensity continuous training result in similar improvements in body composition and fitness in obese individuals. *Int J Sport Nut Exerc Metab.* 2016;26:197-204.

Exercise is a key component in obesity management. However, it is unclear which is the best exercise intensity and duration for weight loss. Therefore, the goal of this study was to determine the effects of a 12-week exercise program of either isocaloric high-intensity interval training (HIIT), moderate-intensity continuous training (MICT), or short duration HIIT with half the caloric deficit of HIIT (1/2 HIIT) on body weight, composition, and cardiofitness. Forty-six obese (mean body mass index [BMI] 33.3 ± 2.9 kg/m²) sedentary males (n=16) and females (n=30) were randomly assigned to HIIT (8-sec sprinting followed by 12-sec rest at 85%-95% maximal heart rate, 250 kcal deficit), one-half HIIT

(HIIT protocol, 125 kcal deficit), or MICT (continuous cycling at 70% maximal heart rate, 250 kcal deficit) performed three times weekly on a cycle ergometer for 12 weeks. Height, weight, waist-hip ratio, body composition (measured with dual energy X-ray absorptiometry), VO₂ max, resting metabolic rate (RMR), fasting substrate oxidation, and fasting and postprandial insulin levels were measured pre- and post-12-week intervention. Habitual food intake was analyzed using 3-day food diaries pre-intervention and at week 11. Results showed a significant reduction in body weight ($P < .01$), waist circumference ($P < .001$), and trunk and leg fat mass ($P < .01$) and a significant increase in VO₂ max ($P < .001$), but no differences between exercise interventions. There were no time or group effects on dietary intake, substrate oxidation, RMR, physical activity levels, and insulin. In summary, all training programs resulted in improvements in body weight, body composition, and cardiovascular fitness. This data suggests that those needing a more time-efficient exercise option may benefit equally from the lower induced-caloric deficit of HIIT as they would from a more time-consuming continuous exercise or longer-duration HIIT regimen.

Summarized by Rose Mattson, graduate student, Coordinated Master's Program Sports Nutrition Concentration, Department of Nutrition and Integrative Physiology, University of Utah, Salt Lake City, UT.

Dietary Flavonoid Intake and Cardiovascular Disease Risk

Kijoon K, Vance TM, Chun OK. Greater flavonoid intake is associated with improved CVD risk factors in US adults. *Br J Nutr.* 2016;115:1481-1488.

Cardiovascular disease (CVD) is the leading cause of death worldwide. Research supports an inverse relationship between a high intake of fruits and vegetables rich in flavonoids and risk of CVD. However, studies examining the association of flavonoid intake with specific CVD

risk factors are limited. Therefore, the purpose of this study was to evaluate the association of dietary flavonoid intake with cardiovascular risk factors including body mass index (BMI), fasting plasma glucose and insulin levels, total and high-density lipoprotein (HDL) cholesterol, and triacylglycerides (TAG). In this cross-sectional, population-based study that included 4,042 adults ages 19 and older, total and individual flavonoid intake, such as anthocyanidins and isoflavones, were estimated using the U.S. Department of Agriculture's Database for the Flavonoid Content of Selected Foods, version 3.1 from 2 days of 24-hour diet recall data from the National Health and Nutrition Examination Survey (NHANES) 2007-2012. This study showed that higher flavonoid intake was associated with improved CVD risk factors ($P < .05$) as follows: insulin resistance was inversely associated with flavone (95% confidence interval [CI]: -3.1% change) and isoflavone intakes (95% CI: -4.01% change), increased HDL-cholesterol was positively associated with total flavonoid intake (95% CI: 0.54% change), TAG and TAG:HDL-cholesterol ratio were inversely associated with anthocyanidin (95% CI: -1.25% change and -1.6% change, respectively) and total flavonoid intakes (95% CI: -1.31% change and -1.83% change respectively), and BMI was negatively associated with anthocyanidin intake (95% CI: -0.60% change). These results confirm a beneficial effect of increased flavonoid intake on CVD risk factors. However, there are some limitations to this study including the use of cross-sectional data, which only allow for statistical associations rather than cause and effect. Because the strength of the associations was moderate, the authors recommend further research to confirm the findings from this study.

Summarized by Sharon Collison, MS, RD, CSSD, instructor of clinical nutrition in the Department of Behavioral Health and Nutrition at the University of Delaware, Newark, DE.

Effects of Low-Dose Fish Oil Consumption on Blood Pressure

Minihane A, Armah C, Miles E. Consumption of fish oil providing amounts of eicosapentaenoic acid and docosahexaenoic acid that can be obtained from the diet reduces blood pressure in adults with systolic hypertension: a retrospective analysis. *J Nutr.* 2016;146:516-523.

Current dietary guidelines regarding n-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) recommend a minimum intake of 0.5 g/day for healthy individuals and 1 g/day for those diagnosed with cardiovascular disease. Most randomized control trials examining the effects of n-3 fatty acids on cardiovascular disease, specifically hypertension, have used daily doses >3 g/day which is difficult to achieve

through diet alone. The purpose of this study was to determine if doses of EPA and DHA between 0.5 to 1.0 g per day can significantly lower blood pressure in adults with and without hypertension. In this double-blind placebo-controlled trial, 312 male and female participants ingested either 3.2 g control oil (80:20 mixture of palm oil and soybean oil), 3.2 g fish oil (1.8 g DHA+EPA), or 3.2 g control oil and fish oil blend (50:50 palm and soybean oil + 0.7 g DHA+EPA) in random order for 8 weeks, with each trial separated by a 12-week washout period. Blood pressure was measured at baseline and at the end of the study. A significant interaction between treatment and blood pressure ($P=.046$) was found in the 48 hypertensive individuals in the study. Individuals with systolic hypertension receiving 1.8 g DHA+EPA experienced a systolic blood pressure drop

of an average of 5.07 mmHg (95% CI: 9.19, -0.96), and those receiving 0.7 g DHA+EPA had a systolic blood pressure drop of an average of 4.98 mmHg (95% CI: -9.14, -0.83). Normotensive and diastolic hypertensive did not see a significant reduction in blood pressure. Intakes of EPA and DHA that can reasonably be achieved through diet or supplementation (2 to 3 portions of fatty fish per week or 2 fish oil capsules a day equaling ~0.7 g EPA+DHA) reduced systolic blood pressure in those with systolic hypertension by 5 mmHG, which is associated with a 20% reduction in cardiovascular disease risk in middle age.

Summarized by Brian Duke, graduate student, Department of Nutrition and Integrative Physiology, Coordinated Master's Program, Nutrition, Education, and Research Concentration, University of Utah, Salt Lake City, UT.

SCAN Notables

■ **Rachel Chambers, RDN** has been selected by Morrison Healthcare as an outstanding employee for her work as a clinical dietitian at Venice Regional Bayfront Health in Venice, FL. Rachel has been described as a role model to both her clients and colleagues. She not only advocates a healthy lifestyle but lives one as well, as a world-class triathlete who has represented the United States in international competition.

■ PULSE'S very own Wellness Editor, **Liz Fusco, MS, RDN**, was recently named the first-ever full-time sports dietitian for US Rowing. Prior to accepting the position, Liz was working

with the United States Olympic Committee and proudly worked with U.S. athletes at the recent Olympics in Brazil.

■ **Meagan Moyer, MPH, RD** has authored *Bits and Bytes: A Guide to Digitally Tracking Your Food, Fitness, and Health*, a recently released book published by the Academy of Nutrition and Dietetics. The book focuses on digital tracking of food and fitness habits, with aims to help maximize such tools for better energy balance. The publication is available in print or as an e-book from the Academy's website at www.eatrightstore.org or from Amazon.

If you have an accomplishment that you would like to be considered for an upcoming issue of PULSE, please contact Michael Stone, MS, at stonemi13@aol.com, or Stone59@purdue.edu

of Further Interest

■ Cast Your Vote for SCAN Leaders

Take an active role in how SCAN is governed by participating in the upcoming election for SCAN leaders. As in past years, SCAN will use an electronic ballot. To vote online, go to the home page of SCAN's Web site (www.scandpg.org) and click on the link that says "2017 Election Ballot." Online voting polls will be open from February 1 to February 22, 2017.

■ View SCAN's Latest Annual Report Online

Members can find SCAN's Annual Report for fiscal year 2015-2016 posted at www.scandpg.org, under the "About SCAN" tab. The report provides an inside look at SCAN's programs, services, initiatives, and more—giving you important highlights on what SCAN has to offer, and how it is continually working for you.

■ Looking for Past PULSE Articles?

If you're doing research or simply want to locate content that appeared in an archived issue of *SCAN'S PULSE*, check out the annual "Index of Topics" posted for each year on SCAN's website. You'll find the issue and page number for each feature article (conveniently listed by practice area) as well as for each item in the "Conference Highlights," "Reviews," and "Research Digest" departments. You can then instantly access the archived issue online. As a member benefit, all *PULSE* issues and annual indexes are available to you for free at www.scandpg.org/nutrition-info/pulse-newsletters.

■ News from Wellness/CV RDs Subunit

Here's an update on developments from the Wellness/CV RDs:

- **Join us in Charlotte for Symposium '17.** Registration is now open for the 2017 SCAN Symposium, to be held March 31 – April 2, 2017 in Charlotte, NC. We have a phenomenal line-up of Wellness/CV-specific sessions and great networking opportunities. Session details and registration are available at www.scandpg.org/2017-symposium/.

- **New Webinar! Sugar and CVD.** Check out our newest webinar, examining the not-so-sweet connection between dietary sugar intake and risk of cardiovascular disease. Go to www.scandpg.org and click on the Professional Development tab, then click "Professionals," then "E-Library" (from the menu on the left), and then "Cardiovascular Health" on the right.

- **Wellness Task Force.** Sincere thanks to all who shared insights in the survey sent out in late 2016! The Wellness Task Force is hard at work evaluating what the results say about how SCAN can best support members' work in wellness. Watch for exciting things ahead!

- **Updated Fact Sheets.** Several of our Wellness/CV fact sheets have been updated to reflect the latest evidence-based practice information. If you use these with your clients, make sure you have the most recent versions. You can access the updated fact sheets on SCAN's website by clicking the Nutrition Info tab and then "Wellness/Cardiovascular Nutrition."

■ News from Sports Dietetics—USA (SD-USA) Subunit

Below are some highlights from the SD-USA subunit:

- **Updated Fact Sheets.** After an extensive revision process, the following fact sheets are now available on SCAN's website: *Alcohol & Athlete Performance*; *Athletes with Type 1 Dia-*

betes; *Caffeine & Athlete Performance*; *Eating Before Exercise*; *Eating During Exercise*; *Eating for Recovery*; *Eating on the Road*; *Exercise Hydration*; *Fueling the Pregnant Athlete*; *Nutrition for the Injured Athlete*; *Optimal Bone Health in Athletes*; *Protein Needs for Athletes*; *Reversing Iron Depletion*; *Smart Supplementation*; *Sports Foods*; *The Female Athlete Triad*; *The Sunny Side of Vitamin D*; *Vegetarian Eating for Athletes*; and *Weight Gain in Sports*. As always, they are free with your SCAN membership.

- **Next CSSD Exam Windows.** The 2017 exam windows will be February 6-27 and July 10-28. The final date to register for the February exam window is January 5. For more information on application deadlines and fees, visit www.cdrnet.org/certifications/board-certification-as-a-specialist-in-sports-dietetics. Also, check out the 20-minute webinar, *CSSD: Prepare Yourself and Succeed!* The webinar can be accessed under "Sports Nutrition Information" at www.scandpg.org. Click on "Become a CSSD."

- **Graduate Sports Nutrition Programs and Certificates list.** Consider earning a graduate degree in a sports nutrition-focused program. You'll find information on this at www.scandpg.org/sports-nutrition-education-programs/.

- **Volunteer Opportunities.** SD-USA has a wide range of volunteer opportunities, from editing and reviewing webinars and publications to working with the social media team. Sign up today at www.scandpg.org/volunteer-opportunities/.

- **Opportunities to Collaborate.** Get involved in these opportunities: **1) NATA Partnership:** If you work with athletic trainers, make sure they know about SCAN and the resources we offer. Encourage them to ask the National Athletic Trainers' Association (NATA) to continue collaborating with SCAN. Each of us plays an important

role in the health and performance of athletes. If you have ideas to share, contact Jen Doane, MS, RD, CSSD, at jdoane@anwnutrition.com; **2) Athletes and the Arts (AATA):** This initiative of the American College of Sports Medicine (ACSM) and other organizations focuses on linking the sport athlete and musician/performing artist communities through collaborative exchange and application of wellness, training, and performance research and initiatives. Visit www.athletesandthearts.com and let SCAN and AATA know if you're working with performance athletes; and **3) PINES:** Join this international group focused on linking professionals in nutrition, exercise and sport around the globe, thereby enhancing excellence in sport nutrition services provided to athletes and active individuals. www.pinesnutrition.org.

• **SD-USA Is Connected!** Don't miss an easy way to keep up with the latest in sports nutrition: You can follow SD-USA on Twitter at our handle @SportsDietetics, and link to our profile page at <http://twitter.com/SportsDietetics>.

• **Sports Nutrition Care Manual® (SNCM).** The Academy's online SNCM contains research-based nutrition information written by authors who are CSSDs. The price is \$75 for Academy members. Preview the manual and selected pages at <http://sports.nutritioncaremanual.org/>.

■ News from DEED Subunit

Following are announcements from the Disordered Eating & Eating Disorders (DEED) subunit:

• **DEED e-Newsletter.** The most recent *Bite by Bite* e-newsletter featured the topic of sports and eating disorders, and the upcoming e-newsletter discusses diabulimia. Be sure to log on to www.scandpg.org to read all past editions.

• **Fact Sheets.** You'll find two new DEED fact sheets on SCAN's website. *Navigating the Complexity Between Weight and Health* discusses how the non-diet approach allows clients to develop lifestyle changes that can positively impact health without the contraindications of dieting. *Basic Facts on Eating Disorders* discusses the latest criteria for ED diagnosis.

• **Let's Hear from You!** We welcome your ideas for DEED and our upcoming publications. To share your thoughts, contact the DEED director, Sarah Gleason RDN, CEDRD, at sarah@sarahthedietitian.com.

■ Two Empowering Resources from the Academy

Through two resources available from the Academy, RDNs can enhance their effectiveness in motivating clients to make healthy changes as well as help them capitalize on today's digital tools:

• **Inspiring and Supporting Behavior Change: A Food, Nutrition, and Health Professional's Counseling Guide, Second Edition.** This latest edition presents a step-by-step approach for guiding clients through the change and goal-setting process. Through sample dialogues and real-life scenarios, the guide demonstrates how to move clients past some of the hurdles they may face in reaching their health goals. Find out how you can be a motivating force for positive change! This price is \$19.95 for members and \$29.95 for nonmembers.

• **Bits and Bytes: A Guide to Digitally Tracking Your Food, Fitness, and Health.** The number of digital health tools have increased rapidly in recent years, and more health professionals are recommending their use. Digitally tracking one's own food and fitness habits has many benefits—it's easy, comprehensive, and fun. This handy

Manuscripts for PULSE Welcomed

SCAN'S PULSE welcomes the submission of manuscripts to be considered for publication. In particular, PULSE is interested in receiving original research reports and review articles. Manuscripts presenting practical guidelines, case studies, and other information relevant to SCAN will also be considered.

Manuscripts must be prepared and submitted in accordance with PULSE's Guidelines for Authors; only manuscripts that follow these guidelines will be considered. The Guidelines for Authors can be accessed at www.scandpg.org/nutrition-info/pulse/.

guide provides practical information to help clients get started with digital health tracking and choose the right resource to achieve their personal health goals. The price is \$9.99.

Both of these publications and other resources can be purchased at www.eatrightstore.org.

■ Call for Abstractors for "Research Digest"

The "Research Digest" department in SCAN'S PULSE includes summaries of published papers relating to all of SCAN's practice areas: nutrition for sports and physical activity, cardiovascular health, wellness, and disordered eating and eating disorders. You can contribute to the "Research Digest" by volunteering to abstract a recently published study on any of the above practice areas. For details on this opportunity, contact Kary Woodruff, MS, RD, CSSD, co-editor of "Research Digest," at kary.woodruff@health.utah.edu. Become a contributor to PULSE!

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Upcoming Events

January 27-28, 2017

"Nutrition for Sports, Exercise & Weight Management: What Really Works and Why" (CPE credit available), Jacksonville, FL. For information: Nancy Clark, MS, RD, CSSD, www.NutritionSportsExerciseCEUs.com

March 3 – April 2, 2017

Mark your calendar and plan to join your colleagues at the 33rd Annual SCAN Symposium, *Syncing Nutrition Science & Practice: Advancing Knowledge and Building Skills*, at the Sheraton Charlotte Hotel, Charlotte, NC. Watch for registration details at www.scandpg.org

April 6-9, 2017

ACSM's Health & Fitness Summit & Exposition, San Diego, CA. For information: acsmsummit.org

April 22-25, 2017

Experimental Biology (EB) 2017, Chicago, IL. For information: experimentalbiology.org/2017/Home.aspx

May 5-6, 2017

Molly Kellogg's Counseling Intensive (18 credits), St. Louis, MO. Registration deadline April 7. For information: <http://www.mollykellogg.com/professionals/counseling-intensive/>

May 30-June 3, 2017

ACSM Annual Meeting, World Congress on Exercise is Medicine®, and World Congress on the Basic Sciences of Exercise and the Brain, Denver, CO. For information: www.acsmannualmeeting.org

SCAN'S PULSE

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Appropriate announcements are welcome. Deadline for the Summer 2017 issue: **Mar. 1, 2017**. Deadline for the Fall 2017 issue: **June 1, 2017**. Manuscripts (original research, review articles, etc.) will be considered for publication. Guidelines for authors are available at www.scandpg.org. E-mail manuscript to the Editor-in-Chief; allow up to 6 weeks for a response.

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(click Nutrition Info tab, then "SCAN'S PULSE")**