SoyConnection
Health & Nutrition News About Soy

Brought to you by U.S. Soy & Soy Nutrition Institute Global SPRING 2024 | VOLUME 32, NUMBER 2

EVIDENCE-INFORMED RECOMMENDATIONS ON PROTEIN AND ITS ROLE IN SUPPORTING EXERCISE ADAPTATION

By Stuart M. Phillips, PhD

The health benefits of exercise are universally recognized and supported by evidence.[1] Exercise provides a set of signals to skeletal muscles to adapt. The stress of exercise, be it energetic or structural stress, leads to muscle adaptations that try to lessen the stress of the subsequent exercise sessions.[1]

Aerobic (endurance) exercise is typified by activities that can be repeated for long(er) durations with sustained effort (biking, walking, running, swimming), and promotes a myriad of muscle adaptations. All of which improve what is known as the oxidative capacity of the muscle tissue due to the proliferation of a mitochondrial network within the muscle.1 This local tissue adaptation is accompanied by improved heart and blood vessel function as fitness improves.[1] The outward manifestation of fitness is captured by $VO_{2\,peak}$, the peak (highest) amount of oxygen the body can consume when we provide maximum effort.

Resistance exercise is a form of exercise that requires the repeated generation of muscular resistance against an external load. The external load could be our body weight (bw) or an external weight (load). Regardless, the practice of resistance training increases strength and, in certain circumstances, can increase muscle size. An increase in muscle size in adults (beyond the period of growth) is referred to as hypertrophy.[2]

A common question is, what diet best supports muscle adaptation? When discussing this question with athletes, I clarify that the 4Rs are important: Rehydrate, Refuel, and Repair to Replay.

1. **Rehydration** is the most easily understood concept for sports performance, and the need to do this is almost implicit.[3]
2. **Refueling** is best accomplished by a balance of carbohydrates, favoring carbohydrates to fuel higher-intensity work,[3] and lipid, which, beyond our small requirement for necessary lipids,[4] is the almost exclusive role of these macronutrients.
3. **Repairing** uses dietary protein as the macronutrient building block substrate for remodeling and restoring tissues to refine the phenotype of tissues like skeletal muscle.[5]
4. **Replaying** happens when the first 3 Rs are acted on, and athletes recover and return to play (or practice).

How much protein do athletes need? The recommended dietary allowance (RDA) defines protein needs and is set at 0.8g protein/kg of bw (actual scale weight)/day or 0.37g protein/lb of bw/day. The RDA defines a minimum protein intake and not an optimal protein intake. The acceptable macronutrient distribution range for protein is 10-30% of total energy intake. Numerous studies and meta-analyses have shown that protein intake greater than the RDA promotes superior muscular adaptations for endurance exercise,[6,7] resistance exercise,[8,9] and mixed arduous (concurrent) training.[10,11] An important consideration is that the repair and remodeling of muscle (and other tissues) takes place over days after exercise, so protein supports this repair and remodeling long after the exercise is over.

Some recommendations focus heavily on the importance of timing of protein consumption with respect to exercise.[12,13] Insofar as protein timing is concerned; however, meta-analyses show no specific advantage to timing protein intake to be in close temporal proximity to exercise to gain an anabolic advantage.[14] By far, the most important variable for protein-related benefits is the total daily protein intake. If there is any advantage of protein timing on exercise-induced adaptations, the effect is small mainly because the effect of exercise in sensitizing muscle to hyperaminoacidemia persists for at least 24h.[15]

The dietary protein intake recommended in the most comprehensive meta-analyses for promoting resistance exercise-induced muscle adaptation is 1.6g protein/kg of bw/day (0.73g protein/lb of bw/day).[8,9] Similar intakes appear beneficial to promote endurance-based or concurrent exercise adaptations.[6,7,10,11]

Since promoting optimal adaptations to exercise requires greater protein intake than the RDA, an important question is whether the source of the “extra” dietary protein matters. However, the axiom that dietary protein from plant-based sources is inherently inferior to animal-derived sources appears to be without merit when considering enhancing exercise adaptations. A randomized controlled trial showed that vegan novice resistance trainees gained similar strength and lean mass as an omnivorous group.[16] It should be noted that both groups were supplemented with protein, from isolated soy in the vegan group, or whey in the omnivorous group, to an intake of 1.6g protein/kg of bw/day.[16]

Importantly, internet-offered arguments that soy affects male reproductive hormones are without substance.[17] Perhaps more surprising is why the concept that male reproductive hormone levels somehow affect hypertrophy is even relevant, given that women gain the same relative amount of muscle as men when undertaking resistance training.[18] A substantive body of evidence shows that testosterone, in particular, is not a primary driver of exercise-induced hypertrophy.[19]

Conversely, a relevant question is how big of an influence added protein (even when optimized) has on the adaptive responses to exercise. The short answer is that the effect is small. It is rare that individual studies, usually employing sample sizes of 8-25 people per group (with versus without protein), show differences between groups.[7-11,20] Pooled effects, with analyses of hundreds or thousands of subjects, show a small but statistically significant effect on outcomes such as strength gain, lean mass (note: not muscle mass) accretion, and increases in peak aerobic capacity.[7-11,20] The pooled estimates indicate benefits, but individual studies do not, which highlights how small the protein effect is.

Protein quality is measured using the protein digestibility corrected amino acid score (PDCAAS) and, more recently, the digestible indispensable amino acid score (DIAAS).[21] While the approaches used to calculate scores share some commonalities, the important differences are around the use of ileal–DIAAS–as opposed to fecal digestibility–PDCAAS. Also, PDCAAS values are truncated at 1.0 with the assumption that essential amino acids (EAA) consumed above the intakes needed for tissue growth and maintenance do not provide any additional benefit. In contrast, EAA are recognized as individual nutrients in

DIAAS, and when their quantities exceed that of the reference protein, proteins can have scores greater than 1.[22] The practical utility of the DIAAS score and what it means for human nutrition has been challenged, especially in the context of a plant-based diet.[23-25] No meta-analysis has identified protein source (plant versus animal) as a variable that affected the outcome, whether in response to aerobic or resistance exercise.[7-11] Meta-analyses specifically focusing on soy-based protein supplements have likewise found no difference between soy-derived versus non-soy-derived protein supplements in promoting hypertrophy and strength gains.[20]

There is minimal evidence showing that plant-based diets are inferior to animal-based diets (or the inverse) in promoting exercise-induced adaptations, especially when protein intakes are 1.6g protein/kg of bw/day (0.73g protein/lb of bw/day).[7-11,20] Soy protein is a high-quality plant protein that does not affect male reproductive hormone levels.[17] In sum, plant-based diets support exercise-mediated adaptations, and soy-derived protein is one of the highest-quality plant proteins and supports aerobic and resistance exercise adaptations well.

ABOUT THE AUTHORS

Stuart Phillips, PhD, is a distinguished university professor in the Department of Kinesiology and a member of the School of Medicine at McMaster University. He is a tier 1 Canada research chair in skeletal muscle health. Dr. Phillips' work centers on the interaction of exercise/physical activity and nutrition in skeletal muscle and body composition.

WORKING WITH ELITE ATHLETES, SERVICE MEMBERS, AND FIRST RESPONDERS: A DIETITIAN'S PERSPECTIVE

By Marie Spano, MS, RD, CSCS, CSSD

Optimal nutrition plays a pivotal role supporting the extreme physical and cognitive demands placed on elite athletes, military service members, and first responders. These populations operate in challenging environments that require individualized evidence-based dietary strategies to enhance performance, health, and recovery

Unique Nutrition Demands

Elite athletes follow training macrocycles to ensure they peak at specific times of the year. These periods typically include pre-season, competition season, and off-season. Nutrition requirements depend on the macrocycle, workload (mode, frequency, intensity, and duration), environment and individual factors including body composition, and metabolic rate.[1]

Unlike elite athletes, service members and first responders must be ready to perform their best year-round. It is challenging to accurately predict energy, carbohydrate, and hydration demands in these individuals due to the unpredictable nature of sustained operations or crisis responses. The duration, type of activity, environment, and load or carrying requirements (typically 10-50kg) can vary substantially between operations. These individuals may be exposed to extreme heat, cold, and high altitude sometimes with little to no time to acclimate. The unpredictable nature of the job for the service member and first responder can lead to short term or prolonged energy imbalance affecting their physical and mental performance as well as risk for injuries.[2]

Performance, Recovery, and the Role of Soy

It is crucial that elite athletes, service members, and first responders regularly consume sufficient calories to meet their training demands, recovery needs, and avoid the consequences of low energy availability.

Energy needs for all of these groups can be approximated using a resting metabolic rate (RMR) equation. As an example, female soccer players may require approximately 3,000 calories/day while an ultra-endurance athlete may require up to 7,000 calories/day.[3,4] Many athletes, particularly female athletes, operate in a calorie deficit which may not only compromise performance but also health.[5]

Calorie needs of service members vary tremendously with reported ranges from 2,342 calories in female combat support personnel to 7,122 calories in male marines.[6,7] Despite their high calorie needs, some service members operate under a large deficit totaling 40-70% of total energy needs (2,500 to 4,500 calories/day) during sustained training or combat situations. This can lead to declines in strength and power, decreases in mental and physical performance, and self-reported increases in depression, anger, fatigue, and confusion.[8,9] Service members can use high-calorie rations during periods of increased caloric demands although rations might not completely bridge the gap in calorie needs.[10] Carbohydrates are the main source of fuel sustaining both anaerobic and aerobic endurance performance. The elite athlete requires 3-12g/kg carbohydrate/day with endurance athletes on the higher end of this range.[11] Approximate carbohydrate needs for service members are 4-8g/kg/day.[2] Specific carbohydrate needs for first responders start at 3-5g/kg/day.[2]

Fat intake can also be manipulated to support one's energy needs. In general, all of these individuals can follow the Acceptable Macronutrient Distribution Range of 20-35% of total calories from fat.

Protein needs for elite athletes range from 1.2-2.0g/kg/day to support metabolic adaptation, immune function, repair of muscle and connective tissue, and accretion of lean mass.[11] However, some athletes, including endurance athletes and bodybuilders, as well as those in a caloric deficit, may benefit from increasing their intake to up to 2.4g/kg/day to decrease muscle mass losses.[11]

Most first responders can follow the recommended protein ranges for athletes. Service members may want to consider the higher end of this range due to the extreme physical stress of their job. Service members often find themselves in negative protein balance during missions which may impair physical performance and increase risk of injury and lost duty time thereby diminishing warfare readiness.[2]

In addition to paying attention to total protein intake, protein quality should be considered. Soy foods are nutrient-rich and a good source of high-quality protein that support the retention and accrual of muscle mass. In fact, soy foods stand out among plant foods as soy protein is similar in quality to animal protein.[11]

Responding to Common Questions About Soy

Long term soy protein intake can support athletic performance especially in sports associated with muscle damage or strenuous exercise. Soy protein can also boost antioxidant defense and limit peroxidation which can lead to tissue damage.[12]

While some individuals have asked if soy protein is as beneficial as whey protein, a meta-analysis of long-term intervention studies (>6 weeks) comparing supplementation with soy protein versus animal protein answered this question. This meta-analysis found both animal protein, including whey, and soy lead to significant increases in strength and lean body mass with no differences between the two.[13]

Prolonged physical exertion, exposure to environmental stressors, and psychological strain can contribute to fatigue, muscle damage, and impaired cognitive function in elite athletes, service members, and first responders. Evidence-based nutrition strategies and an individualized approach can be used to adequately fuel these individuals, thereby optimizing performance, recovery, and resilience while mitigating the risk of injury, illness, and burnout.

ABOUT THE AUTHOR

Marie Spano, MS, RD, CSCS, CSSD, is one of the country's leading sports nutritionists. She is the major league sports nutritionist for the Washington Nationals and previous sports nutritionist for the Atlanta Braves, Chicago Cubs, Atlanta Falcons, Atlanta Hawks, and Atlanta Thrashers. Spano is the lead author of the textbook Nutrition for Sport, Exercise and Health (Human Kinetics 2017), and author of several book chapters on sports performance for the NSCA (National Strength and Conditioning Association) and Human Kinetics. She is a regular speaker at conferences educating strength coaches, sports dietitians, and athletic trainers on a variety of sports nutrition topics.

HEALTHY HANDOUT: NUTRITION NEEDS AND CONSIDERATIONS FOR ELITE ATHLETES

By Kelly Jones, MS, RD, CSSD, LDN

Protein is a regular topic of conversation among health professionals supporting elite athletes. Many elite athletes want to consume more plant proteins for performance as well as personal health. While plant-forward diets are sometimes associated with concerns about protein quality and adequate protein consumption, the primary need among this group is identifying convenient solutions for busy schedules and frequent travel.

Plants can supply adequate protein quality and quantity for elite athletes even if they opt for a plant protein-only diet; although, awareness of the protein content of convenient foods is crucial. Dietitians should discuss total daily protein consumption with a range from 1.2-2.0g/kg of body weight (bw)/day, protein intake timing (ingesting moderate doses every 3-4 hours), and essential amino acids and in particular, leucine.[1]

Leucine is an amino acid that triggers muscle protein synthesis, so consuming adequate amounts may boost muscle recovery and long-term athletic performance. The ideal consumption of leucine is between 700-3,000mg accompanied by at least 0.25g high-quality protein/kg of bw and balanced essential amino acids after exercise and at meals throughout the day.[1] As a high-quality protein containing leucine, soy protein has long been found to promote muscle repair similarly to whey protein.[2]

Evidence also shows soy lowers blood cholesterol levels,[3] an attribute even elite athletes should be mindful of. Athletes struggle to obtain balanced and nutritious meals at appropriate times when at home or traveling and seek guidance to manage blood lipids. This concern is a common thread among athletes in sports such as baseball, as well as those competing in distance running and triathlons.

Since many elite athletes have rigorous travel schedules, convenience, muscle recovery, and overall health are important factors. Because of their variety and versatility, soy foods are a good fit. Health professionals can help athletes identify soy food options in corner stores, quick-serve menus, and those that can be ordered via grocery delivery services. It is also beneficial to outline portion sizes that will provide the recommended leucine doses, along with total protein, so athletes can adjust portions to meet their personal needs.

Soy Food (Portion Size)	Total Protein Content	Leucine Content
Shelled Edamame (1.c, 155gJ)	18g	1.15g
Soybeans, mature seeds, dry roasted (30g)	13g	1g
Extra Firm Tofu (3oz., 85g)	8.5g	0.7g
Tempeh (4oz., 100g)	20g	1.4g
Soymilk 1c. (8oz.)	8g	0.452g
Soy Protein Isolate (1oz., 28.5g)	25g	1.9g

ABOUT THE AUTHOR

Kelly Jones, MS, RD, CSSD, LDN, is a board-certified sports dietitian and media and nutrition communications expert. Jones consults with national sports organizations, global corporations, and like-minded food companies, while her practice has sports dietitians working with athletes at every level, from elite professionals to active parents. Jones also founded and oversees Student Athlete Nutrition.

HEALTHY HANDOUT: NUTRITION NEEDS AND CONSIDERATIONS FOR SERVICE MEMBERS

By Joanne Villaflor, MS, RDN, CSSD, LD

Diet is pivotal in enhancing performance and resilience, especially for elite athletes, military service members, and first responders who push their bodies to the limit in demanding environments. Service members and first responders operate in high-stress environments where physical and mental performance is critical for mission success and personal safety. Their nutritional requirements may differ based on the nature of their duties, environmental conditions, and operational tempo. For example, soldiers deployed in combat zones may require nutrient-dense rations optimized for durability, portability, and shelf stability, while firefighters combating wildfires may face challenges in maintaining hydration and electrolyte balance under extreme heat.[1]

Dietitians collaborate closely with multidisciplinary teams, including strength and conditioning coaches, sports psychologists, and medical professionals, and play a vital role in optimizing performance and resilience across diverse populations. Individualized nutrition plans, periodic assessments, and ongoing support are integral components of comprehensive care to maximize the human weapon systems.[2]

ABOUT THE AUTHOR

Joanne Villaflor, MS, RDN, CSSD, LD, is a performance dietitian with the U.S. military who focuses on service members' body composition and performance for mission readiness. She leads joint efforts with the Department of Defense Performance Nutrition group to optimize operational readiness through fueling strategies. She is a PhD candidate in Leadership, Health, and Human Performance.

REFERENCES

EVIDENCE-INFORMED RECOMMENDATIONS ON PROTEIN AND ITS ROLE IN SUPPORTING EXERCISE ADAPTATION

1. Ashcroft SP, Stocks B, Egan B, et al. Exercise induces tissue-specific adaptations to enhance cardiometabolic health. Cell Metab 2024;36(2):278-300. doi: 10.1016/j.cmet.2023.12.008 [published Online First: 20240105]
2. Lim C, Nunes EA, Currier BS, et al. An Evidence-based Narrative Review of Mechanisms of Resistance Exercise-induced Human Skeletal Muscle Hypertrophy. Med Sci Sports Exerc 2022;54(9):1546-59. doi: 10.1249/mss.0000000000002929 [published Online First: 20220406]
3. Thomas DT, Erdman KA, Burke LM. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance. J Acad Nutr Diet 2016;116(3):501-28. doi: 10.1016/j.jand.2015.12.006
4. Medicine Io. Dietary Reference Intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington, DC: National Academies Press 2005.
5. Phillips SM. Dietary protein requirements and adaptive advantages in athletes. BrJ Nutr 2012;108 Suppl 2:S158-S67.
6. Moore DR, Camera DM, Areta JL, et al. Beyond muscle hypertrophy: why dietary protein is important for endurance athletes. Appl Physiol Nutr Metab 2014:1-11.
7. Lin YN, Tseng TT, Knuiman P, et al. Protein supplementation increases adaptations to endurance training: A systematic review and meta-analysis. Clin Nutr 2021;40(5):3123-32. doi: 10.1016/j.clnu.2020.12.012 [published Online First: 20201215]
8. Morton RW, Murphy KT, McKellar SR, et al. A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training-induced gains in muscle mass and strength in healthy adults. Br J Sports Med 2018;52(6):376-84. doi: 10.1136/bjsports-2017-097608 [published Online First: 20170711]
9. Nunes EA, Colenso-Semple L, McKellar SR, et al. Systematic review and meta-analysis of protein intake to support muscle mass and function in healthy adults. J Cachexia Sarcopenia Muscle 2022;13(2):795-810. doi: 10.1002/jcsm.12922 [published Online First: 20220220]
10. Chapman S, Chung HC, Rawcliffe AJ, et al. Does Protein Supplementation Support Adaptations to Arduous Concurrent Exercise Training? A Systematic Review and Meta-Analysis with Military Based Applications. Nutrients 2021;13(5) doi: 10.3390/nu13051416 [published Online First: 20210423].
11. Hartono FA, Martin-Arrowsmith PW, Peeters WM, et al. The Effects of Dietary Protein Supplementation on Acute Changes in Muscle Protein Synthesis and Longer-Term Changes in Muscle Mass, Strength, and Aerobic Capacity in Response to Concurrent Resistance and Endurance Exercise in Healthy Adults: A Systematic Review. Sports Med 2022;52(6):1295-328. doi: 10.1007/s40279-021-01620-9 [published Online First: 20220203]
12. Kerksick CM, Arent S, Schoenfeld BJ, et al. International society of sports nutrition position stand: nutrient timing. J Int Soc Sports Nutr. 2017;14:33. 10.1186/s12970-017-0189-4
13. Stark M, Lukaszuk J, Prawitz A, Salacinski A. Protein timing and its effects on muscular hypertrophy and strength in individuals engaged in weight-training. J Int Soc Sports Nutr. Dec 14 2012;9(1):54. 10.1186/1550-2783-9-54
14. Schoenfeld BJ, Aragon AA, Krieger JW. The effect of protein timing on muscle strength and hypertrophy: a meta-analysis. Journal of the International Society of Sports Nutrition. 2013;10(1):53.
15. Churchward-Venne TA, Burd NA, Phillips SM. Nutritional regulation of muscle protein synthesis with resistance exercise: strategies to enhance anabolism. Nutr Metab (Lond). May 17 2012;9(1):40. 10.1186/1743-7075-9-40
16. Hevia-Larraín V, Gualano B, Longobardi I, et al. High-Protein Plant-Based Diet Versus a Protein-Matched Omnivorous Diet to Support Resistance Training Adaptations: A Comparison Between Habitual Vegans and Omnivores. Sports Med 2021;51(6):1317-30. doi: 10.1007/s40279-021-01434-9 [published Online First: 20210218]
17. Reed KE, Camargo J, Hamilton-Reeves J, et al. Neither soy nor isoflavone intake affects male reproductive hormones: An expanded and updated meta-analysis of clinical studies. Reprod Toxicol 2021;100:60-67. doi: 10.1016/j.reprotox.2020.12.019 [published Online First: 20201228]
18. Roberts BM, Nuckols G, Krieger JW. Sex Differences in Resistance Training: A Systematic Review and Meta-Analysis. Journal of strength and conditioning research;34(5):1448-60.
19. West DWD, Phillips SM. Anabolic Processes in Human Skeletal Muscle: Restoring the Identities of Growth Hormone and Testosterone. Physician and Sportsmedicine 2010;38(3):97-104. doi: 10.3810/psm.2010.10.1814
20. Messina M, Lynch H, Dickinson JM, et al. No Difference Between the Effects of Supplementing With Soy Protein Versus Animal Protein on Gains in Muscle Mass and Strength in Response to Resistance Exercise. Int J Sport Nutr Exerc Metab 2018;28(6):674-85. doi: 10.1123/ijsnem.2018-0071 [published Online First: 2018/05/04]
21. FAO (2013). Dietary protein quality evaluation in human nutrition. Report of an FAO Expert Consultation, Vol. 92. Rome: FAO Food and Nutrition Paper.
22. Rutherfurd SM, Fanning AC, Miller BJ, et al. Protein digestibility-corrected amino acid scores and digestible indispensable amino acid scores differentially describe protein quality in growing male rats. J Nutr 2015;145(2):372-79.
23. Craddock JC, Genoni A, Strutt EF, et al. Limitations with the Digestible Indispensable Amino Acid Score (DIAAS) with Special Attention to Plant-Based Diets: a Review. Curr Nutr Rep 2021;10(1):93-98. doi: 10.1007/s13668-020-00348-8 [published Online First: 20210106]

24. Lee WT, Weisell R, Albert J, et al. Research Approaches and Methods for Evaluating the Protein Quality of Human Foods Proposed by an FAO Expert Working Group in 2014. J Nutr 2016;146(5):929-32. doi: 10.3945/jn.115.222109 [published Online First: 20160406]
25. Marinangeli CPF, House JD. Potential impact of the digestible indispensable amino acid score as a measure of protein quality on dietary regulations and health. Nutr Rev 2017;75(8):658-67. doi: 10.1093/nutrit/nux025

WORKING WITH ELITE ATHLETES, SERVICE MEMBERS, AND FIRST RESPONDERS: A DIETITIAN'S PERSPECTIVE

1. Thomas DT, Erdman KA, Burke LM. American College of Sports Medicine Joint Position Statement. Nutrition and Athletic Performance. Med Sci Sports Exerc. 2016 Mar;48(3):543-68.
2. Gonzalez DE, McAllister MJ, Waldman HS et al. International society of sports nutrition position stand: tactical athlete nutrition. J Int Soc Sports Nutr 2022;19(1):267-315.
3. Nikolaidis PT et al. Nutrition in Ultra-Endurance: State of the Art. Nutrients 2018;10(12): 1995.
4. Dasa ME et al. Energy expenditure, dietary intake and energy availability in female professional football players. BMJ Open Sport Exerc Med 2023; 9(1): e001553.
5. Jenner SL et al. Dietary Intakes of Professional and Semi-Professional Team Sport Athletes Do Not Meet Sport Nutrition Recommendations—A Systematic Literature Review. Nutrients 2019; 11(5): 1160.
6. Baker-Fulco CJ, Kramer FM, Lesher LL, et al. Dietary intakes of female and male combat support hospital personnel subsisting on meal-focused or standard versions of the meal, ready-to-eat. Army Res Inst Env Med. 2002; https://apps.dtic.mil/sti/citations/tr/ADA406726
7. Hoyt R, Jones T, Stein T, et al. Doubly labeled water measurement of human energyexpenditure during strenuous exercise. J Appl Physiol 1991;71(1):16–22.
8. Nindl BC, Leone CD, Tharion WJ, et al. Physical performance responses during 72 h of military operational stress. Med Sci Sports Exerc 2002;34(11):1814–1822.
9. Castellani J, Nindl B, Lieberman H, et al. Decrements in human performance during 72-84 hours of sustained operations. J Spec Oper Med 2006;11(1):9.
10. Nindl, B. C., et al. Nutrition Needs of Warfighters During Operational Deployments: Accurate and Actionable Metrics Are Needed for Food and Nutrition Research. The Journal of Nutrition 2017;147(11), 2013S-2020S.
11. Spano M, Kruskall L, Thomas T. Nutrition for Sport, Exercise, and Health. Human Kinetics Publishers 2023.
12. Zare R et al. Effect of Soy Protein Supplementation on Muscle Adaptations, Metabolic and Antioxidant Status, Hormonal Response, and Exercise Performance of Active Individuals and Athletes: A Systematic Review of Randomised Controlled Trials. Sports Med 2023;53(12):2417-2446.
13. Messina M, Lynch H, Dickinson JM, Reed KE. No Difference Between the Effects of Supplementing With Soy Protein Versus Animal Protein on Gains in Muscle Mass and Strength in Response to Resistance Exercise. Int J Sport Nutr Exerc Metab 2018;28(6):674-685.

HEALTHY HANDOUT: NUTRITION NEEDS AND CONSIDERATIONS FOR ELITE ATHLETES

1. Jäger, R., Kerksick, C.M., Campbell, B.I. et al. International Society of Sports Nutrition Position Stand: protein and exercise. J Int Soc Sports Nutr 14, 20 (2017).
2. Messina M, Lynch H, Dickinson JM, et al. No Difference Between the Effects of Supplementing With Soy Protein Versus Animal Protein on Gains in Muscle Mass and Strength in Response to Resistance Exercise. Int J Sport Nutr Exerc Metab 2018;28(6):674-85. doi: 10.1123/ijsnem.2018-0071 [published Online First: 2018/05/04]
3. Blanco Mejia S, Messina M, Li SS, Viguiliouk E, Chiavaroli L, Khan TA, Srichaikul K, Mirrahimi A, Sievenpiper JL, Kris-Etherton P, Jenkins DJA. A Meta-Analysis of 46 Studies Identified by the FDA Demonstrates that Soy Protein Decreases Circulating LDL and Total Cholesterol Concentrations in Adults. J Nutr. 2019 Jun 1;149(6):968-981
4. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. Edamame, frozen, prepared. Accessed March 5, 2024. https://fdc.nal.usda.gov/fdc-app.html#/food-details/168411/nutrients
5. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. Soybeans, mature seeds, dry roasted. Accessed April 4, 2024. https://fdc.nal.usda.gov/fdc-app.html#/food-details/172440/nutrients
6. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. Tofu, extra firm, prepared with nigari. Accessed March 5, 2024. https://fdc.nal.usda.gov/fdc-app.html#/food-details/174290/nutrients
7. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. Tempeh. Accessed March 5, 2024. https://fdc.nal.usda.gov/fdc-app.html#/food-details/174272/nutrients
8. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. Soy milk, original and vanilla, unfortified. Accessed March 5, 2024. https://fdc.nal.usda.gov/fdc-app.html#/food-details/172446/nutrients
9. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, 2019. Soy protein isolate. Accessed March 5, 2024. https://fdc.nal.usda.gov/fdc-app.html#/food-details/174276/nutrients

HEALTHY HANDOUT: NUTRITION NEEDS AND CONSIDERATIONS FOR SERVICE MEMBERS

1. Montain SJ, Young AJ. Diet and physical performance. Appetite. 2003;40:255-67.
2. Gonzalez DE, McAllister MJ, Waldman HS, Ferrando AA, Joyce J, Barringer ND, Dawes JJ, Kieffer AJ, Harvey T, Kerksick CM, Stout JR. International Society of Sports Nutrition position stand: Tactical athlete nutrition. Journal of the International Society of Sports Nutrition. Dec 2022;19(1):267-315.
3. Burke LM, Hawley JA, Wong SH, Jeukendrup AE. Carbohydrates for training and competition. Food, Nutrition and Sports Performance III. Aug 2013:17-27.
4. Phillips SM, Van Loon LJ. Dietary protein for athletes: From requirements to optimum adaptation. Food, Nutrition and Sports Performance III. Aug 2013:29-38.
5. Sawka MN, Burke LM, Eichner ER, Maughan RJ, Montain SJ, Stachenfeld NS. American College of Sports Medicine Position Stand. Exercise and fluid replacement. Medicine and Science in Sports and Exercise. 2009;39(2):377-390.

Read the Spring 2024 Soy Connection Newsletter and earn CEUs
Visit us at:
https://www.soyconnection.com/continuing-education/education-credits

SoyConnection
Health & Nutrition News About Soy

The Soy Connection
PO Box 237
Jefferson City, MO 65102
info@soyconnection.com