FOOD WITH BENEFITS

Gain the Competitive Edge With a "Food-First" Approach

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Apply It!

After reading this article, the health and fitness professional should be able to:

- Describe macronutrient and micronutrient recommendations for active individuals.
- Recommend whole-food options and their nutrient profile for replacing supplements in the diets of active individuals.

Key words: Macronutrients, Micronutrients, Performance, Sports Nutrition, Whole Foods

INTRODUCTION

Are supplements necessary to boost performance? In the world of athletics and fitness, many athletes believe a supplement will give them the competitive edge. In 2017, the supplement industry was estimated to be worth 30 billion dollars in the United States, with 40% to 70% of athletes using some type of supplement in an effort to gain a competitive advantage (1). On the contrary, many athletes have adopted a "food-first" approach in lieu of risking a positive drug test due to supplement contamination (2). This article discusses how a food-first approach can provide the "best bang for your buck," and help meet your nutrition needs both during training and off the field. Furthermore, we explore various whole-food options to replace sports nutrition products and supplements because whole foods generally taste better and are more familiar to the digestive tract.

Only a handful supplements have consistently been shown to potentially increase performance, particularly when used to correct an underlying nutrient deficiency including caffeine, antioxidants, nitrates, sodium bicarbonate, beta alanine, and creatine (2). Supplements promising to boost energy are among the most commonly purchased; however, sleep, nutrition, and stress management are more effective and sustainable methods to boost energy levels. If "the athletes' training, sleep, and nutrition are 100%," then a supplement may provide a small benefit. Because whole foods can offer a superior nutrient profile at a fraction of the cost, it makes sense to work on the diet first before spending money on a questionable product.

Meeting Energy and Macronutrient Needs With a Whole-Food Approach

Fueling Preexercise

Consuming a carbohydrate-rich meal before training or exercise will not only increase carbohydrate availability, but also help to abate hunger going into an event. Although there are no magic foods *per se*, it is important for athletes to find their "magic meal," a meal or snack that has been consumed during training sessions for consistent and reliable results. How much carbohydrate should be consumed is related to the timing of the meal. For example, if an athlete chooses to consume the last meal 3 hours before training, 3 g of carbohydrate per kilogram of body weight is recommended (~200 g of carbohydrate for a 150 lb athlete). The following meal would meet these recommendations: 4 cups of sports drink (60 g CHO), 1 banana (30 g CHO), 2 cups of oatmeal (60 g CHO, 20 g PRO), 2 tbsp honey (32 g CHO), 2 tbsp peanut butter (8 g CHO, 7 g PRO) (https://ndb.nal.usda.gov/ndb/).

Protein timing may be less important. For athletes wanting to build and repair muscle tissue, and decrease muscle soreness, a small amount of protein (~15–25 g) may be beneficial to include in the preexercise snack/meal (3). The preexercise meal should be lower in fat and fiber so that digestion is not delayed. However, it should be noted that tolerance of foods that are higher in fat and fiber is highly individual and may be better tolerated further away from the workout (~3 hours before). Furthermore, if athletes get nervous or


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have a queasy stomach, liquids (such as smoothies or yogurt) or nondairy foods (toast with peanut butter or white rice) may be a better option.

Preexercise meal ideas:

- 1 cup oatmeal, 2 tbsp peanut butter, and 1 banana (60 g CHO, 13 g PRO)
- Fruit smoothie made with low-fat milk and a handful of granola (87 g CHO, 12 g PRO)
- PB&J sandwich (~41 g CHO, 11 g PRO)
- Low-fat Greek yogurt, apple, walnuts (58 g CHO, 18 g PRO)

Fueling During Exercise

During exercise lasting longer than one hour in duration, athletes should consume carbohydrates to enhance carbohydrate availability, maintain blood glucose levels, and avoid fatigue. Fueling early and often not only boosts performance but also can optimize exercise recovery. The 2016 Academy of Nutrition and Dietetics (AND), Dietitians of Canada (DC), and the American College of Sports Medicine (ACSM) position paper on Sports Nutrition for Athletic Performance recommends consuming 30 to 60 g of carbohydrate per hour for endurance exercise lasting longer than one hour (3). Sport foods (bars, gels, and sports drinks) have provided athletes with a portable and convenient source of energy to fuel their workouts and competition (See SCAN Fact Sheet on Sport Foods). However, these products may not be cost effective, and therefore, whole foods may offer a more affordable option. For example, a sports bar may cost the individual approximately $1.50, whereas a banana would cost approximately $0.25.

Although studies examining the use of sport foods on performance are well documented, research examining the use of whole foods on performance-related variables is lacking. Bananas are an inexpensive source of energy commonly used by athletes because of their carbohydrate and potassium content. A medium banana contains approximately 105 kcal, 27 g of carbohydrate (14 g of sugar with a mix of glucose, fructose, and sucrose), 3 g of fiber, and 420 mg of potassium (4). Data from Dr. Neiman's laboratory suggest that ingestion of bananas during exercise was just as effective as an isocaloric carbohydrate-electrolyte beverage (0.2 g/kg carbohydrate every 15 minutes) in cyclists during a 75-km cycling time trial (4).

Athletes should experiment with foods during training (not on competition day!) to determine what foods work best for their body. See Table 1 for portable sources of quick carbohydrate.

Fueling Postexercise

Recovery nutrition is crucial for athletes and active individuals engaging in two-a-day training sessions, or with short recovery periods (<8 hours) between workouts. Recommendations suggest consuming a meal or snack containing approximately 1.0 to 1.2 g of carbohydrate/kilogram of body weight, and 15 to 25 g of protein within an hour after exercise, followed by another meal approximately 2 hours postexercise up to 4 to 6 hours postexercise depending on the extent of glycogen depletion (3). The goal of the postexercise meal is to abate hunger also while replacing glycogen stores, repairing muscle tissue, and rehydrating the body.

Low-fat chocolate milk has been suggested to be an effective, lower cost recovery aid with a carbohydrate: protein (CHO:

TABLE 1: Portable Carbohydrate Options

Food	Amount	Carbohydrate (g)
Applesauce	4 oz	20
Pretzels	1 oz (handful)	23
Raisins	¼ cup	31
Fig bars	1 bar	19
Boiled potatoes/ sweet potatoes	½ cup	15
Rice cakes	1 cake	7
Granola bars	1 bar	14
PB&J sandwich	1 sandwich	41

Nutrition information from United States Department of Agriculture (USDA) database: https://ndb.nal.usda.gov/ndb/.

PRO) ratio comparable to many commercial recovery beverages for athletes competing in events with short recovery periods (*i.e.*, 4–6 hours between preliminary heats and finals) such as track and field, swimming, and multiple-day events, such as the stage, race cycling (5). Chocolate milk not only is high in carbohydrate; it also provides fluids and sodium, which are necessary for rehydration. Chocolate milk also is high in calcium, a major constituent in muscular contraction and necessary for building and maintaining strong bones. Based on the recommendations, a 130-lb athlete would need to consume approximately 16 oz (60 g CHO and 16 g PRO) of low-fat chocolate milk per hour postexercise. To meet the postexercise recovery recommendations, a week's worth of chocolate milk would cost the athlete approximately $10 on average compared with $30 per week with an over-the-counter recovery beverage.

Many studies have concluded that the consumption of milk-based protein foods after resistance training is effective in increasing muscle strength (3). Because of high leucine content, dairy proteins are largely regarded as superior protein sources to optimize muscle protein synthesis postworkout; however, lean meats also are a good option (3). See Table 2 for examples of foods with recovery benefits.

Meeting Micronutrients Needs With a Whole-Food Approach

In general, micronutrient needs for active individuals are not different from the average person. However, active individuals with low energy intake, following a diet, or those who need to "make weight" may be at risk for micronutrient deficiencies and require supplementation given that exercise stresses the metabolic usage, and training adaptions may increase the demand of certain micronutrients (3).

Whole Foods and Bone Health

Athletes should focus on consuming a diet rich in calcium (1,300–1,500 mg/d for athletes 11 to 24 years; and 1000 mg/d for active individuals ages 19 to 50 years), vitamin D (600 IU/d), and protein to keep bones strong. Active individuals with low energy availability (LEA) or menstrual disturbances need 1,500 mg of calcium per day, and 1,500 to 2,000 IU of vitamin D per day for optimal bone health (3).

Vitamin D plays an important role in bone health because of its regulatory role in calcium and phosphorus absorption (3). Athletes who live at latitudes above the 35th parallel and those who train and compete indoors are at the highest risk for vitamin D insufficiency (3). Studies have suggested that optimal vitamin D levels may prevent injury, reduce inflammation, and decrease the risk of both acute respiratory illness and stress fracture (3). Because athletes are at increased risk of stress fractures, it is important for vitamin D levels to be assessed in athletes. More research is warranted to determine recommendations and supplementation protocols for active individuals (6). Furthermore, current data are inconclusive as to whether vitamin D supplementation provides an ergogenic benefit or enhances performance (3). Calcium plays an essential role in bone tissue maintenance and muscle contraction, and low intake contributes to the risk of low bone-mineral density and stress fracture. Supplementation with calcium only should be recommended after a thorough assessment of dietary intake (3). Milk, cheese, yogurt, and dark leafy greens are good dietary sources of calcium, whereas good sources of vitamin D include fortified milk, wild salmon, canned tuna, and fortified orange juice. Magnesium also is a crucial component of bone health and is involved in hundreds of metabolic processes. Dark leafy greens and pumpkin seeds are good food sources of magnesium.

Whole Foods and Iron Status

Iron is an important component of blood that assists in oxygen transport throughout the body. Iron deficiency can impair muscle function and work capacity and lead to fatigue, loss of appetite, risk of illness, and decreased athletic performance (3). Without

TABLE 2: Foods With Recovery Benefits

Food	Amount	Carbohydrate (g)	Protein (g)
Chocolate milk	8 oz	30	8
Greek yogurt, fruit, and nuts	1 container, 1 cup, ¼ cup	43	18
Pita and hummus	1 pita, 2 tbsp	19	5
Graham crackers with peanut butter	4 crackers, 2 tbsp	27	9
Fruit smoothie with low-fat milk and spinach	1 cup milk, 1 cup fruit, 1 cup spinach	29	10
Turkey and cheese sandwich	2 oz, 2 slices cheese, 2 slices bread	21	19
Rice and beans bowl	1 cup, ½ cup	48	11

Source: USDA Nutrient database.

clinical evidence of iron deficiency, it is not recommended that athletes routinely take iron supplements. Female athletes, distance runners, and vegetarian athletes are at the highest risk for iron deficiency anemia. Although supplementation may be prescribed for athletes with iron deficiency, unnecessary iron supplementation may lead to gastrointestinal distress and toxicity. Therefore, athletes should only undertake an iron supplement regimen under the surveillance of a physician. Iron supplementation is unlikely to yield performance benefits if the athlete is not clinically deficient (3). Instead, athletes should focus on consuming well-absorbed food sources of iron including meat, poultry, and fish in conjunction with vitamin C-rich foods (oranges, strawberries, and bell peppers) to increase absorption. Fortified cereals, cooked beans, and dark leafy greens also are good sources of iron.

Whole Foods and Antioxidants

Antioxidants, like vitamins C and E, may have important recovery benefits, helping to restore an athlete's capacity to perform work by reducing muscle damage, boosting immune health, and lessening fatigue. However, taking mega doses of antioxidants may prevent adaptations — such as increased strength or increased endurance — that athletes are trying to achieve during training. Morrison et al. (2015) found that daily supplementation of 1,000 mg vitamin C and 400 IU of vitamin E interfered with skeletal muscle adaptation during endurance training (7). Likewise, although there are some noted benefits of vitamin E supplementation, including improved endurance performance in high-altitude conditions, there is more research showing that chronic vitamin E supplementation can impair training adaptations and hinder performance (8). Conversely, researchers have not seen adverse effects to training adaptations from whole-food sources, according to professor of Human Physiology and sports nutrition expert Graeme Close (9). Almonds, sunflower seeds, and cooked spinach are good sources of vitamin E. Citrus fruits, like oranges and grapefruit, strawberries, broccoli, peppers, and tomatoes, are good food sources of vitamin C.

Functional Foods: Benefits Beyond Basic Nutrition?

Beetroot juice is used by some athletes with the goal of improved endurance and muscular efficiency. Beetroot juice is a potent source of dietary nitrate, which helps to increase blood flow and gas exchange in the body, leading to increased cardiovascular endurance (10). Several studies have shown that beetroot juice can provide a small positive effect on cardiovascular exercise performance (11). However, researchers don't yet know if high intake of nitrates over extended periods of time have negative health consequences (10). Furthermore, there is not a recommended dose, and athletes may respond differently to beetroot juice supplementation (11). Depending on the level of training, some athletes may require larger doses or a longer period of adaptation, whereas some athletes may not respond at all to supplementation (11). The most common adverse effect of beetroot juice supplementation is beeturia, or red-colored urine. Fruits

and vegetables have naturally high nitrate contents; therefore, a diet rich in fruit and vegetables is the best practice to improve endurance (10).

Tart cherry juice is a popular recovery aid because of its high content of antioxidants including anthocyanins, flavonoids, and melatonin (12). The antioxidant properties of tart Montmorency cherries can help to reduce inflammation and muscle soreness after exercise, in turn leading to better recovery of muscle function and improved sleep quality (12). Montmorency cherries are best consumed as a fresh pressed juice or a juice concentrate, and it is generally recommended that 30 mL of the concentrate are consumed or diluted with 100 to 200 mL of water (12). Because concentrates typically offer 60 to 90 cherries per serving, it would be difficult to consume sufficient quantities of whole cherries for the same benefit (12). For the best results, athletes should use a *load phase*, where tart cherry juice supplementation is taken twice per day for 1 to 7 days before competition in addition to 1 to 5 days postcompetition (12). It is important to note that tart cherry juice supplementation only should be used when recovery is the main goal, such as when athletes have short periods of time between competition, and not when training adaptation is the goal.

Table 3 displays the nutrient (energy, carbohydrate, protein, fat, and select micronutrients) profile of a pre- and postexercise meal containing whole foods versus supplements. Whole foods provide options for meeting the energy demands pre-, during, and postexercise. Furthermore, whole foods can provide the nutrients necessary for optimal bone and blood health and antioxidant function. A Certified Specialist in Sports Dietetics (CSSD) can prescribe and help design a diet to help meet the demands of training.

Know when to refer! *It's important for health fitness professionals to stay within their scope of practice when it comes to nutrition knowledge, skills, and abilities. Clients should be referred to a CSSD for diet prescription and meal plans that meet the needs of training.*

Additional Resources:

SCAN Fact Sheets (http://www.scandpg.org/sports-nutrition/sports-nutrition-fact-sheets/sn-fact-sheets/)

- Eating Before Exercise

- Sport Foods
- Nutrition During Exercise
- Recovery Nutrition

(These resources are free to members of SCAN and include a nominal charge to non-SCAN members.)

TABLE 3: Nutrient Content of a Preexercise Meal and Postexercise Meal Containing Whole Foods vs Supplements

Whole Foods		Supplements	
Preexercise Meal			
Low-fat Greek yogurt parfait with berries	200 calories	*Preworkout supplement*	80 cal
	1 g fat		0 g fat
	14 g protein		0 g protein
	15 g carbohydrate		3 g carbohydrate
	105 mg calcium		45 mg calcium
	3 g leucine		3 g leucine
Cost	$1.00/ serving		$2.00/ serving
Postexercise meal			
Turkey sandwich (2 oz. turkey, whole-wheat bread) & 2 hard-boiled eggs	250 cal	*Over-the-counter recovery beverage (1 serving = 2 scoops)*	270 cal
	7 g fat		1.5 g fat
	18 g protein		13 g protein
	35 g carbohydrate		52 g carbohydrate
	120 mg calcium		100 mg calcium
	5 mg iron		0.9 mg
	1,575 mg leucine		815 mg leucine
Cost/serving	$1.00		$1.70

Source: USDA nutrient database, BodyBuilding.com.

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BRIDGING THE GAP

Taking a food-first approach offers many benefits to athletes including eliminating the risk for a positive drug test, helping meet nutrition needs on and off the field, and saving money. If training, sleep, and nutrition are optimal, then a supplement may provide a small benefit. Whole foods can meet the energy demands pre-, during, and postexercise and provide nutrients for optimal bone and blood health and antioxidant function.