

## The Role of Soy in the Performance of Active and Athletic Americans

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Optimal nutrition is imperative for physical activity, athletic performance, strength training, and recovery. In general, nutrient needs vary by individual, sport or activity, body composition, weight, and fitness or performance goals. Of course, an individual's age, training status, and the intensity and duration of exercise should also be taken into account. Regardless of these variables, physically active individuals should consume diets that follow the 2010 Dietary Guidelines for Americans and adjust intake to address specific calorie and protein needs.

Soyfoods are well suited to meet individual energy and protein needs for all Americans, while helping to keep dietary cholesterol and saturated fat low and nutrient density high. Soyfoods provide essential fatty acids, dietary fiber, iron, and other nutrients. For recreational and non-elite athletes, little evidence exists to support protein intake greater than amounts recommended for the general population.<sup>1,2</sup> But for elite athletes, the joint Position Statement by the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: *Nutrition and Athletic Performance* suggests that protein needs range from 1.2-1.4 g per kg body weight/day for endurance athletes to 1.2-1.7 g/kg body weight/day for strength athletes.<sup>3</sup> Although optimal protein intake levels for athletes are not totally clear, research suggests intake between 1.2 and 1.7 g/kg body weight would be adequate.<sup>1,4</sup> The high quality of soy protein means that it is uniquely suited among plant proteins because it is an excellent source of all essential amino acids.

Along with adequate protein, athletes need adequate calorie and carbohydrate intakes to replenish glycogen stores and repair and build tissue. Moreover, selection of the right amount and type of fat is important to provide energy, essential fatty acids, and fat soluble vitamins without raising blood cholesterol.

### Antioxidants in Soy

The antioxidants in soy are known to have a positive impact on antioxidant status and other aspects of health. Soy-based foods may improve an individual's oxidative state by supplying antioxidants to the body, helping to protect against free radicals. Research has shown that antioxidants may play a role in preventing various chronic diseases associated with oxidative stress such as cancer, cardiovascular disease, and diabetes.<sup>5</sup>

Exercise can increase free radical production and oxidative stress, thus increasing lipid peroxides.<sup>6</sup> Consumption of soy protein before moderate-intensity, weight-resistance exercise has been shown to decrease serum lipid peroxides post-exercise.<sup>6</sup> In addition, antioxidant intake may improve antioxidant status in the body. In a study involving participants who followed a strength training protocol, after 9 weeks the group assigned to 33 g of soy protein daily experienced a favorable effect on radical scavenging capacities, positively affecting oxidative status, compared with the control and whey groups.<sup>7</sup> Soy can be beneficial in an oxidative capacity, which may also be beneficial in relation to the muscle.

### Soy in Muscle Growth and Recovery

Skeletal muscles are essential to coordination, balance, speed, and strength. Dietary protein provides both the essential amino acids and calories necessary to help build and repair muscles, organs, and tissues in the body. Through physical activity and daily body functions, muscles are constantly broken down into amino acids and new muscle proteins are being made. Consumption of protein is not directly responsible for building muscle, but protein does have an anabolic effect on muscle tissue. After resistance exercise, muscles are in a catabolic state and although carbohydrate intake following exercise will refuel glycogen stores and delay the rate at which muscle protein catabolizes, protein intake is very much needed for protein synthesis. The intake of complete protein is key to providing the necessary amino acids for muscle building and repair, and soy-based foods provide the high-quality protein necessary for protein synthesis.

Moreover, by combining soy with other proteins, such as whey and casein, an added benefit to supporting muscle growth and recovery may be achieved. Soy protein isolate, whey protein, and casein seem to have different amino acid absorption rates (whey protein is considered "fast,"<sup>8</sup> casein is considered "slow,"<sup>8</sup> and soy protein isolate is more "intermediate"<sup>9</sup>). Because of this variability in absorption, the availability of amino acids in the blood is extended, and the absorption of these amino acids by muscle may increase. The latest double-blind, randomized clinical trial of young adults examined the effect of protein beverages, with identical leucine content, in delivering amino acids to the vastus lateralis muscle after resistance exercise. A protein blend beverage (~19 g) of soy, casein, and whey extended the delivery of phenylalanine and the branch chained amino acids (leucine, isoleucine, and valine) to the

muscle for an hour longer than consuming a whey beverage (~18g) alone. Reidy concluded the prolonged increase in amino acid net balance across the leg muscle, during early post-exercise recovery, suggests prolonged capacity for building muscle.<sup>9</sup>

Many studies also have shown that soy protein, like other high-quality protein, can support increased muscle mass during resistance-type training.<sup>10-13</sup> A 9-week study of young male bodybuilders supplemented with 33 g of soy or whey protein while strength training found a significant increase in lean body mass with either type of protein supplementation compared with the control group.<sup>7</sup> Another study found a significant increase in lean mass in males aged 18 to 40 years who supplemented their diets with 50 g of protein, regardless of whether it was soy, whey, or a blend.<sup>14</sup> Likewise, in postmenopausal women, adding 25 g of soy protein per day to a weight-training program significantly increased resting energy expenditure<sup>15</sup> and muscle mass<sup>11,16</sup> compared with a placebo group with no exercise or protein supplementation. Therefore, soy may be as effective as other forms of protein in increasing strength and improving body composition.<sup>17,18</sup>

Soy protein is highly digestible and is comparable to beef, milk, fish, and egg protein in terms of protein quality.<sup>19</sup> The internationally accepted standard method for assessing protein quality is the Protein Digestibility Corrected Amino Acid Score (PDCAAS). Soy protein isolate has a PDCAAS of 1.00.<sup>20</sup> Haub and colleagues compared the effect of beef versus soy-based textured vegetable protein during resistance training in older men, and found similar improvements in strength in both the beef and soy groups. The muscle area of the vastus lateralis, the largest part of the quadriceps, increased in both groups.<sup>17</sup> A high-protein diet has been shown to improve body composition in overweight and obese people by enabling the loss of fat without significant loss of fat-free tissue.<sup>16</sup> By consuming soy-based foods as a source of protein, athletes can keep intake of cholesterol and saturated fat to a minimum.

## A High-Quality, Heart-Healthy Protein

Cardiovascular disease (CVD) risk factors are a concern among some elite athletes, especially large professional football players. In a cross-sectional study, the prevalence of CVD among veteran football players was compared to men of the same age in the general U.S. population. Hypertension and prehypertension were more prevalent among the National Football League (NFL) players with a larger body mass index (BMI). Large BMIs in either group were associated with increased levels of low-density lipoprotein cholesterol, triglycerides, and fasting glucose, and decreased levels of high-density lipoprotein cholesterol. Both groups had similar occurrences of dyslipidemia.<sup>21</sup>

Based on a review of more than 50 studies that found soy protein reduced blood cholesterol about 3% to 5%,<sup>22</sup> the U.S. Food and Drug Administration (FDA) authorized a health claim for products containing at least 6.25 g of soy protein per serving. The claim recognizes that 25 g of soy protein a day (or four servings of foods with 6.25 g of soy protein), as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. Since 1999, numerous meta-analyses and

significant examination of peer-reviewed data have appeared that support the initial FDA health claim.<sup>23</sup> The cholesterol-lowering effect of soy protein may be enhanced to a 13% to 14% reduction when combined with other foods such as plant sterols, viscous fibers, and nuts.<sup>24</sup>

Although some reports in the press have cautioned use of soy protein, research over the past 20 years involving both men and women has not found negative impacts on breast cancer, testosterone, or semen quality, motility, or quantity. A study by Kalman and colleagues found that after 12 weeks of supplementation with 50 g soy protein, no significant differences occurred in levels of total and free testosterone or sex hormone binding globulin (SHBG).<sup>14</sup> An extensive review found no effects of soy protein or isoflavones intake on testosterone or SHBG in men.<sup>25</sup> The National Cancer Institute and the American Cancer Society recommend that breast cancer survivors can safely consume moderate amounts of soyfoods—anywhere from a few servings a week to three servings a day.<sup>26,27</sup> The evidence has shown that intake of soyfoods is not associated with breast cancer risk and may actually provide protective effects against breast cancer,<sup>28</sup> especially if consumed during childhood and adolescence.<sup>29</sup>

## Re-Set the Plate with Soyfoods

Soyfoods can make great training meals for individuals of all ages and levels. MyPlate recognizes soy-based meat alternatives and tofu in the protein food group; fortified soymilk in the dairy food group; and edamame and soybeans in the vegetable food group. With the variety of soyfoods products available, soyfoods can be incorporated into any breakfast, lunch, dinner, or snack plate.

Consumers can try soy burgers or marinated tofu for lunch or dinner; steamed edamame for on-the-go eating or added to a favorite stir fry; and soy yogurts, whole soy nutrition bars, and soy nuts with dried fruit make great snacks. Soy nut butter provides a nutritious alternative to peanut butter for pre- or post-workout fuel. Fortified soymilk, over cereal or in a smoothie, packs protein into the diet after a workout. For added benefits, soymilk or soy protein can be blended with other protein powders. Although soyfoods are generally low in calories, athletes and fitness buffs should always adjust portion sizes to caloric needs. Soyfoods are simple, healthful choices to help anyone stay fueled, meet performance goals, and maintain a healthy heart.

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*This edition of SCANNERS was made possible through support from National Soyfoods Month.*

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# SOY PROTEIN FOR YOUR HEALTH



The FDA says 25 grams of soy protein a day, as part of a diet low in saturated fat, may reduce the risk of heart disease, the only plant protein to have such claim.



Research demonstrates that including soy protein in your daily diet will reduce LDL cholesterol levels by

**2-7%**

## SOY PROTEIN CHART

All soy-based foods bearing the FDA soy and heart health claim provide at least 6.25 grams of soy protein.

Product	Serving	Ave. Grams of Soy Protein
Soy "burger"	1 patty	14
Tempeh	3 ounces	13
Soy pasta	1/2 cup	13
Soy nutrition bar	1 bar	6-14
Edamame	1/2 cup	11
Soy nuts, roasted	1/4 cup	11
Meatless soy crumbles	1/3 cup	10
Soy yogurt	1 cup	9
Tofu	3 ounces	8
Soymilk	1 cup	7
Soy chips	1 bag	7
Soy nut butter	2 Tbsp.	7

## 5 DAYS OF SIMPLE SWAPS

Reaching 25 grams a day of soy protein is so easy!

Breakfast	Bowl of cereal with soymilk	7 grams
Snack	Soy chips	7 grams
Dinner	Soy pasta	13 grams
<b>Total</b>		<b>27 grams of soy protein</b>
Breakfast	Soy breakfast patties	11 grams
Lunch	Soy nut butter sandwich	7 grams
Dinner	Tacos with soy crumbles	10 grams
<b>Total</b>		<b>28 grams</b>
Breakfast	Soymilk smoothie	7 grams
Snack	Soy nuts	11 grams
Dinner	Stir-fry with tofu	8 grams
<b>Total</b>		<b>26 grams</b>
Breakfast	Bowl of soy cereal	7 grams
Lunch	Soy nutrition bar	14 grams
Dinner	Soy pudding for dessert	6 grams
<b>Total</b>		<b>27 grams</b>
Breakfast	Tofu-egg scramble	8 grams
Snack	Soy yogurt with berries	9 grams
Dinner	Green salad with edamame	11 grams
<b>Total</b>		<b>28 grams</b>

## PHYTO-WHAT???

Phytoestrogens are part of the plant's natural defenses that act differently than hormones in humans.

- Soyfoods contain complex mixtures of proteins, fats, carbohydrates, and bio-active compounds such as soy isoflavones. These isoflavones are phytoestrogens with approximately 1/1,000th the biological activity of circulating human estrogens.<sup>1</sup>
- Mean isoflavone intake for the average U.S. person is only 2.35 mg/day, about the amount from one ounce of soymilk.<sup>2</sup> Soy oil and lecithin do not contain isoflavones.
- In humans, studies show soy isoflavones do not lower testosterone levels, may improve the health of arteries, prevent certain cancers including breast and prostate cancers, and reduce menopausal symptoms.<sup>3</sup>

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