# **Research Update: Protein and Body Composition.**

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A new study shows the benefits of ingesting protein after a workout for increasing muscle mass and strength.

Over the past few years, a considerable amount of research has been published related to protein supplementation and muscle/strength development.<sup>12,6,2,10</sup> Recent work has documented significantly greater gains in muscle mass and strength when protein is ingested in close time proximity to a resistance-training session.<sup>7,4</sup> In a 12-week study conducted with previously untrained men, researchers examined the effects of consuming supplemental protein immediately after versus two hours after a strength-training session. Those who consumed protein immediately after their workout gained significantly more muscle size and strength than those who consumed it two hours removed from their workout.

After age 35, adults may lose 3 to 8 percent of their muscle mass per decade, and higher rates are commonly observed after age 60.<sup>5,8</sup> Therefore, the ability to preserve or regain muscle and strength is an important factor with respect to aging and health. In fact, there is ample evidence that an average muscle loss of 5 pounds per decade is associated with a 3 percent-per-decade reduction in resting metabolism,<sup>9</sup> which can predispose individuals to a dramatic increase in body fat.<sup>13,15</sup> Thus, many have speculated that a significant part of the obesity problem may be due to muscle loss and the resulting metabolic slowdown. If so, well-designed strength-training programs should play a larger role in weight management and the many degenerative diseases/problems associated with obesity (e.g., diabetes, heart disease, stroke, back pain, arthritis).

Large-scale studies conducted at the South Shore YMCA, Quincy, Mass., have shown that previously sedentary adults who perform two to four months of regular strength exercise can add 3 pounds of muscle tissue.<sup>16,14</sup> Resistance training has also been shown to elevate resting metabolic rate by approximately 7 percent, which equates to the expending of roughly 100 additional calories per day in a 175 pound individual, or 1.75 calories per pound.<sup>3,11</sup> This is good news for men and women who want to slow the loss of muscle that accompanies the aging process, and establish or maintain a healthy body composition.

### **Table 1. Changes After Exercise Program**

Changes in bodyweight and body composition after 23-week exercise program (46 participants). Measure Week 1 Week 12 Week 23 Six-Month Change

Bodyweight (lbs.)	184.2	183.1*	181.9*	-2.3*
Body fat (%)	32.3	30.7*	28.9*	-3.4*
Body fat (lbs.)	60.2	56.9*	53.2*	-7.0*
Lean mass (lbs.)	124.0	126.2*	128.7*	+4.7*
Waist girth (in.)	37.2	35.8*	35.7*	-1.5*
Hip girth (in.)	43.4	42.7*	42.2*	-1.2*
Systolic BP (mmHg)	127	126	121*	-6*
Diastolic BP (mmHg)	75	73	71	-4

\*Statistically significant improvement from week 1 (p < 0.05).

## New study

Middle-aged men and women seem to be particularly prone to muscle loss, forfeiting about onehalf-pound to 1 pound of muscle every year of life. In addition, they tend to eat less protein and have more difficulty assimilating the amino acids in the protein they do ingest. Consequently, we, the study team at the South Shore YMCA, decided to examine the effects of a standard strength-training program - with and without supplemental protein - on body composition in a group of adults averaging 59 years in age.

Although we have previously conducted strength-training studies in adults, most have been eight to 12 weeks in length. For this study, we examined body composition changes over a six-month training period, in which half of the participants consumed a protein shake immediately after performing their strength exercise.

We enrolled 68 middle-aged men and women in a supervised, 23-week strength-training program with a frequency of two to three days per week. Below is a brief description of the exercise protocol, which was adapted from American College of Sports Medicine (ACSM) guidelines:1

- 11 weightstack machines: leg extension, leg curl, leg press, incline press, seated row, triceps press, biceps curl, low back extension, abdominal curl, torso rotation and neck extension
- One set of each exercise was performed, with resistance that permitted eight to 12 good repetitions.
- Exercise resistance was increased by about 5 percent when 12 good repetitions were completed.
- A controlled movement speed (about 6 seconds per repetition) with full range of motion was used.

To ensure comprehensive physical conditioning, during each session, subjects also performed 20 minutes of endurance exercise (treadmill walking and stationary cycling at 70 to 80 percent of maximum heart rate), and completed a 20-second stretch for the target muscle group following each strength exercise. For example, immediately after completing the leg extension exercise,

participants stretched the quadriceps muscles, and immediately after completing the leg curl exercise, they stretched their hamstrings muscles.

All of the participants performed the same exercise program in our research facility under close supervision of our instructional staff (two instructors for each six-person class). Forty-six subjects completed the 23-week program. Twenty-four participants consumed a protein drink following their training session, and 22 subjects did not receive supplemental protein. The protein drink (Cinch, manufactured by Shaklee Corp., Pleasanton, Calif.) was prepared by mixing 1.5 servings in water, and provided about 270 calories, 4.5 grams of fat, 35 grams of carbohydrate and 24 grams of protein, and was fortified with free l-leucine.

### **Research results**

After 23 weeks of training, all 46 exercisers experienced significant improvements in body composition, including a 4.7-pound gain in lean (muscle) weight and 7-pound loss in fat weight (see Table 1). These changes appeared to be consistent throughout the six-month training period. For example, subjects added 2.2 pounds of lean weight during the first three months, and 2.5 pounds of lean weight during the last three months. Furthermore, participants lost 3.3 pounds of fat weight during the first three months, and 3.7 pounds of fat weight during the last three months. Study subjects also experienced reductions in resting blood pressure over the six-month exercise period. On average, diastolic blood pressure decreased by 4 mmHg, and systolic blood pressure decreased by 6 mmHg.

Subjects who ingested the post-exercise protein drink increased their lean weight by 5.5 pounds, and decreased their fat weight by 9 pounds - a 14.5-pound improvement in body composition. Those who did not receive supplemental protein increased their lean weight by 3.9 pounds, and decreased their fat weight by 4.9 pounds - an 8.8-pound improvement in body composition. As shown in Figure 1, the participants who consumed post-exercise protein added 1.6 pounds more lean weight and lost 4.1 pounds more fat weight than the no-supplement subjects.

### Figure 1. Shake vs. Non-Shake Groups

Changes in body composition in the Shake vs. Non-

Shake groups.

### **Discussion and application**

This study confirmed the favorable effects of a fitness program on body composition and anthropometric measurements. An interesting finding was that the beneficial effects of a basic exercise program were observed at a relatively even rate over a six-month training period. Our 12-week findings are in agreement with previous short-term studies that reported approximately 3 pounds of lean weight gain and 4 pounds of fat weight loss. However, some have questioned whether the rate of these adaptations would continue over longer training periods. Our subjects experienced comparable changes in body composition during both halves of the six-month

exercise program. Over the first three months they added approximately 2.5 pounds of lean weight and lost approximately 3.5 pounds of fat weight. Likewise, over the second three months they added about 2.5 pounds of lean weight and lost about 3.5 pounds of lean weight. Therefore, it appears that previously sedentary adults can attain significant and consistent muscle gains and fat losses over the first six months of a standard exercise program.

Another finding with practical application for middle-aged men and women was the greater body composition improvement experienced by the participants who consumed supplemental protein immediately after their workout. Subjects who consumed the post-exercise protein drink gained about 25 percent more lean weight and lost 50 percent more body fat. This observation reconfirms the finding that supplying the body with extra protein and carbohydrate following a combined strength/endurance exercise session promotes the addition of lean tissue and the loss of body fat. At present, it is thought that provision of protein after exercise increases the rate muscle proteins are made, which increases the amount of muscle over time.

Based on the results of this study, we found that a standard strength/endurance exercise program consistent with ACSM training guidelines is effective at increasing lean weight, decreasing fat weight and reducing resting blood pressure. Furthermore, we believe that consuming supplemental protein shortly after each training session is beneficial in helping promote desirable body composition changes (increased lean weight and decreased fat weight) associated with a standard strength/endurance exercise program.

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