Research Update:
Benefits of Whey Protein on Muscle

Whey protein is a high-quality dairy protein that contains all the amino acids the body requires for muscle protein synthesis. Evidence suggests that whey protein, found naturally in milk, increases muscle protein synthesis which in combination with resistance exercise can improve body composition. Below are summaries of recent studies that further explain the benefits of whey protein.

Whey protein is one of the best sources of branched-chain amino acids (BCAA), including leucine, which has been shown to independently stimulate muscle protein synthesis

This review article shares data from the USDA Food Composition Tables that show dairy products are rich sources of BCAAs and whey protein isolate is a leading source of leucine. The author cites several studies that give increasing evidence that BCAAs, specifically leucine, have a unique affect on metabolism that includes regulation of muscle protein synthesis and glucose homeostasis. The impact of BCAAs is proportional to availability and dietary intake.

Layman DK. The role of leucine in weight loss diets and glucose homeostasis. *Journal of Nutrition.* 2003;133:261S-267S.

Combining whey protein with carbohydrate stimulates greater muscle protein synthesis following resistance exercise than carbohydrates alone

This study measured the effects of a carbohydrate/protein beverage (21 g fructose/10 g whey protein, providing 4.2 g essential amino acids) versus an isocaloric amount of carbohydrate only beverage (21 g fructose/10 g maltodextrin) on the stimulation of acute muscle protein synthesis (MPS) in eight, healthy, resistance trained males (mean 21 years of age). Subjects underwent a testing protocol with a set resistance routine and upon completion of the protocol, subjects received either the carbohydrate/whey drink or the carbohydrate only drink, in a double blind, randomized crossover design. Subjects performed a total of two trials in random order separated by two weeks. Muscle biopsies were taken of both the exercising and resting leg of the subjects. The subjects also received a tracer of different isotopes of phenylalanine, as markers of MPS. It was determined that the whey protein/carbohydrate drink resulted in a significant rise in MPS after resistance exercise as compared to the carbohydrate only drink. This suggests that when consumed regularly after resistance training, even a minimal dose of whey protein (10 g) and carbohydrate (21 g) may be sufficient to support protein accretion.

Jason E. Tang, Joshua J. Manolakos, Greg W. Kujbida, Paul J. Lysecki, Daniel R. Moore, and Stuart M. Phillips. Minimal whey protein with carbohydrate stimulates muscle protein synthesis following resistance exercise in trained young men. *Canadian Journal of Applied Physiology, Nutrition & Metabolism* 32(6):1132-8, 2007.

Consuming whey protein after resistance exercise can stimulate protein synthesis

Ingestion of amino acids is known to stimulate protein synthesis and result in a positive net muscle protein balance. Tipton and colleagues investigated whether consumption of casein or whey proteins have a similar beneficial effect following resistance exercise. Healthy untrained volunteers were randomly assigned to receive a drink containing either: (1) 20 g casein (N=7); (2) 20 g whey protein (N=9); or (3) placebo (N=7) one-hour after performing a bout of resistance training. Leg muscle biopsies were taken to measure net muscle protein balance. Consumption of both casein and whey proteins were found to bring about a similar positive net muscle protein balance, indicating that whole protein consumption can stimulate muscle protein synthesis after resistance exercise which over time could lead to increased muscle size and strength.

Tipton K, Elliott T, Cree M, Wolf S, Sanford A, Wolfe R. Ingestion of casein and whey proteins result in muscle anabolism after resistance exercise. *Medicine & Science in Sports & Exercise.* 2004;36(12):2073-2081.

Consumption of fluid skim milk promotes greater muscle protein accretion after resistance exercise than does consumption of an isonitrogenous and isoenergetic soy-protein beverage

This study examined the effect of consuming a milk or soy beverage on rates of whole body protein synthesis, breakdown, and leucine oxidation, as well as muscle protein synthesis and net muscle protein balance following resistance training in eight young men who regularly participated in weight lifting activities. Volunteers drank fluid milk or a soy protein beverage after a bout of weight lifting. The drinks were made from isolated soy protein or nonfat milk powder and were equal in protein, carbohydrate, fat and caloric content. Results indicate that consuming a protein beverage (soy or milk) following weight lifting resulted in a positive net muscle protein balance and more muscle protein synthesis. Milk consumption after exercise resulted in a greater net muscle protein balance, and 34 percent more muscle protein synthesis compared to soy. The researchers also hypothesized that a combination of “slow” and “fast” proteins like casein and whey, both found in cow’s milk, would be most effective for building muscle.

Wilkinson S, Tarnopolsky M, MacDonald M, MacDonald J, Armstrong D, Phillips S. *American Journal of Clinical Nutrition.* 2007;85:1031-40.

Whey protein isolate, not casein, improves strength and body composition

Cribb et al. found that whey protein isolate has a greater ability to enhance the changes in body composition and strength that accompany routine resistance exercise compared to casein. In this 12-week, double-blind study, 13 male recreational body builders supplemented their normal diet with one of two proteins: hydrolyzed whey isolate or casein. Researchers examined the effects of protein supplementation on strength, body composition and glutamine levels in the blood before and after a 10-week resistance-training program. Results of the study indicate that the hydrolyzed whey protein isolate group achieved a significant increase in lean body mass and a significant decrease in body fat, while the casein group showed no significant change in body composition. Additionally, while all subjects experienced increases in strength following the 10-week training program, the subjects who consumed whey protein showed significantly greater strength improvements in three exercises (barbell squat, bench press, and cable pull-down) compared to those who consumed casein. There were no significant effects of either training or supplementation on blood glutamine levels for either group.

Cribb P, Williams A, Carey M, Hayes A. The effect of whey isolate and resistance training on strength, body composition, and plasma glutamine. *International Journal of Sport Nutrition and Exercise Metabolism.* 2006;16:494-509.

Supplementation with whey protein/creatine/carbohydrate before and after workouts enhances results

In this 10-week, single-blind, randomized study, 17 resistance trained males were matched for strength and placed in one of two groups: (1) a group who consumed a supplement containing protein/creatine/glucose immediately before and after a workout or (2) a group who consumed the same supplement in the morning before breakfast and late evening each training day. Findings of the study indicate that after 10 weeks of training, supplementation before and after each workout resulted in significantly greater improvements in strength and body composition (increase in lean body mass and decrease in body fat percentage) compared with those who took a supplement in the morning and late evening. The authors conclude a whey protein/creatine/carbohydrate supplement may enhance the desired changes from strength straining, when taken immediately before and after a workout session.

Cribb P, Hayes A. Effects of supplement timing and resistance exercise on skeletal muscle hypertrophy. *Medicine & Science in Sports & Exercise.* 2006;38(11):1918-25.

Ingesting whey protein with or without creatine after resistance exercise results in greater gains in muscle mass and strength compared to carbohydrate

Burke and colleagues tested the effects of whey protein supplementation, both with and without creatine monohydrate, combined with resistance training on muscle mass and strength. Thirty-six healthy, resistance trained males were randomly placed into one of three groups receiving supplementation of: (1) whey protein and creatine, (2) whey protein, or (3) carbohydrate placebo during six weeks of resistance training. Males receiving whey protein (with or without creatine) had greater improvements in muscle mass and knee extension peak torque compared to those receiving a carbohydrate placebo during the six week training program. Additionally, subjects that supplemented with whey protein and creatine had greater increases in muscle mass and bench press than the other groups. However, other measures of muscular strength such as squat strength and knee flexion peak torque were not influenced by supplementation. In conclusion, whey protein consumption during resistance training may provide some benefits over resistance training alone.

Burke D, Chilibeck P, Davison K, Candow D, Farthing J, Smith-Palmer T. The effect of whey protein supplementation with and without creatine monohydrate combined with resistance training on lean tissue mass and muscle strength. *International Journal of Sport Nutrition and Exercise Metabolism.* 2001;11(3):349-364.

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http://www.nationaldairycouncil.org
http://www.healthywhey.org
http://www.wheyproteininstitute.org

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