

Build a Better Body with BCAA's(Branched Chain Amino Acids)

BCAA's play an equally important role in maximizing muscle gains.

Whether your goal is to build muscle, improve performance, or even lose fat, the BCAA's (leucine, isoleucine, and valine) will rock your body—*inside and out!*

By Marie Spano, MS, RD, CSCS

Let's get straight to the point: If your workout goals include getting a model-like physique, boosting muscle gains, or recovering rapidly, you should include Branched Chain Amino Acids (BCAA's) in your supplement arsenal. The BCAA's, composed of leucine, isoleucine, and valine, will rock your body inside and out. Here's why:

Muscle Gains

Whey, casein, and even soy are typically tossed around as the protein powders of choice for people who want to pack on muscle. And, there's evidence they all work. However, BCAA's play an equally important role in maximizing muscle gains.

BCAA's work primarily by preventing muscle breakdown in the recovery period after exercise^{1,2}. After a bout of resistance training, muscle protein synthesis increases, but muscle protein breakdown increases as well to the point where breakdown exceeds synthesis if you aren't getting the nutrients you need.

You can munch on some carbohydrate-rich pretzels or a banana after working out to tip this scale slightly. But you'll still be in a state of greater muscle breakdown.

BCAA's, fortunately, work on the right side of this equation by limiting muscle protein breakdown.

In addition to decreasing muscle breakdown, BCAA's, especially leucine, may also work on the right side of this equation by increasing muscle protein growth³.

Minimizing muscle damage is vital not only for making gains but also because it can help with recovery. And when you recover quickly, you can get back in the gym again and train hard—sooner, rather than later.

Less Soreness, Less Pain

Several studies, using different doses of BCAA's, show just how important they are for decreasing muscle damage. In one study, athletes who rode a bike for two hours at a pretty good clip were supplemented with placebo or 12 grams of BCAA's per day. The researchers discovered that when supplementing with the BCAA's, peak levels of enzymes that tell us

there's been some muscle damage were delayed from two hours to five days for one marker, lactate dehydrogenase (LDH), and from four hours to five days post-test for creatine kinase (CK), indicating BCAA supplementation may reduce muscle damage associated with endurance exercise⁴.

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In another study using a different form of endurance exercise, 16 people participated in a 21-day trek at high altitudes and were supplemented with either placebo or 11.5 g BCAA in a double-blind, placebo-fashion. Both groups lost fat mass (11.7% and 10.3% in BCAA and placebo respectively) and the BCAA group gained a slight amount of lean body mass (1.5%). In addition, lower limb maximal power, as measured after the trek, decreased less in the BCAA vs. placebo (2.4% vs. 7.8%). In addition, the placebo group experienced a 6.8% decrease in arm muscle cross-sectional area whereas the BCAA group experienced no change. These results suggest that BCAA's not only have an anti-catabolic effect but also help protect against losses of muscular power as a result of exhaustive exercise at high altitudes⁵.

Additional research lends even more support to the power of BCAA's and minimizing muscle tissue damage. A dose of 2.6 grams of BCAA's given to middle distance runners decreased markers of muscle damage after long distance runs⁶, 5 grams of BCAA's given to women prior to resistance training decreased delayed onset muscle soreness and muscular fatigue in comparison to placebo⁷.

Leucine & BCAA's and Body Composition

There's one more great benefit to BCAA's that stands out from the research: *they may help you lose some fat.*

BCAA's or leucine alone may help regulate bodyweight, especially while dieting^{8,9}. BCAA's may help regulate satiety, leptin (a hormone in fat tissue that signals the brain that the body is full/satiated), glucose, adiposity, and body weight¹⁰.

In a study examining BCAA supplementation during caloric restriction in elite wrestlers, 25 subjects were given a hypocaloric control diet, hypocaloric high-protein diet, hypocaloric low-protein diet, or hypocaloric high BCAA diet for 19 days.

The BCAA group lost a significant amount of bodyweight (-4 kg, $p < 0.05$) and body fat (-17.3%, $p < 0.05$) in comparison to other groups. In addition, the BCAA group experienced a significant reduction in abdominal visceral adipose tissue (i.e., belly fat). There were no between-group differences in anaerobic capacity, VO₂max, or muscular strength¹¹.

Even if you don't want to lose weight, BCAA's may help athletes who have a hard time getting in enough calories and therefore unintentionally dropping weight¹².

Proper Dosages

How much do you need to decrease muscle damage during endurance exercise^{13, 14} and minimize the loss of lean body mass and power experienced during prolonged exhaustive exercise¹⁵? Aim for 3 to 12 grams mixed in a sports drink one hour before exercise and sip on additional BCAA's in a sports drink throughout exercise lasting longer than one hour. Smaller female athletes can use less—approximately 3 to 5 grams of BCAA's, whereas larger athletes may need more (200-lb athletes, for instance, should aim for 7 to 10 grams). Only those participating in very long bouts of endurance exercise (bike rides lasting several hours, long treks uphill etc.) may need higher doses of up to 12 grams of BCAA's.

In Summary

The research on BCAA's is growing by leaps and bounds. Right now the most convincing research tells us that BCAA's may decrease the amount of muscle damage and soreness associated with intense exercise^{16, 17, 18, 19} helping athletes get back in the gym ASAP. In addition to helping mitigate muscle damage, leucine plays a role in the regulation of muscle protein synthesis—i.e., gaining muscle tissue²⁰ and leucine may be one of the key amino acids that can turn up the fat-burning switch in our body.

BCAA's and Amino Acids in general may not be the "sexiest" or most popular supplement on the market. But when it comes to helping you gain muscle, increase performance, and even lose fat, they provide a big bang for a relatively small buck.

References Cited

- 1 Matsumoto K, Mizuno M, Mizuno T et al. Branched-chain amino acids and arginine supplementation attenuates skeletal muscle proteolysis induced by moderate exercise in young individuals. *Int J Sports Med* 2007;28:531-538.
- 2 Louard RJ et al. Effect of infused branched-chain amino acids on muscle and whole-body amino acid metabolism in man. *Clin Sci* 1990;79:457-66.
- 3 Norton LE, Layman DK. Leucine regulates translation initiation of protein synthesis in skeletal muscle after exercise. *J Nutr.* 2006 Feb;136(2):533S-537S.
- 4 Coombes JS, McNaughton LR. Effects of branched-chain amino acid supplementation on serum creatine kinase and lactate dehydrogenase after prolonged exercise. *J Sports Med Phys Fitness* 2000;40(3):240-246.
- 5 Schena F, Guerrini F, Tregnaghi P, Kayser B. Branched-chain amino acid supplementation during trekking at high altitude. The effects on loss of body mass, body composition, and muscle power. *Eur J Appl Physiol Occup Physiol* 1992;65(5):394-8.

6 Koba T, Hamada K, Sakurai M et al. Branched-chain amino acids supplementation attenuates the accumulation of blood lactate dehydrogenase during distance running. *Sports Med Phys Fitness* 2007;47(3):316-22.

7 Shimomura Y, Yamamoto Y, Bajotto G, Sato J, Murakami T, Shimomura N, Kobayashi H, Mawatari K. Nutraceutical effects of branched-chain amino acids on skeletal muscle. *J Nutr* 2006;136(2):529S-532S.

8 Donato J Jr, Pedrosa RG, Cruzat VF, Pires IS, Tirapegui J. Effects of leucine supplementation on the body composition and protein status of rats submitted to food restriction. *Nutrition* 2006;22(5):520-7.

9 Sun X, Zemel MB. Leucine and calcium regulate fat metabolism and energy partitioning in murine adipocytes and muscle cells. *Lipids* 2007;42(4):297-305.

10 She P, Van Horn C, Reid T, Hutson SM, Cooney RN. Obesity-related elevations in plasma leucine are associated with alterations in enzymes involved in branched-chain amino acid metabolism. *Am J Physiol Endocrinol Metab* 293: E1552-E1563, 2007.

11 Mourier A, Bigard AX, de Kerviler E, Roger B, Legrand H, Guezennec CY. Combined effects of caloric restriction and branched-chain amino acid supplementation on body composition and exercise performance in elite wrestlers. *Int J Sports Med* 1997 Jan;18(1):47-55.

12 Mourier A, Bigard AX, de Kerviler E, Roger B, Legrand H, Guezennec CY. Combined effects of caloric restriction and branched-chain amino acid supplementation on body composition and exercise performance in elite wrestlers. *Int J Sports Med*. 1997 Jan;18(1):47-55.

13 Koba T, Hamada K, Sakurai M et al. Branched-chain amino acids supplementation attenuates the accumulation of blood lactate dehydrogenase during distance running. *Sports Med Phys Fitness*. 2007;47(3):316-22.

14 Coombes JS, McNaughton LR. Effects of branched-chain amino acid supplementation on serum creatine kinase and lactate dehydrogenase after prolonged exercise. *J Sports Med Phys Fitness* 2000;40(3):240-246.

15 Schena F, Guerrini F, Tregnaghi P, Kayser B. Branched-chain amino acid supplementation during trekking at high altitude. The effects on loss of body mass, body composition, and muscle power. *Eur J Appl Physiol Occup Physiol*. 1992;65(5):394-8

16 Van Somere KA, Edwards AJ, Howatson G. Supplementation with beta-hydroxy-beta-methylbutyrate (HMB) and alpha-ketoisocaproic acid (KIC) reduces signs and symptoms of exercise-induced muscle damage in man. *Int J Sport Nutr Exerc Metab* 2005;15(4):413-24.

17 Paddon-Jones D, Keech A, Jenkins D. Short-term beta-hydroxy-beta-methylbutyrate supplementation does not reduce symptoms of eccentric muscle damage. *Int J Sport Nutr Exerc Metab.* 2001;11(4):442-50.

18 Shimomura Y, Yamamoto Y, Bajotto G, Sato J, Murakami T, Shimomura N, Kobayashi H, Mawatari K. Nutraceutical effects of branched-chain amino acids on skeletal muscle. *J Nutr* 2006;136(2):529S-532S.

19 MacLean DA et al. Branched-chain amino acids augment ammonia metabolism while attenuating protein breakdown during exercise. *Am J Physiol* 1994;267:E1010-E1022.

20 Norton LE, Layman DK. Leucine regulates translation initiation of protein synthesis in skeletal muscle after exercise. *J Nutr.* 2006 Feb;136(2):533S-537S.