Build and Maintain Your Muscles

- Provides specific amino acids necessary for protein synthesis
- Enhances muscle retention, recovery, and repair post-workout
- Helps control blood sugar and insulin levels
- Vegetarian source of BCAAs in the ideal ratio

Details
The branched chain amino acids (BCAAs) are three essential amino acids that cannot be made within the body and must be obtained through diet: leucine, isoleucine and valine. Unlike other amino acids, BCAAs are primarily processed inside the mitochondria of muscle cells, making them extremely effective at stimulating muscle building. Although protein in general is needed to stimulate muscle growth, BCAAs and especially leucine are particularly vital to muscle growth and repair. In fact, studies have shown that protein blends without leucine did not actually stimulate muscle development. When taken before and after exercise, BCAAs can prevent protein breakdown and enhance recovery time by reducing muscle soreness.

BCAAs can also help prevent muscle loss in people in weakened conditions. They support muscle maintenance, and have the unique ability to promote muscle growth in non-exercising muscles when other muscles are worked. As a result, BCAAs are indicated for frail and elderly people just as much as strength athletes and exercise enthusiasts to promote strength and independence. BCAAs may also help control blood sugar and insulin, and have been suggested to help balance mood.

Any bodybuilder or competitive athlete will know the importance of supplementing with BCAAs to enhance their muscular health and performance, and so should you.
Discussion
Branched chain amino acids are a group of essential amino acids that includes L-leucine, L-isoleucine and L-valine. Studies have shown that these amino acids are involved in protein synthesis.

Product Variation
Product Code	Size
AOR04278	300 G POWDER

Supplements Facts
Serving Size: 1 Scoop (5 g)

<table>
<thead>
<tr>
<th>Amount</th>
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<tbody>
<tr>
<td>L-Leucine</td>
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<tr>
<td>L-Isoleucine</td>
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<tr>
<td>L-Valine</td>
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Non-medical ingredients:
soy lecithin.

Guarantees
AOR™ guarantees that all ingredients have been declared on the label. Contains no wheat, gluten, corn, nuts, peanuts, sesame seeds, sulphites, mustard, dairy, eggs, fish, shellfish or animal byproduct.

Adult Dosage
Take 1 scoop (5 g) mixed with water or juice daily before a meal, or as directed by a qualified health care practitioner.

Cautions
Do not use if pregnant or breastfeeding. Consult a health care practitioner for use beyond 90 days, if you have liver or kidney disease, or if you have been instructed to follow a low protein diet.

Source
Pharmaceutical synthesis

Main Application
Muscle recovery and repair
Blood sugar control
Mood

Disclaimer
The information and product descriptions appearing on this website are for information purposes only, and are not intended to provide or replace medical advice to individuals from a qualified health care professional. Consult with your physician if you have any health concerns, and before initiating any new diet, exercise, supplement, or other lifestyle changes.

**Research**

**Background**

**What are Branched Chain Amino Acids?**

Essential amino acids must be obtained through the diet; they cannot be made in the body. Branched chain amino acids (BCAAs) are the most abundant of the essential amino acids. The BCAA category includes three amino acids: leucine, isoleucine and valine. BCAAs make up over a third of essential amino acids in body proteins and about one sixth of the total amino acids in muscle proteins. Since muscle mass makes up about 40% of human body weight, BCAAs play a large role in the human body.

**What do they do?**

BCAAs are known to be involved in protein synthesis. BCAAs are unique in that they are metabolized mainly in the muscle, and more specifically in the mitochondria, while most other amino acids are metabolized in the liver. In the mitochondria, BCAAs are oxidized to succinyl-coA and acetyl-coA, providing two potential entry-points into the Kreb's cycle where ATP, or energy, is made. These two substrates are also involved in other important functions in the body. Research has shown that ingesting BCAAs prior to exercise may inhibit protein breakdown during exercise and optimize protein synthesis post-exercise. BCAA plasma levels peak about 30 minutes after ingestion.

**Research**

Leucine, in particular, is the most studied of the three BCAAs since it signals the synthesis of protein and glycogen in the muscle (anabolism, or building), and it also appears to modulate the secretion of insulin or its actions on muscle cells. Glycogen is a quick energy supply for working muscles. Post-workout glycogen storage has traditionally thought to be increased only by consuming a good amount of simple carbohydrates immediately post-exercise. Studies have gotten mixed results when examining the effect of combining protein or BCAAs with carbohydrates for elevated post-exercise glycogen synthesis. The more muscle glycogen stores can be increased, the more energy is available for the next exercise session, resulting in better performance. In terms of protein anabolism, the importance of leucine is demonstrated by the fact that when all amino acids are supplemented except leucine, protein synthesis decreases by 40%!

Isoleucine exerts a hypoglycemic effect that has been observed in humans. It stimulates glucose uptake into the cells and may inhibit glucose synthesis in the liver. Isoleucine also appears to signal glucose usage (catabolism, or breakdown) for energy production in order to spare glycogen and protein from being used to produce energy. This helps to maintain muscle mass and basal fuel levels that help with general muscle function.
Valine may be used to help make glycogen in the liver, thus raising blood glucose levels. Animal studies suggest that valine may enhance fat metabolism.

**Regulating Blood Sugar**

Since BCAAs seem to have metabolic regulating activities similar to insulin on proteins, carbs and fats, and in regulating blood glucose, some studies have examined their effects related to insulin.

In untrained males, one study administered a drink containing BCAAs, arginine and carbs after a single bout of exhaustive exercise. Glucose and insulin were higher in the test group at 40 and 60 minutes post exercise. Testosterone to cortisol ratio was higher at 120 minutes in the test group, indicating anabolism. Fatigue at 120 mins post-exercise was significantly reduced in the test group.

**BCAAs Stimulate Protein Synthesis**

Exercise is well known to stimulate protein synthesis and therefore muscle growth. An exciting discovery is that branched chain amino acids can also stimulate protein synthesis, even without exercise! Protein synthesis is thought to be activated by a process called phosphorylation of certain protein enzymes. Exercise and BCAAs can stimulate some of the same enzymes; however, BCAAs can also potentiate the activity of the enzymes activated by exercise as well as activate other enzymes that are not stimulated by exercise. One study found that leg exercise, when accompanied by BCAA supplementation, activated the enzyme p70(S6k) up to 30-fold in exercising muscle and up to 16-fold even in muscles that were not exercising! The peak activity of these enzymes appears to be between 30-120 minutes post-exercise. One session of exercise did not affect this specific enzyme at all without BCAA supplementation.

**Muscle Preservation and Repair**

BCAAs have also showed beneficial effects in strength training, including reducing muscle soreness and fatigue and assisting in strength gains. One study showed that consuming a BCAA drink 15 minutes prior to performing repetitive squat exercises shortened the period of peak delayed-onset muscle soreness (DOMS) from days 2 and 3 to only day 2 in the test group, and also lowered the intensity of muscle soreness for 4 days after exercise, particularly in females. There was also a tendency toward less muscle fatigue immediately post-exercise and in the 4 days afterward. Another study administered 4g of leucine per day during a 12-wk strength training program in untrained males. In this study, the test group experienced significantly greater strength gains compared to the placebo group in all 8 exercises, although only 5 were significantly greater.

BCAAs may also be helpful in post-exercise recovery in endurance athletes, better preparing them for a good subsequent performance. One study administered a leucine-rich protein and carbohydrate-rich drink to trained endurance cyclists and found a small improvement in a subsequent bout of high-intensity cycling, reduced overall fatigue, and lower plasma CK levels, possibly indicating reduced muscle damage or faster muscle repair.

**Central Factors Related to Fatigue and Mood**

Because BCAAs have been found to help reduce perceived overall fatigue, one theory suggests that they may have central effects in the brain on fatigue and mood. One study examined the effects of
BCAA as an adjunct treatment for acute mania. Findings suggested that BCAAs may help control manic episodes, probably by competing with tyrosine for uptake into the brain thereby limiting dopamine synthesis. Even more concrete was that the treatment outcomes continued on a positive trend a week after ending the treatment in the BCAA group while the placebo group displayed a regressive trend.

**Market Trends**

Many people are concerned with maintaining muscle mass and decreasing recovery time periods from exercise, therefore they turn to amino acid supplements to provide their body with an additional energy source.

**AOR Advantage**

AOR’s BCAA supplement offers a convenient way to get valuable branch chained amino acids into the diet; these are unique in that they are metabolized mainly in the muscle, and more specifically in the mitochondria, while most other amino acids are metabolized in the liver.

**References**


**Abstract**
Leucine supplementation chronically improves muscle protein synthesis in older adults consuming the RDA for protein.


Casperson SL, Sheffield-Moore M, Hewlings SJ, Paddon-Jones D.

BACKGROUND & AIM: Protein-energy supplementation is routinely employed to combat muscle loss. However, success is often compromised by increased satiety, poor palatability, high costs and low compliance.

METHODS: For 2-weeks we supplemented meals of older individuals with leucine (4 g/meal; 3 meals/day; days 2-14). Metabolic studies were performed prior to (Day 1) and following (Day 15) supplementation. Leucine was not provided on metabolic study days. Venous blood and vastus lateralis muscle biopsies were obtained during a primed constant infusion of L-[ring-(13)C(6)] phenylalanine. Mixed muscle fractional synthesis rate (FSR), body composition and markers of nutrient signaling (mTOR, 4E-BP1 and p70S6K1 phosphorylation) were measured before and after a low protein/carbohydrate simulated meal.

RESULTS: The meal modestly increased FSR on Day 1 (postabsorptive: 0.063 ± 0.004 vs. postprandial: 0.075 ± 0.006%/h; p = 0.03), however, two weeks of leucine supplementation increased postabsorptive FSR (p = 0.004) and the response to the meal (p = 0.01) (postabsorptive: 0.074 ± 0.007 vs. postprandial: 0.10 ± 0.007%/h). Changes in FSR were mirrored by increased phosphorylation of mTOR, 4E-BP1 and p70S6K1 (p < 0.1). No change in fat free mass was observed (p > 0.05).

CONCLUSIONS: In older adults, leucine supplementation may improve muscle protein synthesis in response to lower protein meals.

New Therapeutic Strategy for Amino Acid Medicine: Notable Functions of Branched Chain Amino Acids as Biological Regulators.


Yoshizawa F.
The branched chain amino acids (BCAAs) leucine, isoleucine, and valine are the most abundant of the essential amino acids. BCAAs have recently been recognized as having functions other than simple nutrition. The importance of BCAAs as nutrient regulators in protein synthesis was recognized over 20 years ago. Leucine is the most potent of the BCAAs in stimulating muscle protein synthesis, while isoleucine and valine are much less effective. The signaling action of leucine in protein synthesis has been well studied, and the mechanisms are currently under investigation. However, the pharmacological effects of isoleucine and valine have not been clarified. It has recently been reported that, among the BCAAs, leucine and isoleucine act as signals in glucose metabolism. We revealed that isoleucine stimulates both glucose uptake in the muscle and whole body glucose oxidation, in addition to depressing gluconeogenesis in the liver, thereby leading to a hypoglycemic effect in rats. Based on these results, we speculate that isoleucine signaling accelerates catabolism of incorporated glucose for energy production and consumption.

**Leucine-protein supplemented recovery feeding enhances subsequent cycling performance in well-trained men.**


Thomson JS, Ali A, Rowlands DS.

The purpose of this study was to determine whether a practical leucine-protein, high-carbohydrate postexercise feeding regimen could improve recovery, as measured by subsequent cycling performance and mechanistic markers, relative to control feeding. In a crossover, 10 male cyclists performed 2- to 2.5-h interval training bouts on 3 consecutive evenings, ingesting either leucine-protein, high-carbohydrate nutrition (0.1/0.4/1.2/0.2 g·kg(-1)·h(-1); leucine, protein, carbohydrate, fat, respectively) or isocaloric control (0.06/1.6/0.2 g·kg(-1)·h(-1); protein, carbohydrate, fat, respectively) nutrition for 1.5 h postexercise. Throughout the experimental period diet was controlled, energy and macronutrient intake balanced, and protein intake clamped at 1.6 g·kg(-1)·day(-1). The alternate supplement was provided the next morning, thereby isolating the postexercise nutrition effect. Following 39 h of recovery, cyclists performed a repeat-sprint performance test. Postexercise leucine-protein ingestion improved mean sprint power by 2.5% (99% confidence limit, ±2.6%; p = 0.013) and reduced perceived overall tiredness during the sprints by 13% (90% confidence limit, ±9.2%), but perceptions of leg tiredness and soreness were unaffected. Before exercise, creatine-kinase concentration was lowered by 19% (90% confidence limits, ±18%), but lactate dehydrogenase and pressure-pain threshold were unaltered. There was a small reduction in anger (25% ± 18%), but other moods were unchanged. Plasma leucine (3-fold) and essential amino acid (47%) concentrations were elevated postexercise. Net nitrogen balance trended mildly negative in both conditions (mean ± SD: leucine-protein, -20 ± 46 mg·kg(-1) per 24 h; control, -25 ± 36 mg·kg(-1) per 24 h). The ingestion of a leucine-protein supplement along with other high-carbohydrate food following intense training on consecutive days enhances subsequent high-intensity endurance performance and may attenuate muscle membrane disruption in well-trained male cyclists.

**Influence of supplementation with branched-chain amino acids in combination with resistance exercise on p70S6 kinase phosphorylation in resting and exercising human skeletal muscle.**

**Apró W & Blomstrand E.**

**AIM:** Skeletal muscle growth is thought to be regulated by the mammalian target of rapamycin (mTOR) pathway, which can be activated by resistance exercise and branched-chain amino acids (BCAA). The major aim of the present study was to distinguish between the influence of resistance exercise and BCAA on key enzymes considered to be involved in the regulation of protein synthesis, including p70(S6) kinase (p70(S6k)).

**METHODS:** Nine healthy subjects (four men and five women) performed unilateral resistance exercise on two occasions separated by 1 month. Subjects were randomly supplied either a mixture of BCAA or flavoured water. Muscle biopsies were taken from both resting and exercising muscle before, after and 1 h after exercise.

**RESULTS:** Phosphorylation of Akt was unaltered by either resistance exercise and/or BCAA supplementation whereas mTOR phosphorylation was enhanced ($P < 0.05$) to a similar extent in both exercising and resting muscle following exercise in the absence (70-90%) and presence of BCAA supplementation (80-130%). Phosphorylation of p70(S6k) was unaffected by resistance exercise alone; however, BCAA intake increased ($P < 0.05$) this phosphorylation in both legs following exercise. In resting muscle, a 5- and 16-fold increase in p70(S6k) was observed immediately after and 1 h after exercise, respectively, as compared to 11- and 30-fold increases in the exercising muscle. Phosphorylation of eukaryotic elongation factor 2 was attenuated 1 h after exercise ($P < 0.05$) in both resting (10-40%) and exercising muscle (30-50%) under both conditions.

**CONCLUSION:** The present findings indicate that resistance exercise and BCAA exert both separate and combined effects on the p70(S6k) phosphorylation in an Akt-independent manner.

**Effects of a branched-chain amino acid drink in mania.**


Scarna A, Gijsman HJ, McTavish SF, Harmer CJ, Cowen PJ, Goodwin GM.

**BACKGROUND:** Administration of a complex tyrosine-free amino acid drink acutely decreases manic symptoms. Although a nutrient-based approach to illness management is attractive, complex amino acid drinks are too unpalatable for repeated administration.

**AIMS:** To assess whether a simple, branched-chain amino acid (BCAA) drink diminishes manic symptoms acutely and following repeated administration.

**METHOD:** Twenty-five patients with mania were randomly and blindly allocated to treatment with BCAA (60 g) or placebo daily for 7 days.

**RESULTS:** Relative to placebo, the BCAA drink lowered mania ratings acutely over the first 6 h of treatment. In protocol completers there was a persistent advantage to the BCAA group 1 week after the end of treatment.
CONCLUSIONS: A nutritional intervention that decreases tyrosine availability to the brain acutely ameliorates manic symptoms. Further studies are required to assess whether this approach has longer-term efficacy.