**Amino Acid Support / Muscle Metabolism**

Branched-chain amino acids with added L-glutamine

By David M. Brady, ND, DC, CCN, DACBN & Amy Berger, MS

**Amino Acid Support / Muscle Metabolism** combines the branched-chain amino acids (BCAAs)—leucine, isoleucine, and valine—along with the amino acid, L-glutamine, in a great-tasting, orange flavored powder. BCAAs make up 35% of the essential amino acids in muscle protein, and approximately 40% of the total amino acids required by mammals. BCAAs are unique in that they are a direct source of energy for skeletal muscles while also serving as intermediates in the ATP-producing citric acid cycle. They stimulate the building of protein in muscle, reduce muscle breakdown during exercise, and regulate protein metabolism throughout the body. BCAAs stimulate lean muscle synthesis even in the absence of resistance training, making them an effective raw material for lean tissue maintenance in athletes as well as in populations who are unable to exercise, but are at risk for muscle loss.

This product is free of sucrose, fructose and artificial sweeteners, and is sweetened with the natural herb stevia.

---

**Amino Acid Support / Muscle Metabolism may be beneficial for:**

- Sports nutrition – enhancing muscle building and recovery in athletes
- Sarcopenia – facilitating muscle tissue maintenance in aging populations
- Post-operative and traumatic injury recovery – reducing muscle mass catabolism
- Cachexia – attenuating muscle wasting in cancer patients, AIDS patients and others

---

**Athletic Performance and Recovery**

BCAAs can be oxidized as a fuel source in skeletal muscle cells. Supplementation with BCAAs before and after exercise has been shown to attenuate exercise-induced muscle damage and promote muscle protein synthesis, making them a useful addition to exercise and bodybuilding regimens. Supplemental BCAAs help reduce post-effort muscle soreness and suppress the rise in creatine kinase and lactate dehydrogenase after exercise, suggesting an inhibitory effect on the breakdown of muscle protein. Moreover, due to the increased oxidation of BCAAs during endurance exercise, athletes may have higher requirements for these nutrients than sedentary populations. Although not considered an athletic performance enhancer, per se, supplemental BCAAs reduced the perceived rate of exertion among untrained athletes during physical exertion, which may allow exercisers to increase the intensity of their efforts, potentially leading to improved results. Immune system support is another benefit of BCAAs for athletes. Intense exercise, particularly of high frequency and long duration, is known to be immunosuppressive. Supplemental BCAAs may reduce the negative impact of strenuous exercise on the immune system.

**Maintenance of Muscle Mass**

Another area where BCAAs are of particular benefit is in attenuating the breakdown of muscle tissue in post-operative patients and those recovering from physical trauma. Under normal conditions in healthy populations, BCAA oxidation accounts for 6-7% of energy in skeletal muscle, but in highly catabolic states this may be as high as 20%. Compared to a dextrose-only solution, post-operative patients receiving dextrose plus 22%, 35% or 100% BCAAs showed significant reductions in weight loss and muscle catabolism. While the dextrose-only group was in a mean negative nitrogen balance, all three BCAA groups were in nitrogen equilibrium or a slight positive nitrogen balance. Compared to the dextrose-only group, the 22% and 35% BCAA groups lost less body weight, and the 100% BCAA infusion group actually gained a small amount of weight. BCAAs could be a powerful adjunct to post-operative care, particularly for patients who may have been underweight or weakened.

In addition to the post-surgical setting, the muscle-sparing effect of BCAAs may be beneficial in attenuating the dramatic weight loss and muscle wasting that are the most commonly reported causes of morbidity and mortality among cancer patients. Patients who received oral BCAA supplementation while undergoing surgical and non-surgical treatment for hepatocellular carcinoma showed reduced morbidity, reduced peripheral edema and lower rates of ascites compared to non-supplemented controls.
**Synergy with Glutamine**

**Amino Acid Support / Muscle Metabolism** combines leucine, isoleucine, and valine with the amino acid, glutamine, for a synergistic effect in building muscle tissue and supporting the immune system. During prolonged physiological stress, increased glutamine utilization may exceed the body's synthetic capacity, resulting in severe muscle glutamine depletion. Glutamine also plays a key role in the immune system; studies that employed glutamine primarily to protect against muscle wasting demonstrated the added benefit of maintaining immune function in patients at risk for immunosuppression.

Post-operative cancer patients receiving infusions of BCAA-enriched amino acid mixtures showed accelerated muscle protein synthesis compared to patients supplemented with mixtures of equal total protein, but not enriched with BCAAs. The BCAA group experienced significant increases in de novo glutamine synthesis, while the isonitrogenous group showed no change in muscle glutamine synthesis.

The presence of glutamine in a BCAA supplement may also be an additional boon to athletes. Lowered plasma glutamine may be used as a marker for overtraining, and when recovery is inadequate between periods of exercise, this dramatic reduction in glutamine may negatively affect the immune system and the cells of the intestines, potentially leading to gut dysfunction and digestive distress.

**How to Take**

- As a dietary supplement, mix 9 grams (approx. two heaping teaspoons) into 10-12 ounces of water per day, or as directed by a health care practitioner.
- Can be taken pre, peri or post workout.

**Amino Acid Support / Muscle Metabolism**

**Supplement Facts**

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leucine</td>
<td>2.5 g</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>1.3 g</td>
</tr>
<tr>
<td>Valine</td>
<td>1.25 g</td>
</tr>
<tr>
<td>Glutamine</td>
<td>1.25 g</td>
</tr>
</tbody>
</table>

**Other Ingredients:** Natural taste enhancer, certified organic stevia leaf extract powder, natural orange flavor, citric acid, malic acid, silicon dioxide, sunflower lecithin.

**References**