Branched-Chain Amino Acids

Also known as: Branched chain, BCAAs

What do they do? Branched-chain amino acids (BCAAs) include leucine, isoleucine, and valine. BCAAs are essential to the human body. They are needed for the maintenance of muscle tissue and appear to preserve muscle glycogen stores and help prevent muscle protein breakdown during exercise.

Some research has shown that BCAA supplementation (typically 10–20 grams per day) does not result in meaningful changes in body composition, nor does it improve exercise performance or enhance the effects of physical training. However, BCAA supplementation may be useful in special situations, such as preventing muscle loss at high altitudes and prolonging endurance performance in the heat. Studies by one group of researchers suggest that BCAA supplementation may also improve exercise-induced declines in some aspects of mental functioning.

BCAAs can active glutamate dehydrogenase—an enzyme that is deficient in amyotrophic lateral sclerosis (ALS), also called Lou Gehrig’s disease. In one double blind trial, 26 grams per day of BCAA supplements helped those with ALS maintain muscle strength. However, a larger study was ended early when people using BCAA not only failed to improve, but experienced higher death rates than the
placebo group.16 Other studies have shown no benefit of BCAA supplementation for ALS or other neuromuscular diseases.17 18

One study investigating the advantages of BCAA supplementation for diabetics undergoing an intense exercise program found no additional benefit of BCAA on reducing abdominal fat or improving glucose metabolism.19

Patients with liver diseases that lead to coma—called hepatic encephalopathy—have low concentrations of BCAAs and excess levels of certain other amino acids. Preliminary research suggested that individuals with this condition might be helped by BCAAs. Double blind studies have produced somewhat inconsistent results,20 21 22 but a reanalysis of these studies found an overall benefit for the symptoms of encephalopathy.23 Therapeutic effects of BCAAs have also been shown in children with liver failure24 and adults with cirrhosis of the liver.25 Any treatment of people with liver failure requires the direction of a physician.

People with chronic renal failure may also benefit from BCAA supplementation. A preliminary study found improved breathing and sleep quality in people given intravenous BCAAs during kidney dialysis.26

Phenylketonuria (PKU) is a genetic disease that allows abnormally high amounts of phenylalanine and its end products to accumulate in the blood, causing damage to the
nervous system. A controlled trial demonstrated that regular use of BCAAs by adolescents and young adults with PKU improved performance on some tests of mental functioning.27

**Where are they found?** Dairy products and red meat contain the greatest amounts of BCAAs, although they are present in all protein-containing foods. Whey protein and egg protein supplements are other sources of BCAAs. BCAA supplements provide the amino acids leucine, isoleucine, and valine.

BCAAs have been used in connection with the following conditions (refer to the individual health concern for complete information):

**Who is likely to be deficient?** Only an individual deficient in protein would become deficient in BCAAs, because most food sources of protein supply BCAAs. Few people in Western societies are protein deficient.

**How much is usually taken?** Most diets provide an adequate amount of BCAA for most people, which is about 25–65 mg per pound of body weight.28 29 Athletes involved in intense training often take 5 grams of leucine, 4 grams of valine, and 2 grams of isoleucine per day to prevent muscle loss and increase muscle gain, though most research does not support this use of BCAAs.

**Are there any side effects or interactions?** Side effects have not been reported with the use of BCAAs, except in
the one study of ALS described above. At high intakes, of BCAAs are simply converted into other amino acids, used as energy, or converted to fat for storage. However, individuals with kidney or liver disease should not consume high intakes of amino acids without consulting their doctor.

References: