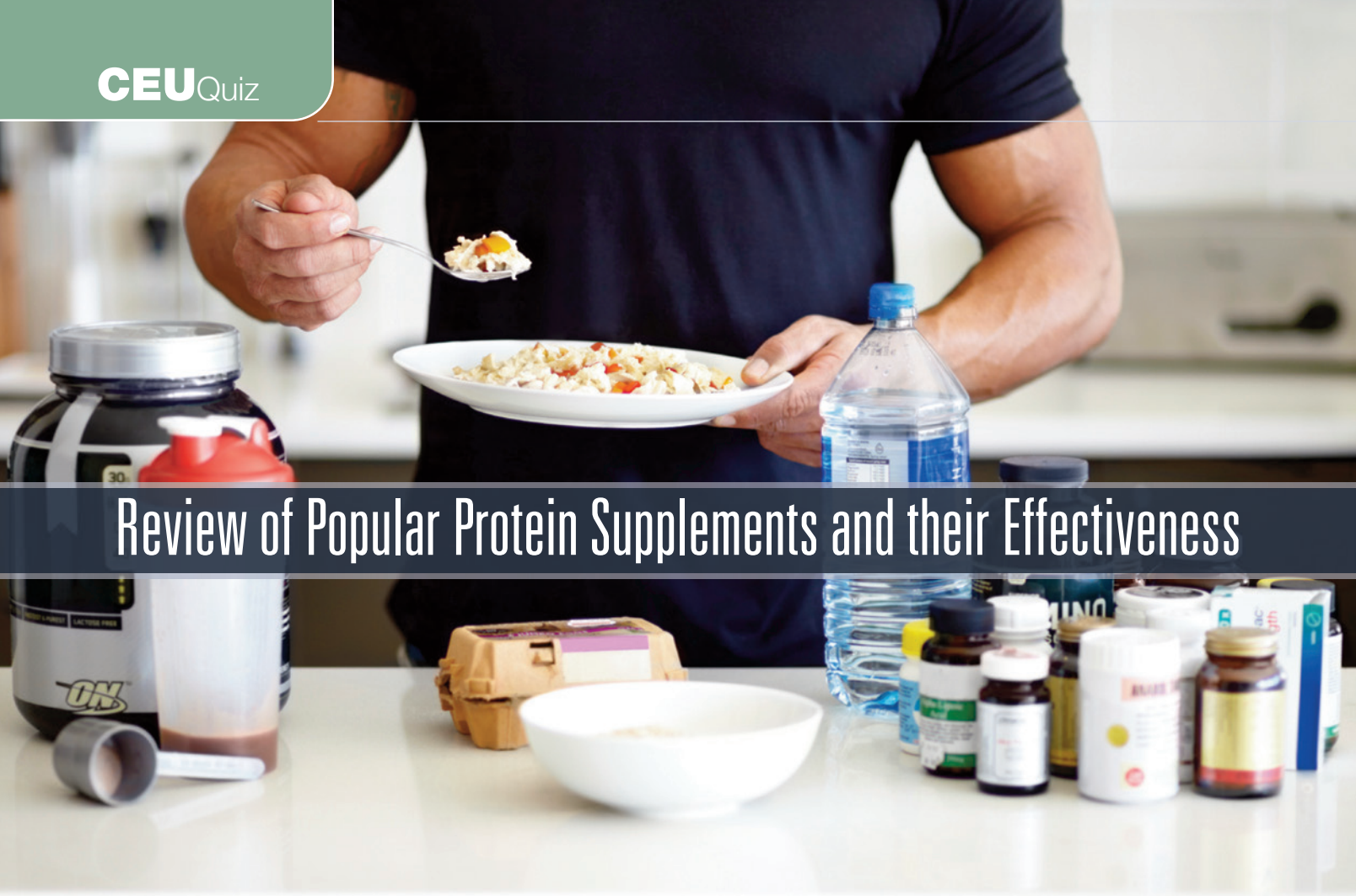


Review of Popular Protein Supplements and their Effectiveness

Dietary supplements are consistently used as part of regimens to increase physical performance or aid in weight loss. Protein powders and individual amino acids are very popular options among health enthusiasts. Commonly, specific types of protein isolates and branched-chain amino acids (BCAAs) are used to promote mass, strength, and power. This article reviews the scientific data concerning common amino acid and protein supplements so that personal trainers can help identify their effectiveness and potential efficacy with their clients.

Amino acids represent the building blocks of all proteins but are categorized as being essential or non-essential depending on the body's ability to produce them. The term essential applies to those nutrients that cannot be synthesized in the human body and must be obtained through dietary sources. Protein molecules are an integral component to the formation of most tissues, but serve roughly 50,000 roles in the human body. Protein and amino acid supplements are used in an attempt to limit muscle tissue breakdown resulting from exercise. Research supports that having a saturated pool of amino acids in circulation combined with carbohydrate consumption improves recovery post-exercise by inducing anabolism and increased protein synthesis.

For protein synthesis to occur, amino acids must be shuttled into the cells where they will be used to repair and rebuild muscle tissue. Higher amino acid levels in circulation increases the rate of uptake into muscles, and in turn, the initiation of protein synthesis. Furthermore, protein synthesis has been found to be three times (300%) higher in subjects who consumed carbohydrates plus protein immediately post-workout, versus three hours later. While carbohydrates are essential to achieve the benefits stated above, including amino acids post-workout is crucial to obtain optimal results. While most amino acid or protein supplements are marketed as recovery-based ergogenic aids, certain products have various roles from glycogen-sparing to improved immune health.

Types of Protein Powders

Whey Protein

Whey is one of the two proteins derived from milk and contains all 9 essential amino acids, including histidine. Furthermore, whey protein has the highest bioavailability (104) of all protein sources. Bioavailability is a key factor when choosing a protein as a higher score denotes faster absorption in the digestive system. Whey protein supplements are not in a naturally-occurring state as it is hydrolyzed and concentrated – which allows the score to be above 100.

Research on whey protein as a pre- and post-workout aid is abundant. It is suggested that utilizing whey prior to exercise can minimize protein breakdown, improve protein balance, lower markers of muscle catabolism as well as spare muscle glycogen. Post-workout benefits include improved protein synthesis and restoration of glycogen stores when consumed with carbohydrates.

Further findings have identified that whey protein is superior to casein and soy for stimulating protein synthesis in response to resistance training. It is hypothesized that this is due to whey's high amino acid concentration and digestibility. Common dosage includes 10-20g post-workout combined with 30-60g of carbohydrates (1:3-4).

Casein Protein

The other popular milk-based protein is casein. Unlike whey, it is digested slowly and releases amino acids gradually into circulation. Casein's digestion pattern promoted the popularity of pre-sleep consumption, ensuring an amino acid pool throughout the night. According to one study, when 40g were taken before sleep subjects performing a resistance training program experienced an approximate 22% increase in protein synthesis. A potential disadvantage of casein protein is that it has lower relative concentrations of BCAAs than whey.

Albumin

Albumin is sourced from eggs and contains all nine essential amino acids. Research currently supports that egg protein is second only to whey in terms of its digestion rate (100 bioavailability value). While individual research comparing egg protein to other sources in terms of protein synthesis is lacking; anecdotally, the digestibility and amino acid levels suggest similar results to whey. However, it is worth noting that egg protein in powder form negates many of the micronutrients found in eggs as a whole food.

Soy Protein

Soy provides a complete vegetable-based protein source for vegetarian or vegan exercisers. The soybean itself is roughly 38% protein, which is processed to remove other substances and concentrate the protein molecules into an isolate powder (58 bioavailability value). Digestion and absorption of the amino acids in soy protein takes longer than with whey protein, indicating that taking soy alone post-workout would not be ideal compared to whey protein. However, research within the last five years found that consuming a blend of 25% whey, 25% soy and 50% casein protein (5g, 5g, 10g respectively) improved anabolism more than whey protein alone.

A potential side-effect of soy protein intake is a reported interaction between estrogenic compounds found in soy – which can cause increased estrogen activity among human subjects (not preferable among males attempting to maximize anabolic activity). However, current research has found no correlation between soy intake and increases in estrogen.

Amino Acids

Glutamine

Glutamine is the most abundant amino acid found in the body. Although it considered non-essential, it is suggested for athletes to consume additional glutamine to "sufficiency"; ensuring optimal recovery and immune system health. Prolonged periods of both resistance and endurance training can cause a drop in blood glutamine levels, estimated to be around 20%. This may promote an increased susceptibility to infection and immune system impairment.

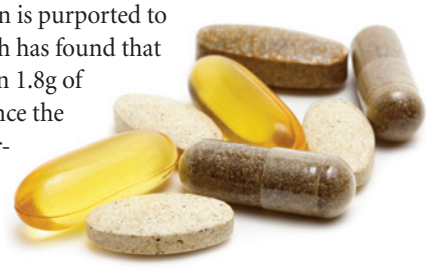
Research is equivocal on immune system and protein synthesis improvements among trained subjects, but extreme endurance athletes have noted benefits. Furthermore, glutamine is found in high quantities within foods commonly consumed by athletes; for example, a 3oz chicken breast alone contains 3.74g of glutamine.

Branched-Chain Amino Acids (BCAAs)

BCAAs consist of leucine, isoleucine, and valine; all of which are essential and oxidized during exercise as a fuel source. Purported benefits include reduced fatigue, improvements in endurance, and reduced muscle protein breakdown. BCAAs are important for individuals with low protein intake each day, but little research identifies any specific performance benefits among athletes who already consume daily requirement through whole food sources.

Leucine

Leucine is considered to be a primary stimulator of the mTOR pathway which is responsible for initiating protein synthesis. It is an important BCAA, but additional leucine supplementation seems to be unnecessary. Supplementing with leucine before and during exercise is thought to prevent protein breakdown, while post-workout supplementation is purported to aid protein synthesis. Research has found that supplementing with more than 1.8g of leucine does not further enhance the aforementioned benefits. Interestingly, that is the quantity of leucine found in a 20 g serving of whey.



Arginine

Arginine is a non-essential amino acid purported to increase growth hormone concentrations in circulation. It is often included in supplements purported to provide a vasodilation-induced "pump". However, research has found that this can only be accomplished with large dosage injections; oral dosages cannot be tolerated at such a high quantity and are therefore ineffective at stimulating increased hormone activity.

Beta-alanine

Beta-alanine is a non-essential amino acid that has been associated with reduced fatigue and improved work capacity during repeat sprint performance. However, other studies have shown no ergogenic effects indicating that more research is needed to conclusively confirm (or deny) beta-alanine's effectiveness.

Conclusion

As the building blocks for cellular repair, protein is essential for exercise recovery. Eating a balanced diet consisting of 10-15% of total calories from lean proteins will provide most individuals with adequate amino acids for growth and repair. However, with the support of current literature outlined above specific supplements (taken at the opportune time) can improve exercise recovery. It is suggested the UL (tolerable upper limit) for protein intake is 2.0 g/kg bodyweight each day, but this is subject to weight gain or weight loss goals and the type and quantity of physical activity an individual engages in each day. It is suggested that timing is as important as total quantity for optimized results.

CEUQuiz

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