



THE SCIENCE BEHIND AMINOFAST™

Maximizing Workout Performance

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Physical exercise is typically an arduous and painful process that, in the long run, will yield positive metabolic, aesthetic, and/or performance adaptations. However, getting the most out of any exercise typically means exercising at a relatively high capacity. It is no coincidence that exercise is difficult, fatiguing and draining of energy. Without the proper fuel in the body, the efforts of exercise may not be optimally applied to achieve the maximal adaptations. Having an optimal nutrition status during exercise that ultimately improves the workout is thus ideal to achieve the desired outcomes most effectively. Regardless if the goal is to achieve more muscle, strength, endurance from the workouts, or simply just burning away fat, the proper source of fuel will allow the muscles to perform at their very best while also minimizing the negative attributes of exhausting exercise.

Muscle Sparing

During exercise, the bulk of the energy may come from any ratio of carbohydrate and fat metabolism, depending on many factors. However, a significant portion of the energy expenditure unavoidably comes from the oxidation of certain amino acids. Skeletal muscle can directly oxidize the branched chain amino acids (BCAAs; leucine, isoleucine, and valine) for the production of energy. Unfortunately, muscle cells only maintain a small pool of free BCAAs for this purpose, which can be rapidly depleted during exercise. Therefore, as amino acids are being oxidized during exercise, muscle proteins are consistently being broken down to sustain the intracellular amino acid concentration. Consequently, the longer exercise lasts, the more muscle protein gets broken down which leads to muscle loss during exercise.

It's a common misconception that muscle loss is required for muscle gain. Muscle breakdown is indeed associated with muscle gain but not all breakdown is the same. Muscle growth is caused by some form of muscle stimulation and trauma to the muscle that leads to muscle breakdown and recovery. However, this is quite a different process than the muscle breakdown that occurs for the sole purpose to liberate energy for exercise. The latter is not associated with any stimulation for regrowth. Therefore, attenuating muscle loss during exercise can be an effective strategy to maintain muscle mass during endurance activities or to achieve the greatest amount of muscle growth with resistance training. Providing free form BCAAs directly to an exercising muscle enhances the pool of intracellular BCAAs and thus reduces the need to break down muscle protein. Human trials of ingesting BCAAs before and during exercise have been shown to effectively reduce the breakdown of muscle proteins during exercise (**Figure 3**).

As an additional benefit, BCAA supplementation is associated with improved recovery post-exercise. Through a mechanism that is not fully understood, the reduction of muscle protein breakdown during exercise can permit expedited recovery afterward. For instance, recent evidence indicates that BCAA supplementation can modify the pattern of the exercise-related cell signaling that affects the immune

system's response to exercise to favor enhanced muscle recovery.

Evidence for improved muscle recovery comes from several studies observing that ingestion of 5-6g of BCAA prior to exercise reduces soreness and muscle fatigue for several days after exercise while also preserving muscle function and strength. This combination allows for optimal performance for subsequent workouts instead of becoming incapacitated with soreness.

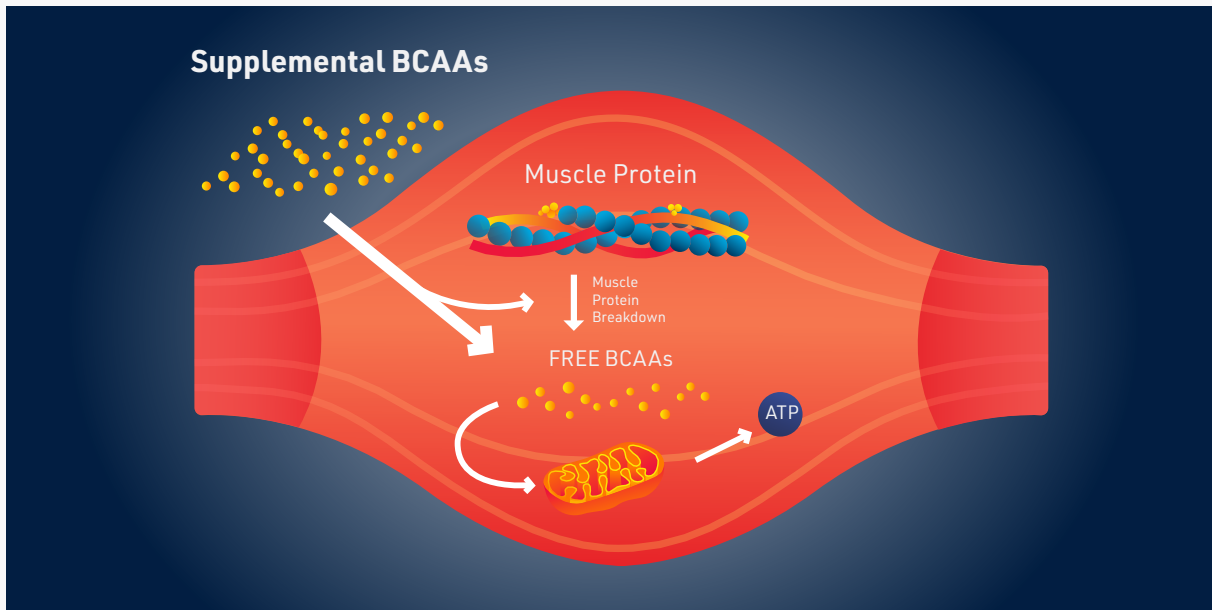


Figure 3. Supplemental BCAAs reduce the necessity for muscle protein breakdown to free up free BCAAs for the purpose to generate energy. Consequently, this preserves muscle mass, muscle function, accelerates recovery and reduces muscle soreness from exercise.

Muscle sparing, faster rates of muscle recovery and improved muscle function are great attributes from BCAAs, but there may be a single limitation that prevents them from getting into the muscle cells in the first place.

Significance of Glutamine for BCAA Delivery

BCAAs cannot simply pass through cell membranes to be delivered to muscle cells. In fact, cells containing basal levels of free amino acids are less susceptible to the uptake of supplemental amino acids. This is also exceedingly difficult without a robust insulin response from typical food ingestion.

Therefore, in order to maintain the delivery of BCAAs toward the inside of cells, muscles rely on a complex active transport system. The active transport system requires three things to function: 1) energy to power

the reaction in the form of ATP, 2) the BCAAs to be transported and 3) Glutamine to facilitate the transport. Glutamine is indeed required for the transport of BCAAs into muscles and can become a limiting factor when supplementing with only BCAAs (**Figure 4**). Therefore, the co-ingestion of glutamine with BCAAs assists with their delivery into muscle cells. The AminoFast™ Shred Series, or simply AminoFast™ is thus formulated with 3 grams of free-form glutamine to ensure optimal BCAA transport.

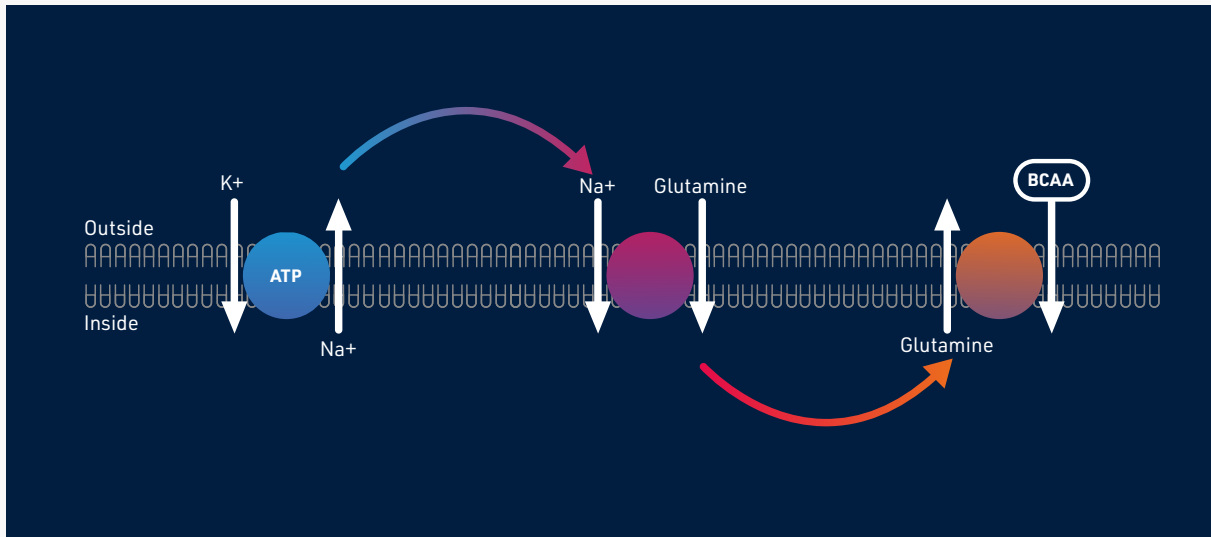


Figure 4. Glutamine is required for the transport of BCAAs across a cell membrane using a tertiary active transport system. Supplemental glutamine is actively pumped into the cell through a sodium dependent transporter, powered by the Na/K pump. The enhanced intracellular glutamine concentration can then be exchanged for the import of BCAAs.

Taurine

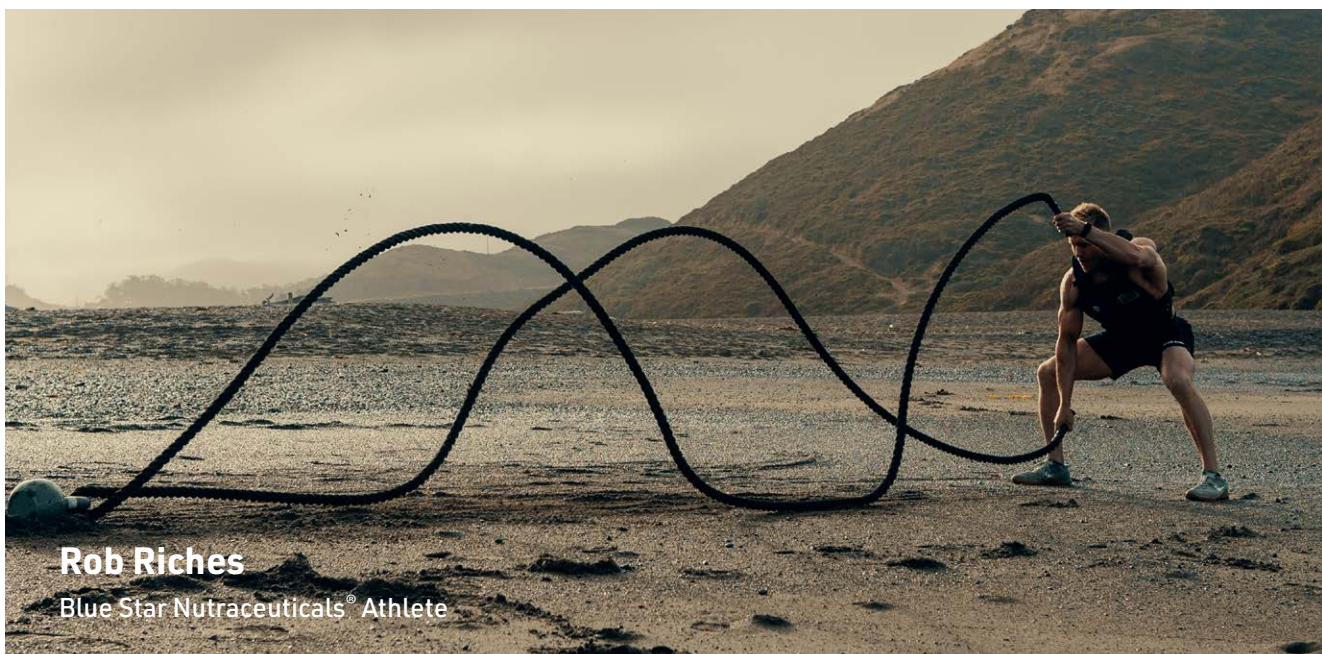
Taurine is a conditionally essential sulfur-containing amino acid that is believed to be involved in a wide range of metabolic processes. In regards to enhancing fat metabolism, research shows that as little as 1.66g of taurine can significantly and acutely increase total fat oxidation in a single 90-minute workout. This research indicates that you can expect to burn an extra 5g of fat per workout just from Taurine alone. The mechanism of action is still relatively unknown but it's believed that taurine directly enhances the activity of the enzyme cascade known as AC/cAMP. This is the same pathway also activated during exercise via the production of catecholamine hormones. The combination of taurine with exercise is believed to augment this process. Activation of the AC/cAMP cascade, either directly by taurine or mediated via augmented catecholamines is the primary mechanism responsible for increased lipolysis and fat oxidation during moderate intensity exercise. One study showed that taurine caused a 45% increase in plasma free fatty acids after 45 minutes and at exhaustion during submaximal steady-state exercise.

N-Acetyl L-Carnitine

The actual process of fat-burning is called beta-oxidation, and as a consequence of exercise, it occurs in the mitochondria of the active muscles. Maximal rates of fat burning during exercise naturally occurs during moderate-intensity exercise, while increased intensity tends to decrease the rate of fat burning. One of the limiting factors of beta-oxidation during exercise is the transport of fatty acids into the mitochondria. The shuttling process requires intramuscular carnitine for this to happen. Research indicates that muscle-carnitine availability is a limiting factor to the rate of fat oxidation and that increasing the intramuscular carnitine pool can have a significant impact upon fat metabolism during higher intensity exercise. The rate of fat oxidation is thus dependent on the rate of fatty acid shuttling into the mitochondria. Supplementing with carnitine has been shown to increase fatty acid oxidation even at higher relative exercise intensities while reducing glycogen utilization. For example, in a study where participants were asked to cycle at 50% maximum intensity, carnitine supplementation was sufficient to reduce glycolytic flux by 31% compared to control. These data suggest that supplementing with carnitine can significantly impact the rate of fat-burning at a given exercise intensity.

Kinetiq®

In terms of fat burning, Kinetiq® is a must. Kinetiq® is a branded extract of Citrus aurantium that has been standardized to 25% p-synephrine. P-synephrine, is a unique fat burning compound that stimulates an increase in metabolic rate, an increase in energy expenditure, and an increase in lipolysis. Collectively this contributes to greater overall weight loss.



The effects of Kinetiq® are supported by over a dozen safety and efficacy human clinical trials, which demonstrate its ability to increase thermogenesis and promote weight loss with exercise. Kinetiq® exerts its beneficial effects through p-syneprine targeting and activating beta-adrenergic 3 (β3) receptors. These receptors are specifically responsible for breaking down fat for energy. As opposed to other beta agonists, p-syneprine exerts its effects without any further cardiovascular interference. Recent research has further demonstrated that Kinetiq® enhances sports and resistance training performance by helping to increase mean power, velocity, number of repetitions and total exercise volume.

In a recent 2018 double-blind randomized exercise trial of healthy exercise participants, ingestion of p-syneprine elicited a 43% increase in the rate of fat oxidation compared to placebo during submaximal exercise. Interestingly, the absolute energy expenditure remained the same, meaning that less energy was consumed by lean muscle or glycogen stores. This evidence suggests that p-syneprine is an invaluable component for those interested specifically in fat loss.

Hydration

The final feature to the performance enhancing effects of the The AminoFast™ Shred Series, or simply AminoFast™ is the hydration support. The inclusion of key electrolytes works to assist with fluid transport into the muscles, and increasing cell volume. Specifically, sodium, potassium and chloride, work together to assist with water balance by creating an osmolarity gradient that pulls water into the cells from the bloodstream. The flux of fluid moving into the cells triggers an increase in thirst that replenishes blood volume. Insufficient cell hydration can interfere with muscle contraction. Thus, the hydrating properties of the The AminoFast™ Shred Series, or simply AminoFast™ allows for normal muscle contraction for the duration of the workout.

Simply drinking mass amounts of water is not always an optimal method to hydrate. Drinking plain water can dilute the existing electrolytes in the bloodstream causing a condition called hyponatremia. Therefore, supplementing with these nutrients will ensure optimal muscle functioning during the workout and prevent hyponatremia.

Coconut Water Powder is known for its concentrations of electrolytes, vitamins and minerals. This will enhance cell volume and hydration, stimulate thirst to keep you drinking water and also prevent cramping during exercise. Coconut water is high in potassium, magnesium, and calcium. Potassium helps maintain water balance, stimulates metabolism of proteins and carbohydrates, helps muscles use glycogen, prevents muscle fatigue and enables normal muscle contraction. Magnesium participates in the conversation of ATP, decreases pain, prevents muscle cramps and spasms. Calcium helps muscles contract and work properly. Rather than pulling calcium out of your bones, coconut water can preserve your bone by supplying the calcium for you.

Pink Himalayan Sea Salt is high in sodium. Since coconut water is low in sodium, pink Himalayan sea salt is a great companion to coconut water powder to get the full spectrum of electrolytes naturally. It also provides additional potassium, magnesium, and calcium. Sodium helps maintain water balance, activates thirst response, prevents water intoxication and hyponatremia, prevents cramps, enables normal muscle contraction. Also enables nerve impulse transmission and maintains normal blood pressure.

CONCLUSION

AminoFast™ is designed to optimize your goals no matter what your workout is. From the endurance athlete, to a power athlete to the everyday gym-goer, AminoFast™ will help take you beyond what you could accomplish without it. Muscle loss, muscle damage and delayed muscle recovery can create setbacks for the overall desired outcomes. The unique formulation of AminoFast™ is the ultimate breakthrough intra-workout supplement that significantly counteracts negative elements of your workout.

A photograph of a muscular man, Rob Riches, running on a beach. He is shirtless, wearing black shorts and grey sneakers. He is carrying a large, weighted parachute (a weighted vest) that is inflated and trailing behind him. The background shows the ocean with waves and a cloudy sky.

Rob Riches

Blue Star Nutraceuticals® Athlete

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Dr. David Gundermann is an award winning nutritional product development scientist, clinical researcher, and known expert in muscle health and metabolism. He developed his passion for health & fitness at a very early age growing up in a family of accomplished competitive athletes.

As Director of Research and Development at Blue Star Nutraceuticals®, he leads all efforts concerning product formulation, key ingredient research, flavor science, long-term scientific assessment, and proprietary development.

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