

What is Beta Alanine?

Beta-alanine is a non-essential amino acid which is found naturally in the body and in food such as chicken, beef, pork and fish¹. It has been the focus of several studies where it has been shown to increase exercise performance and lean muscle mass. We will outline the results of some of these studies in this article, but first we need to talk about carnosine.

Carnosine is a di-peptide made up of beta alanine and histidine (another amino acid). It is found in all muscle fibres but in especially high concentrations in type II fibres, the fibres used in high intensity workouts. Type II muscle fibres also the most responsive to muscular growth.

In 1953, scientists found carnosine acts as an intracellular pH buffer in muscle tissue. During high intensity exercise, energy is produced through the breakdown of glycogen to lactic acid. This lactic acid dissociates into lactate and H⁺ ions. As the H⁺ ions build up, the pH of the muscle cell reduces. Normal muscle cells have a pH of 7.1 and muscle contraction starts to be impaired at a pH of 6.5. The lowered pH also stimulates free nerve endings in the muscle resulting in the perception of pain.²

Carnosine has the ability to neutralise the H⁺ ions, slowing down the decrease in muscle pH. This means that muscle contraction can continue for longer, allowing the muscle to perform more work before fatigue sets in.

The degree of buffering is directly related to the concentration of carnosine in muscle fibres. Increased carnosine concentrations lead to increased intracellular H⁺ buffering capacity.³ By building up the level of carnosine in muscle fibres, the muscle can work harder for longer. This is where beta alanine supplementation is proving effective.

Studies reveal that supplementation with carnosine itself does not increase carnosine concentration in muscles⁵. When carnosine is ingested, it breaks down to its constituent amino acids; beta alanine and histidine. These are then taken up into muscle where carnosine is resynthesised. Histidine supplementation doesn't lead to increased muscle carnosine either - beta alanine is the rate limiting factor in carnosine synthesis⁴.

Suzuki et al demonstrated that athletes involved in anaerobic exercise have a potentially greater requirement for skeletal muscle carnosine stores. This is a factor in determining performance during high intensity exercise⁶. Derave et al showed that beta alanine supplementation increased muscle carnosine and decreased fatigue in repeated bouts of exhaustive dynamic contractions (knee extensions)⁷.

What about Creatine?

Creatine has become a staple for strength and power athletes. There have been over 600 studies published on the benefits of creatine supplementation⁸. Creatine promotes the rate of ATP synthesis by increasing the rate of phosphorylation of ADP. The increased rate of ATP synthesis translates to better recovery during high intensity anaerobic exercise. Creatine also increases muscle synthesis and helps reduce the build up of lactic acid in muscles.

The Research

Studies have shown that creatine and beta alanine work synergistically to increase lean body mass and reduce body fat by increasing training intensity and volume.

The American College of Sports Medicine examined the use of beta alanine in combination with creatine in elite cyclists who also engaged in weight training. One group of cyclists were given a supplement containing beta alanine, creatine and taurine, while the other group were given the same supplement without beta alanine. The cyclists in the beta alanine group saw an average increase of 46% in the carnosine levels as well as significant improvements in time to exhaustion, ventilator threshold and total work done.

Hoffman et al studied the effect of creatine and beta alanine supplementation on strength, power, body composition and endocrine changes. One test group supplemented with 3.2g of beta alanine and 10.5g of creatine a day (BAC), another group with creatine only (C), and a third group with a placebo (P). Test subjects were examined for changes to strength, power, body composition and endocrine system after 10 weeks of resistance training. The BAC group showed a significant decrease in percentage body fat and a significant increase in lean body mass compared to C and P. This group also showed increased strength and increased training intensity and volume compared to P. The study concluded that the supplementation of beta alanine and creatine was beneficial to strength performance, provided a higher quality workout and enhanced training volume.

Note: beta-alanine is a unique amino acid that can cause a tingling and flushing effect on the skin called paraesthesia. Not everyone will experience this and some people tolerate it better than others, but it is not harmful.

References

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