β-Alanine Supplementation

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Abstract

β-Alanine is rapidly developing as one of the most popular sport supplements used by strength/power athletes worldwide. The popularity of β-alanine stems from its unique ability to enhance intramuscular buffering capacity and thereby attenuating fatigue. This review will provide an overview of the physiology that underlies the mechanisms of action behind β-alanine, examine dosing schemes, and examine the studies that have been conducted on the efficacy of this supplement. In addition, the effect that β-alanine has on body mass changes or whether it can stimulate changes in aerobic capacity also will be discussed. The review also will begin to explore the potential health benefits that β-alanine may have on older adult populations. Discussion will examine the potential adverse effects associated with this supplement as well as the added benefits of combining β-alanine with creatine.

Introduction

The benefits associated with histidine dipeptides and muscle buffering capacity has been known for more than 20 years. However, the ergogenic role of β-alanine when combined with histidine became popular before the 2008 Olympic games. Several studies published during the early part of the past decade suggested that β-alanine ingestion by itself, or when combined with creatine, may significantly enhance anaerobic athletic performance (e.g., resistance exercise, repeated sprints) to a greater magnitude than a placebo or to creatine by itself (12,21,25–27,29–30,41,42). These studies have indicated that β-alanine can enhance the quality of a workout and sport performance by delaying skeletal muscle fatigue. This has resulted in a surge in its popularity over the past 5 to 6 years. Recently, the benefits of β-alanine supplementation on nonathletic and/or clinical populations has become of interest within the medical community. Its potential therapeutic role, especially in the aging population, may prove to be valuable. This article will examine the physiology of β-alanine and the mechanism of action, dosing patterns, ergogenic and therapeutic effects, and health issues associated with its use.

Physiology of β-Alanine

β-Alanine is a nonessential non-proteogenic amino acid that is synthesized in the liver (34). It also will be consumed in many of our foods, such as beef, chicken, and turkey. When β-alanine is ingested as part of a meal, it is generally in the form of a histidine-containing dipeptide such aserine, balenine, and carnosine. It is carnosine that is predominant in the human skeletal muscle. The hydrolysis of these dipeptides yields β-alanine, which is then absorbed into the skeletal tissue for the resynthesis of carnosine. The ergogenic properties of β-alanine by itself appear to be very limited, but when combined with histidine to form carnosine in the skeletal muscle, it does appear to have ergogenic effects (13). The primary role of carnosine is in the maintenance of acid-base homeostasis through enhanced intramuscular hydrogen ion (H+) buffering capacity (20). Increasing intramuscular carnosine concentration through β-alanine supplementation has demonstrated an ergogenic potential for endurance, strength, and power athletes (1). In a recent meta-analysis, β-alanine proved to be ergogenic for maximal exercise lasting 60 to 240 s (23). Because carnosine is located in other excitable tissues other than skeletal muscle, such as the brain and heart, it appears to have additional physiological roles. Some studies have suggested that carnosine may serve as a neuroprotector, possibly aiding in the treatment and prevention of neurodegenerative disorders induced by oxidative stress (8) and antiaging activity (11,43).

Carnosine is composed of the amino acids β-alanine and histidine. However, its ability to be absorbed from the circulation by muscle is limited (5); therefore, it needs to be synthesized within the skeletal muscle. Because the skeletal muscle has a relatively low concentration of β-alanine (38), but a high concentration of histidine and carnosine synthetase (the enzyme responsible for carnosine synthesis), β-alanine becomes the rate-limiting step in carnosine synthesis. Supplementing with β-alanine (3.2 to 6 g d⁻¹) for 4 wk has resulted in increases of carnosine concentrations within the skeletal muscle between 37% and 64% (12,20,21). Recently, Stellingwerff et al. (40)
demonstrated that 1.6 g d⁻¹ was sufficient to increase muscle carnosine over a 2-wk period. They concluded that the increase in carnosine is dependent on the total β-alanine consumed over time and is not dependent on baseline muscle carnosine, the muscle fiber type, or daily amount of supplemented β-alanine.

Carnosine is found primarily in human fast-twitch (Type II) skeletal muscle and is estimated to contribute up to 40% of the skeletal muscle’s buffering capacity of H⁺ that are produced during a high-intensity exercise (20,21). While carnosine is much more abundant in Type II muscle fibers, recent evidence has shown an increase in Ca²⁺ sensitivity of the contractile apparatus in both Type I and II human muscle fibers (15). The increase in Ca²⁺ sensitivity from greater carnosine concentrations within the skeletal muscle has been demonstrated to enhance the excitation-contraction coupling, potentially reducing the rate of fatigue during muscle performance (14,15).

Chronic training does appear to have a profound effect on muscle carnosine concentrations. One of the primary physiological adaptations from anaerobic conditioning programs is an enhanced buffering capacity (24). Parkhouse et al. (35) demonstrated that highly trained anaerobic athletes have a greater buffering capacity and a significantly greater skeletal muscle concentration of carnosine than endurance trained athletes and untrained subjects. Sprinters also have been reported to have muscle carnosine concentrations ranging between 17 and 25 mmol·kg⁻¹ of dry muscle (19), which is significantly higher than that typically found in endurance athletes, untrained individuals, and the elderly (20,44). In further support, Tallon et al. (46) reported that muscle carnosine concentrations in the vastus lateralis of trained bodybuilders were significantly greater than those of untrained control subjects, which could not be explained by differences in the muscle size between the groups. Although speculative, the training program of bodybuilders (e.g., high-volumes, moderate-intensity resistance training) may stimulate endogenous changes in muscle carnosine concentrations. This could have important implications during high-intensity athletic performance as a positive relationship is reported between muscle carnosine concentrations and mean power during a 30-s sprint (44). This provides support to the theory that skeletal muscle carnosine concentration has a positive correlation to anaerobic exercise performance resulting from its relationship to muscle buffering capacity. However, data to support the role of prolonged training programs and changes in muscle carnosine concentrations are equivocal.

Suzuki et al. (45) were able to see a 100% elevation in muscle carnosine concentration following 8 wk of high-intensity training. However, the majority of longitudinal training studies (lasting 4 to 16 wk) have been unable to provide support in the increases in muscle carnosine concentrations (30–32). Furthermore, the results of Tallon et al., (46) discussed earlier may be suspect as the subjects examined in that study self-admitted to using anabolic steroids. Previous research has shown that carnosine synthesis is upregulated by circulating testosterone concentrations (36); however, whether exogenous androgens can elevate muscle carnosine content is not clear. Considering that most of the available evidence to date indicates that neither short-term nor long-term high-intensity training regimens can elevate muscle carnosine concentrations, the method that appears to best increase muscle carnosine content is supplementing with β-alanine.

### β-Alanine Dosing Scheme

Harris et al. (20) examined the effect of three different dosing regimens (10, 20, and 40 mg kg⁻¹ body weight). The two highest doses yielded the greatest increase in plasma β-alanine concentrations (Fig. 1), but these doses also were associated with uncomfortable adverse effects (e.g., paresthesia—a tingling-like sensation felt in the skin) that prohibit those dosages from being used. The 10-mg kg⁻¹ (equivalent to an approximate 0.8-g dose) dosing regimen resulted in an elevation in plasma β-alanine concentrations, albeit significantly lower than the higher doses but without the associated adverse effect. The kinetics of the β-alanine response to the low dosing scheme was a time to peak in plasma β-alanine concentration of 30 to 40 min following ingestion, a concentration half-life (time at which there is a 50% reduction in peak concentration) of 25 min, and a return-to-baseline concentration by 3 h after ingestion. According to this kinetic profile, the appropriate dosing regimen should be 0.8 g of β-alanine taken every 3 to 4 h. This would provide a daily dosing regimen of 4.8 to 6.4 g d⁻¹. Furthermore, Hoffman et al. (25) have suggested that dosing should be relative to an individual’s body mass, with a daily dosing between 50 and 80 mg kg⁻¹ d⁻¹ (this would involve multiple feedings). However, Stellingwerff et al. (40) recently demonstrated that 1.6 g d⁻¹ was sufficient to increase muscle carnosine over a 2-wk period, with continued increase with an additional 6 wk of supplementation. Recently, investigators have reported that the increase in carnosine is dependent on total β-alanine consumed over time and is not dependent on baseline muscle carnosine, the muscle fiber type, or daily amount of supplemented β-alanine (40).

Hill et al. (21), using a dosing protocol of 4.0 g d⁻¹ for the first week of supplementation and then 6.4 g d⁻¹ for an additional 9 wk (this was equivalent to the 50 to 80 mg kg⁻¹ d⁻¹), measured muscle carnosine concentrations at weeks 0, 4, and 10. Following 4 wk of supplementation, muscle carnosine concentrations increased by 58%, and an

![Figure 1: Plasma β-alanine concentrations.](https://example.com/figure1)
additional 15% increase was reported by week 10. During the supplementation period, subjects also were performing cycle exercises to exhaustion. A 13% and 16% increase in total work performed was reported at weeks 4 and 10, respectively. Although the majority of studies have found positive results using this dosing scheme, there is some evidence that suggests that muscle carnosine concentrations also may be elevated (37%) in untrained subjects following only 2 wk of supplementation (29).

Recent studies have examined the use of time-release capsule technology and have demonstrated that dosages of 1.6 g per ingestion four times per day also can be consumed without any adverse effects and result in a 40% increase in muscle carnosine concentrations (10,12,20). This latter method appears to be a more practical dosing pattern that has slower absorption kinetics, improved whole-body retention, and sensory side effects that cannot be differentiated from placebo.

On the basis of the available evidence, it is not clear whether a ceiling effect exists regarding increases in muscle carnosine content and β-alanine supplementation. Limitations may be more related to the adverse effects associated with higher dosing regimens. With the use of slow-release capsules, the rate of β-alanine release into circulation is slowed, allowing less excretion through the urine, resulting in a greater percentage of β-alanine retained for carnosine synthesis in the muscle (18). Recent research has reported that ingestion of 1.6 g of slow-release β-alanine capsule in a smaller peak plasma concentration than a similar dose of a regular release capsule (82 vs 248 μmol·L⁻¹, P < 0.001), a delayed time-to-peak concentration (1.0 vs 0.5 h, P < 0.01), but no difference in the area under the curve (10). Regarding the time course of muscle carnosine concentrations returning to baseline levels following cessation of β-alanine ingestion, the information is not clear. However, there does appear to be a dose-response to the total β-alanine consumed. Baguet et al. (4) investigated subjects consuming 4.8 g·d⁻¹ of β-alanine for 6 wk. Following 3 wk of supplement cessation, they reported that muscle carnosine concentrations decreased by 30%. At 9 wk following their last ingestion, muscle carnosine concentrations returned to baseline levels. Additional evaluation of the data suggested that the length of time for muscle carnosine concentrations to return to baseline levels is dependent on the effectiveness of the supplementation program. Subjects who were deemed to be high responders (a greater accumulation of muscle carnosine content) required a greater washout time-to-return to baseline levels (~15 wk), while low responders saw a return-to-baseline levels within 6 wk. Stellingwerff et al. (40) have indicated that the washout rate for muscle carnosine is approximately 2% wk⁻¹ following cessation of β-alanine ingestion.

**Efficacy of β-Alanine Supplementation**

The mechanism of action emanating from β-alanine ingestion suggests that it would be most effective in performances involving high intensity activity. The investigations that have focused on this aspect of athletic performance have consistently reported positive results in the ergogenic benefit of β-alanine supplementation (12,21,26,27,41,42,48). The effect of β-alanine supplementation on the physical working capacity at fatigue threshold (PWC₁⁰) was examined in untrained young men (41). Subjects consumed either 1.6 g of β-alanine or a placebo four times per day (a total of 6.4 g·d⁻¹) for the first 6 d of the study and then ingested 3.2 g·d⁻¹ for the next 22 d. An incremental cycle ergometry test was performed before and following the supplementation period to measure PWC₁⁰. The PWC₁⁰ is determined from the bipolar surface electromyogram recorded from the vastus lateralis muscle; it provides a measure for the highest exercise intensity an individual can maintain before the onset of fatigue and it has been highly correlated with anaerobic threshold measurements (lactate and ventilatory thresholds). Results from that study demonstrated a significantly greater increase in PWC₁⁰ (9%) in subjects supplementing with β-alanine compared with no change in the group consuming the placebo. In a follow-up study, the same research group examined the effect of 28 d of β-alanine supplementation in untrained college-aged women (42). They confirmed their previous results by demonstrating a significantly greater PWC₁⁰ (12.6%), ventilatory threshold (13.9%), and time to exhaustion (2.5%) during a graded exercise cycle ergometry test than the placebo-supplemented group. These studies demonstrated that 28 d of β-alanine supplementation in untrained subjects can delay fatigue during intense exercise.

The efficacy of β-alanine supplementation also has been demonstrated in trained strength/power athletes. Hoffman et al. (25) examined the effect of 2 wk of supplementation (4.5 g·d⁻¹) before the onset of summer training camp in college football players. Supplementation continued for an additional 2 wk during training camp practices. Performance testing that occurred following 2 wk of supplementation revealed no significant difference effect in sprint times or fatigue rates during performance of repeated line drills (an approximate 30- to 35-s shuttle run performed three times with 2-min rest between each sprint). However, a trend (P = 0.07) toward a reduced rate of fatigue during a 60-s Wingate anaerobic power test was found in those athletes who consumed the supplement versus the placebo. Examination of the resistance training logs collected during the training camp revealed a trend (P = 0.09) toward a higher (9.2%) volume of training (load × repetitions in the bench press and squat exercises combined) seen in those athletes supplementing with β-alanine compared with placebo. In addition, subjective feelings of fatigue during camp were significantly lower in athletes using the supplement compared with the placebo.

The inability to see any effect on repeated sprints of approximately 30 to 35 s but a trend toward an improved fatigue rate in a 60-s maximal intensity bout of exercise provides support to the effect that β-alanine supplementation has on improved buffering capacity during a prolonged high-intensity exercise (25). Consistent with these results, Derave et al. (12) reported that 4 wk of β-alanine supplementation in 400-m sprinters was able to delay fatigue in repeated bouts (five sets) of isokinetic exercise but not improve the 400-m race time. Although prolonged bouts (~60 s) of high-intensity exercise appear to benefit the most from improved buffering capacities resulting from increases in muscle carnosine concentrations, recent studies suggest that a high-intensity exercise lasting longer than 60 s may
also benefit from \(\beta\)-alanine supplementation. Baguet et al. (3) provided \(5 \text{ g d}^{-1}\) of \(\beta\)-alanine for 7 wk in rowers. During a 2,000-m rowing performance lasting approximately 5 to 8 min, athletes who supplemented with \(\beta\)-alanine were 4.3 s faster than their presupplement times, while no change was seen in those athletes who consumed the placebo treatment. Intramuscular carnosine content in the treatment group was significantly higher by 45% and 28% in the soleus and gastrocnemius muscles, respectively. High-intensity exercise performed immediately following a prolonged bout of endurance exercise also may benefit from \(\beta\)-alanine supplementation. Van Thienen et al. (48) demonstrated that trained cyclists supplementing for 8 wk with \(\beta\)-alanine improved 30-s sprint performance following a 110-min time trial.

A 4-wk training study, using a double-blind crossover design, examined the effect of \(4.8 \text{ g d}^{-1}\) of \(\beta\)-alanine on the acute endocrine response to a resistance training session in eight experienced resistance-trained athletes (27). When consuming \(\beta\)-alanine, the difference in the total number of repetitions performed in the squat exercise per workout (expressed as the difference between workouts performed at weeks 0 and 4) was significantly greater than when using a placebo (9.0 \pm 4.1 and 0.3 \pm 7.8 repetitions, respectively). In addition, a significant difference in the mean power for each set was seen between the groups (Fig. 2). The greater volume of training, however, did not correspond to any significant change to the acute testosterone or growth hormone response to the exercise protocol. In addition, no difference was seen in the improvement of squat strength following 4 wk of supplementation between subjects supplementing with \(\beta\)-alanine (5.9 \pm 4.3 kg) versus placebo (3.9 \pm 4.1 kg).

The lack of significant strength improvement is consistent with other studies that have failed to show significant improvements in strength following \(\beta\)-alanine supplementation durations lasting between 4 and 10 wk (30,31). These results are not surprising considering the physiological changes that are influenced by elevations in muscle carnosine concentrations. An improved intramuscular buffering system has its greatest effect on fatiguing-type exercises by extending the duration of exercise but does not appear to have a direct effect on strength development during these relatively short-duration training protocols. Such training durations may not be of sufficient length to stimulate significant strength improvements, especially in experienced resistance-trained individuals (24). The ability of \(\beta\)-alanine supplementation to enhance strength gains may become more effective during longer durations of training. Improvements in muscle buffering capacity appear to improve the quality of a resistance training workout by increasing the number of repetitions that can be performed at a given training intensity (25–27). The greater training volume would potentially provide a greater stimulus for muscle adaptation but likely following a longer duration of training.

Effect of \(\beta\)-Alanine Supplementation and Body Mass Changes

Several of the training studies examining \(\beta\)-alanine supplementation have been unable to see any change in body mass in studies ranging from 4 to 15 wk (26,27). This has been attributed to the low daily caloric intake of subjects in those studies. However, the greater volume of training seen in the resistance training program of trained strength/power athletes supplementing with \(\beta\)-alanine appeared to stimulate significant losses in fat mass and gains in lean body mass compared with subjects consuming creatine only or a placebo (26). The greater volume of training associated with \(\beta\)-alanine supplementation could provide additional benefit for individuals whose training goals are focusing on increasing muscle hypertrophy. Thus, athletes whose focus is on high-volume training (i.e., bodybuilders) would appear to benefit from \(\beta\)-alanine supplementation.

Several studies have examined the effect of \(\beta\)-alanine supplementation and running on altering body composition in both men and women. If fatigue were delayed during high-intensity running, it potentially would have a positive effect on reducing body fat. In a 6-wk high-intensity interval training (HIIT) study in recreationally active women, body mass increased for the \(\beta\)-alanine group (6 \text{ g d}^{-1}) with no changes in body mass for the placebo or control groups (49). However, the authors reported no group-related differences (\(\beta\)-alanine vs placebo vs control) for the increases in fat-free mass and decreases in body fat percentage observed across the study duration. Similarly, recreationally active men provided 6 \text{ g d}^{-1} of \(\beta\)-alanine for 28 d were reported to increase body mass (\(P < 0.05\)), whereas no changes in body mass were noted in the group ingesting a placebo (28).

\(\beta\)-Alanine Supplementation and Changes in Aerobic Capacity

The benefits of \(\beta\)-alanine ingestion and endurance exercise appear to be inconclusive. Jordan et al. (28) reported a delayed onset to blood lactate accumulation, but an overall decrease in \(\dot{V}O_2\text{max}\) during 4 wk of \(\beta\)-alanine supplementation (subjects did not aerobically train during the supplementation period). This is not surprising because an increased buffering capacity is not expected to enhance long-term endurance performance because muscle acidosis does not play a major role in fatigue development during this type of
exercise. However, improvements in aerobic capacity have been reported following 6 wk of HIIT and β-alanine supplementation. Smith et al. (39) saw significant improvements in endurance performance in recreationally active males following 6 wk of HIIT and β-alanine ingestion. Subjects performed five to seven sets of 2-min intervals at 90% of their maximum power output with 1-min rest between each interval. Aerobic improvements were seen in both placebo and β-alanine-supplemented groups after 3 wk of training, but only the supplementation group had significant aerobic improvements after the sixth week of training. A similar protocol was used by Walter et al. (49), in recreationally active women, yielding similar improvements in both placebo and β-alanine-supplemented groups. The authors explained the lack of difference observed between the placebo and β-alanine group to be from training-induced increases in intramuscular carnosine content that may have masked the increase in muscle carnosine previously known to occur through β-alanine supplementation. While there is limited evidence to suggest an ergogenic effect of β-alanine supplementation on endurance performance, the use of HIIT and β-alanine supplementation may improve cardiovascular fitness and increase total work done in recreationally active individuals (39,42,49).

**Potential Benefits of β-Alanine Supplementation in Older Adult Populations**

The ergogenic benefits of β-alanine are well documented; however, its potential health benefit for older adult populations are just being realized. Carnosine has been implicated as a potential therapeutic adjuvant in age-related muscle changes (11,43), diabetes (17), and neurodegenerative disorders (9). Supplementation with β-alanine may work indirectly by increasing the biochemical properties of carnosine through increased availability. This is especially true for the older adult population. Stout et al. (43) investigated the relationship between muscle carnosine content and rate of fatigue in elderly men and women ages 55 to 92 years. In a double-blind placebo-controlled study, these subjects supplemented with 2.4 g·d⁻¹ of β-alanine or placebo for 90 d. A 28.6% increase (P < 0.05) in the PWCrTi was seen from before to after supplementation in the β-alanine treatment group, with no change observed in the placebo group. Aging is associated with a gradual transition towards a slower muscle type, which could explain a reduction in skeletal muscle carnosine (47), which has been linked to a reduction in muscle buffering capacity and may increase the rate of fatigue during activity. By improving intracellular pH control, muscle endurance was improved in the elderly subjects. Although performance improvements were noted, changes in skeletal muscle carnosine content were not measured. In a similar investigation, the effects of β-alanine ingestion on performance and muscle carnosine concentrations were examined in elderly subjects (11). Elderly men and women (ranging in age from 60 to 80 years) received 3.2 g·d⁻¹ of a sustained-release β-alanine tablet or a placebo for 12 wk. Muscle carnosine content was measured by proton magnetic resonance spectroscopy in the gastrocnemius muscle. Physical capacity was assessed on a motorized treadmill measuring ventilatory threshold and VO₂peak. After 12 wk of supplementation, a significant 85.4% increase in muscle carnosine content was noted in the gastrocnemius muscle in the β-alanine group compared with a 7.2% increase in the placebo group. Time to exhaustion also was significantly improved in the physical capacity tests of the experimental group and was positively correlated to changes in muscle carnosine content.

Decreases in muscle carnosine concentrations may pose potential health risks. Carnosine acts as an antioxidant, whereby it may scavenge reactive oxygen species, aldehydes, ketones, and inflammatory cells (7). A deficiency of muscle carnosine concentrations may increase oxidative stress-induced lipid and protein oxidation, increase inflammation, and possibly impair insulin signaling in skeletal muscle (17). Lower muscle and plasma carnosine concentrations have been reported compared with age-matched controls in patients with type 2 diabetes (17) and Alzheimer disease (16), respectively. Although evidence showing a cause and effect between carnosine concentrations and these disorders is lacking, the biological role that carnosine has as an antioxidant and an antiglycating and ion-chelating agent stimulates examination of its potential role in neuroprotection of oxidative stress-driven disorders such as Alzheimer disease (6,22). Although carnosine is found in brain tissue, its role has yet to be elucidated (2,33,37,38). Interestingly, a recent study examining carnosine supplementation in an animal model of Alzheimer disease reported a reduction in the intraneuronal accumulation of amyloid-β tangles and age-associated mitochondrial dysfunction (9), suggesting that carnosine may have a role as part of a combined therapeutic approach in the treatment of this disease. Whether β-alanine supplementation can enhance brain carnosine concentrations is still unknown. Thus, additional research regarding increasing carnosine concentrations in the brain and to elucidate further the role that elevations in brain carnosine concentrations have in remediating various disease states is warranted.

**Side Effects Associated with β-Alanine Supplementation**

The only known adverse effect associated with β-alanine supplementation is flushing (also referred to as paresthesia) (37). Paresthesia is a sensation of numbing or tingling in the skin and often appears when high doses of β-alanine are ingested. It generally disappears within 1 h following ingestion (20). If β-alanine is mixed with a carbohydrate and electrolyte drink, the appearance of this adverse effect seems negligible (26). Studies examining potential adverse effects from prolonged (>15 wk) supplementation durations have not been performed. However, considering that β-alanine is an amino acid with an important physiological role in the body, in dosages studied that are similar to those consumed regularly in the diet, it is likely a very safe supplement to use (1).

**Creatine and β-Alanine Combination**

Hoffman et al. (26) were the first research team to examine the combination of both creatine and β-alanine supplements. The hypothesis was that this combination of supplements would provide a significant benefit for strength/power athletes. Results of their study demonstrated that this combination significantly improved the quality of the workout more so than creatine alone. Specifically, improvements in training volume were found to be associated with significantly greater gains in lean body mass. However, studies examining the effects of creatine and β-alanine supplementation on physical performance have been equivocal. The hypothesis was that this combination may work synergistically to improve performance. The only known adverse effect associated with β-alanine supplementation is flushing (also referred to as paresthesia) (37).
mass and decreases in fat mass. Interestingly, creatine and creatine + β-alanine resulted in significantly greater strength gains in one-repetition maximum bench press and one-repetition maximum squat than the placebo. However, the addition of β-alanine did not provide any further benefit to strength improvement. Similarly, Stout et al. (41) also compared the combination of creatine and β-alanine to creatine and β-alanine alone. Significant improvements were seen, but no additive benefits were noted in physical work capacity in previously untrained men.

Summary

β-Alanine ingestion results in an increase in muscle carnosine concentrations, which is an important intramuscular buffer counteracting the insidious drop of pH during high-intensity exercise. The ergogenic benefits of β-alanine supplementation are most evident in activities that elicit a strong intramuscular acidic condition (intense exercise between 60 and 240 s) by delaying the onset of skeletal muscle fatigue. A delay in fatigue during repeated or prolonged sprinting and an enhanced volume of resistance training (greater number of repetitions performed) are common responses observed following β-alanine ingestion. Considering the role that carnosine has as an antioxidant, and the lower concentrations of carnosine found in skeletal muscle and plasma of various disease states in older adults, there is a need for further research on the potential therapeutic benefits of β-alanine supplementation in combating the muscle wasting effects of aging, diabetes, and neurodegenerative disorders.

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References


