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Nutritional Strategies to Modulate Intracellular and Extracellular Buffering Capacity During High-Intensity Exercise.

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Intramuscular acidosis is a contributing factor to fatigue during high-intensity exercise. Many nutritional strategies aiming to increase intra- and extracellular buffering capacity have been investigated. Among these, supplementation of beta-alanine (~3-6.4 g/day for 4 weeks or longer), the rate-limiting factor to the intramuscular synthesis of carnosine (i.e. an intracellular buffer), has been shown to result in positive effects on exercise performance in which acidosis is a contributing factor to fatigue. Furthermore, sodium bicarbonate, sodium citrate and sodium/calcium lactate supplementation have been employed in an attempt to increase the extracellular buffering capacity. Although all attempts have increased blood bicarbonate concentrations, evidence indicates that sodium bicarbonate (0.3 g/kg body mass) is the most effective in improving high-intensity exercise performance. The evidence supporting the ergogenic effects of sodium citrate and lactate remain weak. These nutritional strategies are not without side effects, as gastrointestinal distress is often associated with the effective doses of sodium bicarbonate, sodium citrate and calcium lactate. Similarly, paresthesia (i.e. tingling sensation of the skin) is currently the only known side effect associated with beta-alanine supplementation, and it is caused by the acute elevation in plasma beta-alanine concentration after a single dose of beta-alanine. Finally, the co-supplementation of beta-alanine and sodium bicarbonate may result in additive ergogenic gains during high-intensity exercise, although studies are required to investigate this combination in a wide range of sports.