

NUTRITIONAL ERGOGENIC AIDS FOR TEAM SPORTS

Cemre Didem EYİPINAR

Gaziantep University

1. Introduction

Nutritional ergogenic aids could increase energy availability and/or quicken recover (chronically or acutely), thus enhancing sportive performance. Even still, a lot of athletes regularly use these ergogenic aids without any supporting research (Marocolo et al., 2018). The widespread usage of dietary ergogenic aids to improve performance is strong evidence that athletes are unaware of the necessary nutritional standards (Keat et al., 2017). In order to demonstrate the usefulness of ergogenic aids promising to improve team sports performance, this part focused on presenting scientific evidence from well-controlled research studies while highlighting the biochemical mechanisms and using.

2. Team Sports

People all around the world participate in team sports, which are becoming more and more popular (Bishop, 2010). Athletes in team sports frequently have to put out maximal or almost maximal efforts (such as sprints at full speed for less than 10 seconds) over a prolonged period of time (1–4 hours) (Spencer et al., 2005). Performers must also execute explosive jumps or velocity and acceleration in numerous team sports. Power, speed and strength as well as the capacity for repetitive and intermittent sprinting, are physical factors that affect team athletic performance (Wisløff et al., 2004). Especially in the context of strength and power for both jump and sprint performance, nutritional supplements that can boost the gains brought about by strength training may also contribute to improve crucial elements of team sport performance. On the other hand, team sport performance could be enhanced by nutritional supplements that hasten an athlete's recover after a game or workout (Bishop, 2010).

3. Nutritional Ergogenic Aids

Ergogenic aids are methods, substances, tools or phenomenon that create work and are thought to improve performance in relation to sports science (Arriel et al., 2018).

A component in the diet that is used to increase or accelerate exercise capacity during exercise, sport, or other physical activity is known as a dietary ergogenic aid. For instance, foods that have been enhanced with additives like caffeine or creatine are well-liked nutritional ergogenic aids (Bala & Bhalla, 2022). Sportive supplements can be used in necessary conditions for team sports. These supplements to be examined in this section are listed in the Table 1.

Table 1. Nutritional Ergogenic Aids for Team Sports Athletes

Supplements	Mechanism of Action (Possible)	Effects
Caffeine	• Blockages of adenosine receptors (Fredholm et al., 1999) • Enhances Na⁺/K⁺ATPase activity (Lindinger et al,1993) • Elevates plasma catecholamine concentration (Sinclair&Geiger,2000)	In long-term exercises by reducing the perception of fatigue and thus it can improve performance (Sinclair & Geiger,2000)
Creatine	• Raises the muscle's overall and PCr levels (McKenna et al., 1999)	Maintaining energy stores and increasing power (Vandenbergh et al., 1997)
Sodium Bicarbonat (NaHCO ₃)	• Boosts the outflow of H⁺ from the muscle into the circulation • Improves extracellular buffer capacity (Mainwood & Worsley-Brown,1975) • Decreases metabolic acidosis (Trexler et al., 2015).	During periods of intense exercise, it keeps the pH levels of the muscles somewhat close to normal (Mainwood & Worsley-Brown,1975)
B-Hydroxy-B-Methylbutyrate (HMB)	• Metabolite of leucine; anticatabolic enhances recovery by stimulating protein synthesis (Mahan & Raymond, 2017).	Supports in skeletal muscle function of contractility (Pinheiro et al., 2019)
Beta-Alanine	• Increases carnosine content in muscle (Trexler et al., 2015).	It decreases neuromuscular fatigue and keeps the pH levels during intense exercise Trexler et al., 2015).
Bovine Colostrum	• Increases in skeletal muscle protein production (Bishop, 2010)	It triggers muscle protein synthesis (Bishop, 2010)

4. Caffeine

A most widely used supplement in the world is caffeine (1,3,7-trimethylxanthine), which can be found in chocolate, tea, various energy drinks, cola and coffee.

Plasma caffeine concentration significantly connect with the way that caffeine affects the body as a whole (Sinclair & Geiger, 2000). Several studies conducted recently on animals have offered proof that caffeine may have CNS effects.

Additionally, it has been claimed time and time again that raised plasma epinephrine, which theoretically may function via the CNS or on peripheral tissues, may function as an indirect mediator of caffeine's effects (Lindinger et al., 1993; Graham, 2001; Davis et al., 2003). In a review investigating the effect of caffeine on sportive performance, it was stated that caffeine administration at levels of 4-6 mg/kg on repeated or single sprint activities (demanding high-intensity exercise) has been observed to considerably improve athletes' performances (Buzdaglı et al., 2021).

5. Creatine

Creatine supplementation increases creatine phosphate content in muscle and improves ATP regeneration rate for the phosphogen system. Given that athletes participating in team sports frequently must complete many sprints, it is plausible that taking Cr supplements will enhance various aspects of team athletic performance (Spencer et al., 2004). According to a meta-analysis study examining the effect of creatine, creatine supplementation can enhance increases in power output, fat-free mass and muscle force when taken in conjunction with training (Branch, 2003). Protocol for creatine use: 2-5 g/day for 4-5 days and a total of 20-30 g of creatine use daily. Acute weight due to ~1 g acute fluid accumulation with creatine loading gains may occur (Eskici, 2015).

6. Sodium Bicarbonat (NaHCO_3)

Sodium bicarbonate was identified in the 2018 International Olympic Committee (IOC) conference paper as a supplement having strong support for its benefits for athletic performance (Maughan et al., 2018). By raising blood bicarbonate levels, a buffer that can aid to maintain extracellular and intracellular pH, sodium bicarbonate has ergogenic effects (Grgic et al., 2020).

The bicarbonate system works to prevent alterations in H^+ ions if a strong acid (lactate) or base is administered. It is found in both intracellular and extracellular fluids. H^+ ion is freed by the stronger acid and turns into carbonic acid (H_2CO_3) when a strong acid is added to the intracellular fluids. This supplement, which creates a buffering effect, comes to the fore in the prevention of fatigue (Matson & Tran, 1993). The literature indicates that 0.2–0.3 g/kg of NaHCO_3 administered 60–120 minutes before training would be the ideal intake strategy (Bishop, 2010).

7. B-Hydroxy-b-Methylbutyrate (HMB)

Avocado, catfish, cauliflower, asparagus and grapefruit are just a few examples of foods that naturally contain the bioactive chemical b-Hydroxy-b-methylbutyrate (HMB), a metabolite of the important branched-chain amino acid leucine (Tatara et al., 2012). In a review study it was stated that, HMB had a variety of effects on protein metabolism (Szcześniak et al., 2015). Additionally, the anti-catabolic effect of HMB on skeletal muscle is one of the main benefits of using it as a sportive supplement (Holeček, 2017). Totally, it was stated that, the molecular and metabolic actions of HMB intake are linked to an enhancement in skeletal muscle contractility. These outcomes are advantageous for athletes participating in team sports who are undergoing

resistance training and catabolic conditions (Pinheiro et al., 2019). Manufacturers frequently advise consuming 3 g of HMB daily to preserve or enhance muscle strength and function (Holeček, 2017).

8. Beta-Alanine

The amino acids l-histidine and beta-alanine are used in the skeletal muscle to make carnosine. The availability of beta-alanine is what restricts the production of carnosine (Artioli et al., 2010). A quasi amino acid called beta-alanine is derived from natural sources in the liver and can also be obtained by eating meat and chicken. Via production of intramuscular carnosine, beta alanine supplementatiton which leads to the overall buffering capacity of skeletal muscle cells, and it works as a rate-limiting precursor rather than acting as a buffers on its own (Trexler et al., 2015). Studies show that for individuals whose goals are to increase muscle hypertrophy, supplementation with beta-alanine may provide additional benefits in high-intensity training and may have positive effects on reducing body fat by delaying fatigue during high-intensity exercise (Stecker et al., 2019).

Ergogenic effect is seen when used in 4 divided doses per day (up to 6-7g per day), up to 65mg/kg daily (Bellinger, 2014). Additionally, the most consistently cited adverse reaction to beta-alanine consumption is paresthesia, which typically happens after consuming a bolus dose of 800 mg or more (Helms et al., 2014).

9. Bovine Colostrum

Bovine colostrum, also known as "early milk," is the first milk that cows make and is typically acquired during the first 48 hours after giving birth.

It is a rich source of nourishment, including both regards of macronutrients and micronutrients, just like "typical" milk (Playford & Weiser, 2021). Variety of studies state that, it most likely plays a role in the beneficial effects on skeletal muscle protein synthesis that colostrum has been shown to have (Burrin et al., 1995; Buckley et al., 2002; Hofman et al., 2002; Shing et al., 2006). There may be some data indicating bovine colostrum administration may support training-induced gains in sprint, jump, and endurance performance; however, further study is required, particularly on team sport athletes and employing team sport appropriate tests. In addition, supplementing with bovine colostrum has not been linked to any negative effects, according to the research (Bishop, 2010).

10. Conclusion

Consequently, there is solid proof that consuming NaHCO₃, caffeine and creatine supplementation can enhance multiple-sprint ability (Bishop, 2010). Among these supplements, creatine which is thought to be the most effective by contributing to the development of creatine-phosphate system and anaerobic power for team sports. According to acute (Cox et al., 2002; Ahmun et al., 2005) and chronic (Claudino et al., 2014) creatine loading studies, it is indicated that creatine contributes to the improvement of sportive performance in team sports athletes. The advantages of b-alanine or colostrum for improving performance are not as well supported by the evidence, although more study employing team sport-specific performance testing is necessary (Bishop, 2010). Nutritional or sportive supplements may contribute to sportive performance. However, the right supplement should be taken at the right time and in

the right amount in accordance with the sports branch. Professional support should be sought in this regard, and the guides of authority institutions should be followed (Kolukısa & Eyipınar, 2020).

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ABOUT THE AUTHOR

Cemre Didem EYIPINAR is a research assistant at Gaziantep University, Faculty of Sports, Sciences. She is doing her doctorate in Sports Sciences. Her research is focused on Sports Nutrition, especially on the sportive performance nutrition. She has published in various academic journals and has participated in many international scientific conferences. She has also published one book which are used as basic literature in university.

E-mail: cemreeyipinar@gantep.edu.tr , ORCID ID: 0000-0002- 9778-2074

To Cite This Chapter:

Eyipinar, C. D. (2022). Nutritional ergogenic aids for team sports. In F. Alıncak & M. Vural (Eds.), *Current Studies in Sport Science 2022* (pp. 30-38). ISRES Publishing.