

Evidence-Based Supplementation for Endurance Performance

Primary concerns when considering supplementation to ENHANCE performance:

1. Adequate diet should be the primary goal for every endurance athlete before considering supplementation for performance
 - a. Goal is to consume both adequate macronutrients (carbohydrates, fats, protein) AND micronutrients (vitamins, minerals, trace minerals, etc.)
 - b. Sometimes supplements here are needed to ensure adequate micronutrient intakes (e.g., daily multivitamin, iron, magnesium and other electrolytes, etc.)
2. Adequate daily hydration around training/racing should also be a goal for endurance athletes before considering supplementation for performance
 - a. This includes drinking sufficient water to maintain adequate hydration throughout the day and throughout training/racing
3. Proper fueling during training/racing should be the next most important goal for endurance athletes before considering supplementation for performance
 - a. This includes adequate fluid, electrolyte, and carbohydrate intake to fuel optimal performance during training/racing; *see previous [VO₂ Max Podcast Episode 22](#) for a more detailed discussion on this topic*

Dietary Supplements with Evidence to Support their Effectiveness for Endurance Athletes*

Supplement	Use/Mechanism	Dosage	Frequency/Timing
Caffeine	Improved endurance and repeated-sprint performance via an ↑ central nervous system stimulation and ↓ RPE	2-9 mg/kg (2-3 mg/kg is sufficient)	30-90 min prior to exercise
Beta-Alanine	Non-essential amino acid that is a precursor to carnosine; ↑ concentration of intramuscular carnosine, which leads to greater buffer capacity during exercise	1.6-6.4g/day	>4 weeks; <i>carnosine levels will decline to baseline within 10-15 weeks of ceasing supplementation</i>
Nitrates/Nitrites	Reduced submaximal exercise oxygen cost, reduced systolic and diastolic BP, and improved endurance performance due to increased nitric oxide production (↑ mitochondrial efficiency, ↑ muscle oxygenation, ↑ Sarcoplasmic Reticulum Ca ²⁺ handling)	5-9 mmol/day (or 0.5L/day of beetroot juice) – <i>no clear evidence on whether a dose-response relationship exists yet</i>	1-15 days (may be acute effects on hemodynamics, but improved performance may require multiple days of supplementation); <i>plasma nitrites will decline to baseline after 6-9 hours of supplementation</i>
Sodium Bicarbonate	↑ total muscle buffer capacity during exercise from an ↑ in sodium bicarbonate concentration in the bloodstream; beneficial effects have only been documented through the ingestion of sodium bicarbonate with little to no research documenting the benefits of cream-based or topical application of sodium bicarbonate	0.2-0.4 g/kg	60-120 minutes before exercise

*(Bishop et al., 2010; Kreider et al., 2010; Jones et al., 2014; Sports Nutrition Conference, 2012; Thomas et al., 2016; Peart et al., 2012; Kern et al., 2018; Misell et al., 2018)