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THE IMPACT OF DIETARY NITRATE SUPPLEMENTATION ON EXERCISE PERFORMANCE AND MUSCLE OXYGENATION IN ACTIVE AND INACTIVE MUSCLES UNDER HYPOXIA

Masahiro Horiuchi [1)], Junko Endo[1)], Shohei Dobashi[2)], Masataka Kiuchi[2)], Yoko Handa[1)], Katsuhiro Koyama[2)], Andrew Subudhi [3, 4)]

[1] Division of Human Environmental Science, Mt. Fuji Research Institute, Japan; [2] Graduate School Department of Interdisciplinary Research, University of Yamanashi, Japan; [3] Department of Biology, University of Colorado Colorado Springs, USA; [4] Altitude Research Center, University of Colorado Anschutz Medical Campus, USA

Since, nitric oxide is suggested to be a major factor for hypoxia-induced vasodilation, dietary nitrate (NO_3^-) supplementation (e.g., beetroot juice rich with NO_3^-) may improve exercise performance or have other ergogenic effects under hypoxia. However, whether nitrate supplementation improves exercise performance under hypoxia has shown equivocal results. Because the redistribution of blood from inactive areas to active muscles is essential for optimal exercise performance, we examined the impact of nitrate supplementation on exercise performance and muscle oxygenation profiles between active and inactive muscles.

Nine healthy males performed a 25-minute submaximal (target heart rate ~ 140 bpm) and incremental leg cycling until exhaustion under three conditions: 1) normoxia without any drink, 2) hypoxia (FiO_2 = 13.95%) with placebo (PL), and 3) with beetroot juice (BR). Oxygenated hemoglobin (HbO_2), deoxygenated hemoglobin (HHb), total Hb, and the oxygen saturation of skeletal muscle (StO_2; HbO_2/total Hb) at vastus lateralis (active) and biceps brachii (inactive) muscles were measured via near-infrared spectroscopy. The time to exhaustion with BR (513 ± 24 s) was significantly longer than with PL (490 ± 39 s, $P < 0.05$). BR suppressed increases of HHb in the leg during submaximal exercise and caused greater reductions in StO_2 in the arm during maximal exercise than with PL ($P < 0.05$, respectively).

Collectively, these findings indicate that reduced muscle O_2 extraction during submaximal exercise with BR may help explain an improvement in exercise tolerance.

Key words: sympathetic vasoconstriction, blood flow, muscle O_2 extraction, cardiac output, blood volume