

Influence of Tetrahydrobiopterin Supplementation on Rate Pressure Product

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ABSTRACT

Augmentation of tetrahydrobiopterin (BH₄) could potentially improve eNOS uncoupling by increasing Nitric oxide (NO) bioavailability to improve endothelial health in cardiovascular diseases. With age, the bioactivity of eNOS decreases resulting in a decrease in concentration and bioavailability of NO. Elevated levels of eNOS cofactor BH₄ helps in synthesizing NO, whereas limited concentrations of BH₄ production potentially leads to uncoupling of eNOS and the production of superoxides. A study conducted by Pierce et al., 2012 on young and old men showed that limited BH₄ bioavailability contributed to impaired arterial compliance, elasticity and other hemodynamics of vascular tissue. Experiments on sedentary and aerobically trained men by Eskurza et al., (2005) indicated that flow mediated dilation (FMD) increased by approximately 45% in old sedentary men but did not affect FMD in young sedentary or old aerobically trained individuals. Thus BH₄ supplementation is a potential therapeutic target in regulation of eNOS and NO generation in vascular diseases. We hypothesize that acute oral tetrahydrobiopterin (BH₄) supplementation can influence the heart work through rate pressure product that would negatively affect with age among male and female participants. **Methods:** A double-blinded study conducted on young men and women (21-45yrs), old men and women (60-75yrs), who were asked to consume an acute dose of BH₄ supplements (10mg/kg) or equal dose of placebo supplementation (cellulose) on two separate visits. Single leg knee kick exercise with increase in resistance (0watt, 7watt, 15watt and 20 watt) was performed and measurements of heart rate (ECG), beat-to-beat blood pressure (CNAP finger plethysmography), leg blood flow (Doppler ultrasound) were recorded. Work of heart was calculated as the Rate Pressure Product (RPP), which is a product of Heart rate (HR) and Systolic blood pressure (SBP). **Results:** RPP is generally higher in sedentary old men and women, with treatment RPP decreased in older participants (P < 0.05) when compared to young men and women. **Conclusion:** Low RPP may be due to an increase in compliance of arteries and a decrease in the vascular tone of the resistance vessels and workload conducted by heart. Thus lowering heart rate and systolic blood pressure with BH₄ therapy would be beneficial to patients with systemic hypertension and cardiovascular disease.