

Improving of the Polymorphonuclear Cell Function after Vitamin C with Bioflavonoids
Supplementation and Low-intensity Exercise in Type II Diabetes Mellitus Patients

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Abstract

Introduction: Polymorphonuclear cell (PMN) is defective in T2D with poor glycemic control ($HbA1c \geq 8.5\%$). The exercise program was shown to reduce the oxidative stress but amount of free radical remains abnormally high in T2D patients. We hypothesize that PMN function of T2D patients is improved by vitamin C and bioflavonoids (CB) supplementation and low-intensity exercise.

Methods: Fourteen participants were received both placebo and CB (Blackmores 1,000 mg/day) for 6 weeks in a randomized crossover, double-blinded study. Subjects performed 20 min of cycling ($30\% \dot{V}O_{2peak}$). Blood samples were collected at rest, immediately- and 24h- after exercise. PMN function was determined and analyzed by flow cytometry. Heparinized blood was co-cultured fluorescein isothiocyanate (FITC) labeled *S.aureus* bacteria for 15, 30 and 60 min to detect phagocytosis. The oxidative burst was performed after adding dihydroethidium (HE).

Results: After CB supplementation, there were significantly improved PMN phagocytosis and oxidative burst when compared to placebo at rest ($P = 0.005$ and $P = 0.025$, respectively). Low-intensity exercise had no effect on PMN functions at both CB and placebo groups. The combined effect of CB supplementation and low-intensity exercise shows an increase in PMN phagocytosis at immediately- ($P = 0.012$) and 24h- after exercise ($P = 0.004$). PMN oxidative burst demonstrates a significant increase at 24h- after exercise ($P = 0.030$) but it tends to increase at immediately after exercise ($P = 0.050$).

Conclusion: Prolonged CB supplementation effectively increases PMN function. Low-intensity exercise at a short-duration time had insufficient effect to alter PMN function.

Keywords: Polymorphonuclear cell, Vitamin C and bioflavonoids, Exercise