

Responses of Inflammatory Biomarkers in Circulation and Peripheral Blood Mononuclear Cell To Maximal Exercise with Nasal Breathing

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ABSTRACT

There is growing interest in utilizing nasal breathing (NB) in exercise routines to improve performance. However, there is uncertainty on the impact of such exercise on inflammatory biomarkers in circulation and peripheral blood mononuclear cells (PBMCs), which play a significant role in immune response. PBMCs can undergo functional changes from interactions with exercise-related cytokines, potentially inducing a more efficient immune response. **PURPOSE:** This study examined the acute responses of pro- and anti-inflammatory cytokines in circulation and PBMCs following a maximal exercise with NB. **METHODS:** Eleven physically healthy, sedentary men (age = 20.63 ± 1.36 , BMI = 26.03 ± 3.16 kg/m², and $VO_{2max} = 32.60 \pm 6.46$ mL/kg/min) were randomly assigned to the NB (N=6) or the combined breathing (CB, N = 5) group and performed a maximal graded exercise on a recumbent bike. Blood samples were collected to the vacutainer tubes containing EDTA to separate plasma and PBMCs before and immediately following the maximal exercise. PBMCs were isolated using density gradient centrifugation over Lymphoprep. The acute changes in pro- (IL-6 and IL-1 β) and anti-inflammatory cytokines (IL-10) were measured in both plasma and PBMCs. **RESULTS:** The concentration of PBMC cytokines was significantly lower, ranging from 5 to 22 times, than the plasma cytokine concentrations. The plasma vs. PBMC cytokine concentrations were as follows: IL-6 (10.10 ± 9.3 vs. 1.92 ± 1.55 pg/mL, $p = 0.001$), IL-10 (18.18 ± 17.66 vs. 2.55 ± 1.41 pg/mL, $p = 0.008$) and IL-1b (17.73 ± 16.77 vs. 0.80 ± 0.82 pg/mL $p = 0.008$, $p = 0.004$). No significant changes in either plasma or PBMC IL-10 and IL-1 β were observed immediately following the maximal exercise or between the NB and CB groups, whereas PBMC IL-6 was significantly lower in the NB (1.24 ± 1.27 pg/mL, $p = 0.029$) than the CB (2.79 ± 1.5 pg/mL) group. **CONCLUSION:** The current study found that the concentrations of cytokines in PBMCs were significantly lower than those in circulation. Furthermore, the lower levels of pro-inflammatory cytokine, such as PBMC IL-1 β , associated with NB exercise imply potential immune health benefits. Further research is essential to better understand and validate these findings using different exercise modalities in various subject groups. Doing so will determine whether this benefit of adding nasal breathing to exercise can extend to larger patient populations.