EFFECTS OF PRE-EXPOSED HYPERBARIC HYPEROXIA ON PERFORMANCE AND PHYSIOLOGICAL RESPONSES TO HIGH-INTENSITY EXERCISE

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In humans, oxygen delivery to organs is mainly mediated by red cell at atmospheric pressure of sea level. However, it has been shown that hyperbaric hyperoxia (HBO) condition causes an increase in arterial oxygen partial pressure (PaO2) because of increasing in dissolved oxygen content (1). HBO is also known to cause decreases in heart rate and serum lactate concentration in aerobic exercise (2). Increased PaO2 enhances the tolerance to maximum aerobic work allowing the subjects to delay the time to exhaustion (3). However, no study has investigated the effects of pre-exposed HBO on physical performance and physiological responses to high-intensity exercise. If the pre-exposed HBO had any effect on performance and physiological responses to high-intensity exercise, the results might lead to develop new training and rehabilitation programs. Therefore, the purpose of this study was to investigate the effects of pre-exposed HBO on performance and physiological responses to high-intensity exercise. In addition, oxidative DNA damage due to the HBO exposure was evaluated.

Methods: For investigation of effects of pre-exposed HBO on performance and physiological responses, subjects (N =6) performed randomly maximum isometric knee extensor exercise (30 repetitions x 2 sets) with and without pre-exposed HBO [100% O2 at 1.3 atmosphere of absolute pressure (ATA) for 50 min]. The data of knee extensor torque, electromyography (EMG) of vastus lateralis (VL), heart rate, serum lactate concentration, and blood pressure were obtained throughout the experiment. For evaluate the oxidative DNA damage due to the HBO exposure, healthy subjects (N =8) inspired 100% O2 in the experimental chamber with 1.3 ATA for 50 min once a week for 2 weeks. Urinary 8-hydroxy-2’-deoxyguanosine (8-OHdG) was measured as a marker of DNA oxidative damage on day 0 and days 1, 3, 5 after each HBO exposure trial. Results: Isometric knee extensor torque decreased significantly at the first set after the HBO exposure as compared to the normobaric normoxia (NBO) trial. The decreased torque was associated with the decreased integrated electromyography of VL with respect to time (iEMG). Mean power frequency (MPF), serum lactate concentration, heart rate and systolic blood pressure did not show any difference between the two trials. Urinary 8-OHdG did not show any significant change after the HBO exposure.

Conclusions: The pre-exposed HBO attenuated the performance associated with decreased iEMG, whereas the MPF was not affected. These results suggest that the pre-exposed HBO might suppress the activity of central nervous system in high-intensity exercise. And the present protocol of HBO exposure did not cause DNA oxidative damage.

References


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