

Endurance Training Attenuates Chemoreflex Sensitivity to Intermittent Hypoxia

Ross, A.J., Sauder, C.L., Cauffman A.E., Blaha, C.A., Leuenberger, U.A. Pennsylvania State University College of Medicine, Hershey, PA

The physiological response to hypoxemia is mediated by carotid body chemoreceptors that signal increases in ventilation and muscle sympathetic nerve activity (MSNA), termed the chemoreflex. Patients with heart failure and sleep apnea have greater chemoreflex sensitivity, presumably due to intermittent hypoxia (IH), and this is predictive of mortality. The effect of exercise training on chemoreflex sensitivity in humans is unknown. **PURPOSE:** To investigate the effect of endurance training on chemoreflex sensitivity to IH. **METHODS:** Eleven young healthy subjects (5 male, 25 ± 1 years) were studied twice, before and after eight weeks of endurance training that included running four times/week at 80% predicted max heart rate (HR) and interval training. At each visit, chemoreflex sensitivity, blood pressure (BP), HR, and MSNA were assessed before and after 30 minutes of IH. Chemoreflex sensitivity (ie. our primary outcome variable) was calculated as the slope of minute ventilation / % arterial O₂ desaturation during transient inhalation of pure nitrogen gas. **RESULTS:** Endurance training increased VO₂ max (36.4 ± 1.4 to 40.1 ± 1.7 ml/kg/min, $P < .001$), decreased resting systolic BP (119 ± 3 to 113 ± 3 mmHg, $P = 0.027$) and HR (67 ± 3 to 61 ± 2 beats/minute, $P = 0.004$), but did not alter respiratory parameters at rest ($P > 0.2$). Endurance training attenuated the IH-induced increase in chemoreflex sensitivity (pre-training: $\Delta 0.045 \pm 0.026$ vs. post-training: $\Delta - 0.028 \pm 0.040$ L/min/ %O₂ desaturation, $P = 0.045$). Furthermore, IH increased mean BP and MSNA burst rate before training ($P < 0.05$), but IH did not alter these measures after training ($P > 0.2$). **CONCLUSION:** Endurance training attenuates chemoreflex sensitization to IH, which may partially explain the beneficial effects of exercise training in patients with sleep apnea and heart failure.

This study was supported by NIH R01 HL098379 and ULI TR00127.