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Carotid Body Chemosensitivity to Hypoxia is Attenuated during Hyperbaric Hyperoxia

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Water immersion causes CO₂ retention, thus increasing the risk of CO₂ toxicity. Hyperoxia reduces carotid body (CB) tonic activity, which reduces the ventilatory response to hypercapnia. However, it is not known if CB chemosensitivity is altered during the high partial pressure of oxygen associated with hyperbaria. **PURPOSE:** We tested the hypothesis that oxygen breathing would lower CB chemosensitivity more than breathing air at 6.1 msw depth. **METHODS:** Five subjects (age: 23±2 y; BMI: 28±5 kg/m²) completed two, four-hour dry dives at 6.1 msw (1.6 ATA) breathing either 100% O₂ or air. CB chemosensitivity was assessed using hypoxic ventilatory response (CB_{O₂}) and brief hypercapnic ventilatory response (CB_{CO₂}) tests pre-dive, 75 and 155 min into the dives, immediately post-dive, and 60 min post-dive. CB_{O₂} consisted of inhaling 100% N₂ for 2-6 breaths, repeated four times, with 2 min between hypoxic exposures. CB_{CO₂} consisted of inhaling 13% CO₂, 66% N₂, 21% O₂ for one breath, repeated four times, with 2 min between hypercapnic exposures. CB chemosensitivity was calculated as the slope of the linear regression line of the peak minute ventilation (MV) in three consecutive breaths vs. the nadir oxygen saturation (pulse oximetry; SpO₂) or peak end tidal CO₂ tension (capnography; PETCO₂) for CB_{O₂} and CB_{CO₂}, respectively. Data are reported as a change from pre-dive (mean±SD). **RESULTS:** SpO₂ was higher than pre-dive at all time points (all p<0.02), but was not different between conditions (p=0.46). The change in MV was not different over time (p=0.22) or between conditions (p=0.90). PETCO₂ increased during the dive at 75 (Air: 8±5 vs. O₂: 6 ±4 mmHg) and 155 min (Air: 7±5 vs. O₂: 4±2 mmHg; p<0.01), but did not differ between conditions (p=0.34). CB_{O₂} was lower in the 100% O₂ condition at 75 min (-0.73±0.66L/min/%SpO₂; p<0.01) but returned to pre-dive values thereafter (all p>0.05). There were no changes in CB_{O₂} during the air condition (all p>0.05). There were no changes in CB_{CO₂} at any time point (p=0.38) or between conditions (p=0.92). **CONCLUSION:** These data indicate CB chemosensitivity to hypoxia is briefly attenuated during hyperbaric hyperoxia but this reduction does not appear to contribute to CO₂ retention.

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