Rebreathing-Induced Hypoxia Improves Insulin Sensitivity in Adults with Type 2 Diabetes

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ABSTRACT

Hypoxia stimulates glucose uptake through an insulin-independent pathway. **PURPOSE:** To examine the acute effect of rebreathing-induced hypoxia on plasma glucose and insulin levels in adults with type 2 diabetes. We hypothesized that rebreathing-induced hypoxia would attenuate the increase in glucose and insulin levels during an oral glucose tolerance test. **METHODS:** Nine individuals with type 2 diabetes (4 women, age: 53±10 years, body mass index: 35±7 kg/m², HbA1c: 7.1±0.5%) visited the laboratory on two occasions. On both visits, a 2-hour, 75 g oral glucose tolerance test was conducted while simultaneously performing a rebreathing-induced hypoxia protocol (RIH) or breathing room air (Norm). Venous blood samples were collected 0, 30, 60, 90, and 120 min following ingestion of the high-glucose drink to measure plasma glucose and insulin levels. The rebreathing-induced hypoxia protocol consisted of two series of five 2-min rebreathing bouts in a low-volume, closed circuit system interspersed with two minutes of breathing room air. The first and second series of rebreathing bouts were performed within the first 30 min and 30-60 min after ingestion of the high-glucose drink, respectively. **RESULTS:** Rebreathing-induced hypoxia resulted in a nadir oxygen saturation of 88±4% and a nadir fraction of inspired oxygen of 12±5%. Plasma glucose responses to the oral glucose tolerance test were not different between conditions, however, insulin levels were lower during rebreathing-induced hypoxia than normoxia (RIH vs. Norm: 0: 17±13 vs. 21±14; 30: 37±28 vs. 42±26; 60: 57±32 vs. 77±52; 90: 88±67 vs. 116±81; and 120: 114±96 vs. 136 ±111 uIU/ml, p=0.03), suggesting an acutely improved insulin sensitivity. Accordingly, the insulin area under the curve was lower during rebreathing-induced hypoxia than normoxia (124±84 vs. 157±102, p=0.02). **CONCLUSION:** Exposure to short and intermittent rebreathing-induced hypoxia following ingestion of a high-glucose drink acutely improves insulin sensitivity in adults with type 2 diabetes. Rebreathing-induced hypoxia could therefore represent a novel and simple strategy to improve glycemic control in individuals living with type 2 diabetes.