

## **Impact of Intermittent Hypoxia on Glucose Tolerance in Type 2 Diabetes**

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### **ABSTRACT**

Hypoxia increases glucose uptake in skeletal muscle through an insulin-independent pathway.

**PURPOSE:** To assess the impact of intermittent hypoxia on glucose and insulin concentrations during an oral glucose tolerance test in adults with type 2 diabetes. **METHODS:** Six adults with type 2 diabetes (5 men, age:  $51 \pm 15$  years, HbA1c:  $7.3 \pm 1.5\%$ ) performed a 2-hour oral glucose tolerance test on two separate occasions. On both visits, venous blood samples were collected before and 30, 60, 90, and 120 min after the ingestion of a high-glucose drink. After ingestion of the drink, participants were exposed to either an intermittent hypoxia (IH) protocol, consisting of eight 4-minute hypoxic cycles at a targeted oxygen saturation of 80% interspersed with breathing room air to resaturation, or an intermittent normoxia (IN) protocol consisting of eight 4-minute normoxic cycles interspersed with breathing room air. **RESULTS:** Oxygen saturation was lower during intermittent hypoxia than intermittent normoxia ( $81 \pm 3$  vs.  $97 \pm 1\%$ ,  $p < 0.01$ ). Relative changes in plasma glucose concentrations in response to the oral glucose tolerance tests were not different between conditions (IH vs. IN: 30:  $42 \pm 15$  vs.  $35 \pm 15$ ; 60:  $57 \pm 26$  vs.  $65 \pm 30$ ; 90:  $73 \pm 32$  vs.  $88 \pm 30$ ; and 120:  $78 \pm 26$  vs.  $83 \pm 29$  mg/dl, interaction effect:  $p = 0.13$ ). Similarly, the relative changes in insulin concentrations in response to the oral glucose tolerance tests were not different between conditions (IH vs. IN: 30:  $14 \pm 17$  vs.  $25 \pm 17$ ; 60:  $42 \pm 36$  vs.  $48 \pm 35$ ; 90:  $70 \pm 58$  vs.  $86 \pm 60$ ; and 120:  $103 \pm 72$  vs.  $125 \pm 94$  uIU/ml, main effect for condition:  $p = 0.12$ ). The peak increase in glucose concentrations during the oral glucose tolerance tests was also not different between conditions (IH vs. IN:  $81 \pm 26$  vs.  $90 \pm 30$  mg/dl,  $p = 0.23$ ). **CONCLUSION:** Whereas these initial results did not reach statistical significance, the observed trends for reduced relative glucose and insulin concentrations accompanying intermittent hypoxia suggest that brief episodes of hypoxia enhance glucose tolerance. Additional data from a larger sample of adults with type 2 diabetes are required to confirm these preliminary findings.