

Joseph C. Keenan. 2002. *Achieving altitude acclimation through periodic exposure to hypoxia*. Publication pending

Abstract

Studies have shown that continuous exposure or near-continuous (20-22 hours per day) exposure to hypoxia stimulates altitude acclimation. However, no studies have examined the possibility of reaching altitude acclimation through daily exposure for a lesser period of time. In order to examine this question, we exposed male Sprague-Dawley rats to hypoxia daily for varying times over a 39 day period. The hypoxia simulated an altitude of 7,500 feet. Forty-three individuals were divided into five groups and were exposed to hypoxia as described: 1) Control group, 0 hours per day (n=9) 2) six hours (n=9) 3) nine hours (n=8) 4) 12 hours (n=9) and 5) 24 hours (n=8). Blood samples were taken on weekly intervals and assayed for hemoglobin concentration and hematocrit.

The control group showed no significant increase in either parameter over the course of the study. The six-hour group exhibited increases significant relative to the control group in both hemoglobin concentration, 18.4g/dL (df=16, t=3.98, p=.0011), and hematocrit, 66.6% (df=16, t=3.53, p=.0028). The nine-hour group increased to 19.5 g/dL (df=15, t=2.87, p=.012) and 71.5% (df=15, t=3.53, p=.0017), significantly greater than the six-hour group. The 12-hour group rose to 19.6 g/dL and 68.8%, and the 24-hour group rose to 20.3 g/dL and 70.8%, both similar to the nine-hour group. Exposure to hypoxia for 9-12 hours was sufficient in producing an acclimation response similar to that elicited by chronic exposure. These results bear some importance to developing methods for altitude training in elite athletes today. Should a similar response be exhibited by humans, these results suggest that the “sleep high, train low” training strategy could be as effective as the “live high, train low” strategy.