

Performance Point

Simulated Altitude Training

by Ben Sporer, Physiologist, Canadian Sport Centre Pacific

July 2006

Are you considering using an altitude tent or hypoxic device to complement your training program? If so, there are several things to think about before moving forward.

It is widely believed that altitude training can enhance endurance performance. At altitude, there is a change in the barometric pressure that negatively affects the transfer of oxygen from the lungs to the blood. The higher you go, the greater the effect, resulting in less oxygen available for the working muscle (**hypoxia**). With prolonged exposure, this leads to several physiological changes (noted below) that are associated with positive endurance performance. Hypoxic devices such as tents and re-breathers try to simulate this by actually reducing the amount of oxygen available at sea-level.

What is often not discussed is that exposure to hypoxia can also have negative consequences for endurance athletes (noted below). Furthermore, many factors can affect your hypoxic response. These include the simulated altitude used, the length of each hypoxic period, the duration of the hypoxic training phase, blood oxygen concentration, hypoxic training history, diet and nutrition, breathing response, and many others. Most of these factors are individual and of all the responses to various forms of training, hypoxic responses are one of the most variable. The importance of planning cannot be understated as inappropriate hypoxic training can have an equally negative impact on performance. Below is a list of things to consider when using hypoxic training.

Things to Consider

1. Develop your plan with respect to yearly and quadrennial training plans
2. Your individual response to hypoxic training should not be evaluated right before a major competition as it could have potentially negative effects on performance
3. Determine the purpose of hypoxic training (acclimation for altitude competition or to enhance performance at sea-level) as the procedures will vary.
4. Ensure blood iron status is normal before any altitude exposure
5. If you become sick or injured during the altitude microcycle, stop exposures to hypoxia immediately
6. Increase H₂O, carbohydrate, iron and vitamin intake
7. For blood related adaptations, hypoxic training requires a minimum of 3-4 weeks at simulated altitudes of 2000-3000 meters with 14-16 hours per day spent in hypoxia.

Positive effects of prolonged altitude exposure:

- Increases in natural erythropoietin (EPO) production by the body
- Increases in red blood cell mass and hematocrit
- Increases in VO₂max and aerobic capacity
- Increased muscle buffering capabilities
- Increased breathing rate

Negative effects of hypoxia:

- Dehydration
- Disturbed sleep
- Inadequate rest and recovery
- Reduced training intensity and volume
- Compromised immune system
- Increased fatigue



Powering Sport Performance

The Canadian Sport Centre Pacific, in partnership with the network of Canadian Sport Centres and PacificSport Centres, delivers sport performance programs to help athletes and coaches win medals for Canada. Working in support of our national and provincial sport partners, the Canadian Sport Centre Pacific is creating a stronger system for the development of athletes, coaches, performance enhancement teams and sport performance facilities. www.cspacific.ca