

Acclimatization and Blood Oxygen Saturation at Altitude

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ABSTRACT

The purpose of this investigation was to determine if ascending to high altitude from low altitude after five days of acclimatization resulted in significantly different arterial blood oxygen saturation (%SaO₂) than from ascending after only three days of acclimatization. Subjects for this study included eight physically fit climbers (Mean age=30 ± 6 yrs) with a permanent residence at low altitude (159 meters or 522 feet) who made an ascent of two 4,268 meter plus (14,000 feet) mountains on days three and five during a typical climbing trip. A Garmin GPS receiver was used to determine the selected altitude during both ascents. Measurements of % blood oxygen saturation (% SaO₂) were obtained with a Nonin GO2 Achieve Fingertip Pulse Oximeter (accuracy 70-100% SpO₂ ± 2%) at 4,268 meters (14,000 feet) after three days of acclimatization and after five days of acclimatization (2). A paired t-test was used to determine if there was a significant difference ($p \leq .05$) in %SaO₂ after three days of acclimatization compared with five days of acclimatization. All subjects experienced a drop in oxygen saturation from their typical lower elevation level (Mean 98% ±1) compared to the level of O₂ saturation at high altitude (83% and 87%). A paired t-test revealed a statistically significant difference ($p \leq .05$) in percent oxygen saturation (%SpO₂) between the three and five day acclimatization periods with the five day acclimatization period significantly higher than the three day acclimatization period (Mean 5 day acclimatization period = 87% ±1.28; Mean 3 day acclimatization period = 83% ±1.06). Time constraints often dictate the number of days of acclimatization possible for short trips of 5-7 days when the goal is to ascend two or more mountains. Although acute mountain sickness (AMS) is difficult to predict without prior exposure to high altitude, an improvement in the saturation of oxygen in the blood by even 4% due to an extra couple of days of acclimatization seems prudent for those less fit and not accustomed to the thin air at high altitude. For these individuals, an improvement in oxygen saturation of even 4% might be the difference between a safe, successful summit, or a physically risky, unsuccessful effort.