Letter to the Editor

Hawaii High Altitude Study: High Altitude Sleeping System

To the Editor:

We are reporting some new data collected on a high altitude sleeping system that began development in 1998 in the Biological Altitude Testing Laboratory at the University of Colorado at Boulder where it continues to be developed today.¹ The purpose of this device is to improve the conditions under which a climber sleeps or rests so she may become better acclimated to the altitude and thus enhance her overall performance.² The device works by delivering warmed, humidified air with slightly increased carbon dioxide levels to prevent heat loss, dehydration, and altitude-induced central sleep apnea.

Our most recent study took place on the summit of Mauna Kea (~13 700 feet above sea level) on the Big Island of Hawaii, with the cooperation of the Office of Mauna Kea Management and the Rangers of Mauna Kea, where a nonacclimatized 67-year-old man was tested while sleeping or resting with and without the device. Physiological data over timed intervals were taken including heart rate, blood oxygen saturation, and thoracoabdominal movement. Without the mask, the subject's average heart rate was 89 beats/minute with an average blood oxygen saturation of 75%, taking an average of 15 breaths/minute. However, while wearing the device, the subject's average heart rate was 90 beats/minute with an average blood oxygen saturation of 77%, taking an average of 17 breaths/minute.

Whereas this experiment consisted of tests on a single subject, it suggests that our device may have a measurable effect on the rate of respiration. By imposing a state of slight hypercapnia on a subject, it is our hope that our device can bring about similar effects as with taking acetazolamide by increasing respiration rate to improve blood oxygen saturation, thereby preventing or lessening the severity of acute mountain sickness.² The Biological Altitude Testing Laboratory plans to perform a number of more extensive investigations to determine what effect, if any, our device has on respiration rate at various elevations, as well as accurately quantifying the carbon dioxide levels produced in the device throughout the duration of sleep or rest.

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References

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2. Houston C. *Going Higher: Oxygen, Man, and Mountains*. 4th ed. Seattle, WA: The Mountaineers; 1998.

Climbers at Altitude: Thrombotic Conditions and Maintaining Adequate Nutrition

To the Editor:

I read with interest the case report on cerebral sinus thrombosis ("A Case of Cerebral Sinus Thrombosis Developed During a High-Altitude Expedition to Gasherbrum I," *Wilderness and Environmental Medicine* 2003; 14:226–230), and it raised a question in my mind. Another question was raised by the report on the Trans-Greenland Expedition ("Effects of a 3-Month Endurance Event on Physical Performance and Body Composition: The G2 Trans-Greenland Expedition," *Wilderness and Environmental Medicine* 2003;14:240–248).

In the first instance, I wondered if individuals on peak climbs higher than 6000 m might benefit from a daily subcutaneous injection of low molecular weight heparin. It seems that not only the rare occurrence of cerebral sinus thrombosis but also the more common occurrence of retinal and other thrombotic complications may be ameliorated or aborted, and that perhaps even the high-altitude cerebral edema phenomenon may be impacted.

On the second point, it is known that on high-altitude climbs it is extremely difficult to maintain adequate nutrition. Has anyone tried elemental diets that require little additional energy from the gastrointestinal tract? Although these products are not very palatable, at those altitudes (especially in a heated form) it seems that those individuals attempting to summit over 6000 m might benefit from a product of this type.

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