

Two days of staging as effective as four for high-altitude climbs

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Afghanistan's geography is dominated by a collection of craggy peaks, the highest—a mountain known as Noshaq—has been measured to 7,492 meters. Consequently, the soldiers on duty in this mountainous terrain must often ascend to great heights as part of their duty. However, quick climbs without adapting to altitude can lead to a condition called acute mountain sickness (AMS), marked by headache, fatigue, gastrointestinal distress, nausea, and insomnia.

Conventional knowledge suggests that to avoid AMS, climbers need to "stage," or set up camp, at a lower altitude for four days when summiting peaks as high as 4300 meters. However, with this being impractical in a combat environment, military researchers set out to test whether this goal could be accomplished more quickly—in half the time. In a new study by Beth A. Beidleman, Charles S. Fulco, Robert W. Kenefick, Allen Cymerman, Janet E. Staab, and Stephen R. Muza, all of the U.S. Army Research Institute of Environmental Medicine, researchers tested whether two days of staging at a moderate altitude is enough to avoid AMS before ascent to 4300 meters. Their findings show that this significant shortcut is about as effective as utilizing twice the time to stage, providing evidence that [soldiers](#) can ascend safely much quicker than previously thought.

The team will discuss the abstract of their study entitled, "Two Days of Staging at Moderate Altitude Reduces [Acute Mountain Sickness](#) Upon Further Ascent to 4300 m in Unacclimatized Lowlanders," during a poster presentation at the [Experimental Biology](#) 2013 meeting, being

held April 20-24, 2013 at the Boston Convention and Exhibition Center, Boston, Mass. The presentation is sponsored by the [American Physiological Society](#) (APS), a co-sponsor of the event. As the findings are being presented at a scientific conference, they should be considered preliminary, as they have not undergone the peer review process that is conducted prior to the data being published in a scientific journal.

At the Peak

Study leader Beidleman explains that the U.S. Army Research Institute of [Environmental Medicine](#)'s stated mission is to improve health and performance of the Warfighter when exposed to extreme environments. That includes heat and cold, as well as extreme altitude, Beidleman's own area of expertise.

Years ago, researchers showed that staging for four days cut the prevalence of AMS by about half. However, Beidleman says, researchers had never studied whether this time could be trimmed down even further.

To investigate, she and her colleagues studied male soldiers ascending Pike's Peak in Colorado, the summit of which stands at 4,302 meters above sea level. They assigned 12 of these soldiers to stage for two days at 2500 meters. Another seven soldiers staged for two days at 3000 meters. Seven more ascended directly to the peak.

Trimming AMS by Half

Their findings showed that about 73 percent of soldiers who took a direct route to the peak showed symptoms of AMS. However, only 30 to 40 percent of those who staged for two days ended up with this condition, regardless of their staging height.

"These results suggest that you don't have to stay at a moderate altitude for four days. You can stay there for two days and reap the same benefits," Beidleman says.

She explains that two days is enough time for the body to begin affecting the biological changes necessary to live comfortably at a higher altitude. Within hours to days, she says, climbers begin to breathe faster and reduce blood plasma volume which helps the body bring more oxygen to cells, she says. These immediate changes help cells survive until the body implements more long-term changes, such as increasing the number of red blood cells and other metabolic changes.

"The military is always looking for faster, more effective solutions to problems," she says. "Now we know that our soldiers can climb quicker with less risk of serious problems."

Beidleman notes that future studies will investigate the effects of shorter staging at higher altitudes and in female soldiers.

Provided by American Physiological Society

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