

Taking dex can improve high altitude exercise capacity in certain climbers

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Taking dexamethasone prophylactically may improve exercise capacity in some mountaineers, according to Swiss researchers. Dexamethasone, known popularly to climbers as "dex," has been used for years to treat altitude-related symptoms in mountaineers, but has never been tested for its ability to improve exercise capacity at high altitude.

"We have known that both tadalafil and dexamethasone are good for preventing high altitude pulmonary edema (HAPE) and dex for treating symptoms of acute mountain sickness (AMS). But we did not know whether they could also improve [exercise capacity](#) at altitude by reducing [pulmonary hypertension](#), one of the important factors in altitude-related exercise limitations," said lead authors Manuel Fischler, MD, of the University Hospital in Zurich, Switzerland, and Hans-Peter Brunner-La Rocca, of the University Hospital in Basel, Switzerland.

The results were published in the August 15th issue of the [American Journal of Respiratory and Critical Care Medicine](#), the journal of the American Thoracic Society.

The researchers recruited 23 mountaineers with a history of HAPE and administered baseline cardiopulmonary exercise tests at a low elevation (490 meters, or 1607 feet). Subjects were tested for [oxygen uptake](#) kinetics by pedaling a stationary bike at a constant rate for six minutes, and then for exercise capacity by pedaling at 50 percent of their predicted maximum workload for one minute, then increasing output by 25 percent each additional minute until exhaustion, usually after 8 to 12

minutes.

"At low altitude, peak exercise performance of subjects was significantly above age- and gender-adjusted normal values, indicating superior fitness in these subjects," noted Dr. Fischler.

All participants were randomized to take either tadalafil, dexamethasone or placebo, beginning the day before a cable-car ascent from Alagna, Italy, at 1,100 meters (3,609 feet), to 3,200 meters (10,499 feet). They then ascended on foot to Capanna Gnifetti at 3,650 meters (11,975 feet). After an overnight stay at Capanna Gnifetti, the climbers finally ascended to Capanna Regina Margherita at 4,559 meters (14,957 feet).

A second round of cardiopulmonary exercise tests were performed 4-5 hours after arrival, and echocardiographic examinations were performed the next day.

"Reduced oxygen content in the air is the major limiting factor at high altitude. Reduction in exercise capacity goes in parallel to the reduction in oxygen up to an altitude of approximately 4000 meters. At higher altitudes, there is an even further reduction in exercise capacity," said Dr. Fischler. "As expected, exercise capacity at high altitudes was diminished among all groups and key indicators of cardiopulmonary stress were elevated."

Both tadalafil and dexamethasone subjects showed a smaller drop in oxygen saturation over the placebo group, indicating a better uptake of oxygen, and a measure of pulmonary artery pressure was significantly less for both tadalafil and dexamethasone groups over placebo.

But dexamethasone did show certain advantages over tadalafil. Heart rate increased in all groups, but significantly less so in the dexamethasone group, suggesting less activation of the autonomous

nervous system at high altitude. While AMS did not differ between groups on day one, it was significantly less among the dexamethasone group on day two. Finally, and perhaps most significantly, VO₂max (a key measurement of how efficiently the body is able to use oxygen) was significantly higher in the dexamethasone group at high altitude compared to both placebo and tadalafil groups.

"In this study, we found that the most important limiting factor [with respect to exercise capacity at [high altitude](#)] is primarily pulmonary hypertension—elevated blood pressure in the circulation of the lungs—which may further reduce the oxygen uptake, particularly during exercise. Our study indicates that for HAPE-susceptible climbers, taking dexamethasone improved exercise capacity, oxygen uptake kinetics and decreased the anaerobic threshold," said Dr. Fischler. "Overall, this means that those climbers who took dex felt better, were able to do more, and probably experienced fewer altitude-related discomforts than both other groups."

Glucocorticosteroids such as dexamethasone probably increase exercise capacity through several different mechanisms. They lower pulmonary artery pressure by enhancing nitric oxide availability, as well as stimulating alveolar sodium and water clearance, which may improve oxygen diffusion. Furthermore, they have anti-inflammatory properties and may act on the mental state of those who take it, endowing them with increased willingness to exert themselves.

"There is, however, a word of caution to be made regarding the use of glucocorticosteroids," said Dr. Fischler. "Although short-term tolerability is generally good, they have significant side effects. They reduce the inflammatory response to infections, increase blood glucose and in the long term, they may lead to osteoporosis, reduce muscle mass and skin thickness, just to name the most important ones. Therefore, they should not be used without prescription by a medical

doctor. Further studies need to be done to determine whether these results are generalizeable to non-HAPE-susceptible climbers, but our research strongly suggests that dex taken prophylactically can have a therapeutic effect in those who have experience HAPE in the past."

Source: American Thoracic Society ([news](#) : [web](#))

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