

# Research from Everest: Can leucine help burn fat and spare muscle tissue during exercise?

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Credit: AI-generated image ([disclaimer](#))

Research on Mt. Everest climbers is adding to the evidence that an amino acid called leucine — found in foods, dietary supplements, energy bars and other products — may help people burn fat during periods of food restriction, such as climbing at high altitude, while keeping their

muscle tissue. It was one of two studies reported here today at the 242nd National Meeting & Exposition of the American Chemical Society (ACS) on the elite corps of men and women who have tackled the highest peak on Earth, mountaineering's greatest challenge.

In a pilot study of the feasibility of supplementing the diet of [climbers](#) with the branch chain amino acid, leucine, scientists studied 10 climbers for 6-8 weeks as they ascended Mt. Everest, which towers 29,000 feet above sea level. Since Sir Edmund Hillary and Sherpa guide Tenzing Norgay made the first successful climb in 1953, over 2,500 people have scaled Mt. Everest in the Himalayas. Thousands more tried and failed, with more than 216 deaths. The researchers were studying the physiological benefits of adding leucine to the climbers' diets to help them stay healthy. The researchers are from the University of Utah.

Wayne Askew, Ph.D., and his co-investigator, Stacie Wing-Gaia, Ph.D., who headed the leucine study, explained that the extreme weather conditions, low oxygen levels, treacherous terrain and strenuous exercise during such climbs create a huge nutritional challenge. Weight loss at high altitude is exactly the opposite problem that is on the minds of millions of people in the United States and other countries who are trying to shed excess weight. Climbers often cannot or do not eat enough calories, failing to replenish their bodies with important nutrients. They lose both fat and muscle during an arduous climb, endangering their strength and motor coordination. At high altitudes, fat and muscle loss occurs not only when they are climbing, but also at rest.

“The significant part about this weight loss is that a disproportionate amount comes from the muscle mass,” said Askew. “This can be a problem on long expeditions at high altitude because the longer climbers are there and the higher they go, the weaker they get. The body breaks down the muscle for energy, so climbers don't have it available for moving up the mountain.

“We knew that leucine has been shown to help people on very low-calorie, or so-called ‘calorie-restricted diets’, stay healthy at sea level,” said Askew. “It’s one of the components, the building blocks, of protein. But no one had tested whether leucine would help people stay healthy and strong at high altitudes, so we added leucine to specially prepared food bars that we gave to the climbers.”

Askew didn’t climb Mt. Everest, but members of his research team, Dr. Wing-Gaia and Dr. Rodway, went to base camp and measured expedition members’ fat and muscle by using an ultrasound device placed on the skin. They are currently examining the data to see whether climbers who ate the leucine bar retained more muscle than those who ate a bar without leucine. One finding that was apparent early on in the study was that the food item in which the leucine was delivered was critically important. The Everest climbers had difficulties consuming the three food bars per day that contained the additional leucine. Askew stressed that this was a small pilot study to test the feasibility of leucine supplementation at altitude, so definitive conclusions of its benefits at altitude await the results of a more controlled clinical study. The researchers plan to improve the palatability of the leucine food vehicle in consultation with military food product developers at Natick Research Development and Engineering Center and conduct a more controlled study at high altitude, possibly with the U.S. Army Institute of Environmental Medicine at their laboratory on Pike’s Peak.

Askew pointed out that the findings also could help people at lower altitudes who want to lose weight while preserving their lean body mass, or who are elderly and don’t eat or exercise enough to maintain their strength. He predicts that consumers might one day see leucine-rich bars on grocery store shelves, especially at high-altitude locations, such as Aspen and Denver, where high-altitude skiing and climbing activities are popular.

In the other Everest report, John Finley, Ph.D., described a study in which he gave Mt. Everest climbers a type of fat called “medium-chain triglycerides” in their cookies and hot chocolate. They also took an aspirin every day.

“We tried to improve climbers’ performances by feeding them medium-chain triglycerides — fat that we thought would be metabolized better as quick energy,” said Finley, who is with Louisiana State University.

At high altitudes, the air pressure is low and the oxygen is less dense — making less oxygen available for breathing. In response, the body makes more oxygen-carrying red blood cells. This thickens the blood and puts a strain on the heart and lungs, increasing the risk of potentially dangerous blood clots. That’s why Finley also had the climbers take aspirin, which is known for thinning the blood and reducing the risks of having a heart attack or stroke. “We found that we could reduce the risk factors involved in having more viscous blood at high altitudes by giving the climbers aspirin,” he said.

Finley himself went on the climb and collected urine and fecal samples. The climbers who consumed the medium-chain triglycerides lost less weight and performed better than others on the expedition. The data also suggested that fats aren’t absorbed well at [high altitudes](#) when the body is losing a lot of weight, possibly because too little bile is produced by the liver to dissolve the fats, he explained.

Finley doesn’t have plans to commercialize the medium-chain triglyceride hot chocolate and cookies, but suggests that people going to high-altitude locations talk with their health-care providers about taking a daily aspirin.

Provided by American Chemical Society

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