Everest trek shows how some people get type 2 diabetes

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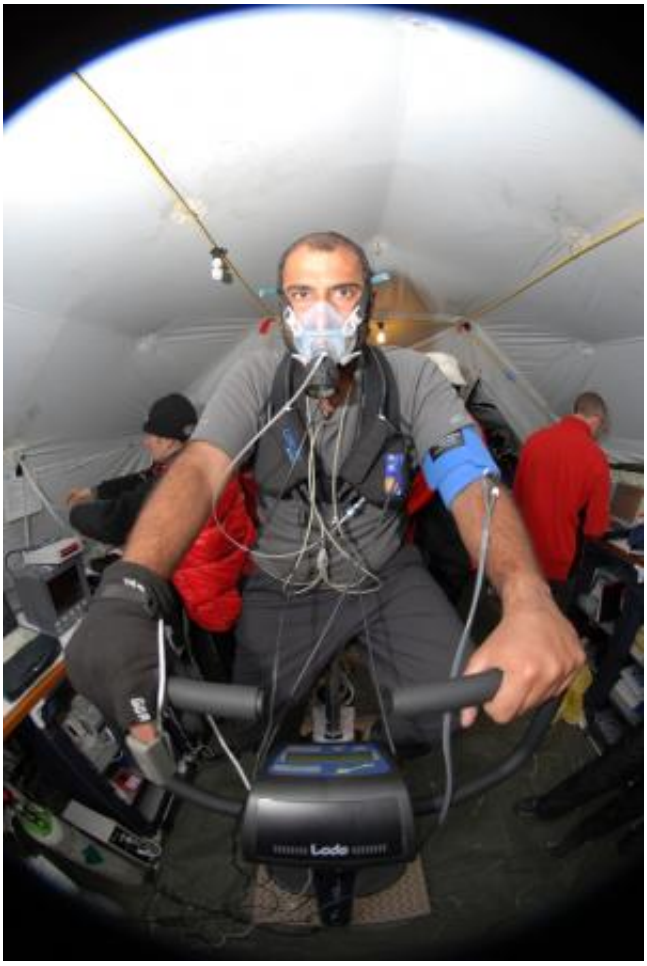


This is Dr. Sundeep Dhillon being tested on an exercise bike at Everest Base Camp. Credit: Caudwell Xtreme Everest

Scientists have gained new insights into the molecular process of how

some people get type II diabetes, which could lead to new ways of preventing people from getting the condition.

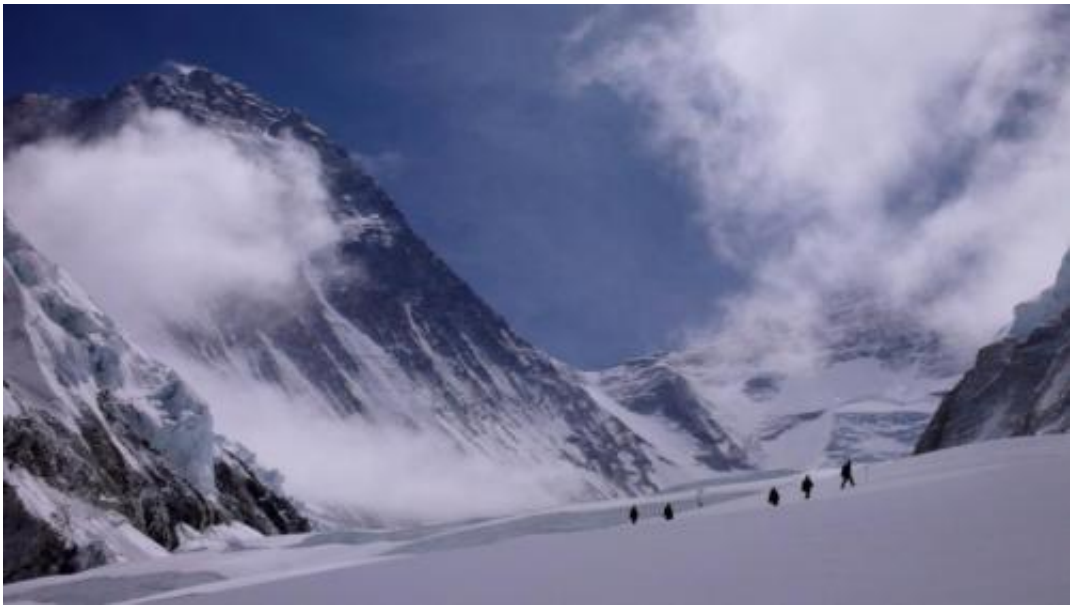
The research, led by the University of Southampton and UCL, which took place on Mount Everest, assessed the mechanisms by which low oxygen levels in the body – known as hypoxia – are associated with the development of insulin resistance.

Insulin resistance is when cells fail to respond to insulin in the body. Insulin enables the body to regulate sugar levels. Too much sugar can be toxic and leads to type II diabetes.

The research, published in *PLOS ONE*, found that several markers of insulin resistance were increased following sustained exposure (6-8 weeks) to hypoxia at high altitude and that this change was related to increased blood levels of markers of inflammation and oxidative stress. The data came from a study called Caudwell Xtreme Everest, which took place in 2007 and was coordinated by the UCL Centre for Altitude, Space and Extreme environment medicine (CASE Medicine).

The study was led by Mike Grocott, Professor of Anaesthesia and Critical Care at the University of Southampton, co-founder of UCL CASE Medicine, who now leads the Critical Care Research Area within the Southampton National Institute for Health Research (NIHR) Respiratory Biomedical Research Unit. He comments: "These results have given us useful insight into the clinical problem of insulin resistance. Fat tissue in obese people is believed to exist in a chronic state of mild hypoxia because the small blood vessels are unable to supply sufficient oxygen to fat tissue. Our study was unique in that it enabled us to see things in healthy people at altitude that which we might normally only see in obese people at sea level. The results suggest possible interventions to reduce progression towards full-blown diabetes, including measures to reduce oxidative stress and inflammation within

the body."



This shows views across the Western Cwm from Camp 2 on Everest. Credit: Caudwell Xtreme Everest

During the study, 24 people travelled to Mount Everest and underwent assessments of glucose control, body weight changes and inflammation biomarkers at Everest Base Camp, which is at an altitude of 5,300m. Half the group remained at Base Camp while the other half climbed the mountain to a maximum of 8,848m. Measurements were taken in each group at week six and week eight of the trek.

The aim was to increase understanding of critically ill patients. The team also made the first ever measurement of the level of oxygen in human blood at 8400m, on the balcony of Everest. This is the centrepiece of an extensive and continuing programme of research into hypoxia and human performance at extreme altitude, aimed at improving the care of the critically ill and other patients where hypoxia is a fundamental

problem. The most recent experiment by the same team, Xtreme Everest 2, took place in spring 2013.

Dr Daniel Martin, Senior Lecturer and Honorary Consultant, UCL Division of Surgery and Interventional Science and Director of UCL CASE Medicine, adds: "These exciting results give us a unique insight into the possible mechanism of insulin resistance in diabetes and provide some clues as to where we should be thinking about focusing further research on novel treatments for this disease. It also demonstrates the value of using healthy volunteers in studies carried out at high altitude to patients at sea level. Our high altitude experimental model for investigating every day illnesses that involve tissue hypoxia is a fantastic way to test hypotheses that would otherwise be very difficult to explore."

More information: dx.plos.org/10.1371/journal.pone.0094915

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