

## Issue 103 In a nutshell

High altitude and severe cold are both situations of oxidative stress.

There have been only a few studies on the clinical benefits of giving antioxidant supplements to climbers at high altitude and with mixed results.

This latest study found a positive result of such supplementation on the clinical symptoms of mountain sickness.

## Antioxidants at high altitude

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## NUTRITION RESEARCH REVIEW

### Study: Antioxidants and altitude sickness

Antioxidant vitamin supplementation can help prevent altitude sickness, according to a study from Wales.

**Subjects:** 18 subjects ascending to Mt. Everest base camp (approximately 5,180 metres above sea level).

**Method:** Randomised, placebo-controlled trial in which supplementation was given for 3 weeks at sea level and then during the 10 day climb to high altitude.

Active treatment was a mixture of vitamin C (L-ascorbic acid 250 mg), vitamin E (dl-alpha-tocopherol acetate 100 IU) and alpha-lipoic acid (150 mg).

The presence of acute mountain sickness (AMS) symptoms was assessed using a standard self-reported measure (Lake Louise AMS score).

**Results:** The antioxidant supplemented group had a significantly lower level of AMS at high altitude, compared to the placebo group (score=2.8 versus 4.0 points,  $p = 0.036$ ).

They also had higher resting arterial oxygen saturation (89% versus 85%,  $p = 0.042$ ), and higher caloric intake (13.2 versus 10.1 MJ/day,  $p = 0.001$ ). The higher caloric intake appeared to be related to a lower level of satiety following a standardized meal.

Reference: Bailey DM, Davies B. Acute mountain sickness; prophylactic benefits of antioxidant vitamin supplementation at high altitude. *High Alt Med Biol* 2001;2:21-9

## Comments

This simple study is typical of many of the reports that are now being published on the clinical use of antioxidant vitamins.

It is typical because it addresses a real clinical situation where prior research suggested a plausible mechanism by which this supplementation might have a benefit.

But it is also typical in that the study is based on a small sample and is one of only a few similar studies. So the results are interesting, but need to be followed up.

It has been known for many years that exposure to even moderately high altitude and to a very cold environment are both situations of oxidative stress that increase antioxidant requirements.

However, at high altitude subjects typically decrease their food intake ('altitude hypophagia') so that they may find it difficult to meet these increased requirements. The increased level of oxidation has been thought by some researchers to be a possible contributing cause to the symptoms of altitude sickness.

A small number of placebo-controlled studies have looked at the response of subjects at high altitude to antioxidant supplementation.

The results have been mixed - several studies have reported that this failed to reverse the increased oxidation (e.g. see <sup>1</sup>), whilst others have found some positive response.

The new research summarised above is interesting in that it is one of the first to study the effects of supplementation directly on the clinical symptoms of mountain sickness. There was a clear benefit.

However, it is not surprising that the balance of results from studies involving antioxidant supplementation at high altitude remains mixed. We have seen this in many situations in sports medicine research involving oxidative stress, where antioxidant supplements have been given in controlled trials to see if they are able to produce helpful clinical benefit.

It is really not clear yet why it has been so hard to demonstrate consistent benefits. Is it because we have not yet worked out how such supplements should be given (the combination, timing and dose) or is it that they only help a specific sub-set of subjects we have yet to identify? Or is it that they actually don't consistently help at all? This all remains to be seen.

Reference:

1. Chao WH et al. Oxidative stress in humans during work at moderate altitude. J Nutr 1999;129:2009-12

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