

# Vitamin C and E supplements hampers endurance training

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Vitamin C and E supplements may blunt the improvement of muscular endurance – by disrupting cellular adaptations in exercised muscles – suggests a new study published today in *The Journal of Physiology*.

As vitamin C and E [supplements](#) are widely used, understanding if they interfere with cellular and physiological adaptations to exercise is of interest to people exercising for health purposes as well as to athletes.

Dr Gøran Paulsen, who led the study at the Norwegian School of Sport Sciences, explains:

"Our results show that vitamin C and E supplements blunted the [endurance training](#)-induced increase of mitochondrial proteins, which are needed to improve muscular endurance."

In the 11-week trial, 54 young, healthy men and women were randomly allocated to receive either 1000mg vitamin C and 235mg vitamin E (consistent with amounts found in shop supplements), or a placebo (a pill containing no active ingredients). Neither the subjects nor the investigators knew which participant received the vitamins or placebos.

The participants completed an endurance training programme, consisting of three to four sessions per week, of primarily running. Fitness tests, blood samples and [muscle biopsies](#) were taken before and after the intervention.

Whilst the supplements did not affect [maximal oxygen uptake](#) or the results of a 20 metre shuttle test, the results showed that markers for the production of new muscle mitochondria – the power supply for cells – increased only in the group without supplements.

The National Health Service (NHS) says taking less than 540mg vitamin E and 1000mg vitamin C supplements per day is unlikely to cause any harm.

Dr Paulsen says:

"Our results indicate that high dosages of vitamin C and E – as commonly found in supplements – should be used with caution, especially if you are undertaking endurance training."

A significant trend has been identified, but the molecular processes requires further research. Dr Paulsen says:

"Future studies are needed to determine the underlying mechanisms of these results, but we assume that the vitamins interfered with cellular signalling and blunted expression of certain genes."

Previous studies show that exercising increases muscle oxidant production, which participates in the signalling processes leading to muscle adaption. It is possible that high doses of vitamins C and E act as antioxidants and take away some of this oxidative stress, hence blocking muscular [endurance](#) development.

**More information:** Paulsen G, Cumming K, Holden G, Hallen J, Ronnestad B, Sveen O, Skaug A, Paur I, Bastani N, Ostgaard H, Buer C, Midttun M, Freuchen F, Wiig H, Ulseth E, Garthe I, Blomhoff R, Benestad H and Raastad T. (2014) Vitamin C and E supplementation hampers cellular adaptation to endurance training in humans: a double-

blind randomized control trial. *Journal of Physiology*. DOI: [10.1113/jphysiol.2013.267419](https://doi.org/10.1113/jphysiol.2013.267419)

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