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Molecular evidence that oral supplementation with lycopene or lutein protects human skin against ultraviolet radiation: results from a double-blinded, placebo-controlled, crossover study

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Abstract

Background: Increasing evidence suggests photoprotection by oral supplementation with β -carotene and lycopene.

Objectives: To examine the capacity of lycopene-rich tomato nutrient complex (TNC) and lutein, to protect against ultraviolet (UV)A/B and UVA1 radiation at a molecular level.

Methods: In a placebo-controlled, double-blinded, randomized, crossover study two active treatments containing either TNC or lutein were assessed for their capacity to decrease the expression of UVA1 the radiation-inducible genes HO1, ICAM1 and MMP1. Sixty-five healthy volunteers were allocated to four treatment groups and subjected to a 2-week washout phase, followed by two 12-week treatment phases separated by another 2 weeks of washout. Volunteers started either with active treatment and were then switched to placebo, or vice versa. At the beginning and at the end of each treatment phase skin was irradiated and 24 h later biopsies were taken from untreated, UVA/B- and UVA1-irradiated skin for subsequent reverse transcriptase polymerase chain reaction analysis of gene expression. Moreover, blood samples were taken after the washout and the treatment phases for assessment of carotenoids.

Results: TNC completely inhibited UVA1- and UVA/B-induced upregulation of heme-oxygenase 1, intercellular adhesion molecule 1 and matrix metalloproteinase 1 mRNA, no matter the sequence (anova, $P < 0.05$). In contrast, lutein provided complete protection if it was taken in the first period but showed significantly smaller effects in the second sequence compared with TNC.

Conclusions: Assuming the role of these genes as indicators of oxidative stress, photodermatoses and photoageing, these results might indicate that TNC and lutein could protect against solar radiation-induced health damage.

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