Assessment of Vitamin E Intake in Relation to Tolerable Upper Intake Levels

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Authors’ contributions

This work was carried out in collaboration between all authors. The opinion has been assessed and approved by the Panel on Nutrition, Dietetic Products, Novel Food and Allergy of VKM. All authors read and approved the final manuscript.

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ABSTRACT

The Norwegian Scientific Committee for Food Safety (Vitenskapskomiteen for mattrygghet, VKM) has, at the request of the Norwegian Food Safety Authority (Mattilsynet; NFSA), assessed the intake of vitamin E (alpha-tocopherol) in the Norwegian population in relation to tolerable upper intake levels (ULs). The existing maximum limit for vitamin E in food supplements is 30 mg/day. VKM was also requested to conduct scenario calculations to illustrate the consequences of amending the maximum limit for alpha-tocopherol to 15, 50, 100, 150, 200 and 300 mg/day.

Naturally vitamin E is a fat soluble compound synthesised by plants and consists of eight different tocopherols (α-, β-, γ- and δ- tocopherols and α-, β-, γ- and δ- tocotrienols) with varying vitamin E

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α-Tocopherol is recognised to meet human vitamin E requirements and accounts for 90% of the activity in human tissue. Vitamin E activity in food is expressed as α-tocopherol equivalents (α-TE) and 1 α-TE is defined as 1 mg d-α-tocopherol.

The physiological role of vitamin E is to react with free radicals in cell membranes and other lipid milieu, thereby preventing polyunsaturated fatty acids (PUFA) from being damaged by lipid peroxidation. This antioxidant activity is important to maintain membrane integrity and takes place in all cells in the body.

Vitamin E deficiency symptoms include peripheral neuropathy, ataxia, myopathy and retinopathy. Vitamin E is dependent on lipid and lipoprotein metabolism and it takes decades for body depletion. The Norwegian recommended intakes for vitamin E for adults are 10 α-TE/day for men and 8 α-TE/day for women.

There is no evidence of adverse effects from the consumption of vitamin E naturally occurring in foods. Animal studies have shown that α-tocopherol is not mutagenic, carcinogenic or teratogenic. However, high doses of α-tocopherol supplements can cause haemorrhage and interrupt blood coagulation.

VKM propose to adopt the tolerable upper intake level set by the Scientific Committee for Food Safety (SCF) which is based on one human dose-response study. Hence, the upper level for supplemental vitamin E is suggested to 300 mg/day for adults. The upper level for children and adolescents is derived from scaling the adult upper level based on body surface area (body weight 0.75).

The tolerable upper intake levels set for vitamin E concern only intake from supplements, since intake of vitamin E from the diet is considered safe. VKM has therefore not conducted or evaluated scenarios with intake from both diet and supplements.

Dietary calculations have, however, been performed for intake in various percentiles (P) P5, P25, mean, P50, P75 and P95 in children (2-4- and 9-year-olds), adolescents (13-year-olds) and in adult men and women as background information.

Mean and median intakes of vitamin E are above the recommended intakes for all age groups. No age group reaches the recommended intake at P5, and 9- and 13-year-old boys and 9-year-old girls do not reach the recommended intake at P25 from diet alone.

Because the tolerable upper intake level for supplemental vitamin E for adults is 300 mg/day, none of the suggested amendments of the maximum limit in food supplements (to 15, 50, 100, 150, 200 and 300 mg/day) will lead to exceedance of this upper level in adults. In 13-year-olds supplements with 300 mg/day vitamin E will lead to exceedance of the upper level. In 9-year-olds supplements with 200 mg/day vitamin E will lead to exceedance of the upper level. In 4- and 2-year-olds supplements with 150 mg/day vitamin E will lead to exceedance of the upper level. Vitamin E intake from fortified products is not included in the calculations, but are however, evaluated to be very low.

Keywords: VKM; risk assessment; Norwegian Scientific Committee for Food Safety; α-tocopherol; vitamin E; food supplement; upper level; exposure.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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