Assessment of Selenium 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.

Article Information

DOI: 10.9734/EJNFS/2018/42536

Received 2nd June 2018
Accepted 28th June 2018
Published 3rd July 2018

ABSTRACT

The Norwegian Scientific Committee for Food Safety (Vitenskapskomiteen for mattrygghet, VKM) has, at the request of the Norwegian Food Safety Authority (Mattilsynet; NFSA), evaluated the intake of selenium in the Norwegian population. VKM has also conducted scenario calculations to illustrate the consequences of amending maximum limits for selenium to 50, 150 or 200 μg/day in food supplements. The existing maximum limit is 100 μg/day.

Selenium is a cofactor for enzymes and proteins with vital importance in antioxidant defence, thyroid hormone and insulin function and regulation of cell growth.

We reviewed four risk assessments undertaken by the Institute of Medicine (IOM), Scientific Committee on Food (SCF), Expert Committee on Vitamins and Minerals (EVM), and the Nordic
Nutrition Recommendations (NNR). Because of limited evidence from human studies and due to the selection of a high uncertainty factor (UF), we decided to use the tolerable upper intake levels (ULs) set by the SCF (2000) and later adopted by NNR (2012).

Early signs of selenium toxicity are a garlic breath and a metallic taste. Severe selenosis results in fast hair loss and brittle nails, as well as other gastrointestinal symptoms such as nausea, vomiting, diarrhea, fatigue, irritability, and rash. Acute selenium intoxication and chronic overexposure may affect the nervous system and result in nerve damage.

The SCF established a UL for selenium at 300 μg/day for adults, including pregnant and lactating women. This UL was based on a no observed adverse effect level (NOAEL) of 850 μg/day for clinical selenosis applying a UF of 3, and was supported by three studies reporting no adverse effects for selenium intake between about 200 and 500 μg/day.

As there were no data to derive specific ULs for children, the SCF (2000) extrapolated the UL from adults to children based on reference body weights. The proposed UL values for children and adolescents ranged from 60 μg/day (1–3 years) to 250 μg selenium/day (15–17 years).

According to the scenario estimations in adults, the dietary selenium intake at the 95th percentile and additionally 150 μg selenium from food supplements will be below the UL while 200 μg selenium from food supplements will lead to exceedance of the UL for adults. For 13- and 9-year-olds, supplemental doses of 100 and 50 μg selenium per day, respectively, do not lead to exceedance of the ULs in these age groups. For 2- and 4-year-olds, all the suggested doses in food supplements will lead to exceedance of the ULs.

Keywords: VKM; risk assessment; Norwegian Scientific Committee for Food Safety; selenium; food supplement; upper level; exposure.

Available: https://vkm.no/download/18.645b840415d03a2fe8f26388/1499329648173/2ed9fd5983.pdf


NOTE:

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 the Norwegian Scientific Committee for Food Safety. VKM Report 2017: 20, ISBN: 978-82-8259-277-2, Oslo, Norway.

COMPETING INTERESTS

Authors have declared that no competing interests exist.