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Assessment of Dietary Intake of Molybdenum in Relation to Tolerable Upper Intake Level

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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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Grey Literature

ABSTRACT

The Norwegian Scientific Committee for Food and Environment (Vitenskapskomiteen for mat og miljø, VKM) has, at the request of the Norwegian Food Safety Authority (Mattilsynet; NFSA), evaluated the intake of molybdenum. VKM has also conducted scenario calculations to illustrate the consequences of amending maximum limits for molybdenum to 100, 250, 500 or 1000 µg/day in food supplements. The previous maximum limit was 250 µg/day.

Molybdenum is as a cofactor for some important enzymes in humans. These enzymes are involved in the catabolism of sulfur amino acids and heterocyclic compounds, including purines and pyridines. A distinct molybdenum deficiency has not been described in animals when subjected to molybdenum restriction, despite considerable reduction in the activity of molybdoenzymes. Molybdenum deficiency is not observed in healthy humans. The estimated Adequate Intake (AI) proposed by the European Food Safety Authority (EFSA) is 65 µg per day for men and women. Legumes, grains, and nuts are major contributors of molybdenum in the diet.

Molybdenum is a potential antagonist to copper absorption, but symptoms of copper deficiencies due to excess molybdenum intake have only been observed in ruminants. Based on the effect on

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reproduction and growth in animals, tolerable upper intake levels (ULs) have been estimated to be 2 mg/day by the U.S. Institute of Medicine (IOM) in 2001 and 0.6 mg/day by the Scientific Committee on Food (SCF) in 2000. These ULs were based on the same scientific evidence, but IOM used an uncertainty factor (UF) of 30 and SCF used a UF of 100 because the evidence base was considered to be weak.

Because of the limited safety data on molybdenum, VKM support the use of the default uncertainty factors at 100 for extrapolation of data from animal studies to humans. Additionally, molybdenum deficiency is very rare and no studies have indicated a nutritional need for additional molybdenum from dietary supplements. The ULs for children were derived by adjusting the adult UL according to default body weights.

According to the scenario estimations, only the highest suggested maximum limit of 1000 µg molybdenum from food supplements will lead to exceedance of the UL for adults. For 1-3 year old children, all the suggested maximum limits for molybdenum will lead to exceedance of the UL. In children 4-10 years, supplements with 250, 500 or 1000 µg molybdenum will lead to exceedance of the ULs, whereas for adolescents 11-17 years, the UL will be exceeded with supplemental doses at 500 or 1000 µg per day.

VKM emphasises that the current assessment of maximum limits for molybdenum in food supplements is merely based on published reports concerning upper levels from the SCF (2000, EU), IOM (2001, USA), EVM (2003, UK) and NNR (2012, Nordic countries). VKM has not conducted any systematic review of the literature for the current opinion, as this was outside the scope of the terms of reference from NFSA.

Keywords: VKM; risk assessment; Norwegian Scientific Committee for Food and Environment; molybdenum; food supplement; upper level; exposure.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.