Assessment of Copper Intake in Relation to Tolerable Upper Intake Levels

Tor A. Strand1*, Inger Therese L. Lillegaard2, Livar Frøyland3, Margaretha Haugen4, Sigrun Henjum5, Martinus Løvik6, Tonje Holte Stea7 and Kristin Holvik4

1Norwegian Scientific Committee for Food Safety (VKM), Innlandet Hospital Trust, Norway.
2Norwegian Scientific Committee for Food Safety (VKM), Norway.
3Norwegian Scientific Committee for Food Safety (VKM), Institute of Marine Research, Norway.
4Norwegian Scientific Committee for Food Safety (VKM), Norwegian Institute of Public Health (FHI), Norway.
5Norwegian Scientific Committee for Food Safety (VKM), Oslo and Akershus University College of Applied Sciences (HIOA), Norway.
6Norwegian Scientific Committee for Food Safety (VKM), Norwegian University of Science and Technology (NTNU), Norway.
7Norwegian Scientific Committee for Food Safety (VKM), University of Agder, Norway.

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), evaluated the intake of copper in the Norwegian population in relation to tolerable upper intake levels (ULs). VKM has also conducted scenario calculations to illustrate the consequences of amending maximum limits for copper to 1, 2, or 3, mg/day in food supplements. The existing maximum limit is 4 mg/day. Copper is a micronutrient essential for energy utilisation, brain function (neurotransmitter regulation), soft tissue and bone (collagen synthesis), nutrient metabolism (especially iron) and antioxidant defence against free radicals. Foods account for 90% or more of copper intake in adults when the copper content in drinking water is low (< 0.1 mg/L). If the copper content is higher (> 1-2 mg/L), water may account for up to 50% of total intake (EFSA, 2015).

*Corresponding author: Email: tron.gifstad@vkm.no;
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). Liver damage was selected as a critical endpoint from which to derive a UL because it was judged to be the most reliable marker and consequence of a long-term chronic high copper intake. However, copper-related liver damage is observed almost exclusively in patients with genetic predispositions of copper accumulation.

VKM suggest to use the UL at 5 mg/day (NNR Project Group, 2012; SCF, 2003). This UL was derived from human studies. In the light of the evidence, SCF decided that an uncertainty factor (UF) of 2 was adequate to allow for potential variability within the normal population, whereas the Institute of Medicine (IOM) applied a UF of 1. VKM find the higher UF suitable because human data is limited, the uncertainty of the copper content of drinking water and the potential severe and irreversible adverse effects.

According to the scenario calculations, adults and 13-year-olds with high copper intakes from regular foods (95th percentile) will exceed the ULs with supplemental copper at doses of 3 mg/day or higher. 9-year-old children will exceed the UL with use of 2 mg supplemental copper per day. For younger children the ULs will be exceeded in more than 5% without adding supplemental copper.

In our calculations, copper from drinking water is not included. Copper concentrations in annual samples from waterworks are in general below 0.1 mg/L (Nordheim et al., 2016).

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

Available: https://vkm.no/download/18.645b840415d03a2fe8f26258/1499329257334/4de098adad.pdf


NOTE:

This work was carried out in collaboration between all authors. The opinion has been assessed and approved by the Panel on Food Additives, Flavourings, Processing Aids, Materials in Contact with Food and Cosmetics of VKM. All authors read and approved the final manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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