Assessment of Dietary Intake of Manganese 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.

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 manganese from the diet and 1, 5 or 10 mg manganese per day in food supplements. The former maximum limit for manganese in food supplements was 5 mg per daily dose.

Manganese (Mn) is an essential dietary mineral for mammals, and is a component of metalloenzymes such as superoxide dismutase, arginase and pyruvate carboxylase. Manganese is involved in amino acid-, lipid- and carbohydrate metabolism and in proteoglycan synthesis in bone formation. In 2013, the European Food Safety Authority (EFSA) suggested 3 mg/day to represent an adequate intake (AI) of manganese because data was considered insufficient to set an average requirement (AR).

Reports of adverse effects resulting from manganese exposure in humans are associated primarily with inhalation in occupational settings. Excess oral exposure to manganese, especially from...
contaminated water sources, has been shown to cause permanent neurological disorder known as “manganism” which can be irreversible. The amount of manganese absorbed is inversely related to the concentration of manganese in the diet. This regulation seems to be part of the adaptive changes to the amount of dietary manganese intake, which allow the maintenance of manganese homeostasis over a wide range of intakes. Manganese is mainly absorbed as Mn(II), and absorption is reported to be below 10% of ingested manganese.

The main route of elimination of manganese from the body is via bile to the small intestine, while very little is excreted in the urine. Half-life for manganese can vary from 13 to 37 days, with a longer half-life in women than in men, but large inter-individual variation exists.

In Norway, manganese content in drinking water is low, and does not contribute to any magnitude of manganese intake. Daily dietary intake of manganese in Norway is not known, but it is proposed that manganese intake is adequate in the Scandinavian countries (NNR Project Group, 2012). Results from the Swedish Market Basket study, 2015, indicate an average daily manganese intake of 4.2 mg per person and day. Calculations based on data from Denmark, 2013 and 2015, evaluate mean dietary intake of manganese to 3.9 mg/day for adults and up to 6.9 mg/day in the higher intake groups. EFSA report on an observed mean intake in EU around 3 mg/day for adults. Main contributor to dietary manganese intake is cereals (57%) followed by fruit, vegetables, nuts and coffee/tea.

Irreversible neurotoxic adverse effects from intakes of manganese close to adequate intakes have been reported in humans (SCF, 2000). The Scientific Committee on Food (SCF) could not set a no observed adverse effect level (NOAEL), because no relevant dose-response animal studies were found. Consequently SCF did not set a tolerable upper intake level (UL) for manganese.

VKM considers that any dose of manganese as an ingredient in food supplements may be associated with increased risk of negative health effects.

VKM emphasises that the current assessment of maximum limits for manganese in food supplements is merely based on published reports concerning upper levels from the IOM (2001, USA), SCF (2003, EU), 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; manganese; food supplement; upper level; exposure.

Available: https://vkm.no/download/18.18fdf1161d31d8fb92463b/1521019598516/Assessment%20of%20dietary%20intake%20of%20manganese%20in%20relation%20to%20tolerable%20upper%20intake%20level.pdf


NOTE:

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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