

pTDI OF COPPER FOR THE GENERAL POPULATION - RATIONALE

Prepared November 15, 2002

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Copper (Cu) is an essential element for humans and, therefore, its adverse health effects may be related to deficiency as well as excess. In order to prevent excessive intake of Cu, the World Health Organization (WHO) in 1982 set a provisional tolerable daily intake (pTDI) of 0.5 mg/kg bw/day for the general population (30 mg/person/day).

This level has been used for many years by the WHO to recommend drinking water guideline values (WHO, 1993;1996a) and by the Food Directorate to evaluate the health risk of Cu in foods. However, the confidence in this pTDI has been questioned, as the animal data used to derive it were from a rather old study in which dogs were dosed with copper-gluconate for up to 12 months only (WHO, 1993;1996a; Janus et al., 1989; Fitzgerald 1995).

In addition, this level has been found to be approaching a threshold level observed in humans (adults). A case study on a 28-year patient showed that consumption of a copper supplement at 30 mg/person/day for 2 years, followed by 60 mg/person/day for an additional period can cause cirrhosis and acute liver failure (O'Donohue et al., 1993). In comparison, when seven subjects were given 10 mg Cu as copper gluconate for a period of 12 weeks there was no evidence of gastrointestinal symptoms and adverse effects on liver function (Pratt et al., 1985).

In light of these human data, it appears that the appropriate TDI is probably closer to 10 mg/person/day (Pratt et al., 1985) or that the safe upper level intake of 10 to 12 mg/person/day proposed by WHO (1996b) can be accepted rather than the current pTDI of 0.5 mg/kg bw/day (30 mg/person/day). The value of 10 mg/person/day has also been recently accepted by the Food and Nutrition Board of the Institute of Medicine (IOM, 2002) as the tolerable upper intake level (UL) for Cu (the "no observed adverse effect level" or NOAEL of 10 mg/person divided by an uncertainty factor of 1.0). If 5.0 mg/person/day from the mean daily diet and water intake (IPCS, 1998; IOM, 2002) is added to this UL, a TDI for Cu may be accepted at 15 mg/person/day. Thus, it is recommended that, for the general adult population, the current TDI of 0.05-0.5 mg/kg bw/day be changed to 0.25 mg/kg bw/day (15 mg divided by 60 kg body weight).

References:

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