

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 14, 1996

TO: File for Magnesium Chloride (7786-30-3)
FROM: Marco Bianchi
SUBJECT: Initial Threshold Screening Level

The initial threshold screening level (ITSL) for magnesium chloride is 5 µg/m³ based on an annual averaging time.

The following references or databases were searched to identify data to determine the ITSL: IRIS, HEAST, NTP Management Status Report, RTECS, EPB-CCD, EPB library, CAS-online, NLM-online, IARC, NIOSH Pocket Guide, and ACGIH Guide.

A complete reference check was conducted for magnesium chloride, but information was limited to one study. In a Japanese study conducted by Tanaka et al., magnesium chloride was administered at dietary levels of 0 (control), 0.3, 0.6, 1.25, 2.5, or 5% to groups of 10 male and 10 female B6C3F₁ mice for 13 weeks. Animals were observed for overt signs of toxicity or change in behavior, Measurements of individual body weights, and food and water consumption by cage were performed weekly. Hematological determinations of erythrocyte and leukocyte counts, hemoglobin concentrations, and hematocrit values were routinely performed, in addition to determining blood biochemistry parameters.

Results revealed no treatment-related effects in terms of survival, clinical observation, hematology or blood biochemistry. Renal cell vacuolation was mainly found in the P1 and P2 segments of the proximal tubules in high dose males, but not females. This change might reflect reabsorption of magnesium, because the proximal tubules are the major reabsorbing site. As this alteration was not linked with change in any blood biochemical parameters indicating renal failure, its toxicological significance was considered by the authors to be minimal.

The average body weights of both sexes fed diets containing 5% magnesium chloride were lower than those of the controls throughout the study period, which was considered a direct effect. More specifically, fasted body weights before sacrifice were significantly decreased for males fed 1.25% or above, and for females fed 5% magnesium chloride. Although significant increases in the relative body weights of some organs were observed in both sexes of the 2.5 and 5% groups, no blood biochemical or histopathological changes were found. Significant decrease of the relative spleen weight was apparent in the male 2.5 and 5% groups. However, since no hematological or histopathological alterations were seen, these organ weight changes were considered to be simply related to the lower body weight.

According to the authors, this study demonstrated that a diet containing over 2.5% magnesium chloride exerted toxic effects (renal tubular changes in male mice). The authors concluded this dose level to be the minimal toxic dose. In addition to evaluating renal tubular changes in mice, magnesium chloride also exerted an effect on body and organ weights. The authors mentioned significant increases in relative organ weights observed in both sexes of the 2.5 and 5% dose groups, but no blood biochemical or histopathological changes were found. A few statistically significant outliers were also found in the lower dose groups but not enough to justify setting a LOAEL any lower than 1.25% magnesium chloride. Therefore, a LOAEL of 1.25% magnesium chloride (2150 mg/kg) will be used to derive an ITSL for this compound.

The ITSL was determined as follows:

1.25% MgCl₂ in the diet = 12,500 ppm

12,500 ppm x 0.172 (food consump. kg/kg body wt. for B6C3F₁ mice) = 2150 mg/kg

$$\frac{2150 \frac{mg}{kg}}{10 \times 10 \times 100} \times \frac{0.036 \text{ kg (body wt. B6C3F}_1\text{ mice)}}{1.688 \frac{m^3}{kg} \text{ per day (B6C3F}_1\text{ inhalation rate)}} \times \frac{1}{1} = 0.00458 \frac{mg}{m^3}$$

$$0.00458 \text{ mg/m}^3 \times 1000 = 4.6 \text{ } \mu\text{g/m}^3$$

The ITSL for magnesium chloride = 5 μg/m³ based on annual averaging.

References:

Tanaka H. et al., 1994. Thirteen-week oral toxicity study of magnesium chloride in B6C3F₁ mice. Toxicology Letters 73: 25-32.

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