



Guidance for Groundwater

## Manganese: Tiered Health Based Guidance for Water

May 2012

*The following guidance was developed by the Health Risk Assessment Unit (HRA) of the Minnesota Department of Health (MDH) as a result of activities related to Health Risk Limits rule making. For more information, contact the [Health Risk Assessment Unit](#).*

**Chemical:** Manganese (Mn)

**CAS Number:** 7439-96-5

**Endpoint:** Neurological effects

**Value for infants (< one year of age):** 100 µg/L

**Value for children and adults:** 300 µg/L

**Source:** Minnesota Department of Health, 2012, and US EPA Drinking Water Standards and Health Advisories, 2006

In 2012, the Minnesota Department of Health (MDH) replaced past manganese guidance (last updated in 2008) with tiered guidance for two populations.

MDH established 2012 Risk Assessment Advice (RAA<sub>12</sub>) of 100 µg/L for infants less than one year of age and specifically applies to infants that drink plain tap water or formula prepared with tap water. This value is the same as the MDH 1993 Health Risk Limit (HRL<sub>93</sub>) but the basis of the number has changed.

MDH established 2012 Risk Assessment Advice (RAA<sub>12</sub>) of 300 µg/L for children equal to, or older than one year of age, and adults. This value also applies to infants less than one year of age that exclusively breast feed and do not drink tap water. This value is the same as the U.S.

Environmental Protection Agency (U.S. EPA) Lifetime Health Advisory for manganese.

Manganese (Mn) is considered a trace beneficial element, which means that low levels of manganese are a benefit to humans. However, high exposures to Mn can also harm the nervous system. The level at which Mn benefits one individual could overlap with the level at which it is harmful to another individual. There is no evidence to suggest that people eating a normal diet are at risk of having too little manganese. Recent studies suggest that manganese from drinking water poses a greater health risk than manganese found in foods. MDH has determined that it is possible to develop a drinking water concentration for Mn that is protective without compromising the beneficial exposures from food.

Beginning in 2011, the Minnesota Department of Health (MDH) conducted a thorough review of recent and relevant scientific human and animal studies about Mn to determine whether existing guidance was health protective for all populations. Based on this review, MDH has developed tiered water guidance for Mn to provide an appropriate level of health protection for different groups based on age-related susceptibility to the harmful effects of

Mn.

MDH has determined that a guidance value of 100 µg/L of Mn in groundwater protects the health of infants. During the reevaluation of Mn, MDH considered the most recent scientific studies and applied updated methodology to calculate a short-term guidance value (< 30 days) that would be protective of infants, the population most sensitive and susceptible to manganese toxicity. Based on the recent animal toxicity studies and updated risk assessment methodology, MDH calculated a water guidance value of 100 µg/L. This guidance was issued as Risk Assessment Advice 2012 (RAA<sub>12</sub>). This guidance is appropriate for infants who drink tap water or are fed formula mixed with tap water.

The RAA<sub>12</sub> for Mn happens to be the same value as the MDH Health Risk Limit (HRL<sub>93</sub>) for manganese. In 2010, as a result of rulemaking activities, MDH determined that the HRL<sub>93</sub> value should be retained until a reevaluation was complete. The reevaluation has demonstrated to MDH that the HRL<sub>93</sub> Mn value should continue to be retained in rule.

During the reevaluation, MDH also determined that the U.S. EPA lifetime health advisory of 300 µg/L (EPA-822-R-04-003)<sup>1</sup> for Mn continues to be an appropriate level of protection for evaluating exposures and managing health risks of children and adults. This value is protective of nursing mothers and their infants. This guidance was originally issued by MDH as a Health Based Value in 2008 (HBV<sub>08</sub>) but was changed to Risk Assessment Advice in 2012 (RAA<sub>12</sub>) to adhere with MDH guidance development methodology. The RAA<sub>12</sub> is based on dietary studies focusing on what is considered a safe oral intake of Mn for children and adults. Also note that U.S. EPA has set a Secondary Maximum Contaminant Level (SMCL) for Mn of 50 µg/L based on staining and taste considerations.

1 U.S. EPA, Office of Water. (2004) [Drinking Water Health Advisory for Manganese](#)

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