Current Regulatory Limit: Manganese

MANGANESE:
CASRN: 7439-96-5

DATE: October 2013

Current Massachusetts Regulatory Limit
Office of Research and Standards Guideline (ORSG):

Target Population	Exposure Period	ORSG, mg/L (ppm)
General population	Lifetime	0.3
General population	10-day	1.0
Infants/children less than 1 year of age	< 10 days (Address within 10 days or sooner if possible)	0.3

Federal Regulatory Limit
The US EPA has not published a Maximum Contaminant Level (MCL) for manganese. It does have a Secondary MCL (SMCL) (http://water.epa.gov/drink/contaminants/index.cfm) and Health Advisory values for manganese (https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf).

Basis for Criteria
The Massachusetts ORSG for manganese closely follows the United States Environmental Protection Agency's (US EPA) Health Advisory (HA) for manganese. The basis for the US EPA manganese HA is explained in US EPA (2004). The lifetime HA value is 0.3 mg/L. For shorter term exposures, US EPA established a ten-day HA of 1 mg/L for the general population (based on Mn intake data for children from 7 months to 3 years of age, which was conservatively applied to older individuals). Because no suitable data were available in the literature to determine a one-day HA, US EPA used the ten-day value for the one day HA as a default. For infants younger than 6 months, US EPA stated that these individuals should not be given water containing more than 0.3 mg Mn/L for longer than ten days. US EPA did not establish a one-day HA for infants in this age range. Together these HAs help to limit the potential for excess intake of manganese, which has been associated with adverse neurological effects in several studies of children.

The lifetime US EPA Health Advisory value of 0.3 mg/L represents a reasonable value for consumption of water from public drinking water supplies and is adopted as part of the ORSG for manganese.

Data on the duration of Mn exposure that is of concern is limited. In addition, Mn intakes from other sources, such as from food, are variable over time and Mn in drinking water is more easily absorbed into the body than from food. These factors preclude the establishment of a precise bright line for health-protective short-term guidelines for Mn in drinking water. Instead, US EPA established short-term HAs based on upper-end manganese intake estimates (not adverse health effects), yielding a ten-day HA of 1 mg/L. The 10 day limit is not a bright line, but is used to minimize Mn exposures. ORS has adopted it as part of its ORSG for manganese.

However, to address concerns that:

1) infants and younger children may be particularly susceptible to manganese toxicity;
2) intakes of water on a weight basis are higher for younger children; and,
3) infant formulas contain variable (and sometimes high) levels of manganese,

ORS further recommends limiting drinking water exposures for infants/children under one year of age to less than 10 days when manganese levels are in excess of 0.3 mg/L, if possible. This ten day limit isn't a critical bright line but is used to underscore the need to minimize high exposures to infants/children. At drinking water Mn concentrations greater than 0.3 mg/L parents are advised to use bottled or treated water for their young children, in particular to make formula and/or to discuss with their pediatrician whether use of a formula with lower amounts of Mn may be appropriate.

This is somewhat different from US EPA's advisory language; expanding the age group to which a lower manganese concentration applies from less than six months of age to less than one year of age.[1] Because of a lack of information on very short-term exposures ORS has also concluded that EPA's one-day HA value is not supported.

Class
Inorganic, heavy metal

Reference
US EPA (2004). Drinking Water Health Advisory for Manganese. EPA-822-R-04-003. Washington, DC, US Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division. (https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf).

[1] One year of age was selected as a cutoff because intake of formula containing Mn by older children is unlikely.