



## Manganese in Drinking Water

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### Introduction

Manganese is a mineral that naturally occurs in rocks and soil and is a normal constituent of the human diet. It exists in well water in CT as a naturally occurring groundwater mineral, but may also be present due to underground pollution sources. Manganese may become noticeable in tap water at concentrations greater than 0.05 milligrams per liter of water (mg/l) by imparting a color, odor, or taste to the water. However, health effects from manganese are not a concern until concentrations are approximately 10 times higher.

The CT Department of Public Health (DPH) recently set a drinking water Action Level (AL) for manganese of 0.5 mg/l to ensure protection against manganese toxicity. This AL is consistent with the World Health Organization guidance level for manganese in drinking water. The CT AL provides guidance for prudent avoidance of manganese concentrations of potential health concern. Local health departments can use the AL in making safe drinking water determinations for new wells, while the homeowner in consultation with local health authorities makes decisions regarding manganese removal from existing wells.

This fact sheet is intended to help individuals who have manganese in their water understand the health risks and evaluate the need for obtaining a water treatment system.

### What Health Effects can Manganese Cause?

Exposure to high concentrations of manganese over the course of years has been associated with toxicity to the nervous system, producing a syndrome that resembles Parkinsonism. This type of effect may be more likely to occur in the elderly. The new manganese AL is set low enough to ensure that the potential nervous system effect will not occur, even in those who may be more sensitive. Manganese is unlikely to produce other types of toxicity such as cancer or reproductive damage.

## **Is Manganese of Particular Concern for Young Children?**

Yes, and especially so for bottle-fed infants. Certain baby formulas contain manganese, and if prepared with water that also contains manganese; the infant may get a higher dose than the rest of the family. In addition, young children appear to absorb more manganese than older age groups but excrete less. This adds up to a greater potential for exposure in the very young. Since manganese's effects on the developing nervous system have not been adequately studied, it is especially prudent for pregnant women and young children to have drinking water that is below the manganese AL.

## **How Do I know if I have Manganese in My Water?**

You may suspect that manganese is in your water if the water is discolored (brownish-red), causes staining of plumbing fixtures (faucets, sinks) or clothing, or has an off-taste or odor. If this is the case, you should have your water tested by a state-certified laboratory for manganese. When you get the results, you should contact your local health department to help you interpret the results. The following questions and answers should also be helpful.

## **What is the Water Concentration Where Manganese Becomes a Health Risk?**

As stated in the introduction, manganese concentrations below 0.5 mg/l are not a health concern even though they may cause the water to look, taste, or smell unusual. The CT AL of 0.5 mg/l is set well below any health effect level and thus provides a margin of safety. You should consider treating the water to reduce the manganese concentration if it is above the AL. This will ensure that an adequate margin of safety exists to protect you and your family.

## **What is the Background or Normal Levels of Manganese in Groundwater?**

The level of manganese in groundwater from natural leaching processes can vary widely depending upon the types of rock and minerals present at the water table. Typically, manganese concentrations from natural processes are low but can range up to 1.5 mg/l or higher. Sources of pollution rich in organic matter (e.g., runoff from landfills, compost, brush or silage piles, or chemicals such as gasoline) can add to the background level by increasing manganese release from soil or bedrock into groundwater.

Although natural processes can cause manganese concentrations to reach the State AL of 0.5 mg/l, these levels are still a health concern.

## **How Else Can I be exposed to Manganese?**

Manganese is a common trace element in the diet, with the amount of dietary exposure typically outweighing that which comes from drinking water. It should also be noted that manganese is added to some dietary supplements leading to even greater exposures for those taking such supplements. When water concentrations exceed 0.5 mg/l, the contribution from water becomes significant and put you at an increased health risk. Bathing and showering in manganese-containing water does not increase your exposure since manganese does not cross the skin and doesn't get into the air.

## **How Can I Decrease My Family's Exposure to Manganese?**

If you have a water concentration greater than 0.5 mg/l, you should consider installing a water treatment system or drink bottled water. People often choose to treat the water if the concentration is above 0.05 mg/l because of the way manganese can affect the water's properties (color, taste, staining) at these low levels.

Treatment systems are primarily of the filtration type, including manganese greensand, manganese dioxide, cation exchange with potassium chloride regeneration, or aeration followed by filtration. The concentration of manganese in the water and its physical state in the water will help determine the optimum treatment design. Therefore, before purchasing a system check with your local health department, the CT Department of Energy Environmental Protection (DEEP) (860) 424-3705, or CT DPH's Drinking Water Section at (860) 509-7333. If the manganese water concentration is above 1.5 mg/l or if the concentration suddenly increases, you or your local health department should contact the DEEP. They will investigate whether a source of pollution may be responsible for the manganese concentrations in your well.

## **Are There Federal Standards for Manganese in Drinking Water?**

There are no enforceable federal drinking water standards for manganese. The US Environmental Protection Agency has a secondary standard of 0.05 mg/l, which is intended to let the public know that manganese can affect water quality at this level. This secondary standard is not health-based and is not enforceable. In the absence of a federal standard, the CT DPH has developed the AL described above.

## **Where Can I get More Information?**

You can contact the CT DPH at 860-509-7742 or your local health department for more information regarding manganese in well water. In addition, you can contact the CT DEEP, (860) 424-3705, about potential sources of manganese in well water and treatment options. DPH's Drinking Water Section, (860) 509-7333, can also be called for assistance on manganese treatment options.