MANGANESE: Too Much of a Good Thing in Drinking Water

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Mankind has been using manganese for thousands of years; it was used as a pigment in ancient cave paintings and the Romans used it to create colorless glass. In the 19th century it became widely used in the production of steel, iron, and an alloy aluminum that doesn’t rust. Even that disposable AA battery that you just put into your TV remote control has manganese in it. Not only does manganese have industrial uses, it is a mineral that is commonly found in everyday food such as pineapple, spinach, corn, and rice. It is essential for human health as a strong antioxidant, for supporting bone health and growth, balancing blood sugar, supporting respiratory health, helping with brain function and many other benefits. But when is it too much of a good thing?

Even with all its health benefits, when too much manganese is ingested, it may cause negative neurological impacts. High levels of manganese ingestion are of special concern for bottle-fed infants under one year of age and young children who are still developing.

Historically, before health effects of over-exposure had been observed, the U.S. Environmental Protection Agency (EPA) had considered manganese to be mostly an aesthetic nuisance due to the staining and brown color it gives to drinking water. There still are no primary federal regulatory limits under the Safe Drinking Water Act, though, in 2004, EPA established a maximum contaminant level of .05 mg/L. The EPA also developed a lifetime health advisory level (HAL) for manganese in drinking water of 0.3 mg/L.

The HAL allows states to issue a public notice to communities found to have manganese levels in their drinking water that exceed 0.3 mg/L. This level is set to protect a person over a lifetime of exposure. It is recommended that infants up to 6 months of age should not be given water or have formula made with manganese concentrations greater than 0.3 mg/L for more than a total of 10 days, and the rest of the population should not ingest water with manganese concentrations greater than 1 mg/L for more than a total of 10 days per year. Some states may have more stringent standards regarding manganese levels in drinking water.

How do water systems treat for manganese and what can homeowners do to protect their family from ingesting dangerous levels of manganese? Methods used to treat for manganese in drinking water treatment plants will depend on the chemistry of the water. Drinking water systems with lower amounts of manganese can use phosphate compounds to sequester the manganese. This is a fairly inexpensive and widely used process. Water sources with higher concentrations of manganese may need to use oxidation and filtration, lime softening, reverse osmosis, or ion exchange. Each of these processes have pros and cons to consider regarding cost and effectiveness for the drinking water system.

When a public notice goes out for exceeding the HAL, it is important to educate the customers that boiling water does not remove manganese; it actually makes it worse by increasing the concentration. Point-of-use devices such as reverse osmosis and water softeners are both effective ways for residents to treat for manganese in the home. If a resident is concerned about manganese levels in their drinking water, we suggest taking a sample to a laboratory that is certified to test drinking water.

The U.S. EPA has recently renewed their interest in manganese levels in drinking water. The agency is asking drinking water systems serving 10,000 or more customers to sample for manganese as part of the Fourth Unregulated Contaminant Monitoring Rule (UCMR4) which is conducted every five years. This data will give the EPA a broad picture of the manganese levels in drinking water systems across the country. For now, the future of manganese guidance and regulations for drinking water is unknown. As more studies are conducted and the scope of manganese in drinking water is analyzed further, the best practice is to stay up-to-date with your state drinking water primacy agency’s guidance. Meanwhile, eat a healthy dose of manganese in that spinach salad and enjoy that channel surfing!

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