

## **Summary Document from the Health Advisory for Boron and Compounds**

*Prepared by Health and Ecological Criteria Division (HECD), Office of Science and Technology (OST), Office of Water (OW) for Office of Groundwater/Drinking Water (OGWDW), OW, U.S. EPA.*

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This is a Summary derived from the [Health Advisory for Boron and Compounds](#), unregulated contaminants occasionally found in drinking water. Health Advisories (HAs) serve as informal guidance on the concentrations of chemicals that may raise a health concern when spills or contamination situations occur. They are prepared for the Federal, State and local officials responsible for protecting public health. The guideline values are not enforceable Federal standards and are subject to change as new information becomes available.

### **What is boron?**

Boron is a non-metallic, naturally-occurring, element found in rocks, soil, and water. Boron does not exist as a pure element but is combined with oxygen as borate minerals and various boron compounds such as boric acid, borax, and boron oxide. The boron compounds listed above are odorless crystals, granules, or powders. Elemental boron is insoluble in water and boric acid and borax are slightly soluble in water.

### **What are the uses of boron and its compounds?**

Boron compounds are used primarily in the production of glass and ceramics, pesticides, fire retardants, plus insulation-grade- and textile-grade-glass fibers. Boron can be present in commercial plant foods and fertilizers. Boron compounds are often found in household laundry and cleaning products.

### **How does boron get in my drinking water?**

Boron gets into drinking water from both naturally-occurring and man-made sources. Some areas in the western United States (California, Nevada, Oregon) have high concentrations of boron in some of their soils. Contamination of water can come directly from industrial wastewater and municipal sewage, as well as indirectly from air deposition and soil runoff. Natural weathering processes, burning of coal in power plants, chemical plants, and manufacturing facilities releases boron into the air; and fertilizers, herbicides, and industrial wastes are among the sources of soil contamination.

### **How much boron am I exposed to from sources other than in my drinking water?**

Approximately 800,000 to 4,000,000 metric tons of boron are released into the atmosphere from sea water, and about 180,000 to 650,000 metric tons of boron are

released into the atmosphere from the industries that use boron and boron-containing products. Boron concentrations in the air are reported to range from <0.5 to 80 ng/m<sup>3</sup>. Boron is found in soil and is taken up by plants. It found naturally in fruits, legumes, nuts, vegetables, and grains. The average intake of boron in the U.S. diet ranges from 0.85 mg B/day (4-8 year old child) to 1.47 mg B/day (male vegetarian). Dietary levels can be as high as 5-6 mg/day for some individuals.

### **What adverse health effects have been observed in humans and animals exposed to high levels of boron?**

An acute overdose to infants has caused diarrhea, vomiting, signs of irritability, erythema in the diaper area, a mild red rash on the face and neck, a pus-like discharge or mild congestion of the eye, and possibly convulsive seizures. In adults, an acute overdose causes nausea, vomiting, redness of the skin, difficulty swallowing due to ulcers in the throat, and a non-bloody diarrhea. In animals, acute excessive exposure has caused lethargy, rapid respiration, eye inflammation, swelling of the paws, shedding of the skin on the paws and tails, excitation during handling, and changes in the cells of the forestomach.

### **What are the amounts of boron and compounds that might cause adverse health effects?**

As levels of boron in drinking water increase above the One-Day and Ten-Day Health Advisory (3.0 mg/L) and the Longer Term Health Advisory (2.0 mg/L) for children, the risk for the potential effect on the testes of young males increases when consumed for the duration indicated by the advisory. As the level of boron in drinking water increases above the Longer Term Health Advisory and Lifetime Health Advisory for adults (5 mg/L), the risk for the potential effect on the fetuses of pregnant women and the testes of males increases. Direct effects on a pregnant woman would occur at doses higher than those that would affect the fetus. Data are not available to assess any potential differences in susceptibility of pregnant vs. non-pregnant women. Water containing boron at levels above the HA should not be used to prepare food or formula for infants and children.

### **How will I know if I have boron in my drinking water?**

The Federal Government does not regulate boron in drinking water and, public drinking water systems are not required to monitor for this contaminant. Some states have drinking water standards or guidelines for boron (California, Florida, Maine, Minnesota, New Hampshire and Wisconsin); these range from 0.6 to 1 mg/L. You may want to call your drinking water utility or state drinking water program to determine if monitoring is required in your state.

If there is no requirement for monitoring in your state, you can have your water analyzed by a laboratory that is certified for the analysis of similar compounds. The following EPA website provides a list of state certification officers or links to certified

laboratories in your state: <http://www.epa.gov/safewater/labs/index.html>. The contacts provided may be able to assist you in finding an appropriate laboratory.

You can also call your local public health office or the Safe Drinking Water Hotline Phone: 800-426-4791- toll free; <http://www.epa.gov/safewater/hotline/index.html> to determine if they are aware of any problems with boron in your area.

### **How can boron be removed if it gets in my drinking water?**

Three technologies have been shown to reduce boron levels to below 0.3 mg/L. They are a boron-specific ion exchange resin, a strong-base anion-exchange resin, and reverse osmosis, which has limited capabilities. Before installing a home treatment unit, the manufacturer should be contacted to determine if it can remove boron from your water supply.

### **How can I find out more about boron?**

The Drinking Water Health Advisory will provide additional detail about boron. You can access the Health Advisory at [www.epa.gov/waterscience/](http://www.epa.gov/waterscience/).

### **Reference**

United States Environmental Protection Agency (U.S. EPA). 2008. Drinking Water Health Advisory for Boron and Compounds. *Prepared by Health and Ecological Criteria Division (HECD), Office of Science and Technology (OST), Office of Water (OW) for Office of Groundwater/Drinking Water (OGWDW), OW, U.S. EPA.*