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TECHNICAL BULLETIN

HEALTH EFFECTS INFORMATION

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ENVIRONMENTAL TOXICOLOGY SECTION
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BORON

Department of Human Services
Environmental Toxicology Section
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SYNONYMS

There are no common synonyms for boron but it is frequently encountered in a variety of chemical formulations including boric acid, various borate salts, borax and boron soil supplements.

USES

Boron compounds have been used for generations in eyewashes, mouthwashes, burn ointments, baby ointments, and baby powders. In the last few decades there has been a growing recognition that boron can pose serious health hazards, and has been largely eliminated from these uses, particularly those involving children and infants. Boron compounds are used industrially in glass making, leather preservation, in welding and brazing fluxes, and in fire proofing and fire resistance treatment. It is also used as a fertilizer or soil additive in areas where soils are found to be deficient in boron.

CHEMICAL AND PHYSICAL PROPERTIES

The chemical symbol for boron is B. Boron does not exist as a pure element in nature, but is always present as oxides or other combined forms. It is a natural ingredient in many soils and natural mineral formations. It is commonly found in soils and ocean water at levels below 10 micrograms per kilogram (ppm). Boron oxides are generally found as white solids or powders. These oxides and other salts are soluble to varying degrees in water.

WHERE DOES IT COME FROM? HOW DOES IT ENTER THE ENVIRONMENT?

Boron is a natural element so it exists in many soils and natural waters, particularly in seawater. In areas where very rich deposits exist and where it is mined or used by man, it is released in greater quantities by dust, mining waste, and in solid and liquid waste from mines and industries.

WHAT HAPPENS TO IT IN THE ENVIRONMENT?

Since boron is a natural element it does not degrade or disappear from the environment. It may change its form physically and chemically, but it always remains as boron. Since it exists primarily as a solid or dissolved in water, it can be moved about in the environment by wind, transportation of materials and by

movement of waters.

HOW CAN BORON ENTER AND LEAVE MY BODY?

Everyone is exposed regularly to small amounts of boron in food. Generally the amounts pose no harm because boron is regularly excreted in feces and urine over a period of several days. High-level exposures can occur in industries where people handle concentrated boron compounds, inhale dust from boron materials or ingest excessive boron in food products. Persons who use boric acid, borates and borax or other boron-containing household products can be exposed by inhalation and ingestion as well as by absorption through skin, especially if the skin is damaged. If food products or drinking water contain abnormal amounts of boron, persons can also be exposed to excesses in this way.

WHAT ARE ITS HARMFUL EFFECTS?

Children and infants on which boron compounds are used for medication can become acutely ill with nausea, vomiting, diarrhea, circulatory collapse, skin rash and confusion. Fatal poisonings often involve kidney failure. Acute poisonings are rare and are generally associated with deliberate use of concentrated boron products. Other adverse effects that do not include any immediate symptoms of illness can occur when smaller amounts of boron are used on a regular basis. These injuries are not as well known but involve stunted growth (in experimental animals) and infertility in human beings. Other symptoms that have been linked to long-term overexposure to boron include loss of appetite, vomiting, diarrhea, loss of hair, skin rashes, anemia and convulsions.

Although boron is known to be an essential plant nutrient it has not been demonstrated to be needed or beneficial in human nutrition. It is beneficial to plants only within narrow limits, and excesses are injurious and even lethal to plants. Regular use of irrigation water with more than 1 ppm boron is harmful to most kinds of plants.

DRINKING WATER STANDARDS

There is no mandatory maximum limit in the US for boron in drinking water, but US EPA is considering adoption of 0.6 ppm as the standard. The World Health Organization and several European countries have adopted or recommended drinking water limits for boron of 0.3 ppm.

CAN BORON BE REMOVED EFFECTIVELY FROM DRINKING

WATER?

Little is known about the treatment of drinking water for removal of boron. Heating, aeration or boiling are not effective and could actually increase the concentrations of boron. Mechanical filtration probably would not be effective either because the boron is usually dissolved rather than particulate. Reverse osmosis and ion exchange resin systems may be able to remove significant amounts of boron. Both technologies are expensive and require careful and regular maintenance. Before purchasing or installing treatment equipment you are encouraged to contact the Drinking Water Program (971) 673-0408 for consultation and advice.

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