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Ligia Mora-Applegate
Bureau of Waste Cleanup
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Relative source contribution for boron

Dear Ms. Mora-Applegate:

At your request, we have developed a chemical-specific relative source contribution (RSC) for boron based on dietary and supplemental intake data. Boron is an inorganic element that is found naturally in the environment. It is utilized in the production of glass, ceramics, pesticides, fire retardants, and high-energy fuels (EPA, 2008). A biological function for boron has not yet been established in humans. Therefore, neither a Recommended Dietary Allowance nor an Adequate Intake have been established (NAS, 2001). The primary adverse effects of boron toxicity include decreases in testes and fetal weights (EPA, 2008). Based on decreased fetal weights in rats, the US EPA developed an oral reference dose of 0.2 mg/kg-d in 2004.

The National Academy of Sciences (NAS) estimated total dietary and supplemental ingestion rates for boron. Based on the NAS Dietary Reference Intake report (NAS, 2001), major dietary sources of boron include coffee, milk, apples, beans, and potatoes. The report utilized data from the Third National Health and Nutrition Examination Survey (NHANES III) to derive a median consumption rates for boron ranging from from 0.87 to 1.35 mg/day for adults, depending upon age and gender. The NHANES III was also utilized to derive an adult median boron intake from supplements of 0.14 mg/day. Based on these data, NAS calculated an adult median dietary and supplement boron intake of 1.0 to 1.5 mg/day.

Using the larger median ingestion value of 1.5 mg/day and assuming a 70 kg body weight for adults, we calculated a combined dietary and supplemental boron dose of 0.02 mg/kg-d. This value (0.02 mg/kg-d) is 10% of the oral RfD (0.2 mg/kg-d). Therefore, the RSC for boron in drinking water is 90% (0.9). The US EPA states, "where data indicate drinking water exposure is between 80 and 100 percent of total exposure to a contaminant, EPA assigns a relative source contribution for drinking water of 80 percent" (Federal Register, Vol. 54, No. 97, May 22, 1989). This allows for boron exposure in air and other sources that were not considered in the assessment. It also allows for the protection of individuals that may have higher dietary exposure than the median. Based on this recommendation, we propose using a provisional RSC of 0.8 for boron in drinking water.

A modified **GCTL of 5,600 µg/L** was calculated using the formula in Figure 2 of Chapter 62-777, F.A.C. Promulgated assumptions were taken from Table VI of the rule. Chemical-specific inputs for this GCTL include a provisional RSC of 0.8 and the oral RfD (0.2 mg/kg-d).

Please let us know if you have any questions regarding the development of these values.

Sincerely,

Leah D. Stuchal, Ph.D.

Stephen M. Roberts, Ph.D.

References:

National Academy of Sciences (NAS) (2001) *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc.* Food and Nutrition Board, Institute of Medicine, Washington, D.C.

US EPA (2008) *Regulatory Determinations Support Document for Selected Contaminants from the Second Drinking Water Contaminant Candidate List (CCL 2), Part II: CCL2 Contaminants Undergoing Regulatory Determination, Chapter 3: Boron.* Office of Ground Water and Drinking Water, Washington, D.C.