

# **Boron**

## **Facts:**

- ◆ Boron (B) is a trace mineral essential for plants. Boron has only recently been established as an mineral of nutritional significance to humans and animals.<sup>1</sup> Although this mineral has not been officially recognized as essential by the National Academies of Science, there is growing consensus within the scientific and medical community that it plays a valuable role in a number of physiological functions—primarily calcium and bone metabolism.<sup>2</sup>
- ◆ Boron is found in most tissues but is primarily concentrated in the bone, spleen, and thyroid.
- ◆ Excesses of boron are excreted in the urine.

## **Functions:**

- ◆ Several studies have demonstrated that this trace mineral is required in calcium and bone metabolism to help prevent bone loss associated with osteoporosis.
- ◆ Several studies have also shown an association between sufficient boron intake and a reduction in the incidence of tooth decay.<sup>1</sup>
- ◆ Studies have linked optimal intakes of boron with enhanced memory, alertness, and cognitive function.<sup>3</sup>
- ◆ Some studies have shown that boron supplementation of 3 milligrams per day results in both calcium and magnesium retention and elevations in serum concentrations of testosterone and estrogen.<sup>4</sup>
- ◆ Men who consume optimal intakes of boron also have decreased risk of developing prostate cancers.
- ◆ Elderly individuals benefit from supplementing their diet with 2 to 3 milligrams per day of boron due to a reduced ability to absorb calcium.<sup>4</sup>
- ◆ Some research findings have indicated that boron is a “dynamic” trace element that can affect the metabolism of other substances involved in many processes including hormones such as estrogen and thyroid hormone.<sup>5</sup>

## **Requirements:**

No recommendations or Daily Values have been established. Typical daily intakes in the United States vary between 0.5-7.0 milligrams. Those consuming Westernized diets consume between 0.1-0.5 milligrams of boron per day.<sup>1</sup>

## **Signs of Deficiency:**

In animals (with a vitamin D deficiency) fed low amounts of boron, there were increases in total calcium loss, interruption with the use of insulin, fat and glucose as well as diminished bone development. In closely monitored studies, humans fed a diet low in boron exhibited similar changes as witnessed in the boron-deficient animals. Low intakes of boron may also aggravate the symptoms of arthritis. It reduces

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blood ionized calcium and calcitonin levels and elevates urinary calcium loss in humans, while adequate supplementation inhibits these conditions.

### **Interactions:**

Low levels of boron can cause increased urinary excretion of calcium and magnesium.

### **Signs of Toxicity:**

The majority of boron that enters the body is excreted through the urine. Boron is considered non-toxic unless consumed in highly excessive amounts. Doses up to 18 mg daily appear safe even when taken for prolonged periods of time. In animals, large doses of boron have caused loss of appetite, nausea, vomiting, skin rashes, lethargy, and diarrhea.

### **Current Research:**

**Heart Disease:** Researchers at the University of Sydney in Australia have found that boron might reduce cardiovascular disease by inducing small increases in plasma estrogen concentrations.<sup>6</sup>

**Arthritis:** Researchers at the International Symposium on Health Effects of Boron and its Compounds held at the University of California at Irvine report that boron levels in arthritic patients are low and that the arthritis rates are typically higher in regions where boron intakes are the lowest. However, in patients that supplemented their diet with boron, bone density is much greater. **Osteoarthritis:** Supplemental boron may relieve some of the symptoms of osteoarthritis. Some epidemiological studies suggest that in areas of the world where boron intakes are 1 mg or less, the incidence of arthritis ranges from 20 to 27 percent.<sup>10</sup> A double-blind, placebo-controlled study of 20 patients in which half of the patients were given 6 mg of boron daily and the other half received placebo reported that 50 percent of those taking boron reported improvement while only 10 percent of those on placebo showed similar improvement.<sup>10</sup>

**Cognitive Function:** According to the United States Department of Agriculture (USDA) Agricultural Research Center, boron is essential for mental function, hand-eye coordination, attention span, perception, and short and long-term memory.<sup>5</sup> Comparing spectral analysis of electroencephalographic data of low boron intake compared to high boron intake, there was a significant increase in the proportion of low-frequency activity and a decrease in the proportion of higher frequency activity (an effect often observed in general malnutrition or heavy metal toxicity). In addition, low boron intake resulted in "significantly poorer" performance on tasks emphasizing manual dexterity, eye-hand coordination, attention, perception, encoding, and short-term memory and long-term memory.<sup>5</sup>

**Prostate Cancer:** Researchers at the University of California at Los Angeles conclude that men whose diets had the most boron, at least 1.8 milligrams of boron per day, had less than one-third as many prostate cancers as men who consumed less than 0.9 milligrams per day.<sup>8</sup>



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Immune Function: There is emerging evidence that dietary boron aids the immune system by reducing the incidence and severity of inflammatory disease. Researchers believe boron facilitates the normal inflammatory process by reducing the activity of serine proteases, enzymes that are typically elevated during the normal inflammatory process.<sup>9</sup>

Osteoporosis: Boron may help prevent against postmenopausal osteoporosis. Researchers at the USDA Agricultural Research Service found that women who supplemented their diet with 3 milligrams of boron excreted approximately 40 percent less calcium, 30 percent less magnesium and slightly less phosphorous through their urine than they had prior to supplementation.<sup>4</sup>

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