

# USANA Technical Bulletin

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## Boron

### Technical Background

- Elemental boron was first isolated in 1808. It primarily occurs in nature in combination with oxygen (as borate). Boron, in trace amounts, is essential for the growth of plants and is also found in animal and human tissues in low concentrations.<sup>1</sup>
- Prior to 1980, boron was not thought to be an essential nutrient for humans. In 1981, however, it was reported that boron stimulated growth and prevented bone abnormalities in vitamin D-deficient chicks.<sup>2</sup> Boron is now regarded as an essential trace mineral that affects the absorption, excretion, and metabolism of calcium, magnesium, and phosphorus in the body. Consequently, boron plays an important role in keeping bones and joints healthy, and may be important in treating and/or preventing osteoporosis<sup>3,4,5</sup> and arthritis.<sup>6</sup>
- Recent studies have found that dietary intake of boron may be associated with reduced risk for prostate cancer.<sup>7,8,9</sup>
- Boron may also be needed for membrane function,<sup>10</sup> and may play an additional role in human brain function and cognitive performance.<sup>11</sup> Research also suggests that boron may play a role in the immune system and inflammatory responses.<sup>12</sup>

### Sources and Recommended Intake

- No Recommended Dietary Allowance (RDA) has yet been established for boron. Average dietary intakes are thought to range from 0.87 to 1.35 mg per day.<sup>13</sup>
- The best dietary sources of boron include nuts, fresh and dried fruits, legumes, fresh vegetables, coffee, and milk.<sup>14</sup>
- Taken in excess, boron can become toxic.<sup>15</sup> In one study, humans consuming more than 500 mg of boric acid a day for 50 days displayed disturbed appetite, digestion, and health. In humans, signs of acute boron toxicity include nausea, vomiting, diarrhea, dermatitis, and lethargy.<sup>16</sup> High boron intake can also lead to increased urinary excretion of riboflavin.<sup>17</sup>

### Abstracts

**Barranco WT, Eckhart CD. Boric acid inhibits human prostate cancer cell proliferation. *Cancer Lett.* 2004 Dec 8;216(1):21-9.** The role of boron in biology includes coordinated regulation of gene expression in mixed bacterial populations and the growth and proliferation of higher plants and lower animals. Here we report that boric acid, the dominant form of boron in plasma, inhibits the proliferation of prostate cancer cell lines, DU-145 and LNCaP, in a dose-dependent manner. Non-tumorigenic prostate cell lines, PWR-1E and RWPE-1, and the cancer line PC-3 were also inhibited, but required concentrations higher than observed human blood levels. Studies using DU-145 cells showed that boric acid induced a cell death-independent proliferative inhibition, with little effect on cell cycle stage distribution and mitochondrial function.

## References

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