

Boron Reduces Prostate Cancer Risk

Compelling evidence indicates that the trace mineral boron plays an important role in protecting men against deadly prostate cancer by selectively killing prostate cancer cells while leaving healthy cells unharmed. Adequate boron levels are associated with a 64% reduced risk of prostate cancer as well as a reduction in PSA levels.

By [Michael Downey](#), Health & Wellness Author.

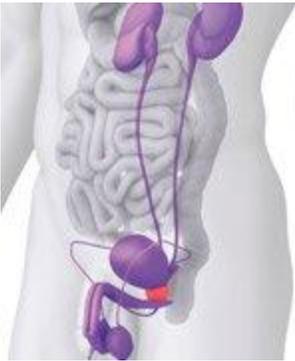
Compelling evidence is accumulating that the trace mineral **boron** plays an important role in protecting men against *deadly* prostate cancer.¹⁻³

As men grow older, their risk for prostate cancer skyrockets and metastasis outside the prostate is “uniformly lethal.”¹

Fortunately, eye-opening studies demonstrate that **boron** has been found to *selectively* kill prostate cancer cells while leaving healthy cells unharmed.^{2,4} In addition, boron has been found to lower **PSA**¹—which was previously believed to be only a marker for prostate cancer. More recent research shows that **elevated PSA** is a causative factor in prostate cancer progression.¹

Adequate boron levels are associated with a **64%** reduced risk of prostate cancer,³ but obtaining protective levels of boron from food alone is difficult.⁵ This means that **supplementation** with low-cost **boron** could be a lifesaver for aging males at risk for prostate cancer, in addition to other health benefits provided by this vital mineral.

Preferentially Targets Prostate Cancer Cells



The idea that supplemental use of boron might reduce the risk of prostate cancer was first brought to the attention of scientists following a 2001 study on dietary patterns of prostate cancer patients as reported long ago in *Life Extension* magazine.

This study compared the diets of 76 prostate cancer patients with those of 7,651 men without cancer. Researchers found that men who ingested the greatest amount of boron from their diets were **64%** less likely to develop prostate cancer than those who consumed the least.

Interestingly, while there was a significant decrease in cancer risk in the group that consumed the most boron, those in the highest intake group only consumed 2.5 additional servings of fruit and one additional serving of nuts per day compared to those in the lowest boron intake group.³

A subsequent study confirmed these findings. For the study, the researchers compared the dietary boron intake of 95 prostate cancer patients with that of 8,720 healthy male controls. Researchers controlled for age, race, education, smoking, body mass index, dietary caloric intake, and alcohol consumption. They found that men with the highest boron intake showed a **54%** lower risk of prostate cancer compared to those with the lowest intake.⁶ In addition, they noted that increased dietary boron intake was associated with a decreased risk of prostate cancer in a dose-response manner.

These findings not only underscored the remarkable, broad-spectrum health benefits associated with consuming fruits, but also suggested that boron in particular may be responsible for some of these protective benefits.

Encouraged by these epidemiological findings showing a connection between dietary intake of boron and reduced risk for prostate cancer, scientists set out to determine if supplementing with boron could protect against prostate cancer. Initial animal studies indicate that the answer is yes.

In a validated animal model of prostate cancer, researchers found that oral administration of various concentrations of a boron-containing solution substantially decreased tumor size. It also lowered levels of prostate-specific antigen or PSA—the most abundant protein synthesized in the prostate gland—suggesting a possible mechanism for these anticancer effects.⁷

In this animal model, researchers orally administered various concentrations of a boron-containing solution to test subjects and found that this resulted in decreases in prostate tumor size by **25% to 38%**. Remarkably, PSA levels dropped by an astounding **86% to 89%** in the animals that received boron.⁷

These findings suggested that supplemental boron may have both preventive and therapeutic effects—helping both to shrink prostate tumors and to decrease levels of PSA.

Novel Protective Mechanisms

The finding that supplemental boron can help to shrink prostate tumors while also decreasing levels of PSA⁷ is particularly exciting. At one time, PSA was viewed primarily as a blood indicator of prostate cancer, infection, or inflammation. However, evidence now reveals that PSA plays a critical role in the progression and metastasis of prostate cancer, thus opening up new therapeutic pathways for preventing and treating this epidemic disease with PSA-lowering nutrients such as boron.^{1,8-11}

Scientists now believe that elevated PSA breaks down the protein surrounding the cells (called the extra-cellular protein matrix) within the prostate gland. The breakdown of these cellular barriers by excess PSA may be what enables prostate cancer cells to more readily invade healthy tissue and spread themselves beyond the prostate gland, with potentially lethal consequences.⁸ This remarkable data provides further understanding as to how we may prevent or slow down prostate cancer by reducing PSA levels.

Published evidence further suggests that higher intake of boron-containing compounds can inhibit PSA activity⁷ and lower the risk of prostate cancer by reducing intracellular calcium signals and storage.¹²

Reduce Cancer Risk With Boron

- Boron is increasingly recognized for its targeted capacity to destroy prostate cancer cells and lower prostate-specific antigen, or PSA—while leaving healthy cells unharmed.
- Sufficient amounts of boron also support healthy bones and joints, as well as reducing the risk and pain of osteoarthritis.
- Boron quantities found in food are usually very low.
- Adequate boron intake via supplements may help prevent or control potentially lethal prostate cancer and support optimum health.



Using Boron As Adjuvant Treatment

A number of studies have led researchers to conclude that boron could have specific therapeutic potential in the treatment of prostate cancer.

Less well-known than PSA is a protein called **prostate specific membrane antigen** or **PSMA**. While PSMA has not yet been completely verified as a marker for prostate cancer, studies have shown that the expression of PSMA in tumors and metastases of men with prostate cancer is greater than PSMA in men without prostate cancer.¹³

In **2014**, scientists published a cell study based on the ability of boron to inhibit **PSMA**. They found that boron-rich compounds demonstrated significant uptake by prostate cancer cells, which indicated that boron compounds may be useful in developing a new class of therapeutic agents—among those known as **boron neutron capture therapy** or **BCNT**—against prostate cancer. BCNT is a type of noninvasive, injection-based anticancer therapy using boron.¹⁴

Another aspect of boron that makes it an especially beneficial therapeutic agent is its ability to *selectively* inhibit the growth of prostate cancer cells while still allowing normal prostate cells to grow. Scientists know that these actions are dose-dependent, though the underlying mechanism for this targeted effect is still under investigation.⁴

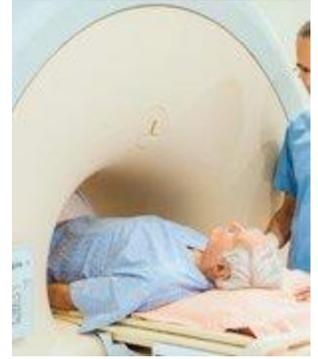
A **2014** study published in *Tumour Biology*, however, did reveal that a compound containing boron induced apoptosis, or cell death, in prostate cancer cells. The researchers were able to determine that the boron agent disrupted the normal organization of prostate cancer cells' **actin filaments**, which are threadlike, protein fibers that are an essential element or building block of the cell. The compound containing boron exerted other cytotoxic or cell-killing effects, including the reduction of telomerase activity in the cancer cells. They concluded that the boron in this compound "***could be an important agent for its therapeutic potential in the treatment of prostate cancer.***"²

The increasingly evident conclusion is that ensuring an adequate daily boron intake via supplementation—and not relying on the small and extremely variable amounts of boron available in plant foods from different agricultural regions—represents an important component of a strategy to prevent prostate cancer and maintain optimal PSA levels.

In fact, emerging studies now suggest that boron delivers another layer of protection against the symptoms of this prostate cancer—in the bone.

Also known as carcinoma of the prostate—a gland in the male reproductive system—prostate cancer:

- Is diagnosed in about 209,000 American men every year³¹
- Is the most common cancer among men^{32,33}
- Is the second leading cause of cancer death among men (after lung cancer)³²
- Kills about 28,000 American men annually³¹
- Can occur without exhibiting any symptoms at all³⁴
- Can result in any of the following symptoms:³⁴
 - Difficulty starting urination
 - Weak or interrupted flow of urine
 - Frequent urination, especially at night
 - Difficulty emptying the bladder completely
 - Pain or burning during urination
 - Blood in the urine or semen
 - Pain in the back, hips, or pelvis that doesn't go away
 - Painful ejaculation
- May be up to **64%** less likely to strike men with adequate boron levels than men with boron deficiency³



Critical Player In Bone Health

The major and most deadly danger in prostate cancer is its ability to spread to the bone, which is its natural evolution. Bone is the initial and main site for about **80%** of all prostate cancer metastases.¹⁵ They occur most commonly in the spine, pelvis, ribs, skull, and proximal femur.¹⁶

These bone metastases induce significant skeletal remodeling, fractures, anemia, and pain—and are a major cause of morbidity and mortality.¹⁷ Prostate cancer has been described as “uniformly lethal once it has escaped the confines of the prostate gland.”¹ Sadly, the median survival of patients after prostate cancer has spread to the bone is 40 months.¹⁶

Although more studies are needed, boron’s remarkably targeted capacity to inhibit the spread of prostate cancer cells while sparing normal cells⁴ may have the same targeted effect against prostate cancer cells that have migrated to the bone. With wider boron supplementation, this cytotoxic effect—combined with boron’s potential to help prevent prostate cancer from occurring in the first place—could reduce the current 28,000 American deaths from this disease every year.¹

Weak bones—whether the result of cancer or aging—can lead to pain, fracture, and disability. Few people realize that boron plays an integral part in bone metabolism. Boron supports the functions of calcium, magnesium, and vitamin D, all of which are crucial to promoting dense, healthy bone tissue.^{5,18-20}

In an important study of postmenopausal women who were not on estrogen replacement therapy, scientists found that a boron-supplemented diet increased levels of two hormones associated with healthy bone mass. Boron also reduced depletion of the body’s stores of bone-building calcium and magnesium—importantly, this benefit occurred during periods of both adequate magnesium intake and magnesium deficiency.¹⁹

Another study showed that when animals were fed a diet deficient in vitamin D, increasing their dietary intake of boron helped support optimal calcium absorption—demonstrating that boron promotes optimal mineral balance and ensures healthy calcium utilization.²⁰

A 2013 scientific review found that calcium fructoborate—a natural boron complex—significantly reduces human serum levels of **C-reactive protein** (CRP). This protein is a marker for inflammation, and has been

identified as a possible contributor to the disruption of the normal bone remodeling process. Remodeling is essential to healthy bone mineral density, and the study author concluded that this boron complex “*may contribute to bone health by controlling the inflammation associated with loss of bone mineral density.*”²¹

BORON: NOT ABUNDANTLY FOUND IN FOOD

Boron is a trace mineral that is essential to plant growth and finds its way into the human diet through our consumption of plant foods—especially apples, plums, grapes, avocados, vegetables, nuts, and legumes.

Despite its widespread availability in plant foods, ingesting adequate amounts of boron through dietary choices can be difficult. Why? Because the total quantity of boron in any one plant food is very low.³⁵

For example, apples are considered to be a good source of boron. However, to attain the minimum **3 mg** daily intake of boron that is generally suggested, you would need to eat about **2.4 pounds** of apples a day³⁵—that’s over eight apples!³⁶ You wouldn’t have to worry about surpassing the tolerable daily intake (TDI) for boron until you managed to consume about 68 apples during a single day!^{35,36}

Worse, with modern dietary habits, many individuals can develop a boron deficiency by simply failing to eat enough fruits, vegetables, and nuts. And even among those whose diets include rich quantities of these plant foods, their boron intake will be greatly affected by regional geology because the food content of boron varies greatly according to the boron content of the soil in the region where the produce was grown. Even local preferences for some foods over others can result in high or low human boron levels.^{36,37}

Ensuring optimal boron intake becomes increasingly important as we age. While boron has long been recognized for its critical role in safeguarding bone health, scientists are increasingly excited about growing evidence of boron’s powerful role in blocking the development of prostate cancer.

This idea has sparked intense interest among researchers, because this potentially fatal disease is at epidemic proportions. Autopsy evidence indicates that prostate cancer is histologically evident in up to **34%** of men aged 40 to 49 and up to **70%** of men aged 80 and older.³⁸⁻⁴⁰

Helps Reduce Inflammatory Conditions

Beyond its promising reduction of prostate cancer risks, boron’s anti-inflammatory mechanisms have other benefits throughout the body. About **52 million** Americans suffer from some form of arthritis.²² Fortunately, boron inhibits pro-inflammatory factors that contribute to the development of arthritis.^{21,23}

A review of previous studies found that boron exerts favorable immunomodulatory effects on the inflammatory process, decreasing joint swelling and improving restricted movement. Boron was also found to inhibit *lipxygenase* (LOX)—an enzyme that triggers the inflammatory cascade to increase inflammatory **leukotrienes**.²⁴

In a double-blind study in people with severe osteoarthritis, scientists found that in those who completed the trial, **71%** of those taking boron improved, while only **10%** of those taking placebo improved. No side effects were observed.²⁵

We mentioned earlier that boron is essential to promoting strong, healthy bones. This makes boron especially important for those suffering from osteoarthritis. This was clearly demonstrated in a study in which scientists compared control bone samples to samples taken from fracture patients and osteoarthritis patients. While fracture bone samples did not differ from control samples, bone samples taken from areas adjacent to osteoarthritic joints showed reduced-mineral content—including a lower level of boron. This suggests that there

is a more rapid turnover of bone in afflicted joints and that boron—used as a bone-building material—is quickly depleted.²⁶

One study even found that boron can reduce the pain associated with osteoarthritis. For the study, **50%** of osteoarthritis patients who received **6 mg** of boron daily reported less pain from movement, while only **10%** given a placebo experienced similar improvement.²⁵ This was likely due to decreased production of pain-provoking inflammatory mediators.²⁷⁻²⁹

Adding further proof to boron's beneficial impact on arthritis, researchers have found a connection between dietary intake and incidence of arthritis. In areas of the world where daily boron intake is **1 mg** or less, the incidence of arthritis ranges from **20%** to as high as **70%**. Conversely, in world regions where daily boron intake is **3 to 10 mg**, the incidence of arthritis is much lower, ranging from **0 to 10%**.³⁰

These findings indicate that adequate boron intake confers powerful protection against osteoarthritis.

Summary

In addition to its potent support for healthy bones and joints, boron is emerging as a highly targeted inhibitor of prostate cancer cells and their metastases.

It can kill these cancerous cells without harming healthy prostate cells.

Scientists have demonstrated that boron lowers prostate-specific antigen, or PSA—and may help prevent or control the spread of prostate cancer. Other evidence links boron to reduced cognitive decline.

Boron levels in foods are low, but supplementing with this trace mineral may be the little-known missing link for those seeking a mechanism of defense against prostate cancer, bone loss—as well as overall support for optimum health.

For many years, most Life Extension supporters have been getting **3 to 6 mg** of **boron** in their multi-nutrients supplements. For most individuals, this may be an optimal amount. Certain individuals may want to increase this dose to **9 to 12 mg** daily. Fortunately, boron is a very low-cost supplement.

If you have any questions on the scientific content of this article, please call a **Life Extension**[®] Health Advisor at 1-866-864-3027.

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