

Protecting Your Bones

PhysiciansCommittee
for Responsible Medicine

The bones that make up your skeleton undergo constant changes in shape and size throughout your lifetime. Bones that become damaged are replaced with new bone through a remodeling process that is largely dependent on dietary intake and lifestyle factors. Any imbalance to this remodeling process can lead to the development of bones that are thin, brittle, and susceptible to fracture, a condition known as osteoporosis. In U.S. populations of adults who are 50 years of age and older, approximately 10.2 million are affected by osteoporosis, and 43.4 million have low bone mass.¹ In order to prevent and reverse osteoporosis, it is important to acquire the nutrients necessary for bone growth and maintenance, such as calcium and magnesium, in addition to practicing healthy lifestyle modifications that preserve bone integrity.

How to Get Calcium Into Your Bones

1. Get calcium from greens, beans, or fortified foods.

Recommended calcium intake is 1,000 milligrams/day for men and women 19-50 years old, and 1,000 milligrams/day for men and 1,200 milligrams/day for women older than 51.² As a general rule, the most healthful calcium sources are green leafy vegetables and legumes. While dairy products do contain calcium, they also contain animal proteins and growth factors, lactose sugar, occasional contaminants, and a substantial amount of fat and cholesterol (in all but the defatted versions), making them an unfavorable choice for obtaining calcium. Broccoli, Brussels sprouts, collards, kale, mustard greens, and other greens are loaded with highly absorbable calcium and a host of other healthful nutrients. Exceptions are spinach and chard, which contain a large amount of calcium but hold on to it very tenaciously, making it difficult for you to absorb much of it. Beans are loaded with calcium; there is more than 100 milligrams of calcium in a plate of baked beans. You will find plenty of calcium in chickpeas, tofu, or other beans or bean products as well. These beans and greens also contain magnesium, which your body requires along with calcium to build bones, making them optimal dietary choices for improving bone health.

Calcium-fortified products contain very concentrated amounts of calcium. For example, calcium-fortified plant milks and fruit juices contain 300 milligrams or more of calcium per cup in a form as absorbable as the calcium found in cow's milk.

2. Get adequate amounts of vitamin D.

Vitamin D controls your body's use of calcium. Without vitamin D, only 10-15% of dietary calcium is absorbed.³ Thus, in order to maintain bone health and to experience benefits from calcium, vitamin D intake must be sufficient. In fact, while calcium in dairy products alone may not directly strengthen bones, increasing intake of vitamin D has been shown to reduce fracture risk up to 26%.⁴

About 15 minutes of sunlight on your skin each day may produce all the vitamin D you need, depending on other factors such as season, geographical location, and skin tone. If you get little or no sun exposure, you can get vitamin D from a supplement or from fortified foods. The recommended dietary allowance is 600 IU per day and 800 IU for those over the age of 70.²

How to Keep Calcium in Your Bones

Calcium is an essential mineral for maintenance of bone integrity, but studies show that adding more calcium to your diet doesn't automatically protect your bones. In a systematic review of more than 40 studies, researchers found that increased intake of dietary calcium was not associated with decreased fracture risk.⁵ In order to protect your bones, you not only need calcium in your diet, but you also need to make sure you keep calcium in your bones. Here are some ways you can accomplish this:

1. Avoid excess salt.

High salt intake is a commonly recognized risk factor for osteoporosis because it leads to calciuria, or excessive urinary calcium excretion. Most of the calcium in the body is stored in the bones, and the rest is found in the blood. The blood level of calcium is carefully controlled. When it is too low, calcium from the bones dissolves into the bloodstream. When it is too high, the extra calcium either passes through the kidneys and out of the body through the urine or gets stored in the bones. Normal levels of calcium found in the urine are 100-250 milligrams/day. If you excrete more than this amount, calcium loss becomes a problem. Sodium in the foods you eat can greatly increase calcium loss through the kidneys.⁶

In a study investigating the impact of salt intake as related to calcium absorption in postmenopausal women, salt was found to be

responsible for a negative change in bone calcium balance, which measures how much calcium absorbed from the diet actually stays in the bones. It was also directly associated with increased urinary calcium excretion.⁷

If you reduce your sodium intake to 1,000 to 2,000 milligrams/day, you will hold on to calcium better. To do this, avoid the top sources of sodium in the diet including processed foods such as cured meats, cold cuts, and cheese.

2. Exercise.

Exercise is vital for keeping calcium in the bones and increasing bone density. Benefits have been observed in studies of both children and adults.⁸⁻¹⁰ In a yearlong study of 320 postmenopausal women, those who completed aerobic, weight-bearing activity combined with weight lifting three times a week had a significant increase in regional bone density, compared with those who did not exercise.¹¹ Moreover, physical activities help to stimulate increases in bone diameter, which can counteract the thinning of bones, and in turn, lessen the risk of fractures.¹²

Calcium supplementation **alone** may not be effective for **fracture prevention**.¹⁹

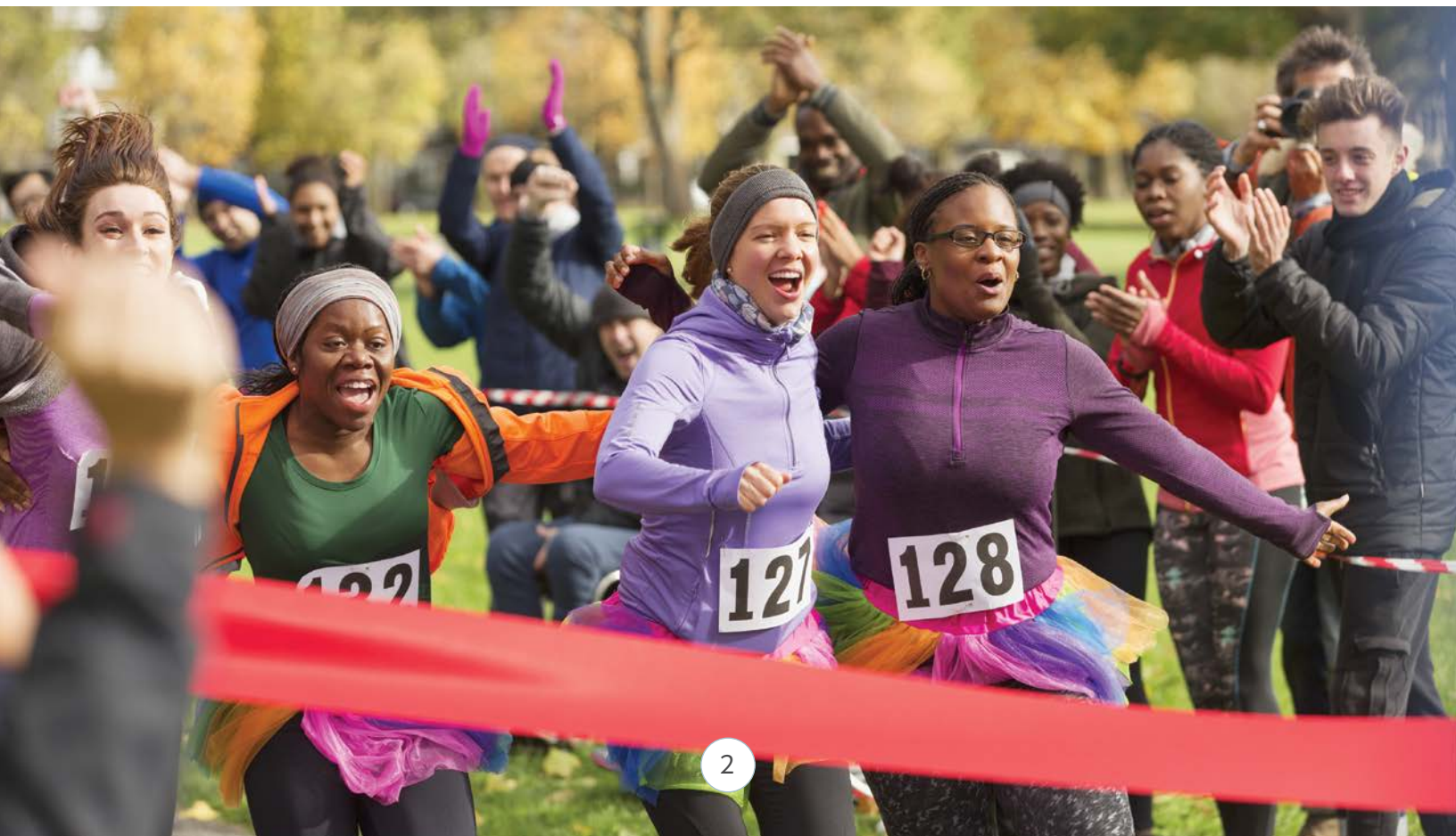
3. Don't smoke.

Smoking is a risk factor for increased bone mineral density loss. Smoking may affect bone loss through toxic effects on bone collagen synthesis, changes in hormonal metabolism, and decreased efficiency of calcium absorption.^{13,14} A study of identical twins showed that if one twin had been a long-term smoker and the other had not, the smoker had more than a 40% higher risk of a fracture.¹⁵

American recommendations for calcium intake are higher than in other countries, partly to compensate for our poor dietary habits, tobacco use, and physical inactivity of American life; all of these choices may lead to overly rapid and unnatural loss of calcium through the kidneys. By controlling these basic factors, you can have an enormous influence on whether calcium stays in your bones or drains out of your body.

Calcium Supplements

Calcium supplements are commonly recommended to men and women as they age to promote bone health. Research on the risk and benefits of such supplementation is mixed. In a meta-analysis evaluating the occurrence of cardiovascular events in 11 placebo-controlled trials of calcium supplements, researchers found those taking supplements had about a 30% increased risk for heart attack. In addition, boosting overall calcium had no cardiovascular benefit.¹⁶ Another study, which analyzed cardiovascular health of 23,980 participants of the Heidelberg cohort in the European Prospective Investigation into Cancer and



Nutrition (EPIC) study, aged 35–64, users of calcium-only supplements had a 70% increased heart attack risk.¹⁷

A recommendation by the U.S. Preventive Services Task Force (USPSTF), based on the review of more than 100 studies, said that postmenopausal women should not take supplements to prevent fractures.¹⁸ Therefore, in an effort to promote bone health, calcium intake should come from food sources instead.

Calcium supplementation alone may not be effective for fracture prevention.¹⁹ However, in a recent meta-analysis, women who took both calcium and vitamin D supplements had a 30% lower risk for hip fracture and a 15% lower risk for fracture overall, compared with those not taking these supplements.²⁰ Combined calcium and vitamin D supplementation has also been found effective for treating low bone mineral density in certain populations taking medications.^{21–23}

To determine whether you are a good candidate for calcium supplementation, check with your physician.

Other Key Nutrients for Bone Health

While it is important to limit exposure to nutrients that can lead to bone loss, it is equally critical that we expose our bodies to nutrients that promote bone growth, and this balance can be met by consuming a plant-based diet. In addition to providing calcium, plant-based diets also supply other key nutrients necessary to maintain healthy bones that are not typically consumed in animal-based diets. These nutrients include vitamin K, folate, phytoestrogens, and various minerals, such as magnesium, copper, zinc, and selenium.

Magnesium is of particular importance in that it helps the body transport calcium. Approximately 60% of magnesium in the body is stored in the bones, and diets that cause the blood to become acidic (“Westernized” diets) can cause magnesium to be removed from the bones to keep the body in balance.²⁴

Studies have shown that consuming fruits and vegetables is protective of bone health in both men and women.^{25,26} Plants are a rich source of phytonutrients, which contain antioxidative and anti-inflammatory benefits that are protective of bone health. Plants also provide other sources of antioxidants, such as vitamins C and E and carotenoids, which help protect against free radicals.

Hormone Supplements Have Serious Risks

Some doctors recommend estrogen supplements for women after menopause as a way to slow osteoporosis, although they are rarely able to stop or reverse bone loss. These hormones may pose other health hazards such as increased breast cancer risk and cardiovascular problems. The Harvard Nurses’ Health Study found that women taking estrogen supplements had a 30–80% increased risk for breast cancer, compared with those not taking estrogens.²⁷ In a study of 2,763 postmenopausal women with coronary disease followed for an average of four years, hormone-treated women

were more likely to develop dangerous blood clots and gallbladder disease.²⁸

A nonprescription hormone preparation derived from wild yams or soybeans, called natural progesterone, may be a safer and more effective alternative for stimulating the building of healthy new bone. In a three-year study involving postmenopausal women, bone density increased by about 15% for those treated with natural progesterone.²⁹ This increase in bone density is enough to significantly decrease fracture risk.

Preventing and Reversing Osteoporosis

Osteoporosis is a bone-thinning condition commonly seen in elderly men and in postmenopausal women. It can lead to dangerous and potentially disabling fractures, particularly in the vertebrae and the hip. Approximately one in two women and up to one in four men age 50 and older will break a bone due to osteoporosis.³⁰

Bone Health and Osteoporosis in Women

It is recommended for postmenopausal women with other risk factors and for women over 65 to have their bone density tested. If diagnosed with osteoporosis, you will want to speak with your doctor about exercises and perhaps even medications that can reverse it. Bisphosphonates are often prescribed because they can prevent bone reabsorption.³¹ Nonpharmacologic interventions, such as dietary changes and exercises, can reduce the risk of fracture in those with osteoporosis as well.

Bone Health and Osteoporosis in Men

Osteoporosis is less common in men than in women largely because men typically accumulate more bone mass than women before bone loss naturally begins. In cases where the causes of bone thinning are excessive calcium loss and inadequate vitamin D, following the guidelines mentioned earlier will decrease risk of fractures. In about half the cases of male osteoporosis, however, a specific cause of this bone thinning can be identified and addressed.³²

- Steroid medications, such as prednisone, are a common cause of bone loss and fractures. If you are receiving steroids, you will want to work with your doctor to minimize the dose and to explore other treatments.

- Alcohol can weaken your bones by interfering with the absorption of calcium and vitamin D and by killing osteoblasts, the bone-making cells. Thus, heavy alcohol consumption can increase risk of fracture. The effect is most likely only significant for heavy consumers—those who have more than two drinks per day of spirits, beer, or wine.³³

- A lower than normal amount of testosterone can encourage osteoporosis. One study found a 6% increased prevalence for osteoporosis in men with deficient testosterone levels.³⁴ This is a significant concern because about 40% of men over 70 years of age have decreased levels of testosterone.

Conclusion

Bone health is incredibly important and cannot be overlooked. Getting calcium from plant-based products is optimal, as these sources will allow you to meet the daily recommended amounts while also providing you with other essential nutrients. The methods outlined here to keep the calcium in your bones are much safer than

taking calcium supplements and will help to prevent osteoporosis. Remember: Osteoporosis is much easier to prevent than to treat. Prevention of osteoporosis should begin in childhood and continue throughout one's life. ◀

Calcium and Magnesium in Foods (in milligrams)³⁵

	CALCIUM	MAGNESIUM
Collards (1 cup, boiled)	368	40
Orange juice, calcium-fortified (1 cup)	350	27
Figs, dried (10 medium)	136	57
Tofu, calcium-set (1/2 cup)	355	44
Spinach (1 cup, boiled)	245	157
Soybeans (1 cup, boiled)	175	148
Oatmeal, instant (1 packet)	102	37
White beans (1 cup, boiled)	159	112
Mustard greens (1 cup, boiled)	165	18
Navy beans (1 cup, boiled)	126	96
Vegetarian baked beans (1 cup)	86	69
Great northern beans (1 cup, boiled)	159	112
Black beans (1 cup, boiled)	46	120

	CALCIUM	MAGNESIUM
Swiss chard (1 cup, boiled)	102	51
Broccoli (1 cup, boiled)	62	33
Kale (1 cup, boiled)	94	23
English muffin	93	14
Butternut squash (1 cup, boiled)	84	59
Pinto beans (1 cup, boiled)	79	86
Chickpeas (1 cup, canned)	74	43
Almonds (1 ounce)	76	77
Sweet potato (1 cup, boiled)	67	48
Green beans (1 cup, boiled)	55	23
Barley (1 cup)	19	44
Brussels sprouts (8 sprouts)	82	45
Navel orange (1 medium)	52	13
Raisins (2/3 cup)	48	31



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