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## Calcium & Milk

### What's Best For Your Bones?

Those advertisements pushing milk as the answer to strong bones are almost inescapable. But does "got milk" really translate into "got strong bones?"



The pro-milk faction believes that increased calcium intake - particularly in the form of the currently recommended three glasses of milk per day - will help prevent osteoporosis, the weakening of bones. Each year, osteoporosis leads to more than 1.5 million fractures, including 300,000 broken hips.

On the other side are those who believe that consuming a lot of milk and other dairy products will have little effect on the rate of fractures but may contribute to problems such as heart disease or prostate cancer.

Which view is right? The final answers aren't in. But here is a summary of what's currently known about calcium and its effects on the body.

### What is calcium?

Calcium is a mineral that the body needs for numerous functions, including building and maintaining bones and teeth, blood clotting, the transmission of nerve impulses, and the regulation of the heart's rhythm. Ninety-nine percent of the calcium in the human body is stored in the bones and teeth. The remaining 1 percent is found in the blood and other tissues.

### Where do we get calcium?

The body gets the calcium it needs in two ways. One is by eating foods that contain calcium. good sources include dairy products, which have the highest concentration per serving of highly absorbable calcium, and dark leafy greens or dried beans, which have varying amounts of absorbable calcium.

The other way the body gets calcium is by pulling it from bones. This happens when blood levels of calcium drop too low, usually when it's been a while since having



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eaten a meal containing calcium. Ideally, the calcium that is "borrowed" from the bones will be replaced at a later point. But, this doesn't always happen. Most important, this payback can't be accomplished simply by eating more calcium.

## **Growing healthy bones**

Bone is living tissue that is always in flux. Throughout the lifespan, bones are constantly being broken down and built up in a process known as remodeling. Bone cells called osteoblasts build bone, while other bone cells called osteoclasts break down bone.

In healthy individuals who get enough calcium and physical activity, bone production exceeds bone destruction up to about age 30. After that, destruction typically exceeds production.

## **What is osteoporosis?**

Osteoporosis, or "porous bones," is the weakening of bones caused by an imbalance between bone building and bone destruction. People typically lose bone as they age, despite consuming the recommended intake of calcium necessary to maintain optimal bone health. An estimated 10 million Americans - 8 million women and 2 million men - have osteoporosis. Another 34 million have low bone mass, placing them at increased risk for osteoporosis.<sup>(1)</sup>

Achieving adequate calcium intake and maximizing bone stores during the time when bone is rapidly deposited (up to age 30) provides an important foundation for the future. But it will not prevent bone loss later in life. The loss of bone with aging is due to several reasons, including genetic factors, physical inactivity, and lower levels of circulating hormones (estrogen in women and testosterone in men).

Postmenopausal women account for 80 percent of all cases of osteoporosis because estrogen production declines rapidly at menopause. Of course, men are also at risk of developing osteoporosis, but they tend to do so 5-10 years later than women, since testosterone levels do not fall abruptly the way estrogen does in women. It is estimated that osteoporosis will cause half of all women over age 50 to suffer a fracture of the hip, wrist, or vertebra.

## **How can osteoporosis be slowed down?**

Preventing osteoporosis depends on two things: making the strongest, densest bones possible during the first 30 years of life and limiting the amount of bone loss in adulthood.

There are a number of lifestyle factors that can help with the latter:

- **Getting regular exercise, especially weight-bearing and muscle strengthening exercise.**

- **Getting adequate vitamin D, whether through diet, exposure to sunshine, or supplements.**
- **Consuming enough calcium to reduce the amount the body has to borrow from bone.**
- **Consuming adequate vitamin K, found in green-leafy vegetables.**
- **Not getting too much preformed vitamin A.**

## **Preventing bone loss in adulthood**

Several complementary strategies can help prevent or minimize bone loss during adulthood and old age. These include:

### ***Getting regular exercise***

Physical activity that puts some strain or stress on bones causes the bones to retain and possibly even gain density throughout life. Cells within the bone sense this stress and respond by making the bone stronger and denser. Such "weight-bearing" exercises include walking, dancing, jogging, weightlifting, stair-climbing, racquet sports, and hiking.

Swimming is a useful form of exercise for the heart and cardiovascular system. But because water supports the bones, rather than putting stress on them, it's not considered a good "weight-bearing" exercise for bone strength. In addition, physical activity doesn't strengthen all bones, just those that are stressed, so you need a variety of exercises or activities to keep all your bones healthy.

Another function of physical activity, probably at least as important as its direct effect on bone mass, is its role in increasing muscle strength and coordination. With greater muscle strength, one can often avoid falls and situations that cause fractures. Making physical activity a habit can help maintain balance and avoid falls.

### ***Getting enough calcium***

Despite the debates surrounding milk and calcium, one thing is clear: adequate calcium - both for bone development and for non-bone functions - is key to reducing the risk of osteoporosis. However, the healthiest or safest amount of dietary calcium hasn't yet been established. Different scientific approaches have yielded different estimates, so it's important to consider all the evidence.

Balance studies - which examine the point at which the amount of calcium consumed equals the amount of calcium excreted - suggest that an adequate intake is 550 mg/day. To ensure that 95 percent of the population gets this much calcium, the [National Academy of Sciences](#)

established the following recommended intake levels:

- 1,000 mg/day for those age 19-50
- 1,200 mg/day for those age 50 or over
- 1,000 mg/day for pregnant or lactating adult women

But most balance studies are short-term and therefore have important limitations. To detect how the body adapts to different calcium intakes over a long period of time - and to get the big picture of overall bone strength - requires studies of longer duration.

The results from such long-term studies may be surprising to some. While they do not question the importance of calcium in maximizing bone strength, they cast doubt on the value of consuming the large amounts currently recommended for adults.

In particular, these studies suggest that high calcium intake doesn't actually appear to lower a person's risk for osteoporosis. For example, in the large Harvard studies of male health professionals and female nurses, individuals who drank one glass of milk (or less) per week were at no greater risk of breaking a hip or forearm than were those who drank two or more glasses per week.[\(2, 3\)](#) Other studies have found similar results.

Additional evidence also supports the idea that American adults may not need as much calcium as is currently recommended. For example, in countries such as India, Japan, and Peru where average daily calcium intake is as low as 300 mg/day (less than a third of the US recommendation for adults, ages 19-50), the incidence of bone fractures is quite low. Of course, these countries differ in other important bone-health factors as well - such as level of physical activity and amount of sunlight - which could account for their low fracture rates.

Ideally, these issues might be resolved by randomizing a large group of adults to get different amounts of calcium and following them to see how many would eventually break a bone. In fact, a few such studies have been conducted, but they have not provided clear results because they were small or of short duration, or they provided calcium in combination with vitamins, which could obscure the true effects of calcium.

To illustrate the different conclusions drawn from examining the same body of data, a British committee that is comparable to the U.S. group that established calcium requirements here concluded that 700 mg/day was enough for individuals aged 19 and older.

### ***Getting enough vitamin D***

Vitamin D plays a critical role in maintaining bone health. When blood levels of calcium begin to drop, the body responds in several ways. It promotes the conversion of vitamin D into its active form, which then travels to the intestines (to encourage greater calcium absorption into the blood) and to the kidneys (to minimize calcium loss in the urine).

For bone health, an adequate intake of vitamin D is no less important than calcium. Vitamin D is found in milk and vitamin supplements, and it can be made by the skin when it is exposed to sunlight in the summertime. But not all sunlight is created equal. Above 40 degrees latitude (north of San Francisco, Denver, Indianapolis, and Philadelphia), the winter sunlight isn't strong enough to promote vitamin D formation. Sunscreens also prevent the formation of vitamin D, although they are still recommended to reduce risk of sun-induced skin cancer and skin damage.

An examination of clinical trials of vitamin D for the prevention of osteoporosis found that the vitamin decreases vertebral fractures and may decrease nonvertebral fractures.<sup>(4)</sup> A similar analysis of the effect of vitamin D on falls indicated that supplementation with vitamin D reduces the risk of falls among ambulatory or institutionalized older individuals with stable health by more than 20%.<sup>(5)</sup>

### ***Getting enough vitamin K***

Vitamin K, which is found mainly in green, leafy vegetables, likely plays one or more important roles in calcium regulation and bone formation.<sup>(6)</sup> Low intake of the vitamin has been associated with low bone mineral density in women, but not men.<sup>(7)</sup> Getting one or more servings per day of broccoli, Brussels spouts, dark green lettuce, collard greens, or kale should be enough to meet the daily recommended target of 120 micrograms/day for men and 90 micrograms/day for women.

### **Some other factors may also help lower the risk of osteoporosis:**

- **Take care with caffeine.** Although the votes aren't all in, there is some evidence that drinking a lot of coffee - about four or more cups per day - can increase the risk of fracture. Caffeine tends to promote calcium excretion in urine.
- **Avoid too much protein.** Getting too much protein can leach calcium from your bones. As your body digests protein, it releases acids into the bloodstream, which the body neutralizes by drawing calcium from the bones. Animal protein seems to cause more of this calcium leaching than vegetable protein does.<sup>(3)</sup> Just how important protein is as a risk factor for osteoporosis is still up in the air.

- **Get enough vitamin A, but not too much.** Long-associated with good vision, vitamin A has also been found to direct the process of borrowing and redepositing calcium in bone. However, too much preformed vitamin A can promote fractures. Avoid vitamin supplements that have a full RDA (5,000 IU) of vitamin A as preformed vitamin A, unless prescribed by your doctor. Vitamin A in the form of beta-carotene does not increase one's fracture risk.

Postmenopausal women may also want to talk to a health care provider about taking a medication that can strengthen bones. The estrogen in postmenopausal hormones can compensate for the drop in estrogen levels after menopause, helping to prevent - and perhaps even partially reverse - bone loss. However, hormone replacement therapy has fallen from grace as the mainstay for preventing osteoporosis after results from several studies showed that it increased the risk of heart disease, stroke, and blood clots.<sup>(8)</sup> Other medications such as alendronate (Fosamax), risedronate (Actonel), calcitonin (Miacalcin), raloxifene (Evista), and parathyroid hormone (Fortéo) have been approved for the prevention or treatment of osteoporosis.

### **Should you get calcium from milk?**

When most people in the United States think of calcium, they immediately think of milk. But should this be so? Milk is actually only one of many sources of calcium, and there are some important reasons why milk may not be the best source for everyone. These include:

- ***Lactose intolerance***

Many people have some degree of lactose intolerance. For them, eating or drinking dairy products causes problems like cramping, bloating, gas, and diarrhea. These symptoms can range from mild to severe. Certain groups are much more likely to have lactose intolerance. For example, 90 percent of Asians, 70 percent of blacks and Native Americans, and 50 percent of Hispanics are lactose-intolerant, compared to only about 15 percent of people of Northern European descent.

One alternative for those who are lactose intolerant but who still enjoy consuming dairy products is to take a pill containing enzymes that digest milk sugar along with the dairy product, or to consume milk that has the lactase enzyme added to it.

- ***High saturated fat content***

Many dairy products are high in saturated fats, and a high saturated fat intake is a risk factor for heart disease. And while it's true that most dairy products are now available in fat-reduced or nonfat options, the saturated fat that's removed from dairy products is inevitably consumed by someone, often in the form of premium ice cream, butter, or baked goods.

Strangely, it's often the same people who purchase these higher-fat products who also purchase the low-fat dairy products, so it's not clear that they're

making great strides in cutting back on their saturated fat consumption. For more information on dietary fats, [click here](#).

- **Possible increased risk of ovarian cancer**

High levels of galactose, a sugar released by the digestion of lactose in milk, have been studied as possibly damaging to the ovaries and leading to ovarian cancer. Although such associations have not been reported in all studies, there may be potential harm in consuming high amounts of dairy products.<sup>(9, 10)</sup>

- **Possible increased risk of prostate cancer**

A diet high in calcium has been implicated as a potential risk factor for prostate cancer. In a Harvard study of male health professionals, men who drank two or more glasses of milk a day were almost twice as likely to develop advanced prostate cancer as those who didn't drink milk at all.<sup>(11)</sup> Moreover, the association appears to be with calcium itself, rather than with dairy products in general. Clearly, although more research is needed, we cannot be confident that high milk intake is safe.

## **The bottom line-recommendations for calcium intake and bone health**

Adequate, lifelong dietary calcium intake is necessary to reduce the risk of osteoporosis. Consuming adequate calcium and vitamin D and performing regular, weight-bearing exercise are also important to build maximum bone density and strength. After age 30, these factors help slow bone loss, although they cannot completely prevent bone loss due to aging.

Milk and dairy products are a convenient source of calcium for many people. They are also a good source of protein and are fortified with vitamins D and A. At this time, however, the optimal intake of calcium as well as the optimal sources of calcium, are not clear. As noted earlier, the National Academy of Sciences currently recommends that people ages 19-50 consume 1,000 mg of calcium per day, and that those age 50 or over get 1,200 mg per day. Reaching 1200 mg per day would usually require drinking two to three glasses of milk per day over and above an overall healthy diet.

However, these recommendations are based on very short-term studies, and are likely to be higher than what people really need. Currently, there's no good evidence that consuming more than one serving of milk per day in addition to a reasonable diet (which typically provides about 300 milligrams of calcium per day from nondairy sources) will reduce fracture risk. Because of unresolved concerns about the risk of ovarian and prostate cancer, it may be prudent to avoid higher intakes of dairy products.

At moderate levels, though, consumption of calcium and dairy products has benefits beyond bone health, including possibly lowering the risk of high blood pressure and colon cancer.<sup>(12-14)</sup> While the blood pressure benefits appear fairly small, the

protection against colon cancer seems somewhat larger, and most of the latter benefit comes from having just one glass of milk per day. Getting more than this doesn't seem to lower risk any further.

For individuals who are unable to digest - or who dislike - dairy products and for those who simply prefer not to consume large amounts of such foods, other options are available. Calcium can also be found in dark green leafy vegetables, such as kale and collard greens, and in dried beans and legumes.

Calcium is also found in spinach and chard, but these vegetables contain oxalic acid, which combines with the calcium to form calcium oxalate, a chemical salt that makes the calcium less available to the body. A variety of calcium-fortified foods, such as orange juice, are now on the market.

Calcium (and vitamin D) can also be ingested as a supplement. Antacids contain calcium as well. However, men may want to avoid calcium supplements for men because of questions about possible risks of prostate cancer.

An extensive list of the calcium content of foods is available online from the [U.S. Department of Agriculture](#). These foods are good sources of calcium:

| <b>Food</b>                              | <b>Amount</b>  | <b>Calcium</b> |
|--|----------------|----------------|
| Yogurt, plain, low fat                   | 8 oz           | 415            |
| Collards, frozen, boiled                 | 1 cup          | 357            |
| Skim milk                                | 1 cup          | 306            |
| Spinach, frozen, boiled                  | 1 cup          | 291            |
| Yogurt, plain, whole milk                | 8 oz           | 275            |
| Cheese food, pasteurized American        | 1 oz           | 162            |
| Cottage cheese, 1% milk fat              | 1 cup          | 138            |
| Baked beans, canned                      | 1 cup          | 154            |
| Iceberg lettuce                          | 1 head         | 97             |
| Canned salmon                            | 3 oz           | 181            |
| Oranges                                  | 1 cup          | 72             |
| Trail mix (nuts, seeds, chocolate chips) | 1 cup          | 159            |
| Almonds                                  | 1 oz (24 nuts) | 70             |
| Blackeye peas, boiled                    | 1 cup          | 211            |
| Green peas, boiled                       | 1 cup          | 94             |

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