

Osteoporosis: Part 1

Can it be prevented? Reversed?

"Many people are unaware of the link between broken bone and osteoporosis."¹ Osteoporosis means "porous bone."² It is a disease in which bones become fragile and more likely to break.³ "If you looked at healthy bone under a microscope, you would see that parts of it look like a honeycomb. If you have osteoporosis, the holes and spaces in the honeycomb are much bigger than they are in healthy bone. This means your bones have lost density, or mass. It also means that the structure of your bone tissues has become abnormal. As your bones become less dense, they become weaker."² As a result, you are at greater risk for fractures (broken bones). "People typically do not know that they have osteoporosis until their bones become so weak that a sudden strain, twist, or fall results in a fracture."¹



Currently in the U.S., about 10 million people (8 million women and 2 million men) suffer from osteoporosis, and about 34 million more people are estimated to have low bone mass, placing them at increased risk for the disease.⁴ Osteoporosis often causes a loss of height and dowager's hump (a severely rounded upper back).⁵ Weak bones can break easily, causing terrible pain.⁶ It is estimated that 1 in 2 women and 1 in 4 men will have an osteoporosis-related fracture in their lifetime.¹ Bones most prone to fracture with osteoporosis are the hip, spine, and wrist bones,¹ and these are often not without further consequences. "Hip fractures are the most common reason for nursing home admissions."⁷ "One in five people with a hip fracture ends up in a nursing home within a year."⁶ Some fractures may cause loss in the ability to stand or walk,⁶ while others may make daily activities like dressing or feeding oneself difficult.

Like muscle, bone is a living, growing tissue that constantly breaks down and reforms. We often think about building and maintaining our muscle strength; we need to remember to build and maintain our bone strength as well.^{8,9} Osteoporosis is a disease that can be prevented and treated.¹⁰ An early diagnosis can make a difference.¹⁰ Talk with your doctor about when to begin looking at how dense your bones have become. "At any age, it is never too

late to take steps to protect your bones and prevent fractures."¹⁰

The Bone Bank Deposit & withdrawal

"Think of bone as a bank account where you "deposit" and "withdraw" bone tissue. During childhood and the teenage years, new bone is added to the skeleton faster than old bone is removed. As a result, bones become larger, heavier, and denser. For most people, bone formation continues at a faster pace than removal until bone mass peaks during the third decade of life."⁸ "The more bone you have at the time of peak bone mass, the better you will be protected against weak bones once bone loss begins."²

In midlife, bone loss (*withdrawals*) usually speeds up in both men and women and begins to exceed *deposits*. For most women, bone loss increases after menopause, when estrogen levels drop sharply. In fact, in the five to seven years after menopause, women can lose up to 20 percent or more of their bone density.² Other factors also increase your risk for developing osteoporosis, including:

- **Getting older.** Not every older person gets osteoporosis, but it does become more common with age. All of us lose some bone density as we age, but some lose it faster than others. That's why it's important to *make deposits* in your bone bank.

- **Having a family history of osteoporosis.** Research suggests that heredity and genetics play a major role. If either of your parents had osteoporosis or a history of broken bones, you are more likely to get it. Parental height loss and spine curvature are also factors.
- **Being small and thin (low-body weight).** Men and women with smaller bones are at greater risk.
- **Being a woman of white, Asian, or Latin descent.** Women in these ethnic or racial groups are more likely than those of African heritage to develop osteoporosis.
- **Taking certain medicines.** [Certain medications](#), such as steroid medicines,¹¹ used at high doses or over long periods of time may increase your risk. Talk with your doctor about risks and benefits of your medications.
- **Low estrogen levels.** Estrogen protects bone. Bone loss increases significantly in women after menopause or after the removal of the ovaries due to the sharp drop in levels of estrogen.
- **Low testosterone levels.** Testosterone protects bone. Low levels of testosterone (as well as estrogen) in men can lead to bone loss.^{12, 13}

Making Deposits

Preventing bone loss

“Osteoporosis is preventable for many people.” Prevention is important because although there are treatments for osteoporosis, a cure has not yet been found. A comprehensive program that can help prevent osteoporosis includes:

- a balanced diet rich in calcium and vitamin D;
- weight-bearing exercise;

- a healthy lifestyle with no smoking or excessive alcohol intake;
- bone density testing; and
- medication, when appropriate.”⁸

“Osteoporosis develops when bone removal occurs too quickly, replacement occurs too slowly, or both.”⁸ There are steps you can take to prevent, slow, or stop the progress of osteoporosis. “In some cases, you may even be able to improve bone density and reverse the disorder to some degree.”¹⁴ By participating in these healthy lifestyle factors (above) and using medication when appropriate, you can make “deposits” in your “bone bank” that can help reduce your risk for osteoporosis and the consequences of fractures that come with it.

In this issue, we will address diet and exercise as related to bone health. We will address the remaining factors in the next issue of [HealthHints](#).

“The relationship between calcium and vitamin D is similar to that of a locked door and a key. Vitamin D is the key that unlocks the door.”¹

Calcium & Vitamin D

“Bone is living, growing tissue. It is made mostly of collagen, a protein that provides a soft framework, and calcium phosphate, a mineral that adds strength and hardens the framework. This combination of collagen and calcium makes bone both flexible and strong, which in turn helps bone to withstand stress. More than 99 percent of the body’s calcium is contained in the bones and teeth. The remaining 1 percent is found in the blood.”¹⁵

Increasing intake of calcium and vitamin D can decrease the risk of fracture. This is true even among women who have gone through menopause and among men and women who already have osteoporosis.⁵

Calcium

“An inadequate supply of calcium over a lifetime contributes to the development of osteoporosis. Many published studies show that low calcium intake appears to be associated with low bone mass, rapid bone loss, and high fracture rates. National nutrition surveys show that many people consume less than half the amount of calcium recommended to build and maintain healthy bones.”¹⁵

Food sources of calcium include:

- low-fat dairy products, such as milk, yogurt, cheese, and ice cream;
- dark green, leafy vegetables, such as broccoli, collard greens, bok choy, and spinach;
- sardines and salmon with bones;
- tofu;
- almonds; and
- foods fortified with calcium, such as orange juice, cereals, and breads.¹⁵

To find out how much calcium you’re consuming, see [How to Use the Nutrition Facts Panel on Food Labels for Calcium](#).

“Depending on how much calcium you get each day from food, you may need to take a calcium supplement.”¹⁵

“Calcium needs change during one’s lifetime. The body’s demand for calcium is greater during childhood and adolescence, when the skeleton is growing rapidly, and during pregnancy and breastfeeding. Postmenopausal women and older men also need

to consume more calcium. Also, as you age, your body becomes less efficient at absorbing calcium and other nutrients. Older adults also are more likely to have chronic medical problems and to use medications that may impair calcium absorption.¹⁵ Recommended daily intakes of calcium by age are currently as follows:

- infants birth to 6 months: 210 mg per day;
- infants 6 months to 1 year: 270 mg per day;
- children 1 to 3: 500 mg per day;
- children 4 to 8: 800 mg per day;
- males and females 9 to 18 years: 1,300 mg per day;
- women and men 19 to 50 years: 1,000 mg per day;
- women and men over 50: 1,200 mg per day;
- pregnant or nursing women up to age 18: 1,300 mg per day; and
- pregnant or nursing women 19 to 50 years: 1,000 mg per day.⁵

Vitamin D

The body needs vitamin D to absorb calcium.¹⁶ “The relationship between calcium and vitamin D is similar to that of a locked door and a key. Vitamin D is the key that unlocks the door, allowing calcium to enter your bloodstream. As we age, our bodies become less able to absorb calcium, which makes getting enough vitamin D even more important.”¹¹ “If you don’t get enough vitamin D or if your body does not absorb it well, you are at much greater risk for bone loss and osteoporosis.”¹²

There are three ways people get vitamin D:

- **Sunlight.** Many people get enough vitamin D by getting about 15 minutes each day of natural exposure to sunlight,

which our bodies use to make vitamin D.¹⁵

- **Foods.** Vitamin D-rich foods include items such as egg yolks, saltwater fish, liver, and fortified milk.¹⁵
- **Supplements.** Depending on how much vitamin D you get each day from sunlight and food, you may need to take a vitamin D supplement.¹⁵ “Studies show that vitamin D production decreases in the elderly, in people who are housebound, and for people in general during the winter.”¹⁵ They may need vitamin D supplements to achieve the recommended daily intake of vitamin D.¹⁵

The recommended daily intake for vitamin D is 400 to 600 IU (International Units) and not more than 2,000 IU, unless prescribed by your doctor.¹⁶

Calcium & Vitamin D Supplements

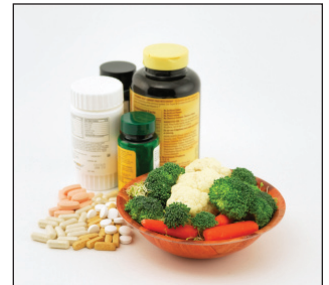
Making the right choice

So, how do you make the right choice in vitamin supplements? There is a lot of advertising, and it can be confusing. Here are some guidelines that may help:

- Determine your daily calcium intake from foods.¹⁷ You can do this by looking at food labels and adding a zero to the %DV (percent daily value) of calcium. For example, if the food has 50% DV of calcium, it has 500 mg of calcium (see [How to Use the Nutrition Facts Panel on Food Labels for Calcium](#)). If you are an adult age 19-50, you need 1000 mg calcium per day. If you are over age 50, you need 1200 mg calcium per day.
- If calcium intake is around 1000-1200 mg a day, keep up the good work. If additional calcium is needed from a

supplement, determine which supplement provides the closest to the amount needed (for example, one that provides 200 mg, 400 mg, or 500 mg per pill).¹⁷ Again, look at the [food label](#) to determine this amount.

- Decide on the form of calcium that will be easiest for you to take. In nature, calcium is found only in combination with another substance, such as carbonate, citrate, or gluconate.¹⁷ The National Osteoporosis Foundation recommends that you read labels carefully and choose “purified” calcium carbonate or calcium citrate.¹⁷ The best calcium supplement is one that you will take; that the [body easily absorbs](#); that has few, if any, side effects (e.g., gas, constipation); and that fits within your budget. You may need to try more than one type before finding what works best for you.



- Choose calcium supplements with familiar brand names, or check with the pharmacist in a local store.¹⁷ Look for labels that state “purified” or have the USP (United States Pharmacopeia) symbol. Avoid supplements made from unrefined oyster shell, bone meal, or dolomite that don’t have the USP symbol because they may contain high levels of lead or other toxic metals.¹⁸
- Remember, calcium alone does not protect your bones. Vitamin D is necessary for calcium absorption. Many people take a daily multivitamin that provides 400 IU of vitamin D.

Many calcium supplements are also fortified with vitamin D,¹ although you don't have to take your vitamin D supplement at the same time as calcium for it to be effective.¹⁷

- “There are two types of vitamin D supplements. They are vitamin D₃ and vitamin D₂. Previous research suggested that vitamin D₃ was a better choice than vitamin D₂. However, more recent studies show that vitamin D₃ and vitamin D₂ are equally good for bone health. Vitamin D₃ is also called cholecalciferol. Vitamin D₂ is also called ergocalciferol.”¹⁹

Weight-bearing Exercise Keeping your bones in shape

Exercise plays an important role in lifelong bone health.¹⁷ “Like muscles, bone is living tissue that responds to exercise by becoming stronger.”¹⁵ “No matter what your age, exercise can help minimize bone loss while providing many additional health benefits.”⁵ “Weight-bearing exercise is the best for your bones because it forces you to work against gravity.”¹⁵ “Weight-bearing describes any activity you do on your feet that works your bones and muscles against gravity.”⁹ Because bone is living tissue that constantly breaks down and reforms, when you do regular weight-bearing exercise, your bone adapts to the impact of the weight and pull of muscle by building more cells and becoming stronger.⁹ “Some activities recommended to build strong bones include:



- brisk walking, jogging, and hiking;
- yard work, such as pushing a lawnmower and heavy gardening;
- team sports, such as soccer, baseball, and basketball;
- dancing, step aerobics, and stair climbing;
- tennis and other racquet sports;
- skiing, skating, karate, and bowling; and
- weight training with free weights or machines.

Although they are excellent cardiovascular exercise choices, swimming and bicycling are not weight-bearing activities, so they are not as effective as the above activities in adding bone mass. If musculoskeletal conditions prevent weight-bearing exercise, then swimming and cycling are good alternatives. They do have some bone-building capacity.

You should exercise for at least 30 minutes a day, four or more days a week. Besides improving bone strength, regular exercise also increases muscle strength, improves coordination and balance, and leads to better overall health. To sustain the bone-strengthening benefit of weight-bearing activity, you must increase

the intensity, duration, and amount of stress applied to bone over time.”⁹

Talk with your doctor about what types of exercise are right for you. If you have osteoporosis, certain movements like twisting of the spine, high-impact aerobics, or bending from the waist can be harmful. If

you are at high risk for fracture, you should work with a physical therapist to develop a safe exercise program.²⁰ “The key to exercising with osteoporosis is to find the safest, most enjoyable activities for you, given your overall health and amount of bone loss. There’s no one-size-fits-all prescription.”²¹

Osteoporosis Prevent, maintain, reverse

For many people, bone loss can be prevented by continuing to get calcium, vitamin D, and exercise and by avoiding tobacco and excessive alcohol use.⁸ If you already have weakened bones, you can maintain and improve your bone density with these steps. You can also build some bone and potentially get out of the osteoporosis range with drug therapy, and you can reverse the consequences of osteoporosis by preventing broken bones.²² See [Part 2 of HealthHints: Osteoporosis: Can It Be Prevented? Reversed?](#) to learn about the effects of smoking and alcohol on bone health, bone mineral density (BMD) testing (when and why to have it done), and how osteoporosis medications can help.

To view the references used in this newsletter, go to:
<http://fcs.tamu.edu/health/healthhints/2010/sep/ref.php>

This document is meant for educational purposes only and is not intended to replace the advice of your doctor or other health care provider.

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Medications that May Cause Bone Loss

The following is an excerpt from the National Osteoporosis Foundation's Prevention: Who's at Risk?

Some medications can be harmful to your bones, especially if you take them at high doses or for a long time. One of the riskiest types of medications for bones is steroid medications. Many people take these medications to ease inflammation in conditions like rheumatoid arthritis or asthma.



It's important to talk with your healthcare provider about the risks and benefits of any medications you take and about how they may affect your bones. Do not stop any treatment or change the dose of your medications unless your healthcare provider says it's safe to do so. Many of the medications that can cause bone loss include the following:

- Aluminum-containing antacids
- Antiseizure medications (only some), such as Dilantin® or Phenobarbital
- Aromatase inhibitors, such as Arimidex®, Aromasin®, and Femara®
- Cancer chemotherapeutic drugs

- Cyclosporine A and FK506 (Tacrolimus)
- Glucocorticoids, such as cortisone and prednisone
- Gonadotropin-releasing hormone (GnRH), such as Lupron® and Zoladex®
- Heparin
- Lithium
- Medroxyprogesterone acetate for contraception (Depo-Provera®)
- Methotrexate
- Proton pump inhibitors (PPIs), such as Nexium®, Prilosec®, and Prevacid®
- Selective serotonin reuptake inhibitors (SSRIs), such as Lexapro®, Prozac®, and Zoloft®
- Tamoxifen® (premenopausal use)
- Thiazolidenediones (Actos® and Avandia®)
- Thyroid hormones in excess

This list may not include all medications that cause bone loss.

Source: National Osteoporosis Foundation (2008). Prevention: Who's at risk? [online]. Retrieved August 9, 2010. From <http://www.nof.org/prevention/risk.htm>.

How to Use the Nutrition Facts Panel on Food Labels for Calcium

Figure 7-1. How To Use the Nutrition Facts Panel on Food Labels for Calcium

Nutrition Facts	
Serving Size 1 cup (236 ml)	
Servings Per Container 1	
Amount Per Serving	
Calories 80	Calories from Fat 0
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol Less than 5mg	0%
Sodium 120mg	5%
Total Carbohydrate 11g	4%
Dietary Fiber 0g	0%
Sugars 11g	
Protein 9g	17%
Vitamin A 10%	Vitamin C 4%
Calcium 30%	Iron 0% " Vitamin D 25%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

30% = 300 mg

Note: The Nutrition Facts panel on food labels can help individuals choose foods high in calcium. To convert the % Daily Value (DV) for calcium into milligrams (mg) multiply by 10 or add a 0. As an example, a container of yogurt might list 30% DV for calcium. To convert this to milligrams, multiply by 10 or add a 0, which equals 300 mg of calcium for the serving size of 1 cup of yogurt. A food with 20% DV or more contributes a lot of calcium to the daily total, while one with 5% DV or less contributes a little.

Source: FDA 2003.

Excerpted from U.S. Department of Health and Human Services. *Bone Health and Osteoporosis: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General, 2004, page 163.

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Is My Body Absorbing My Calcium Supplement?

“The body easily absorbs most brand-name calcium products. If you aren’t sure about your product, you can find out how well it dissolves by placing it in a small amount of warm water for 30 minutes and stirring it occasionally. If it hasn’t dissolved within this time, it probably will not dissolve in your stomach. Chewable and liquid calcium supplements dissolve well because they are broken down before they enter the stomach.”¹

The body best absorbs calcium, whether from food or supplements, when it’s taken several times a day in amounts of not more than 500 mg, but taking it all at once is better than not taking it at all.

In many individuals, calcium supplements are better absorbed when taken with food.

- Calcium carbonate is absorbed best when taken with food.
- Calcium citrate can be taken anytime.¹

“Some people may have problems producing sufficient stomach acid or may be taking [medications](#) that suppress acid production. For them, a calcium citrate supplement might be better.”² Talk with your doctor about your supplement choice if you have a gastrointestinal disease³ or if you take proton pump inhibitors.⁴ And, remember, calcium alone does not protect your bones. Vitamin D is necessary for

calcium absorption – so make sure you are getting enough vitamin D, whether from sunlight, foods, or a supplement.

Sources

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