The NIH Word on Health
Consumer Health Information Based on Research from the National Institutes of Health

# The Low-Down on Osteoporosis

## What We Know and What We Don't

by Bobbi Bennett

It's in our cereals, our orange juice, our bread. Manufacturers are adding calcium to all sorts of foods and beverages. That's because increasing the amount of calcium you consume daily can decrease your chances of fracturing a bone due to osteoporosis. Ten million people in the United States already have osteoporosis and 18 million more have low bone mass (osteopenia) and are at increased risk for developing osteoporosis.

The bones of a person with osteoporosis have become thin and fragile and are more likely to fracture. In the U.S., osteoporosis is responsible for more than 1.5 million fractures annually, 700,000 of them in the vertebrae of the spine and 300,000 in hips, at an estimated cost of more than $14 billion each year. Other common fractures occur in wrists, forearms, feet and toes.

And according to Dr. Joan McGowan, director of the Musculoskeletal Diseases Branch of NIH's National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), the number of fractures in the U.S. is expected to increase in the next 40 years due to the increase in the average age of our population.

Many myths have sprung up about osteoporosis and its fractures that aren't based on solid science. While scientists don't yet have all the answers about the best ways to diagnose, treat or prevent osteoporosis, NIH, led by NIAMS, is conducting and supporting research to help find those answers. Here's what we know now about some of those myths.

### Myth: Our bones don't change after we have finished growing.

We reach our peak bone mass around age 30 but our bones are changing constantly throughout our lives. This process — known as remodeling — involves two major types of bone cells: osteoclasts, which break down old or worn bone and thus create bone cavities, and osteoblasts, which fill in the cavities. If the amount of new bone equals the amount being dissolved, your bones stay strong. But several things can shift the balance so that bones become weaker and more brittle (see "Risk Factors for Osteoporosis" on page 3).

### Myth: We know all the risk factors for osteoporosis.

"We don't have a complete set of risk factors that describe a person who is at very high risk for fracture," says Dr. McGowan. One of the biggest risk factors, she points out, is age. "Forty to fifty percent of women over 50 will have an osteoporotic fracture sometime in their life," she says. "As you age, your bones become less dense and weaker due to an increased rate of bone loss — the osteoclasts are breaking down more bone than the osteoblasts are filling in. Younger people ice skate or ski and, without severe trauma when they fall, they don't break any bones. We get older, do the same activities and fall, and we do suffer a fracture."

We also know that being a woman makes a big difference, too. Women have an increase in the rate of bone loss during the first three to five years after menopause. After that, it continues at a slower but steady rate. NIH is now funding several studies to learn more about how and why bones become fragile and fracture.

# Risk Factors for Osteoporosis

## Ones You Can't Change:

- Being a woman
- Getting older
- Being Caucasian or Asian; however, African American and Hispanic women are also at risk
- Having a family history of fractures

## Ones You Can Change:

- Low estrogen levels in women; low testosterone levels in men
- Anorexia
- Lifetime diet low in calcium and vitamin D
- Use of medications such as steroids you take by mouth, or some anticonvulsants
- Inactive lifestyle or prolonged bed rest
- Cigarette smoking
- Excessive use of alcohol

## Myth: A DXA scan can predict whether or not you will have a fracture.

A DXA scan, a special type of x-ray exam, is used to measure the bone mineral density (BMD) of the spine or hip. BMD is used as a common indicator of bone health. But BMD is just one component of bone strength and is not the perfect marker for gauging a person's risk of fracture.

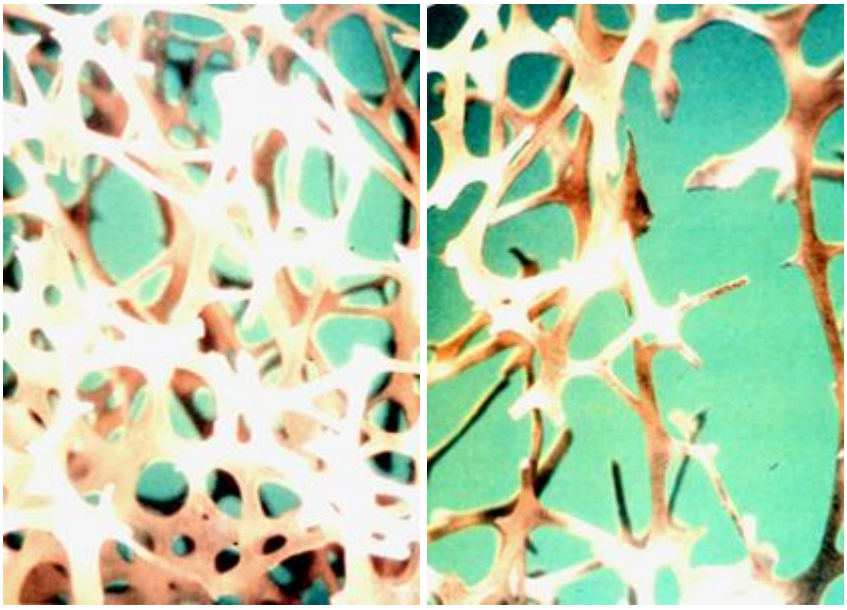
"There is a lot more about the quality of bone that isn't captured by DXA," says Dr. McGowan. "Yet DXA is as good at predicting fracture as blood pressure measurement is at predicting stroke and better than cholesterol numbers at predicting heart disease. However, just because you have normal blood pressure doesn't mean that you won't have a stroke, or just because you have normal cholesterol levels doesn't mean that you are protected from having a heart attack. There are many different risk factors involved for those diseases and the same is true for osteoporosis and for fractures."

NIH-funded investigators are now working to develop ways to measure bone strength and quality that, coupled with some simple risk factors like age and previous fractures, could more accurately predict a person's fracture risk.

## Myth: You can't get all the calcium you need from food.

On the contrary, Dr. McGowan says it is best to get your daily amounts of calcium from food whenever possible. "You won't have to worry about getting enough calcium, vitamin D and vitamin K," she explains, "if you eat a balanced diet of fruits, vegetables — especially leafy green ones — grains, protein, and low-fat dairy products." And with so many calcium-fortified products on the market, it's getting easier all the time to get all the calcium you need from food.

If you can't get enough calcium from your diet, you may need a calcium supplement. They come in different forms, such as calcium carbonate and calcium citrate. Dr. McGowan says there is no significant difference among the various forms. So if one type seems to disagree with you, switch to another. Check your supplement's label to ensure that your calcium supplement meets USP standards. (USP, or the U.S. Pharmacopeia, is an organization that helps ensure consumers receive quality medicines by setting standards that drug manufacturers must meet.)



**Normal bone (left) is dense and strong whereas osteoporotic bone (right) is thin and brittle and can fracture easily. Images courtesy of the National Osteoporosis Foundation**

Men and women between the ages of 19 and 50 should get about 1,000 milligrams (mg) of calcium daily while those over 50 should get 1,200 mg. Dr. McGowan recommends spreading out the calcium over the day so that you get better overall absorption of the calcium, and taking it with food helps, too.

You also need enough vitamin D every day in order to absorb calcium from the diet. Vitamin D is found in food, particularly fortified food, but can also be made by your body after exposure to the sun; 15 minutes outside in the sun per day is usually sufficient for your body to make all the vitamin D you need. If you have limited sun exposure, especially during the winter, you should take vitamin pills with 200 to 400 international units (IU) of vitamin D per day if you are below age 70, or 600 IU if you are over 70. Too much vitamin D can be harmful, so don't take more than 800 IU per day without a doctor's supervision.

## Myth: We have highly effective drugs to prevent and treat osteoporosis.

The U.S. Food and Drug Administration (FDA) has approved several medications for the prevention or treatment of osteoporosis. However, Dr. McGowan cautions, "None of these can completely stop fractures and may not be suitable for taking the rest of your life since we don't yet know what their long-term effects are."

Millions of women were taking estrogen along with progestin — known as hormone replacement therapy or HRT — beginning at menopause, and planning to continue it for the rest of their lives. "Estrogen used to be considered a sheet of armor for your bones," Dr. McGowan says. But NIH's long-term clinical trial, the Women's Health Initiative (WHI), revealed last year that, although estrogen and progestin combined to prevent fractures, the overall health risks of taking HRT outweighed the benefits. (For more on the WHI, go to http://www.nih.gov/PHTindex.htm.)

Another part of the WHI that is not scheduled to be completed until 2005 is investigating the effect of 1,000 mg of calcium carbonate plus 400 IU of vitamin D daily on hip and other osteoporosis-related fractures and colorectal cancer. Until these studies are finished, women should consult their doctor or health care provider about the risks and benefits of the various options available for treating or preventing osteoporosis.

There are several FDA-approved medications available. Most inhibit the osteoclasts, the cells that break down bone; only one, teriparatide, actually stimulates the growth of new bone. These drugs have not been available for very long, so we don't yet know all their long-term effects. Here is a brief description of each:

- Teriparatide (brand name Forteo®) is a synthetic form of human parathyroid hormone (PTH) that FDA has approved for the treatment of osteoporosis in postmenopausal women at high risk of fracture. This drug must be injected daily for no longer than two years.
- Two drugs in a class known as bisphosphonates, alendronate (brand name Fosamax®) and risedronate (brand name Actonel®), reduce the risk of fractures in postmenopausal women with osteoporosis and now come in a once-a-week pill. Both can cause problems in your stomach and esophagus (the tube that connects the mouth with the stomach) if not taken with 6 - 8 ounces of water and if you do not remain upright for 30 minutes after taking it.
- Raloxifene (brand name Evista®) mimics estrogen's positive effects on bone without the negative effects on the breast or uterus. It prevents bone loss and reduces the risk of vertebral fractures. However, it could cause blood clots and hot flashes.
- Calcitonin (brand names Miacalcin® and Calcimar®) is a synthetic protein similar to a hormone made by the thyroid. It is approved for treating osteoporosis in women at least five years beyond menopause. It can be taken as a daily nasal spray or by injection under the skin. Calcitonin increases spinal bone density but its effects on fracture risk are still unclear. The nasal form has few side effects but may not be as effective as the injected one, which may cause an allergic reaction.

NIAMS is funding trials to test various combinations of these drugs. Recently, a trial of PTH and alendronate showed that the concurrent combination provided no additional improvement in BMD than PTH alone. Ongoing studies will determine whether the sequential use of the two drugs is superior to just one of the drugs. NIAMS and several other NIH components are investigating other agents for preventing or treating osteoporosis as well. These include statins (cholesterol-lowering drugs), phytoestrogens (chemicals found in plants that can act like estrogen), and nitric oxide (a drug given to heart patients in the form of nitroglycerin).

## Final Advice

Dr. McGowan has one last recommendation: Do regular weight-bearing exercise, such as walking, jogging, stair-climbing, tennis, weight-training and dancing. These activities may not only help strengthen your bones; they can build muscle and help with your balance, reducing your risk of falling. As doctors are learning with many other functions of the body, use it or lose it — in this case, exercise or lose your bone and muscle strength.

## A Word to the Wise...What You Can Do to Prevent Osteoporosis

Get enough calcium: Kids ages 8 -18 need 1,300 mg; adults 19 - 50 need 1,000 mg; those over 50 need 1,200 mg. Don't exceed 2,000 mg per day.

Take calcium with meals; the body absorbs it better that way and you are more likely to remember to take it. Buy fortified orange juice and cereals, and eats lots of green leafy vegetables and low-fat dairy products like cheese, milk, ice cream and yogurt.

If you can't get enough calcium through foods, take calcium supplements from well-known manufacturers. Be wary of supplements from "natural sources".

It's best to take only 500 mg of calcium at a time if you can.

Get enough vitamin D. Spend 15 minutes outside in the sun each day or take 200 to 400 IU below age 70 and 600 over 70.

Get out of that chair and walk or do other weight-bearing exercises like jogging, dancing, or tennis.

***— a report from The NIH Word on Health, December 2003***

For more information about osteoporosis, go to http://www.osteo.org/ or contact the NIH Osteoporosis and Related Bone Diseases~National Resource Center at:
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