

Osteoporosis

Causes and Treatments

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What is Osteoporosis?

Our bones are constantly undergoing a repair and remodeling process that breaks down 20-40% of our entire skeleton every year. The rate of remodeling peaks in our 20's and declines with advancing age. Osteoporosis develops when the rate of break down exceeds the rate of remodeling. Menopause speeds this process due to a decline in various hormones that will be discussed below.

According to the World Health Organization, osteoporosis is a disorder that is characterized by a loss of bone mass *and* abnormal bone architecture. Pharmaceutical advertising in the media has only been focusing on bone mass and medical advice suggesting high intake of calcium ignores basic knowledge about bone health. Medications, like Fosamax, that prevent bone remodeling result in increased bone density but they do so by preventing the remodeling of old bone being replaced by new bone, and at the expense of bone strength.

The DEXA scan is a procedure that measures the bone density, also called bone mass. It does not measure bone strength and does not tell how fast bone is being lost or repaired. A urine test for the bone substance called NTx Collagen can indicate the rate at which bone is turning over and therefore the rate of loss. In essence the DEXA scan is like looking at your bank account and the NTx measures your spending habits. But neither test can measure bone strength, and in fact we do not have a good test for that very important piece of information. It is noteworthy that not everyone with low DEXA scores will suffer bone fractures and not everyone with fractures will have low DEXA scores. These scores can only be used as part of a statistical statement about a population at risk for fractures.

Why does Osteoporosis Develop?

Our body was designed (or evolved) to be self-sufficient. It should not need any studies to enable us to realize that, as a species, we survived the millennia by a process of evolution because we were able to derive our needs from the existing world. Species that were not so well adapted became extinct. Animals that live in their wild environment eat what is available and do not take supplements or medications. They do not drink cow's milk and do not even drink their own mother's milk outside of their infancy. Even cows do not drink milk. And yet the giraffes and elephants do not get osteoporosis. So what is the problem with humans?

It is simply our diet and our life style. Skeletal bones serve two functions. They support our frame and enable movement. And they also are a reservoir for our body's main buffering agent, calcium. All cellular functions result in a certain amount of acidity. The body must maintain pH (acid-base) balance and it does this very effectively by buffering the acids with calcium. Anything that produces an acid residue must be dealt with in this way.

Acidity results from stress, emotional as well as physical. It results from unhealthy lifestyle choices like cigarettes and alcohol. Yet, the major sources of total body acidity come from our diet. Animal proteins (furred, finned and feathered) all contain a large amount of phosphates. When we consume large amounts of these flesh foods we produce a large phosphate ash that must be buffered with calcium that is pulled from our skeletal storage depot. Because our diets, over the last few thousand years, have increased dramatically in the amounts of flesh foods consumed, we now have a need for more calcium than we ever did in the past.

No problem, our body was made to absorb calcium from the diet just like all other species. All it takes is some help from magnesium and vitamin D. Unfortunately, in shifting to a high flesh diet we also shifted away from a leafy, plant based diet from which we derive magnesium. In addition, sugar and caffeine deplete our magnesium reserves. Today the average American consumes 150 pounds of sugar every year. That comes to nearly ½ pound of sugar per day for every man woman and child in this country! And more caffeinated beverages are consumed than water. Consider just one coke and we have a beverage that contains 10 teaspoons of sugar, 40 mg of caffeine **and** enough phosphates to turn a chicken bone into a rubber toy overnight. Try putting your chicken's thighbone into a glass of coke overnight and see what happens.

Calcium absorption from the GI tract is dependent on adequate stomach acid. As we age there is a tendency to loose acid production. Heartburn (GERD) and peptic ulcer disease (PUD) often accompany this decreased acid production. This is a very important point that needs to be emphasized. **GERD and peptic ulcers are associated with too little stomach acid not too much acid.** Nonetheless, conventional medical wisdom is to treat GERD and PUD with acid *suppressing* medications. The result is decrease in symptoms at the expense of further impairing digestive functions and impaired absorption of calcium, vitamin D and many other nutrients.

Then there is vitamin D, which is readily made from cholesterol by our skin cells utilizing energy from the UVB rays in sunlight. Unfortunately we have been encouraged to reduce our cholesterol (also the precursor of all our steroid hormones) and have been told to stay out of the sun. The sunscreen that you were advised to use, does nothing at all to prevent skin cancer but it does block nearly 100% of our ability to produce vitamin D. There is growing evidence that an adequate level of vitamin D not only prevents osteoporosis, but also prevents falls in the elderly, reduces the risk of cancer and autoimmune diseases, and relieves the winter blues.

What About Hormones?

We have all heard that women get osteoporosis after menopause. I hope you have already appreciated that bone health is important throughout life and prevention of osteoporosis begins from youth. Important preventive measures include exercise, stress management and a healthy diet.

Even with healthier diets the aging process will still take it's toll on hormone levels. All hormones tend to decline with age except for cortisol. Cortisol is the stress hormone that increases bone breakdown. Estrogen slows the breakdown process and several hormones speed the rebuilding process. These include progesterone, testosterone and an adrenal hormone called DHEA. If you are planning to consider hormone support, it is important that you only use hormones that are biologically identical to natural human hormones. Other "hormones" are just chemical mimics that produce new problems for the body to repair. Recent studies that raised concerns about hormone replacement therapy used non-human substances derived from horse urine (Premarin) and a chemical progestin (not progesterone) called Provera. It is important to realize that no study has ever shown a health risk with bio-identical human hormones.

Men and women need an adequate amount of testosterone and DHEA for general health, libido as well as bone and muscle strength. There have been studies done on use of human growth hormone and parathyroid hormone. Both of these hormones can have powerful effects on repair of weakened bones.

Thyroid hormone also regulates metabolism. Too much thyroid activity will wear down bone and muscle but too little will impair necessary remodeling and bone strength. Proper thyroid function requires selenium and iodine, two substances deficient in a standard American diet.

What About Other Supplements?

Magnesium is one of our most vital minerals. It is involved in over 700 biologic processes that are essential to our overall health. It is also deficient in about 70% of Americans. Magnesium is necessary in the GI tract to be able to absorb calcium. It activates certain bone forming enzymes and is necessary for the conversion of vitamin D into the activated form called 1, 25 hydroxy vitamin D. Taking calcium without a balancing amount of magnesium will result in much of the calcium being passed on in the stool without being absorbed.

Boron has been found to increase activity of bone forming enzymes. At just 4 mg/day boron was associated with a 50% increased level of estrogen and a 200% increased level of testosterone.¹ Manganese and silicon are important cofactors in development of healthy bones. Strontium is often added to bone support supplements but calcium blocks the absorption of strontium so it needs to be taken separately and is best taken without food. This mineral, in adequate dosages (680 mg per day), has been shown to increase bone density by 15%.^{2,3} This is better than most studies with Fosamax (5-10%) and related drugs so it deserves consideration.

Let me not forget to mention vitamin K. This is another essential vitamin derived from green leafy vegetables. This is the vitamin that is blocked by coumadin when we want to decrease clotting tendencies. But it is also essential for bone health. It stimulates the cells that build new bone in the remodeling process. Inadequate vitamin K results in slow repair mechanisms and weak bones.

Zinc deficiency has been associated with accelerated bone loss so adequate intake is important. Copper is also necessary for bone development but is often already adequate or excessive in our "diet" due to copper pipes and copper cookware. The methylation-associated vitamins are also important including folic acid, B12 and B6.

Milk Deserves Its Own Section.

We have heard so much about milk that I am dedicating this section to exploding the myth that milk is good for you. As I stated before, no species on this planet drink milk outside of infancy and no species drink milk from another species. Only pussycats joined humans in consumption of cow's milk, at least until the veterinarians convinced owners to stop the practice.

Milk contains a good amount of calcium but, in the absence of magnesium, that calcium is poorly absorbed. Furthermore milk contains a high level of phosphate rich, animal protein that depletes bone calcium. If humans required milk for healthy bones we would have to maintain a relationship with our mothers that would be unique in the animal kingdom. If we were dependent on mother's milk for our health we would not be expected to outlive our parents. Need I say more? I will anyway...so the following paragraph will contain some information and references for anyone to look up.

A study reported in 1997 noted that women who drank at least 2 glasses of milk per day had a 45% **increased** risk of hip fracture compared to women who drank less than 1 glass per week.⁴ Countries with the highest rate of milk consumption, like US, England and Sweden, have the highest rates of osteoporosis, while countries like Japan and China that consume the lowest amounts of dairy and have a lower protein content in their diets, have the lowest rates of osteoporosis.⁵ Even if we consume 1400 mg of calcium per day we could still lose up to 4% of our bone mass per year if we maintain a diet too high

¹ FASEBJ 1987; 1:394-397

² Proceedings Mayo Clinic 1959; 34:329-334

³ New England Journal of Medicine, 2004, Jan 29;350(5):459-68

⁴ American Journal of Public Health, 1997

⁵ Nutrition Action Health Letter, June 1993

in protein.⁶ In fact doubling our protein intake may also double our rate of bone loss.⁷ And in the US the average man eats 175% more protein than the RDA, for women this is slightly better but still 144% more than the RDA.⁸ “Consumption of dairy products, particularly at age 20 years, were associated with an increased risk of hip fractures” in later life.⁹ Finally a 12-year Harvard study of 78,000 women concluded, “There is no significant association between teenaged milk consumption and the risk of adult fractures. Data indicate that frequent milk consumption and higher dietary calcium intakes in middle aged women do not provide protection against hip or forearm fractures...women consuming greater amounts of calcium from dairy foods had significantly increased risks of hip fractures, while no increase in fracture risk was observed for the same level of calcium from nondairy sources.”¹⁰

Alkalinizing Diets

Alkalinization is a complex topic that impacts every aspect of health and wellness. Every metabolic process results in an acid residue. This is fine to the extent that it remains in a state of balance. We need the process for a life functions, but if acidity gets out of balance the body becomes unhealthy. This is similar to free radicals and antioxidants, about which we have heard so much, remaining in balance. When there is an excess acidity the body very rapidly mobilizes its major buffer, calcium derived from bone, to “put out the fire”. In a state of constant acid excess, there will be a constant drain on the bone stores and we will see an increase in calcium loss in the urine.

Acid residue occurs from normal metabolic activity and increases with higher levels of exertion. It also occurs from emotional stress, whether from retained anger, fear, despair, etc, or from the highly stressed “day at the office”. It occurs with illness, pain syndromes, and lack of sleep, and with unhealthy lifestyle choices such as those involving tobacco and alcohol.

So...

So if we are not going to enslave cows (sorry about the editorial) to supply our calcium needs then where else would be good sources. Let me first state clearly that if we eat a healthy diet, with adequate fruits and vegetables, legumes, nuts and seeds and minimize animal source proteins, our calcium needs would be met in our diet alone. If we avoid salt, sugar, caffeine, alcohol and tobacco and reduce stress in our lives, we would be happier, healthier and better boned. But if we are to make up for some inadequacies of modern diets and lifestyles, we can find good sources of calcium in many foods and I have copied a chart from the Calcium Information Center for some helpful ideas.

Food group	Amount	Calcium(mg)
Milk		
Yogurt, plain (low fat)	1 cup	415
Milk, nonfat (dry)	¼ cup	377
Milk	1 cup	302
Mozzarella, skim milk	1 oz	205
Ice cream	½ cup	88
Cottage cheese, creamed	½ cup	63
Fruits and Vegetables		
Collards cooked from frozen	½ cup	168
Broccoli, cooked	½ cup	68
Orange	1 medium	60

⁶ American Journal of Clinical Nutrition 1979; 32 (4)

⁷ Journal of Nutrition, 1981; 111 (3)

⁸ Surgeon General’s Report on Nutrition and Health, 1988

⁹ American Journal of Epidemiology 1994; 139

¹⁰ American Journal of Public Health 1997; 87

Food group	Amount	Calcium(mg)
Protein		
Sardines, canned with bones	3 oz	372
Salmon, pink canned with bones	3 oz	165
Tofu processed with calcium	4 oz	145
Almonds	1 oz	66
Soybeans, cooked	½ cup	66
Grain		
Farina, enriched instant cook	1 cup	189
Tortilla, corn	1 medium	60
Calcium fortified foods		
Orange or Grapefruit juice	8 oz	300
Calcium fortified cereals	1 cup	300

For many of us a supplemental source of calcium, balanced with other nutrients necessary for healthy bones will be appropriate. We need to be careful in what choices we make for supplements as well as for our food sources. I have listed below the levels of lead contamination found in different types of calcium products. The numbers represent the average amounts of lead in 70 brands of calcium supplements.¹¹

Refined calcium carbonate	0.92 mcg lead per 800 mg calcium
Calcium chelates	1.64
Dolomite	4.17
Unrefined calcium carbonates	6.05
Bone meal	11.33

For some with more advanced bone loss, we may want to consider various hormone supplements and for others, we will want to consider more advanced strategies such as parathyroid hormone or growth hormone therapies. Once yearly intravenous treatment with Zometa may yield very positive results. There have also been studies that showed people with osteoporosis who underwent EDTA chelation for cardiovascular disease had increased bone density as a result of the treatments. This EDTA effect is due to stimulation of natural parathyroid hormone activity.¹²

What about men?

Men often fall through the cracks when it comes to osteoporosis, not because they are not at risk, but because so much emphasis has been placed on the effects of menopause that we often forget to consider that 50% of the population that does not get to enjoy menopause. But there is simple formula that is very good at predicting which males are at risk for osteoporosis. Simply subtract your age in years from your weight measured in kilograms (your weight in pounds divided by 2.2 equals your weight in kilograms). Multiply this number by 0.2 and round off the result to the nearest whole number. If that number is more than 4 your risk is very low, less than 3%, for have osteoporosis. If the result is less than 3, your risk is about 34% and you should get screened.

¹¹ American Journal of Public Health, 83:1155-60, 1993

¹² 1976 Tamburino (IRCS Med Sci Libr Compendium 4:362)