

Calcium - What you need to know.

Calcium is best known for its contribution to strong teeth and bones. It also has many other functions necessary to continuing life. And, it may be protective against high blood pressure and colon cancer.

Although calcium is especially important for children and adolescents, our growing years don't end when we think they do. Our bones continue to grow in density until we are thirty or thirty-five years old. Then, within a couple of years, we begin to lose calcium from the bones. This apparently age-related phenomenon, called senile osteoporosis, is universal among humans regardless of sex, race, dwelling place, occupation, or economic status. Because of it, people over thirty can require up to 67 percent more calcium than do 16 year olds. Consequently, to maintain good health, we need a calcium rich diet throughout our lives.

A number of minerals are required to build and maintain our skeleton; however, calcium is far and away the most abundant. There is nearly twice as much calcium in the body as phosphorus (the next most prevalent mineral) and about 40 times more than the amount of magnesium.

Along with other minerals, calcium is involved in vitamin function and is essential to the synthesis of hormones and enzymes. For that reason, calcium is not only in our bones and teeth but is transported to our soft tissues in soluble form by the blood. It takes only one percent of our total body calcium to perform these functions. (The other 99 percent is in the bones.) This tiny amount is crucial, and body mechanisms are organized to keep it constant. This is possible because bone itself is living tissue in a state of continual flux.

Calcium comes and goes from the bone in a regular cycle. New bone cells are formed and others are resorbed in an on-going process. In her excellent book *Better Bones, Better Body*, Susan E. Brown, PhD, explains that every atom of the skeleton is replaced within a three month period.

In effect, our bones are our calcium reserves.

When our calcium supplies are adequate, long slender crystals of calcium are formed at the ends of our large bones. This is where the body can access calcium when the serum calcium is not sufficient. This process is controlled by the parathyroid glands. These are four tiny bead-sized glands embedded in the surface of the thyroid gland which monitor the release of calcium from the bones, keeping serum calcium levels stable.

The calcium in the body tissues works with sodium, magnesium, and potassium (the electrolytes) in sending nerve impulses from one part of the body to another. Calcium is also needed to promote the contraction of the muscles, including the heart muscle. (Calcium deficiency has been shown to have an association with heart disease.) Other uses of calcium include improving the tone and elasticity of our muscles and ligaments, helping the blood to clot, reducing fatty substances in the blood (including cholesterol), reinforcing the immune system, and displacing strontium 90 (radiated strontium) and other toxic substances from the body. Plus, calcium is thought to be protective against colon cancer.

Between 250 mgs and 400 mgs of calcium are lost daily in these normal body functions.

If we take in more calcium than we lose, we are in a positive calcium balance. If we lose more than we replace, then our balance is negative. A negative balance causes our bodies to go into stress mode. Then calcium is taken directly from the bones to insure the one percent serum level. Since we are not usually aware that our bones are being decalcified, this slow and insipid process can go on unrecognized for years and osteoporosis is the result.

Calcium Sources

Many people get 60 to 70 percent of their calcium from dairy products. Low fat and non-fat milk contain about 300 mg of calcium per 8 ounce glass. Milk contains both lactose (milk sugar) and vitamin D which add to the absorption of calcium. Sounds good, but milk doesn't contain enough magnesium. Extra needs to be taken to keep the minerals in balance.

In addition, some 30 million Americans cannot tolerate milk because of their inability to digest lactose. One option in this situation is to eat milk in the form of yogurt or other fermented milk products. Fermentation changes lactose to lactic acid. Other options are 1) using lactase tablets (the enzyme which digests lactose); 2) eliminating milk and using calcium supplements; 3) eliminating milk, using supplements and upping your intake of other calcium rich foods.

Source foods for calcium are very good for us in general. They include collard greens (357 mgs for a cooked cupful), turnip greens, kale, mustard greens and seaweed, plus Brussels sprouts and broccoli. Other calcium rich foods are egg yolks, almonds, sesame seeds, molasses, maple syrup, tofu, canned salmon, and sardines.

Some foods which are basically good for us contain acids which inhibit calcium absorption. These are oxalic and phytic acids. Oxalic acid is found in spinach, rhubarb, beet leaves, chard and chocolate (a strange bedfellow). It is best not to eat these foods on a daily basis. Phytic acid is found in the germ and bran of grains as well as in legumes. Since yeast breaks down phytic acid, yeasted breads are no problem, nor are sprouted grains. However, if you use bran regularly, you may want to vary your fiber source. Soaking legumes before cooking takes care of the phytic acid problem.

Not Enough

Bad eating habits, lack of exercise, and stress all contribute to a calcium deficiency state. Calcium deficiency problems can include irritability and nervousness, fatigue and muscle and menstrual cramping, menstrual problems, insomnia, osteoporosis, periodontal disease, and high blood pressure. Let's take a closer look at the calcium connection to osteoporosis, periodontal disease, and high blood pressure.

Public education about osteoporosis has been prevalent enough that the name of this dread disease has become a household word. Osteoporosis is a depletion of the bone mass to the point where it is predisposed to fracture under stresses that are well-tolerated by normal bone. The incidence of osteoporosis has doubled since the 1960s, and now causes more than a million

fractures annually. Too often, a fracture is the first recognized sign of the disease. These fractures occur most frequently in the hip, vertebrae, and wrist. For example, hip fractures do not usually occur from slipping and falling. It only *appears* that way. Instead, the bones have lost so much calcium that they can no longer support the body weight. They give way as the person is standing on them.

Some people are more at risk than others. The acknowledged risk factors are:

Short stature	Slender body type	Small-bones	Fair complexion
Smoking	Excess alcohol intake	Low dietary calcium	Lack of exercise

The first four risk factors explain why women, particularly Caucasian women, are more at risk than men. In fact, they are eight times more prone to osteoporosis, and after thirty-five, they lose bone tissue three times faster. There are several reasons for this. In general, men have greater bone density than women; women may lose calcium supplies through pregnancy; and, women are more likely to go on reducing diets which can lead to bone loss as well as weight loss.

Further, women lose bone very rapidly the first few years after menopause. For a long while, it was thought that a decrease in estrogen was the cause. However, it now appears that the etiology is more complex and involves decreased progesterone levels as well as stress and faulty eating habits. (Estrogen inhibits calcium resorption while progesterone participates in bone building.) Unfortunately, post-menopausal bone loss is in addition to the effects of normal senile osteoporosis. This means women who do not have adequate calcium intake or absorption are hit twice as hard as men...a double whammy.

Eating a high calcium diet has increased bone regeneration and calcium retention in some patients with osteoporosis. For a very thorough discussion of osteoporosis, read *Nutrition News*, "Down to the Bone." (If this newsletter is not currently in the health food store, it is available by request from the publisher.)

It has been known for a number of years that calcium supplements help bone regeneration in periodontal disease. In several well-documented studies, jaw bone density was significantly improved with the use of dietary supplements of 1,000 mgs calcium per day over six months to one year. It is now recognized that deterioration of the jaw and not bone fracture is the first sign of osteoporosis. Periodontal disease is a degeneration and thinning of the jaw bone that leads to loss of teeth.

Commonly known as pyorrhea, this problem affects 80 percent of the adult population. It is the source of the old joke, "Your teeth are fine but your gums have got to go." This is too true to be funny. Regular six month dental check-ups are important to be sure you are on track with your calcium intake. Receding gums are a sign of impending periodontal disease which you can see yourself.

Calcium may be a factor in both reducing and preventing high blood pressure. Although not as important to healthy blood pressure as magnesium and potassium, calcium supplementation has lowered blood pressure in a number of studies conducted at Cornell University, Johns Hopkins University, and the Oregon Health Sciences University in Portland. David McCarron of Oregon

Health Sciences was first to investigate the connection between calcium intake and blood pressure. His work suggests that insufficient calcium intake may have more to do with high blood pressure than too much salt. (Regular table salt is our most abundant source of sodium.)

McCarron's studies further suggest the possibility that calcium and sodium interact in constriction and relaxation of the blood vessels. Increasing calcium intake and absorption may help many people to avoid the dangers of high blood pressure.

Don't Call Up the Reserves!

Mineral imbalance, faulty diet, and stress can all deplete blood calcium. Minerals function in specific ratios to each other. This interrelationship has been compared to a spider's web: One weak thread weakens the entire structure. Mineral imbalance is an important cause of calcium loss. The utilization of calcium is especially dependent on magnesium levels. As you might anticipate, magnesium deficiencies are common in the US.

In *Preventing and Reversing Osteoporosis*, Alan Gaby, MD, reports that magnesium deficiencies cause abnormal calcium metabolism. This results in calcification of the tissues. He believes that irregularities in the calcium-magnesium relationship are the basic cause of poor bone quality, hardening of the arteries, and calcium deposits.

In fact, many people limit their use of calcium and calcium supplements because of a fear of calcium deposits and kidney stones. When the body is functioning normally, calcium absorption is limited. If you eat more than you need, it isn't absorbed into the bloodstream, but is excreted with the feces. Urinary excretion only happens when blood calcium levels are inadequate and calcium is being drawn from the bones.

Calcification of the tissues tends to occur where there is some kind of low grade injury. It occurs most frequently in the regions of the shoulder joint (bursitis), the ligaments of the neck and back, around the nerve roots of the spinal cord, in the joints, and in the rib cartilage. Calcification of these tissues is most likely to happen when damage to them occurs repeatedly. *Damaged tissues do not become calcified unless serum calcium is inadequate and calcium has been withdrawn from the bones.* According to Dr. Gaby's theory, this could also occur when magnesium levels are insufficient.

Kidney stones is another condition involving mineral imbalance. Actually, calcium is imperative to normal kidney function. If it is not supplied, again, it is taken from the bones. As with other tissues, when calcium is supplied to the kidneys from the bones, it causes calcification. This adds to the overall problem of calcium imbalance since kidney damage prevents calcium from being retained in the body so it is excreted with the urine. If both B6 and magnesium are under-supplied, the kidneys are further damaged with as much as three-fourths of the kidney being replaced with scar tissue. There is evidence that the use of both these nutrients prevents the recurrence of stones. This indicates that in sufficient amounts they would also act preventively.

Please note: Some researchers think that increased calcium supplementation may encourage the formation of calcium oxalate-type kidney stones. According to Michael Murray, ND, this is not a concern when calcium citrate is used. Some of citrate's effects function in the body to inhibit stone formation.

One last example of mineral imbalance is the over abundance of phosphorus generally found in the American diet. The body needs phosphorus in a ratio of 1:1 with calcium.

However, in the US, phosphorus intake is frequently as much as four times that of calcium! Processed foods, meat, and soft drinks are all very high in phosphorus. One could be ingesting the required gram of calcium each day but every molecule of phosphorus beyond a gram would cause the body to pull calcium from the bones, resulting in a calcium loss.

Too much protein and too much fat both put us at risk for calcium loss. How much protein is too much? The answer is over 120 grams per day. Unless one is a vegetarian or careful about protein intake, it might be easy to eat too much. The adult standard for protein is 54 grams per day. This would equal a cup of cooked lentils (15 gm), a cup of nonfat milk or yogurt (9), six ounces of tofu (12), an egg (6), and a two ounce (1/2) serving of halibut (12).

Protein digestion results in acid residues which have to be neutralized by alkaline minerals like calcium. Meat (including fish and poultry) is the most highly concentrated protein commonly eaten. It is high in both phosphorus and sulfur both of which inhibit calcium utilization. This is not going to be a problem if enough fresh fruits and vegetables are eaten. By and large, these foods are rich in alkaline minerals, not to mention that they are low in calories, full of fiber, and contain many protective substances, including antioxidants.

Meat and dairy products can contain large amounts of saturated fat. The saturated fatty acids from these foods combine with calcium, yielding an insoluble calcium "soap" which is then excreted from the body. On the other hand, unsaturated oils high in essential fatty acids make calcium available for tissue use and help maintain serum levels. Eat no fats liberally.

Supplement Your Health

Several years ago, the National Institutes of Health recommended that people four years old and over ingest a gram of calcium per day. They also recommended 1,000-1,500 mgs for women and indicated that this would be difficult without the use of supplements. According to data, most women eat only about 450 mgs of calcium daily. This would indicate 1 gram daily in supplement form. Pregnant women need one to one and a half times the amount recommended for nonpregnant women. The NIH panel also recommended that people with a personal or family history of kidney stones not take calcium supplements except on a physician's advice. (Actually, this emphasizes the need for sufficient magnesium.)

Calcium supplements come in a number of forms. The most common is refined calcium carbonate. Chelated calcium supplements (those bonded to an organic molecule) are very popular and thought to be more easily absorbed than carbonate. These include calcium citrate, orotate, aspartate, gluconate, lactate, and ascorbate (calcium combined with vitamin C). Calcium hydroxyapatite is a form of calcium that is an extract of whole bone. Studies of the different forms vary as to which might be best. However, the NIH recommends calcium citrate.

Lead contamination is a consideration in choosing any form of calcium. In an investigation of 70 brands of calcium supplements, results indicated that we need to be wary of buying any form from natural sources. These include unrefined calcium carbonate (from limestone or oyster shells), dolomite (a mineral crystal of calcium and magnesium), and bone meal. Bone meal can contain unacceptable levels of lead. This also means that if you choose a hydroxyapatite calcium, you need to be sure it is from a reputable manufacturer and that the contents have been analyzed for lead content. Concentrations of 2 parts per million or less are acceptable.

Differing numbers of tablets or capsules are needed to assure the amount of supplementation you want to take. Amounts are indicated on the label. I vary the amount of supplementation I use

depending on the amount of food source calcium I am eating in a given day. (For example, if I drink milk, I take less calcium and still take my magnesium.) It is best to take calcium in 2-3 doses on an empty stomach. Taking your last serving before bed can mean more restful sleep.

Bone building formulas may be best. Using a bone building formula plus a multivitamin-mineral formula is probably the best way to insure calcium intake and absorption. This is because a number of nutrients are important to the uptake and utilization of calcium. These include the minerals magnesium, manganese, boron, zinc, copper, silicon, and strontium, and the vitamins D, K, C, B6, and folacin (folic acid). I was able to cover all of these between my bone builder and multi, except vitamin K (which I purchased separately) and strontium (may not be in formulas yet)

Each of these nutrients enhances the use of calcium. We will discuss a few of them. Vitamin D is imperative to calcium absorption because it moves calcium and phosphorus from the digestive system into the bones. The importance of vitamin K is beginning to be recognized. This vitamin is needed for the production of osteocalcin. A protein found only in bone, osteocalcin attracts calcium to bone and helps it to crystalize into new bone cells. It also accelerates the healing of fractures and reduces calcium loss. Regarding strontium, early studies confirm that it accelerates bone formation. It is safe and non-toxic. Until it begins to appear in formulas, sea foods and sea veggies are the best sources.

It makes sense that calcium absorption is even further enhanced when accompanied by a multivitamin-mineral supplement. In a year long study, 12 women using calcium supplements and a multi had significantly greater bone density than the 12 controls.

Contrary to an old theory that calcium needs stomach acid for absorption, a carefully executed study suggests that calcium is equally well absorbed with or without stomach acid. The researchers hypothesize that the intestinal walls may secrete their own acid to dissolve calcium.

Calcium on the Move

Physical activity is also vital for preserving bone mass. Older people, invalids, and astronauts (weightless in space) do not get the weight bearing stress needed to promote bone cell formation. Exercise combining pull and stress on the long bones is the most beneficial. Weight bearing exercise or resistance training epitomizes this type of exercise. (This kind of exercise is also called strength training, weight training, weight lifting, body building, and body sculpting.) Aerobic exercise (such as walking, jogging, and jumping rope) is helpful as are stretching and yoga. A combination program is best for all 'round fitness.

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