

## SAVE YOUR BONES

### Smart Ways to Fight Osteoporosis

**B**one may look like stone, but actually it's very lively tissue. Throughout our lifetime it continually breaks down and rebuilds. As older parts of bone are being tunneled away, new replacement bone is being formed. That's how our skeleton stays tough and resilient. In the tunneling process, minerals such as calcium and phosphorus from bone are released into the bloodstream where they circulate to all parts of the organism. So, besides providing the body's structural framework, bones are storage depots for elements that drive the body's machinery. Also, the soft interior, the marrow, is where red blood cells, as well as lymphocytes for our immune system, are made.

**A**bnormally porous bone, as in osteoporosis, results when the balance between breakdown and remodeling tilts steadily towards bone loss. To some degree, this negative shift appears to be natural to aging. However, many very old people maintain bones with good mineral density that don't fracture easily. Osteoporosis thus may be a phenomenon over which we have a good measure of control. Let's look at ways we may be able to implement this more optimistic scenario.

**CALCIUM.** Because scientists prefer to set up human experiments using only one nutrient at a time, research on osteoporosis has tended to focus on the major mineral needed by the bones--calcium. Currently, the public is awash in news items and advertising offering calcium as a panacea. This 'parts-smart' approach misses the broader picture. *All nutrients are needed to build and maintain bone.* (Also, to keep ligaments, tendons and muscles sturdy enough to reinforce our skeleton.) Bone formation is an exceedingly complex dynamic cellular process which draws upon all proteins, vitamins, minerals, and essential fatty

acids. Example: lack of one tiny trace mineral, manganese, can cause malformed bones. We can't afford to be parts-smart when laying our 'foundations'--a process that goes on as long as we live!

So let's talk about calcium (Ca) as just one of many elements needed for good bones. Our body adjusts to low Ca intake by stepping up Ca absorption--but why take chances? *A reasonable goal to shoot for is 800 to 1200 milligrams a day from diet and supplements,* the higher intakes for adolescents and for women who are pregnant or breastfeeding.



**I**nevitably, the subject of dairy products comes up in connection with Ca intake. Some pro's: (a) Milk, cheese and yogurt are concentrated sources of Ca. A cup of milk has about 300 mg, a cup of yogurt or 2 oz natural cheese about 400 mg. (b) Cow's milk products have a ratio of Ca to phosphorus that works in favor of Ca absorption, about 1.3 parts Ca to 1 part phosphorus.

A few con's: (a) Since a majority of the earth's folks don't depend on milk or milk products after they stop drinking mother's milk, many no longer make the enzyme (lactase) to digest lactose (the only sugar in milk). Milk

commonly causes them uncomfortable bloating and diarrhea. \* (b) Aside from problems it creates for lactose-intolerant individuals, cow's milk happens to be a common, often unsuspected allergen. Clinicians report that stubborn sinus problems in adults, as well as repeated ear infections in children, sometimes clear up surprisingly fast when their patients skip dairy products. (c) Dairy is a poor source of the essential mineral, magnesium. A desirable ratio of Ca to magnesium intake is estimated to be about 2 to 1. The ratio in dairy is about 12 to 1.

**MAGNESIUM.** It may turn out to be at least as important to our bones as calcium. Paleontologists estimate that strong-boned hunter/gatherers in the Stone Age got 1800 mg Ca a day from plant sources alone, plus Ca from meat, fish, insects, and bones. *Plants and aquatic food also supplied very large amounts of magnesium, far more than typical intakes today.* We are beginning to appreciate the role this mineral has in bone metabolism. For one thing, *it increases our absorption of Ca.* For another, it affects the workings of two major hormones that regulate bone. Parathyroid hormone (PTH), secreted by glands behind the thyroid gland, raises blood levels of Ca by triggering breakdown of bone, and by stimulating the kidneys to conserve Ca from urine. Calcitonin, made by the thyroid gland, works the opposite way, causing bone to be rebuilt. Calcitonin also stops excess Ca from being dumped in soft tissues where it could provoke inflammation and damage.

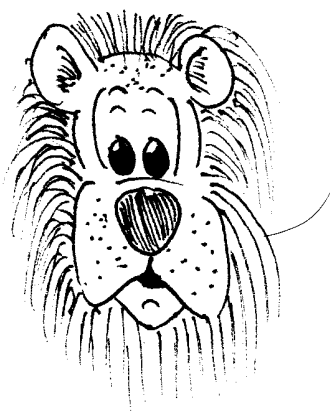
**G**uy Abraham, M.D. says *a diet that supplies plenty of magnesium will keep*

\* Cultured milk such as yogurt has much of its milk sugar digested by lactic acid-making bacteria and often is better tolerated, especially if the bacteria are still alive, i.e., not pasteurized, when the yogurt is eaten. (Pasteurizing the milk *before* adding the culture is okay.) Experiments show these friendly microorganisms continue to digest milk sugar for us inside our digestive tract.

PTH in check. Otherwise, too much PTH causes (a) tunneling of bone that overtakes bone rebuilding, (b) zooming blood levels of Ca, and (c) excess Ca deposits in soft tissues. Abnormal calcium deposits clutter up each cell's energy 'factories,' (the mighty mitochondria), impairing their workings. The heart and arteries seem to be especially vulnerable. Irregular heartbeat, increased risk of blood clots, and plaque buildup in arteries are among the disorders cardiologists are finding associated with low magnesium levels. Dr. Abraham says a high magnesium diet works naturally to do for the cardiovascular system what doctors hope calcium-blocker drugs will do!

The parts-smart approach to osteoporosis that pushes high calcium supplementation as a cure-all may defeat its purpose, *because a high Ca/low magnesium intake lessens our ability to absorb the little magnesium we're getting.* According to Abraham, too much PTH is secreted, setting in motion the breakdown of bone even in the face of high calcium intake.

Calcium ends up, instead, making mischief in muscles, joints, bursae, and arteries. He says plenty of magnesium in the diet lowers our calcium requirements, producing a natural calcium-sparing effect.



Maybe nature gave us a taste for foods like the following (before we followed the primrose path that led to Twinkies and hot fudge sundaes!) because many are high in calcium AND magnesium both, like those our Paleolithic ancestors ate.

FOOD, Typical edible portion (Not in any particular order)	CALCIUM milligrams	MAGNESIUM milligrams
<b>VEGETABLES, LEGUMES, NUTS, SEEDS</b>		
Broccoli, ckd. 3-1/2 oz [100 grams]	88	20
Turnip greens, ckd. 2/3 cup [100 g]	184	42
Green beans, froz. 1 cup [150 g]	65	30
Okra, ckd. 8-9 pods [100 g]	92	50
Parsley, raw, 5 Tbsp [50 g]	100	20
Green peas, raw, 3/4 cup [100 g]	26	35
Lima beans, ckd. 5/8 cup [100 g]	47	63
Garbanzo beans [chick peas] 3-1/2 oz	75	54
Tofu [soybean curd] 3-1/2 oz	128	111
Soybean milk, 1 cup [263 g]	55	57
Blackeyed peas, froz. 2/3 cup [100 g]	25	55
Peanut butter, 3 Tbsp [45 g]	33	66
Almonds, 25 [30 g]	70	80
Sunflower seeds, 2 oz [56 g]	68	22
Sesame seeds, 2 Tbsp [16 g]	20	56
<b>GRAINS</b>		
Tortilla [corn], 2 [60 g]	84	40
Rolled oats, ckd. 3/4 cup [175 g]	15	42
Brown rice, ckd. 1 cup [187 g]	22	56
Wheaties, 1 cup [28 g]	43	31
Cheerios [oat], 1-1/4 cups [28 g]	48	39
Wheat germ, 1/4 cup [28 g]	13	90
<b>FRUIT</b>		
Orange, 1 med. navel [140 g]	56	15
Blackberries, raw, 1 cup [144 g]	46	28
Papaya, 1 med. [304 g]	72	31
Raisins, 2/3 cup [100 g]	49	33
Figs, dried, five [93 g]	134	55
Guava, strawberry, raw, 1 cup [244 g]	52	41
<b>AQUATIC FOOD</b>		
Trout, ckd. 3-1/2 oz	218	35
Shrimp, raw 3-1/2 oz	63	42
Salmon, canned 3-1/2 oz	185	30
Sardines, canned w/bones, 8 med.	354	40
Oysters, Eastern, raw, 5-8 med.	94	32
Mackerel, canned, 1/2 cup	184	27
Striped bass, broiled, 3-1/2 oz	47	43
Dulse, dried, 1 oz	83	62
Kelp, dried, 1 oz	306	212
<b>MEAT [Low values compared with seafood]</b>		
Beef, pot roast, 3-1/2 oz	8	19
Lamb chop, 3-1/2 oz	7	2
<b>DAIRY</b>		
Cow's milk, low fat, 1 cup	297	33
Yogurt, low fat, 1/2 cup	207	20
Cottage cheese, 2% fat, 1/2 cup	77	7
Cheddar cheese, 1 oz	204	8

These foods are merely a sample listing from hundreds of equally good sources of Ca and magnesium. You might enjoy doing what I did--make up a casual one-day personal menu, choosing from the foods listed, then take calculator in hand to add up your

intakes of Ca and magnesium. I think you'll be surprised by the totals. They'll reinforce the comforting realization that nature intended us to have plenty of BOTH of these minerals. (Were I to list the entire nutrient contents of these foods, you'd be even more comforted!)

Then why are so many people inviting osteoporosis (maybe heart trouble, too) by shortchanging themselves of magnesium, as revealed by one scientific survey after another? The answer lies ultimately in the choices individuals make, but heavy brain-washing goes on, courtesy of big advertising, to steer populations into choosing foods that have been 'relieved' of much of their magnesium content.

Here are examples of stripped foods, with better choice(s) below:

	MAGNESIUM [milligrams]
White bread, 2 slices	10
Whole wheat bread, 2 sl	46
White rice, ckd, 4/5 cup	12
Brown rice, "	45
Corn flakes, 1 cup	1
Bran flakes, 3/4 cup	68
Wheat germ, 1 oz	91
Frozen fries, 3.5 cup	17
Baked Potato, med.	44
Bologna sandwich on white bread	18
Tuna or Sardine sandwich on whole wheat	80

The tendency in osteoporosis research to pin down the effects of one nutrient at a time leaves a lot of threads hanging. What if the subjects get all the calcium AND magnesium they need but don't get enough vitamin C, for example? The organic matrix of bone is mostly collagen, which uses up a bunch of vitamin C in its formation and repair. Mineral salts—mainly Ca and phosphate—form the bone crystals, known as hydroxyapatites, that reinforce the organic matrix. *Magnesium, sodium, potassium, carbonate, manganese, zinc, silicon and iron* are among the ionized minerals that need to be attached to hydroxyapatite crystals.\* Remember, the body can't make these minerals; they have to come from our food.

\*Chronic ingestion of fluoride converts hydroxyapatite to fluorapatite. There are studies that suggest there's less osteoporosis in areas with naturally or artificially fluoridated water, but others show no protective effect. Some scientists say bone that's modified by fluoride may be too crystalline, less elastic, and more easily fractured. No easy answers as yet, on either side.

One hardy research group took the admirable step of correlating intakes of some of the major nutrients with bone mineral density in about 100 women volunteers over a 4-year period (*Am J Clin Nutr* 1986; 44:863-76). Nutrients that showed up as having some effect on slowing down bone loss in postmenopausal subjects were vitamin C, niacin, magnesium, calcium, zinc, and moderate protein intakes (about 65 grams a day). Complex factors make studies like this one expensive and difficult to monitor, but it's a start!



#### Obscure Minerals That Build Bone

**SILICON** may be more vital to osseous tissue than we realized. Not long ago it finally was acknowledged to be an essential mineral, after enough data accumulated to show we can't develop healthy bone and cartilage without it. Silicon also stops aluminum from interfering with mineralization.

**BORON** is another element that's capturing the imagination of scientists, even though it hasn't reached 'essential' status as yet. At the USDA's Human Nutrition Research Center in Grand Forks, North Dakota, they credit this mineral with a potential role in halting osteoporosis via an unusual route. A boron supplement of 3 mg a day (1 mg per meal) cut down urinary losses of calcium and magnesium in their postmenopausal women subjects.

The scientists suggest the conserving of minerals was *hormonally induced, because estrogen and testosterone*

*levels in the women's blood unexpectedly DOUBLED during the days they got boron supplements.* When the women remained for 119 days on a controlled low-boron diet (0.25 mg/day), no improvement was seen. Within eight days after 3 mg boron daily were given, the women began to conserve minerals, at the same time that their sex hormones shot up and remained at apparently newly effective levels (F.H. Nielsen et al., *FASEB J.* 1:394-7, 1987).

After menopause, osteoporosis may develop as the levels of hormones that promote bone density begin to dwindle. The researchers speculate boron achieves its mineral-sparing effect by improving the body's natural output of these hormones, as well as of the hormone from vitamin D that promotes absorption of calcium.

[To doctors who prescribe estrogen and progesterone routinely to menopausal women in spite of cancer risk, in the hope of forestalling bone loss: There may be more ways than one to skin a cat.]

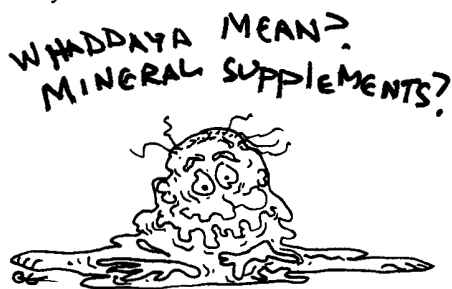
Here's some (not entirely unexpected, I hope) nice news: Many plant foods, like those listed in the table as being high in Ca and magnesium, also will provide us with appropriate amounts of *silicon and boron*. Leafy greens, fibrous cereals such as oats and brown rice, fruits, nuts, seeds, and sea vegetables (kelp, dulse, hijiki, etc.) are the best sources. Boron, like many trace elements, is toxic in large amounts; the North Dakota researchers describe 1.5 to 3 mg a day as a reasonable amount that could be gotten daily if we eat goodly amounts of vegetables and fruit. (Any supplements of boron should stay in that range.) Silicon is safer, but the intake needed is not well-established. I hope the National Research Council's newly updated RDA, out shortly, will give clearer guidelines on silicon than the 1980 edition.

If you estimated your Ca intake from the previous tables and still think you need a supplement, recent studies suggest calcium citrate to be a form that's well-absorbed. **Caution:** Ca supplements in high doses may lessen our absorption of magnesium and other minerals, so it makes sense to keep the dose moderately low and/or take it several hours apart from other mineral supplements.

**D**octors in the U.K. are using a supplement known as microcrystalline hydroxyapatite to treat patients who already have osteoporosis or are in danger of developing it (for example, because of longterm treatment with steroid hormones). A British medical report describes it as being "prepared from young bovine bones by grinding and sieving after removing the fatty constituents, leaving the minerals in their natural ratios as well as residues of matrix, proteins, and glycosaminoglycans."

**N**ow, there's a medical remedy with a wholistic quality to it! Calcium would be only one of many minerals in it, together with organic matrix components of bone. I saw reports by three British medical teams who used microcrystalline hydroxyapatite in 1- and 2-year trials with osteoporotic patients. They described increases in bone density in patients, "dramatic relief" of back pain, and no side effects whatsoever. Sounds encouraging. I was glad to learn that supplements along similar lines have become available as non-prescription items in the U.S.

**O**f course, if you're an unrepentant chomper of chicken bones and marrow bones, as I am, you're probably getting all that good stuff the old fashioned way!



**M**ales lay down more mineral-dense bone when they're young than females do, and lose it more slowly in old age. Once past menopause, a woman has a better chance of maintaining good bones if

. She's black. Women of black African descent may have the genes that help them develop denser bones in their youth and maintain them better in old age than their Asian, Caucasian, or Latino counterparts.

. She doesn't smoke cigarettes.

. She is physically active many hours of most days: gardens vigorously, cleans house with a vengeance, dances, works out regularly, takes long walks, etc.

. She is NOT (unnaturally) 'fashionably' thin. She should just say no to the Nancy Reagan image, and rejoin the ranks of the reasonably stocky or 'zofitig'! Adipose tissue helps us make the sex hormones that strengthen bones. Also, it's extremely unlikely a woman gets a full complement of bone-building nutrients regularly if she martyrs herself with one weightloss diet after another.

**F**or men and women, young or old, the following apply:

. Too many sweets cause us to lose calcium in urine.  
 . Too much salt may do the same.  
 . Daily overdosing on soda pop washes calcium out in urine (too much sugar, too much phosphate).

. **EXERCISE!** Bone builds up in response to weight-bearing needs, but all conditioning activities help, including swimming. Regular long walks are terrific for the non-athletically inclined. I joined a tap dance class a few years ago, learned a few basic steps, and now can turn on the music and dance in the kitchen. Home tappers do not have to limit themselves to Ruby Keeler numbers from "42nd Street." Once you've learned the basic 'time-step' it works for anything from Scott Joplin rags and Mozart to Ray Charles doing "Hit the Road, Jack!" Also, I found that jogging on a small trampoline at home is easier on the feet and back than pavement or track.

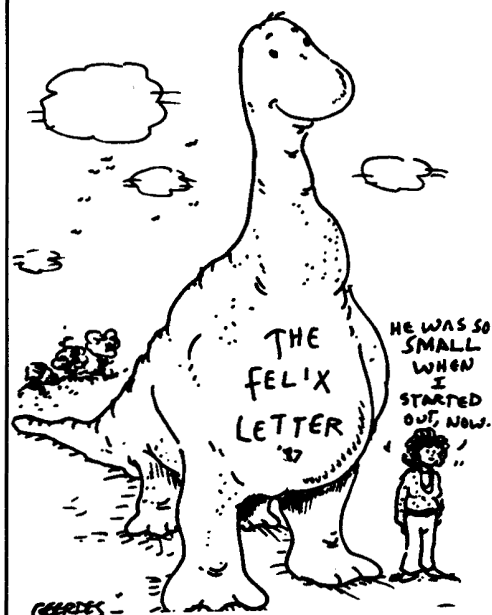
In Berkeley where I live, many friends in their 70s and older go folkdancing faithfully two and three nights a week.

I have disabled friends who make sure they get taken to a warm water pool two or three times a week for gentle but wonderfully energizing water exercises.

### Use It or Lose It

**R**esearchers are confirming that the right nutrients and lusty exercise can

bring osteoporosis to a halt, sometimes even turn it around. Just recently, I watched a television report on old people and *muscles*. When a group of frail, sedentary residents of a nursing home were cajoled by a medical team into doing a daily exercise routine, these men and women in their 80s demonstrated rapid, extensive growth of new muscle fibers (analyzed by electron microscope), and significant, measurable increases in their strength, in a matter of weeks. Don't know who was more surprised--the doctors or the old folks. \*\*\*



**A**s we go to press with this 50th edition, we learned that Ms. magazine has given up a losing battle to pacify cigarette, whiskey, etc. advertisers and may be coming out next year--in newsletter form! "--a low-cost, non-slick sheet that speaks its mind without worrying what the make-up and shampoo sellers think." Subscription-supported---what else? Welcome to the fighting front, ladies! \*\*\*

*Illustrations are by Clay Geerdes and other artists as noted.*

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