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## HEALTHY CHOICES FOR MIND AND BODY

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# CALCIUM DOES NOT = BONE

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(04/2006)

**Bottom line at the top: Calcium and vitamin D are necessary but not sufficient to maintain healthy bone and prevent fractures. For healthy bone, consider hormones, do weight bearing exercise, optimize your diet and do not stop your calcium supplements if you consume a low calcium diet.**

The recently publicized Women's Health Initiative (WHI) and RECORD trials of calcium and vitamin D prove that it is not a slam-dunk that taking supplements will prevent fractures. But we've known that. Since the 1980's.

Most old people don't fracture because of calcium or vitamin D deficiencies. Most fracture because they are hormone deficient or malnourished or take medications that diminish their bone health. **The loss of estrogen at menopause and testosterone with aging are the primary causes of age-related osteoporosis.** Men lose testosterone gradually over years and women lose their estrogen relatively suddenly during menopause. Women have more problems with osteoporosis than do men because they lose more bone more quickly and at an earlier age.

If people aren't fracturing BECAUSE they lack calcium or vitamin D, they certainly aren't going to get better FROM calcium or vitamin D. On the other hand, we all need calcium in order to build bone. We also need calcium to keep our body from thinking that it is low in calcium: If the body and parathyroid gland think blood levels are low, they pull calcium out of bone in order to maintain optimal levels. Make someone severely calcium deficient and her bone will grow holes.

Scientific studies in the 1980's concluded that calcium is NECESSARY but NOT SUFFICIENT (all by itself) for bone health. Hormonal status, physical activity and dietary status all contribute to fine-tuning the genetically predetermined quantity, size and shape of a person's bone.

In both early-adulthood and post-menopausal life, **physical activity and hormones** each trump diet and calcium with respect to effect on bone. However, if a person with low bone density fixes the major underlying problem, by taking hormones or dramatically

improving his nutritional state or stopping prednisone, he stills needs a good diet to reverse osteoporosis. A severe deficiency of calcium or any other nutrient necessary for bone, limits the material with which to build bone. It would be like having a construction crew and piles of wood and other building materials, but no nails.

Bone building and maintenance require MANY building materials – protein, calcium, phosphorus, magnesium, boron and calories – and their helpers – vitamin D, vitamin C, vitamin K, copper, zinc, potassium, and all the micronutrients necessary for energy and protein metabolism. No one of these will make bone or prevent fractures: They are all crucial.

Bone is a protein matrix with a lattice-like structure. When calcium and phosphate are deposited on the lattice, it becomes calcified and hard. Without the protein matrix, there is nothing to calcify. No matter how much calcium one consumes, the absence of even one of the many other nutrients necessary to build the matrix halts the whole bone-building process.

The overall quality of the diet and weight bearing exercise determine skeletal growth during adolescence and the early adult years. A poor diet short-changes the body, providing insufficient material to optimally build bone. A superb diet enables the body to attain the maximal bone density and size pre-determined by individual's genes.

Adolescents consuming abundant calories and dairy foods have greater bone mass by age 30 than do those who scrimp on them. Women usually achieve peak bone mass by age 25-35 years.

After achieving peak bone mass, the body constantly breaks down and replaces bone (sort of like hair naturally coming out in your comb and being replaced by new hair growing in). The **balance of bone loss & replacement** reflects a balance of parathyroid hormone, calcitonin, estrogen, testosterone, diet and physical activity.

Calcium intake by women in the decade prior to menopause does not appreciably affect bone mass. During the early post-menopausal period, calcium balance changes and the bone balance shifts to more breaking down and less building. Calcium balance changes because they have lost their hormones, not because they suddenly changed their calcium consumption.

**Calcium supplements do improve the part of the bone balance equation that is due to inadequate calcium intake.** Calcium supplementation does improve calcium absorption and bone mass of women on low-calcium diets. It does little to improve calcium status in women who consume at least 800 mg of calcium in their diet.

Calcium, at any level of intake, does not prevent bone loss by early post-menopausal women who do not take hormones. It has never, in any study, entirely reversed the bone-loss process associated with aging, which is why the WHI and RECORD results really do not conflict with prior study results.

The WHI study compared two groups of ~18,000 post-menopausal women, who took calcium and/or vitamin D or placebo for an average of seven years. Officially the placebo group got no calcium or vitamin D, but neither group was told to stop their own supplements or dairy foods. The study participants were also part of overlapping, concurrent studies of estrogen and diet. Approximately equal numbers of each were group were on estrogen and given dietary advice.

At final tally 38.5% of *each* group consumed more than 1200 mg/day of calcium and 42% of each group consumed more than 400 Units of vitamin D daily. By 7 years only 59% of the supplement group was still consuming their study pills. Bone density improved and there were 12% fewer fractures in the supplemented group, but these differences did not achieve statistical significance. The statistical analysis concluded that supplementation did not prevent fractures.

The RECORD trial tested calcium and vitamin D in people who had already suffered at least one fracture. The investigators followed 5292 participants in the United Kingdom for two to five years. Six hundred eighty nine (13%) sustained a further fracture, including 183 with hip fractures. Neither calcium nor vitamin D supplementation improved the risk of fracturing again. The findings do not support the

*routine* use of calcium and/or vitamin D for the prevention of further fractures in older people with a recent low-trauma fracture.

**Neither trial made an effort to identify and selectively supplement people with inadequate diets or calcium or vitamin D deficiencies.** Large trials often suffer from a wash-out effect, in which the people who don't need the intervention (like calcium supplementation) far out-number those who might benefit. This skews the statistics away from showing a benefit, even if a sub-population might need it.

The new studies haven't changed anything. They've only 'proved' that calcium is not some super-nutrient that, in large quantities, can do the job of multiple nutrients and hormones. Calcium is still necessary, but not sufficient. **Elderly people who do not consume at least 800 mg calcium per day should continue to take their calcium supplements**, so that calcium deficiency does not contribute to weak bones.

**Addendum:** The notion that Calcium = Bone looms so large in the minds of many people, that they equate the anti-osteoporosis medications with calcium, believing that they are just another form of the mineral. They are not. Those medications work on bone, either by mimicking estrogen, replacing parathyroid hormone or calcitonin, or cobbling together a new bone structure. People on those drugs should make sure they consume enough calcium, about 800 mg/day, and all the other building blocks for bone, either in the diet or as supplements. Neither the drugs nor the nutrients are sufficient alone to maintain healthy bone and prevent fractures.