

## Trace minerals and calcium increase bone growth in postmenopausal women, according to UCSD-Led study

July 1, 1994

Hold for embargo: July 1, 1994

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Postmenopausal women, prone to fractures from osteoporosis, may increase the strength and density of their bones with dietary supplements of calcium and a cocktail of trace minerals that includes zinc, manganese and copper, according to a study published in the July issue of the Journal of Nutrition.

"This is the first time we have grown bone back nutritionally in postmenopausal women," said Paul Saltman, a biology professor at the University of California, San Diego and the study's principal investigator.

"All the papers published before our study that used calcium supplements alone showed you can slow down bone loss, but there is still a loss," Saltman added. "We increased bone mineral density."

Saltman said this study, and previous research in his lab, suggest daily supplements of trace minerals along with calcium can alleviate osteoporosis or fragile bone disease in some women. Nationally, it's estimated that osteoporosis affects about 25 million Americans.

"I think it's time for people to be aware of this knowledge and to act on it," he said.

As outlined in the paper, volunteers--consisting of postmenopausal women aged 59 to 73--were assigned to four separate treatment groups according to the nutritional supplement they were offered: calcium plus trace minerals; calcium alone; trace minerals alone; or placebo.

Participants received either 1,000 milligram elemental calcium or placebo per day and were instructed to maintain their normal diets. The group also received separate trace mineral supplements or placebo with breakfast. Each supplement consisted of 15 milligrams of zinc, 2.5 milligrams of copper, and 5.0 milligrams of manganese. These trace mineral salts are commonly found in over-the-counter multimineral preparations.

Neither researcher nor volunteer knew who was listed in any particular category.

Volunteers were contacted by phone every two months to check compliance and provide information about other medications or other changes in their health status. Of the 113 postmenopausal women who initially chose to participate, 59 finished the study.

Following two years, the volunteers were scanned with an imaging device called a dual-photon absorptiometer, which measures bone density of the lumbar spine region. The spine is particularly sensitive to bone loss.

Though the study group was relatively small, the scans demonstrated that women who consumed the calcium plus trace minerals had roughly 5 percent more bone mass than women who were given the placebo, and 1.5 percent more bone mass than when they began the study. According to previous studies, an extra 5 percent bone density can reduce fracture risk by 50 percent.

"The trend was clear that the trace elements were exerting an effect," said Saltman. "It's unambiguous."

In some ways, bone can be likened to reinforced concrete. Calcium and phosphorus form the concrete; trace metals like manganese, copper and zinc help create a network of reinforcing collagen rods over which the concrete is poured and allowed to set. Without the reinforcement network, both concrete and bone will crack and crush under pressure.

"That's exactly why buildings have strength," said Saltman. "That's exactly why bone has strength. If these fibers of reinforcing rods are not properly laid down, you've got problems."

It was a series of problems with the feet of basketball star Bill Walton that sparked Saltman's interest in trace minerals and bone. The story began in 1980 when Saltman, attending a sports and nutrition seminar, was shown X-rays of Walton's feet by his physician Dr. Ernie Vandeweghe. At the time, the career of the 6-foot 11-inch center had virtually ground to halt from repeated fractures and foot problems.

Saltman, a speaker at the seminar, noticed that Walton's bone was riddled with small holes, like "Swiss cheese." It even looked like osteoporosis, which was unusual for a competitive male athlete. Saltman asked Vandeweghe if he could analyze Walton's blood for trace minerals. His interest was piqued because of Walton's well-publicized diet, which consisted principally of vegetables, lots of brown rice, one or two cups of milk per day, an occasional piece of fish, almost no dairy and no meat.

Shortly thereafter, Walton went to the UCSD Student Health Center, where a sample of blood was taken and sent to Saltman's lab for analysis. Results showed high quantities of calcium, but unusually low amounts of copper and zinc, and no manganese whatsoever.

After consulting with Vandeweghe, Saltman offered Walton a dietary supplement equivalent to one regular daily allowance of calcium, zinc, copper, manganese and fluoride. Following three months of this regimen, Walton's blood showed normal amounts of calcium, zinc and copper. However, his manganese levels never improved, possibly as a result of a congenital deficiency.

Nevertheless, Walton's bone seemed to heal and he resumed his professional basketball career.

"This study represents the end of the Bill Walton story, for me," said Saltman. "We've shown this regimen works in rats; we've shown it in people now. We've studied it in cell cultures, and in every set of experiments we've done, in all these organs and clinical studies, it's clear that these trace minerals are essential for optimal bone growth."

Saltman's study was supported by the National Institute of Aging and the Proctor & Gamble Company. Other study members included Mark Bracker, M.D., UCSD Department of Community and Family Medicine; Linda Strause, UCSD Biology Department; and Mark B. Anton and Kenneth T. Smith, both of Proctor & Gamble.