

Paul Saltman and team of biologists link manganese deficiency with bone disease

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UCSD BIOLOGISTS LINK MANGANESE DEFICIENCY WITH BONE DISEASE

A team of biologists at the University of California, San Diego has uncovered new evidence linking a manganese-deficient diet with osteoporosis, the painful and crippling disease that weakens the bones of many older women.

Paul Saltman, professor of biology, announced the results of an animal study on the impact of manganese and other trace elements on bone formation and breakdown today at the national meeting of the American Chemical Society in Anaheim, California. He also reported findings of a collaborative clinical study with physicians in Liege, Belgium, which further implicates a manganese deficiency in the onset of the bone disease.

In their laboratory experiment, Saltman and research biologists Linda Strause and Julie Glowacki wanted to find out how trace elements work in the bone. They implanted packets of bone powder under the skin of laboratory rats to induce the growth of two kinds of cells: osteoclasts and osteoblasts. Osteoclasts induce the breakdown of bones, and osteoblasts promote bone formation. Both activities are essential to bone turnover, an ongoing process throughout the lifetime of all normal vertebrates.

The experimental rats were maintained on three different diets. One group received a diet low in manganese, a second, a diet free of manganese, and a third, feeding on normal amounts of manganese, served as a control group.

At the end of various time periods, the packets were removed and inspected for bone breakdown and formation.

"There is a balance in normal bone between breakdown and synthesis. What we found is that in the animals deficient in trace elements, both processes are being decreased compared to bone metabolism in animals on normal diets," Saltman said in a recent interview.

"Even though the rate at which bone breaks down is severely reduced in a manganese-deficient animal, the rebuilding of the bone is reduced by an even greater amount. Therefore, the net result is an animal with substantially less bone mass than animals on normal diets."

At the same time he was conducting these experiments, Saltman was collaborating with a group of orthopedic physicians in Belgium. They compared the level of manganese in the blood of osteoporotic women with that of age-matched normal women.

"The net result was very exciting because we were able to show that there was a significant decrease in the serum manganese in those women who had osteoporosis when they were compared with the women who had normal bone," he said.

Saltman offers the two recent studies as concrete evidence that manganese and other trace elements play an important role in bone development and synthesis and that their absence from the diet may lead to osteoporosis or other bone diseases.

In his next study, Saltman hopes to learn whether it's possible to reverse the osteoporotic process. "We want to see if we can supplement people with manganese and change the status of their bone."

Saltman stressed that he is not calling manganese a cure-all for osteoporosis and related diseases.

"We don't say everybody should rush out and superdose on manganese. What we hope to do is convince individuals to obtain on the order of one recommended dietary allowance of manganese a day. That's about five to seven milligrams of manganese--in the diet or in supplements--which is a very modest level."

Saltman presented his paper at a special all-day symposium on manganese metabolism at the week-long American Chemical Society conference.

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