



Using DXA (dual energy x-ray absorptiometry), physiologist Mary Gustafson-Storms makes a bone density measurement of the spine of a research volunteer.

## Better Choices in Youth Can Lower Osteoporosis Risk

**Y**ou probably remember your parents urging you to “Drink your milk!” and “Turn off that TV and go outside and play!” Though you may have been reluctant at the time, your parents were right: in the first two decades of life our bodies are most active in forming our skeletons, so our eating patterns and activity levels are especially important. It’s yet another example of how the choices we make in our younger years shape our health in old age.

We store calcium mainly in our bones, where it provides structural support. As it moves via the bloodstream to perform other critical chores throughout the body, the calcium from our food replaces it. This flow is a natural process called bone turnover. But the rate at which we restore calcium to our bones slows as we age, leading to a weaker and thinner skeleton.

By the time you’re in your mid-20s, the amount of bone that makes up your frame, or skeleton, likely peaks. That’s why measures of your bone health later in life are compared to

standardized figures of the “peak bone mass” of a healthy young adult of the same sex.

Your healthcare professional uses this information to evaluate your risk of osteoporosis, a weakening of bone that can lead to painful fractures of the wrist, spine, and hip; a crippling and disfiguring curvature of the spine; or even death, especially in the case of hip fractures in elderly women.

Today an estimated 10 million Americans, mostly women, have osteoporosis. Another 44 million are at risk, according to recent estimates from the Washington, D.C.-based National Osteoporosis Foundation. Within the past decade, the incidence of this bone disease in the United States increased sevenfold.

The genes you inherited from your parents are 60 to 80 percent responsible for the health of your bones throughout your life. But what you eat and how much time you spend on a regular basis doing weight-bearing exercise—walking, jogging, running, or weightlifting, for instance—also play a role.

ARS and university scientists in California are adding more detail and precision to what we know about the effects of our childhood and adolescent eating and exercise habits on bone health. Analyzing data collected in a 1987-1997 study of about 2,700 healthy American girls has aided them in their effort. The National Heart, Lung, and Blood Institute of the National Institutes of Health sponsored the study, which followed the girls from age 9 or 10 until age 18 or 19.

Data included health records, diaries of what the girls ate during specific 3-day intervals, and estimates of how much time they spent watching TV or videos in a given week.

Now, the researchers have supplemented that earlier study with an analysis of the apparent influence of adolescent lifestyles on the subsequent bone health of nearly 700 of the original study’s volunteers. These young women ranged from age 21 to 24 when they took part in the bone-health analyses.

The scientists’ intent? To determine whether there are crucial windows of time during which eating and activity patterns influence young-adulthood bone health most strongly. The results will be of use in the nation’s ongoing reevaluations of how much calcium and other essential nutrients we need daily. What’s more, the findings will contribute to the growing body of knowledge about osteoporosis.

### Preteen Patterns: A Prediction of Future Bone Health?

ARS physiologist Marta D. Van Loan of the Western Human Nutrition Research Center, Davis, California, collaborated with Patricia B. Crawford, Mark Hudes, and Kirsten Shimmering of the University of California at Berkeley, and Laura K. Bachrach of Stanford University, who led this look-back investigation.

Van Loan took the young-adult-bone-mass measurements using DXA, or dual-x-ray absorptiometry, and ultrasound

readings of the left or right heel of whichever was the young woman's dominant foot. The findings appear in a 2003 issue of the *American Journal of Clinical Nutrition*.

The analyses by Van Loan and colleagues showed that pre-teen girls who spent more time watching television or videos had lower young-adult-bone-mass scores than did those who logged fewer hours in front of the screen. This finding agrees with conclusions drawn from several earlier studies, done elsewhere, which showed sedentary activity compromises bone health.

The result underlines the need for parents to help their pre-teen daughters participate in weight-bearing exercise during this critical period of bone formation.

Another key window of opportunity emerged from the analyses: The amount of calcium that the girls received in mid-puberty was closely correlated to higher young-adult bone mass measures. Specifically, the girls who consumed a daily average of more than 1,000 mg of calcium from food (the amount in about 6.5 slices of American cheese) during mid-puberty had more young-adult bone mass than those who consumed less than 1,000 mg.

Though the finding doesn't agree with those of certain earlier studies, it nevertheless provides new support for the recent increase in suggested average daily intake of this essential mineral. The recommendation for Americans age 9 to 18 has been raised from 1,000 to 1,300 mg, the amount in about 8.5 cheese slices.

Foods that may appeal to adolescents and help them hit the 1,300-mg target include flavored milk, fresh fruit smoothies, macaroni and cheese, quesadillas, and grilled cheese sandwiches.

The National Heart, Lung, and Blood Institute records that provided the backbone of the scientists' analyses represent a treasure trove of data that the researchers have yet to finish mining. "We'd like to look at the relationship between young adult bone mass and adolescent body composition—the amount of lean mass, such as muscle, in relation to body fat," notes Van Loan. "We'd also like to examine the influence of genetics on young adult bone mass."

More details about the role of nutrition in boosting bone health and preventing osteoporosis are urgently needed. Investigations such as the California research may help us to better protect ourselves from the painful grip of this devastating disease.—By **Marcia Wood, ARS.**

*This research is part of Human Nutrition, an ARS National Program (#107) described on the World Wide Web at [www.nps.ars.usda.gov](http://www.nps.ars.usda.gov)*

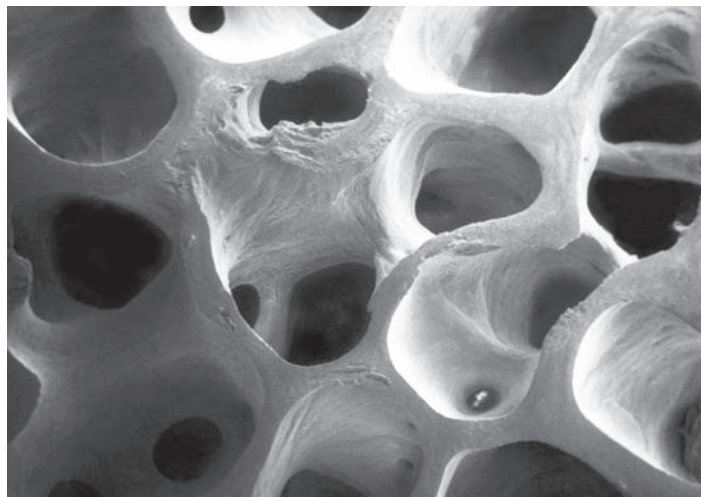
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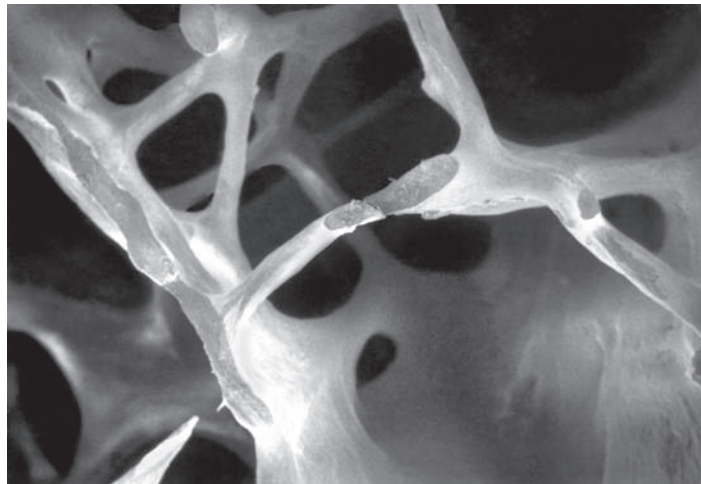
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**Chemist Erik Gertz (left) and physiologist Marta Van Loan examine a tray of serum samples to be analyzed for markers of bone formation and resorption.**

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**Scanning electron micrographs of normal human bone (top) and an osteoporotic human bone (bottom). Reproduced from the *Journal of Bone Mineral Research* (1986, 1:15-21) with permission of the American Society for Bone and Mineral Research.**