

## Magnesium: Another metal to bone up on

To head off osteoporosis, a potentially crippling loss and embrittling of bone, doctors have been advocating that adults down plenty of bone-building calcium as a lifelong habit. Magnesium, however, may also prove pivotal in preserving bone, a new study hints.

Bone stores about 60 percent of the body's magnesium. Though certain bone cells use the mineral, uncertainties abound as to how it affects bone growth and breakdown. In the past decade, however, supplements have been found to build up bone in people with a deficiency, notes K.-H. William Lau of the J.L. Pettis Memorial Veterans Administration Medical Center in Loma Linda, Calif.

For instance, in postmenopausal women, magnesium supplements are more important than calcium in reversing bone loss, according to a May 1990 report in the *JOURNAL OF REPRODUCTIVE MEDICINE*. Indeed, its authors argued, late-onset osteoporosis in women may largely represent "a skeletal manifestation of chronic magnesium deficiency."

In the new study, Lau says, "we wanted to see whether magnesium supplementation in nondeficient individuals—especially young and healthy people—also benefits bone." So, together with researchers at the University of Graz Medical School in Austria, he launched a pilot study of 24 healthy young men who had already been eating the recommended daily allowance (RDA) of magnesium, about 350 milligrams. For 30 days, half of the men doubled their magnesium consumption by taking a supplement.

Because the body excretes any magnesium it doesn't need, the researchers could compare amounts of the metal in blood and urine throughout the trial to evaluate whether and how the body used the supplements. The team also monitored blood concentrations of several biomarkers of bone turnover—its continual breakdown and reformation. Young people usually rebuild at least as much bone as they break down, but in people with osteoporosis, each cycle of bone breakdown can lead to a net loss of bone.

In the August *JOURNAL OF CLINICAL ENDOCRINOLOGY AND METABOLISM*, Lau's team reports that while bone turnover continued unchanged throughout the trial in the unsupplemented men, it appeared to slow dramatically in all who received the extra magnesium.

One possibility is that the supplements may be suppressing all phases of bone turnover, Lau says. "But we believe that most action is on the osteoclast," cells important to bone breakdown. Therefore, he says, the supplements are preserving bone—and possibly fostering a net buildup.

These data are "suggestive" that magnesium cuts bone loss, agrees Connie M.

Weaver of Purdue University in West Lafayette, Ind. "What is needed now to prove this hypothesis is a large clinical trial measuring the effect of supplementation on bone density or [osteoporotic] fracture."

Burton M. Altura of the State University of New York Health Science Center at Brooklyn remains perplexed, however, by the Graz study's blood data on magnesium ions, the biologically active form. His data have invariably shown that supplementation raises blood levels of these ions—the opposite of what Lau's team found.

Lau also was initially surprised by this finding, but he says a follow-up study has confirmed it. For him, however, the main

issue is whether magnesium supplementation increases bone. If future studies show it does, he says, "that would mean the current RDA is too low."

Altura doesn't challenge that. Work by his group and others over the years has shown numerous benefits of magnesium in reducing risks of heart disease, stroke, and even migraine headaches. The mineral is especially prevalent in nuts, legumes, unmilled grains, bananas, and green vegetables. If everyone made an effort to consume 500 to 600 milligrams of magnesium daily, Altura maintains, "maybe we could prevent much cardiac disease, hypertension, and stroke, saving the nation a lot of money and visits to the doctor."

He says the data from a host of studies are already bearing out that suspicion. —J. Raloff

## How cardinals tell her songs from his

A New York researcher has finally figured out how to distinguish a female cardinal's song from a male's, a feat that has challenged birdwatchers for years.

The adult females whistle slightly more nasal songs than males do and show more variation from syllable to syllable, reports Ayako Yamaguchi of Columbia University. In the August *CONDOR*, she proposes that hormonal differences leave the adult females stuck with the avian equivalent of a teenage-boy voice.

The female Northern cardinal may have the coloring of a muddy hiking boot, but she's remarkable as one of the few female birds to sing in the temperate zone. Females of many tropical species do sing, Yamaguchi points out, perhaps because keeping in touch with a mate can be so difficult in dense vegetation. Yamaguchi sees cardinals as essentially a tropical species, which spread north only during the last hundred years.

A male and female cardinal sing the same types of songs, and to people, her version sounds very similar to his, Yamaguchi observes. Yet the birds know the difference. She has found that male cardinals attack speakers broadcasting a male song, and a female recording prompts females to sing.

After listening to the songs for about a month, Yamaguchi thought of comparing their harmonics. Female versions have more overtones, creating a nasal sound much as bagpipe overtones do. Also, females do not repeat notes as precisely as males do.

Yamaguchi rejects the idea that the females learn only from Mom and males just copy Dad. Thirty cardinals raised in captivity learned songs from recordings of both males and females, she reports. Yet, "if a girl learned a song from Daddy,

she still made it sound feminine," Yamaguchi says. Likewise, males added guy traits to songs they picked up from a recorded female.

Hormones might explain the song differences, Yamaguchi suggests. Young male cardinals go through a nasal, wobbly phase as their androgen kicks in. Females sing "as if they have a juvenile male song," Yamaguchi says.

The idea intrigues J. Jordan Price of the University of North Carolina at Chapel Hill, who has studied male and female tropical birdsongs (*SN*: 3/28/98, p. 199). "There may be a reason why [cardinal] females aren't developing," he says. They may use music close-up, chatting with mates or fussing at another female who dares to invade. Males, however, may face stronger pressure to evolve purer tones, which carry farther, to announce "no trespassing" or "seeking mate" to distant cardinals. —S. Milius



The song of a male cardinal is less nasal than that of a female.