

New Misgivings About Low Magnesium

The average American consumes only about 40 percent of the recommended daily allowance of magnesium, according to data collected by the U.S. government. While this dietary deficiency produces no overt symptoms, it probably is not benign either, researchers reported last week in St. Louis at the 22nd annual Conference on Trace Substances in Environmental Health. Their data and analyses link low-magnesium diets to diabetes, high blood pressure, pregnancy problems and cardiovascular disease, including arrhythmias and high blood pressure.

The data, derived largely from animal studies, paint a consistent and troubling picture, says Mildred S. Seelig, executive director of the American College of Nutrition in Scarsdale, N.Y. The studies suggest many people face serious consequences — including death — from preventable magnesium deficiency, she says, and contributing to the problem is that this deficiency “is likely to be silent until it is severe.”

Among the more provocative data unveiled last week were findings from a trio of animal studies by the husband-wife team of Burton and Bella Altura. The two physiologists at the State University of New York Health Sciences Center in Brooklyn reported that:

- High blood pressure can be prevented in rats that have been treated to initiate salt-induced hypertension. All it takes is spiking the rats' drinking water with four to eight times their recommended daily allowance of magnesium.

- Most of the ill-effects of pulmonary hypertension (elevated blood pressure only in the lungs), in this case chemically induced in rats, can be prevented by supplementing a rat's drinking water with similar amounts of magnesium. Untreated rats suffer a tripling of lung blood pressure, a doubling or tripling of right-heart size and a three- to seven-fold thickening in arterial walls, along with reductions in the diameter of the vessels' interior.

- Among young rabbits, blood lipid levels and the formation of artery-clogging fatty deposits depend in part on dietary magnesium. Animals were fed diets with normal or high (1 or 2 percent) cholesterol levels. The diets were also deficient, sufficient or highly supplemented with magnesium. When compared with rabbits getting just 40 percent of their magnesium requirement, those eating normal cholesterol and getting five or more times the recommended daily allowance of magnesium showed 30 to 40 percent reductions in blood levels of cholesterol and other lipids. Similarly, among rabbits on a high-cholesterol diet,

those getting the megadose of magnesium experienced a 50 to 65 percent decline in their quite elevated blood lipid levels, compared with those in the low-magnesium group. But most important, Burton Altura says, is that the rabbits on the high-cholesterol/low-magnesium diet experienced 80 to 90 percent more atherosclerosis than those on the high-cholesterol/high-magnesium diets. Rabbits on a magnesium-sufficient diet developed changes somewhere between those of rabbits fed high or low levels.

Commenting on this last study, directed by his wife, Altura says, “I know of no one [else] who has been able to lower cholesterol and triglyceride levels in a normal, healthy animal” — one that had previously experienced no serious blood lipid elevations. These studies, he says, point not only toward a new magnesium-lipid connection, but also to serious effects at levels characteristic of the U.S. population.

At the same conference, Kenneth Weaver, an obstetrical researcher at East Tennessee State College of Medicine in Johnson City, described his studies with sheep and humans indicating that magnesium deficiencies during pregnancy can result not only in migraines and pregnancy-associated high blood pressure, but also in low-birthweight babies, miscarriages and stillbirths. Conversely, magnesium supplements can dramatically reduce the incidence of these events, animal and human studies by Weaver and others show.

Weaver's data indicate a magnesium deficiency can set up spasms in blood vessels. “Then blood platelets become a problem,” he says. “They can actually plug up some of the small [blood] vessels” in the placenta and in the mother's body.

Adding to the problem is the ability of phosphates to bind magnesium in the bowel and prevent its absorption, his studies show. A 12-ounce can of carbonated soft drink might contain 30 milligrams of phosphate, he says, and could “take out an equivalent quantity” of dietary magnesium.

Seelig believes 80 to 90 percent of the U.S. population may be notably magnesium deficient. At particular risk of “severe” deficiency, she says, are alcoholics and persons taking medications that interfere with magnesium absorption or increase its excretion — including diuretics, digitalis and other heart drugs, as well as some antibiotics and anticancer drugs. In addition, she says, studies by herself and others have shown that “stress, whether psychological or physical, increases magnesium requirements.”

What's the solution? While green, leafy vegetables, seafoods and whole-grain cereals are rich sources of magnesium, Weaver says, it's often hard to get enough of the metal through the diet. That's why some, like Weaver, suggest taking supplements. “If I were to name just one thing I'd supplement everybody with,” he says, “it would probably be magnesium.”

— J. Raloff

Speaking to an understanding SPHINX

Until now, the award for best performance by a computer able to understand spoken words has gone to systems trained to recognize a particular individual's voice. The SPHINX system, recently developed by graduate student Kai-Fu Lee of Carnegie-Mellon University (CMU) in Pittsburgh, matches that level of performance — but with a significant difference. It responds to just about any voice. Users don't have to endure the lengthy preliminary process of providing speech samples to ensure the computer can understand their words. Lee describes SPHINX as the world's first “accurate, large-vocabulary, speaker-independent” speech recognition system.

Researchers have long felt that speaker-independent systems can't work as well as speaker-dependent ones, says CMU's D. Raj Reddy, who more than a decade ago pioneered the HEARSAY speech program. “For the first time, we seem to have at least one [speaker-inde-

pendent] system doing about the same as or better than a speaker-dependent system.”

“Lee's achievement is definitely noteworthy,” says James R. Baker of Dragon Systems, Inc., in Newton, Mass., a company specializing in speech-processing technology. “There's no question he has singlehandedly produced a state-of-the-art speech recognition system.”

Computer-based speech recognition is already well established. Systems that recognize single words or simple phrases from a limited vocabulary are used in factory settings for controlling machinery, checking inventory, entering data and inspecting parts on an assembly line. In some hospitals, to keep their hands free for working with critically ill patients, nurses wear microphones so that they can describe their actions and observations to a computer that logs the information and keeps the necessary records. Lee's system, with a 997-word