Eating your greens could prove life-saving if a heart attack strikes

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A diet rich in leafy vegetables may minimize the tissue damage caused by heart attacks, according to researchers at the Albert Einstein College of Medicine of Yeshiva University. Their findings, published in the November 12 *Proceedings of the National Academy of Sciences*, suggest that the chemical nitrite, found in many vegetables, could be the secret ingredient in the heart-healthy Mediterranean diet.

“Recent studies show that administering nitrite to animals, either intravenously or orally, can greatly limit the damage caused by a heart attack and the stress to tissue that follows due to reperfusion—the return of blood to oxygen-starved heart muscle,” says Dr. David Lefer, the study’s senior author and professor of medicine and of pathology at Einstein. “We wondered if feeding animals much lower levels of nitrite and nitrate—equivalent to what people can readily obtain from their diets—could also provide protection from heart-attack injury.”

Nitrite and its “chemical cousin” nitrate are important because of their role in producing nitric oxide gas. In 1986, researchers made the remarkable finding that nitric oxide—famous until then mainly as an air pollutant—is produced by cells lining healthy arteries and plays a crucial role in cardiovascular health by dilating arteries and aiding blood flow. Damage to the artery lining (in atherosclerosis, for example) impairs nitric oxide production and leads to cardiovascular disease and, ultimately, to heart attacks and strokes.

Researchers now have good evidence that hearts undergoing heart

attacks have a “backup” pathway for making nitric oxide. Triggered by falling oxygen levels, enzymes in heart muscle convert nitrite stored there into nitric acid that can then help minimize tissue damage. Nitrite in the diet comes mainly from vegetables—celery, beets, and spinach, lettuce and other leafy types. Once consumed, nitrite exits the bloodstream and then accumulates and become stored in organs such as the heart, kidney and brain. But it wasn’t clear whether boosting nitrite in the diet could actually translate into better protection from heart-attack damage.

To find out, the Einstein researchers administered nitrite (50 mg/liter) in the drinking water of mice for seven days, while a comparison group of mice received a standard diet that was not supplemented with nitrite. Then, to simulate a heart attack, blood flow to the animals’ hearts was stopped for 30 minutes, followed by 24 hours of reperfusion. Examination revealed that the hearts of the nitrite-supplemented mice were significantly richer in nitrite, and heart-muscle damage was reduced by an impressive 48 percent compared with the controls. (See illustration at end of press release.)

In contrast to nitrite, nitrate in the diet comes mainly from cured meats such as bacon, sausage and luncheon meats. Consuming nitrate augments our nitrite supply: Once absorbed in the bloodstream, nitrate circulates to the salivary glands where bacteria convert it to nitrite, which is then swallowed in our saliva. About 10 percent of dietary nitrate is converted to nitrite in this way.

As with the mice and nitrite, the Einstein researchers spiked drinking water with nitrate and then induced heart attacks. A protective effect was found yet again: Compared with the control animals, the nitrate-supplemented mice had greater stores of nitrite in their heart muscle along with significantly less heart-muscle damage, although the reduction was not as impressive as in the nitrite-fed mice.

“This new appreciation of the health benefits of nitrite and nitrate is ironic,” says Dr. Lefer, “They’ve traditionally been regarded as toxic because they tend to form chemicals called nitrosamines, some of which are carcinogenic. But recent research has found no convincing evidence that nitrite and nitrate pose a cancer risk.”

Dr. Lefer notes that Europeans’ copious consumption of vegetables puts them far ahead of us in terms of nitrite and nitrate intake: On average, European consume 76 mg of nitrite and nitrate daily compared with a 0.77 mg American intake—nearly a 100-fold difference. “This large intake of nitrite and nitrate poses no known risks and could certainly help explain why the Mediterranean diet is heart-healthy despite its relatively high fat content,” says Dr. Lefer.

Dr. Lefer says that the nitrite levels found cardioprotective in his study can easily be achieved by consuming more vegetables containing the chemical. That dietary change, he says, might be especially helpful for people at increased heart-attack risk—those who’ve already suffered a heart attack, have been diagnosed with cardiovascular disease or have a family history of it.

“Our study suggests that building up nitrite stores in heart muscle could spell the difference between a mild heart attack and one that causes lasting heart damage or death,” says Dr. Lefer. “And since nitrite also accumulate in the brain, they could potentially help minimize the damage from strokes as well.”

Source: Albert Einstein College of Medicine