Food Science

Carol Ezzell reports from Baltimore at a joint meeting of clinical research societies

Celery studies yield blood pressure boon

When the father of University of Chicago medical student Quang T. Le developed a mild case of hypertension five years ago, he reached for an old Oriental remedy: celery. After eating a quarter pound of the ribbed vegetable every day for a week – but not altering his diet in any other way – he noted that his blood pressure dropped back into the normal range.

Now Le and William J. Elliott, a clinical pharmacologist at the University of Chicago, have found a possible explanation for this crunchy cure. They discovered that celery contains a chemical called 3-n-butyl phthalide, which relaxes the smooth-muscle lining of blood vessels, making them wider and thereby lowering blood pressure.

In experiments with normal rats, a dose of the phthalide compound equivalent to four stalks of celery in humans lowered blood pressure by an average of 13 percent, the researchers report. The same dose also pared the rats' cholesterol levels by 7 percent.

Le and Elliott determined that the phthalide compound works by lowering the concentration of stress hormones, or catecholamines, in the blood. These hormones cause blood vessels to constrict. In test-tube studies, the scientists found that the phthalide compound blocks the action of an enzyme called tyrosine hydroxylase, which the body uses to produce catecholamines.

Elliott hopes that studies of 3-n-butyl phthalide will yield a more effective drug for hypertension. "Phthalide works through such a simple and direct mechanism to dilate vessels," he says. "Many of our current antihypertensive agents act through more roundabout mechanisms ... and can have troubling side effects, such as fainting, drowsiness or impotence."

However, he cautions people with high blood pressure against treating themselves by eating large amounts of celery. "While it may have helped Mr. Le," Elliott says, "eating more celery is not the recommended way to lower blood pressure." He notes that celery contains sodium, which can raise blood pressure, as well as other chemicals that can be toxic at high doses.

Eat eggs and cut your cholesterol, too

Everywhere you look, health organizations are urging Americans to reduce their intake of saturated fat and cholesterol. For people who like eggs for breakfast, this can be a real problem, because a typical low-fat, low-cholesterol diet allows only four eggs per week.

To make such people happier about adopting a more healthful diet, researchers at a company named C.R. Eggs, Inc., in King of Prussia, Pa., have developed an egg with 15 percent less saturated fat than regular eggs. Working with physicians at the Medical College of Pennsylvania in Philadelphia, they have found that people on cholesterol-lowering diets could reduce their cholesterol counts and still eat 12 of the modified eggs per week.

The investigators, led by Jeffrey L. Garwin of C.R. Eggs, studied 98 people with moderately high serum cholesterol whose physicians had put them on identical diets. The researchers asked 48 of the volunteers to break their diets and eat 12 of the modified eggs per week; they told the other 50 to eat no eggs. After six weeks, they found that *both* groups' cholesterol counts had dropped roughly 9 percent.

Garwin says his company reduces the fat content of its eggs by feeding laying hens a grain-based diet supplemented with canola oil, vitamin E and iodine-rich kelp. Currently, he says, most hens are fed everything from leftover bakery crumbs to used deep-frying fat from fast-food restaurants. C.R. Eggs plans to begin marketing the reduced-fat eggs later this year, he says.

Materials Science

Elizabeth Pennisi reports from San Francisco at the spring meeting of the Materials Research Society

Enzymes under glass

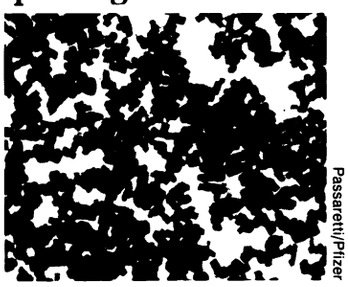
Because enzymes bind to specific substances, they show promise as sensors that can detect minute amounts of chemicals. To take advantage of the sensitivity of enzymes, scientists have embedded them in glass without destroying their activity. The clear glass traps the enzymes but lets in small molecules through its pores. If these molecules react with the enzymes, the glass changes color.

To make prototype sensors, chemist Stacey A. Yamanaka and her colleagues at the University of California, Los Angeles, modified a process called sol-gel synthesis. They start with a solution of water, methanol and a silicon compound and mix in acid. Typically, these ingredients form a silicon-oxygen compound that dries down to a clear, rigid glass. The Los Angeles group made the process hospitable to enzymes by adding buffer to the solution, reducing the amount of alcohol and keeping the resulting glass cool.

In early experiments, the researchers trapped one kind of enzyme throughout small cubes. Now they have embedded two kinds of enzymes – one that breaks down glucose and one that destroys hydrogen peroxide – plus dye precursors (to make the glass turn color) all in the same cube. When they dipped these cubes into a solution containing glucose, "the samples turned red," Yamanaka reports. For the red to appear, one enzyme had to break glucose into gluconic acid and hydrogen peroxide. These products then had to react with the second enzyme and the dye precursors. "By utilizing the specific binding properties and the molecular recognition properties of these [enzymes], there's the hope of making molecules biosensors," she concludes.

New crystal makes paper bright

Materials scientists have created a new form of calcium carbonate to help whiten paper.



Passaretti/Pfizer

Calcium carbonate crystals take on a new shape.

This printed page and any other paper product would look gray if it weren't for "filler," white minerals added to pulp during processing. Paper companies typically use mixtures of calcium carbonate and titanium dioxide as filler. As the industry's use of recycled paper fiber increases, so will the amount of filler needed per page, says June D. Passaretti of Pfizer, Inc., in Bethlehem, Pa.

Though much less expensive than titanium dioxide, calcium carbonate (limestone) whitens less. But adding too much filler weakens paper, forcing companies to balance many considerations in making their products, Passaretti adds.

To create a better filler, she and her colleagues worked to make calcium carbonate particles the optimal size for light refraction – between 0.2 and 0.4 micron across. Titanium dioxide crystals fall in that range already, but the 15 or so known types of calcium carbonate are too big or too small.

The Pfizer researchers first tried to precipitate crystals of the right size by altering reaction conditions. But they succeeded in making crystals 0.3 to 0.35 micron across only by chemically modifying them as they develop, Passaretti reports. Each particle resembles a cube twisted in such a way that it contains no 90° angles. Most calcium carbonate crystals resemble prisms or rosettes, she notes.

Though more expensive than traditional calcium carbonate filler, this new form is "clearly better" and may decrease the overall cost of whitening, Passaretti says.