Nutrition

Eating soy to lower cholesterol . . .

You've seen them—the nutritionally enlightened who munch on curried tofu as though they actually enjoyed it. But a new study vindicating vegetarians' claims that soy's good for you may persuade you to give the pasty-looking foodstuff another try.

Researchers from the University of Kentucky in Lexington report that eating soy protein significantly reduces moderate to high concentrations of cholesterol in the blood.

"People with the highest levels of cholesterol benefited the most from eating soy protein," says endocrinologist and nutritionist James W. Anderson, who led the study. "They saw an average reduction of about 24 percent." Most cholesterol-lowering drugs achieve similar feats, although with side effects.

Anderson and his colleagues pooled the results of 38 clinical trials that together included 730 men, women, and children. Using the pooled data, they analyzed the effect of eating 47 grams, on average, of soy protein a day. As they report in the Aug. 3 New England Journal of Medicine, volunteers who got half their protein from soy saw their cholesterol concentrations drop by about 10 percent, on average.

But soy protein's benefits may extend further, Anderson notes. Soy contains vegetable compounds known as isoflavones, which some researchers think may help prevent cancer. "The reason that I can be enthusiastic about using soy in baking and instead of meat is that it will necessarily lower fat intake," says Anderson. "And it could have other benefits."

However, Nancy D. Ernst of the National Heart, Lung, and Blood Institute in Bethesda, Md., notes that the researchers may be seeing simply the benefits of more healthful eating. Because the Kentucky group pooled the data from very different types of studies, interpretation becomes difficult. "The study itself doesn't convey any greater wisdom," says Ernst.

She worries that instead of replacing animal proteins with soy proteins, people will just add soy protein to their diet. This practice would lead to a higher-calorie diet and ultimately more overweight Americans.

Nevertheless, Ernst agrees that "if you substitute soy proteins for animal proteins associated with saturated fats, that would likely be a very healthy practice."

. . . and folic acid to prevent cleft palate

Women thinking about getting pregnant have even more reason to supplement their diets with folic acid. Researchers from the California Birth Defects Monitoring Program found that taking folic acid prior to becoming pregnant and during the first 2 months of pregnancy may reduce the incidence of cleft lip (known as harelip) and cleft palate.

"We found that taking multivitamins reduced the risk of [cleft palate and cleft lip] by 25 to 50 percent," says epidemiologist Gary Shaw, who reported his results in the Aug. 12 Lancet. The current recommendation for folic acid supplementation among women of childbearing age is 0.4 milligram a day.

Researchers know that folic acid prevents spina bifida, a birth defect affecting the spinal column, and that it may play a similar role in oral and facial deformities. The California team surveyed 731 women whose children had these deformities and 734 women whose children had no birth defects. Women who had taken multivitamins, which ordinarily contain folic acid, had fewer children with oral or facial deformities. The researchers acknowledge, however, that another vitamin or mineral could be responsible.

"People often think that just because you can fix a cleft palate surgically, it isn't a very serious condition," says Shaw. But it typically takes four surgeries to correct the condition, he notes. In addition, children born with oral-facial defects in California in 1988 will need $90 million worth of medical care over their lifetimes to treat the defect.

Physics

How sand piles pull their own weight

Sand and other granular materials stake out an intriguing middle ground between solids and liquids, as any shifty sand castle demonstrates. Now, scientists have modeled just how these powdery piles stand up on their own. The model marks a step toward understanding how powders flow and designing better containers to hold them, matters of interest to the agricultural, mining, and pharmaceutical industries.

The analysis appears in the July 28 Science.

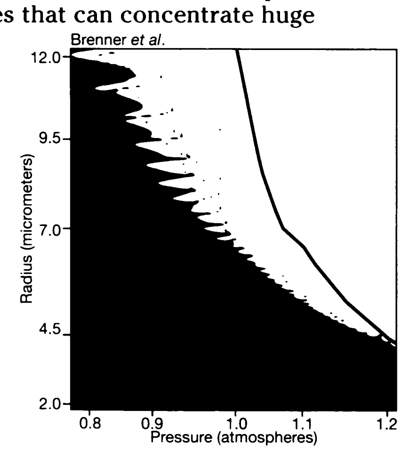
Sand distributes its weight unevenly, forming "stringy" lines of force that run through the pile, says Susan N. Coppersmith, formerly of AT&T Bell Laboratories and now at the University of Chicago. To measure those forces, Coppersmith and her colleagues placed an open-ended cylinder filled with glass beads on a piece of carbon paper. Larger marks on the paper indicated where the beads exerted more pressure. The researchers then simulated a bead pile and developed a mathematical model based on the knowledge that each bead leans unevenly on its neighbors.

The beauty of the final model, Coppersmith says, is that it brings together experiment, simulation, and theory. "It works disgustingly well," she says.

Why fiery bubbles live in a waterworld

The prospect of carrying out chemical reactions at temperatures hotter than the sun has driven scientists to explore the process known as sonoluminescence (SN: 04/29/95, p.266). In a new study, scientists at the University of Chicago offer a theory about why it occurs in water but not in other liquids.

Sonoluminescence takes place when sound waves pass through water, forming bubbles that can concentrate huge amounts of energy. When the bubble walls collapse, they compress the gas inside, heating it tens of thousands of degrees and creating the glow that gives the phenomenon its name.



But sonoluminescence doesn't work in more viscous liquids. To find out why, Michael P. Brenner and his colleagues looked at the interplay between two instability mechanisms at work in the bubble. Their analysis appears in the July 31 Physical Review Letters.

One mechanism, called parametric instability, occurs when the bubble wall oscillates, distorting the bubble's spherical shape. Given enough time, these slow fluctuations would overwhelm the bubble and cause it to collapse in on itself.

The other mechanism, Rayleigh-Taylor instability, kicks in when a bubble is at its smallest. Then, the relatively larger movement of molecules on the surface can cause it to implode. "You're a poor little bubble, and you get hit over the head [with these molecular movements]," Brenner says.

Parametric instability, ironically, provides some protection against the Rayleigh-Taylor effect. The diagram shows how a bubble's radius responds to increasing pressure. The slow parametric oscillations (jagged line) give the bubble some time to adjust its size before it hits the Rayleigh-Taylor instability region (solid line). When the pressure reaches 1.15 atmospheres, the bubble wall collapses.

In a thicker liquid, though, the parametric instability threshold is higher than that of the Rayleigh-Taylor. Thus the Rayleigh-Taylor instability takes its quick and deadly effect at pressures too low to create sonoluminescence.