Food Science

Eggs naturally rich in 'fish oils'

Do you long for the benefits of the omega-3 fatty acids in fish oil without having to endure the fishy taste? At least one Greek poultry farmer may have what you desire.

Three years ago, Norman Salem Jr., a lipid biochemist with the National Institute on Alcohol Abuse and Alcoholism in Bethesda, Md., identified purslane – a weedy herb sometimes thrown into salads – as the richest known omega-3 source in the world of leafy greens. When Salem's collaborator, Artemis P. Simopoulos of the American Association for World Health in Washington, D.C., found that range-fed chickens at one Greek farm voluntarily feast on purslane, the duo decided to investigate the farm's eggs.

Just one yolk from a large-sized egg produced by these chickens contains roughly 300 milligrams of omega-3 fatty acids – the same amount contained in a standard fish oil capsule and 10 times more than what's found in a typical U.S. supermarket egg, their data show. Best of all, they report eggs from the purslane-noshing hens lack the fishy taste and smell of eggs from hens feeding on fish oil (SN: 5/7/88, p.300). Salem and Simopoulos describe their findings in a letter published in the Nov. 16 New England Journal of Medicine.

This starch yearns to be a fiber

Until a few years ago, scientists believed starch was fully absorbed in the small intestine, especially if it came from food that had been heated, as starchy foods usually are, says Nils-Georg Asp, a food chemist at Lund University in Sweden. His research now suggests heating can change that.

At the August International Congress on Nutrition in Seoul, Korea, Asp reported that heating amylose – the relatively soluble portion of a starch granule – under wet conditions can cause a crystallization that realigns its molecules into a lattice structure. "And we've shown that compact crystallization makes this starch resistant to digestion," he says. As a result, he says, some of the amylose in processed foods will escape digestion and behave "like a soluble fiber."

Chemists don't always include this crystallized starch when figuring a food's fiber tally. If they did, Asp's data suggest, it could boost the fiber content of white bread by about 50 percent and double or triple the fiber in corn flakes.

To stymie cancer, eat broccoli raw

Several studies have linked a reduction in cancer risk with diets featuring lots of vegetables from the *Brassica* genus – such as cabbage, broccoli, cauliflower and brussels sprouts. But whether one eats them raw or cooked could make a big difference, suggest Lloyd D. Campbell and Bogdan A. Slominski of the University of Manitoba in Winnipeg.

Brassica vegetables contain relatively high levels of compounds called indole glycosinolates (IG). In animal studies by others, IG derivatives – including several that form when these vegetables are cut or heated – not only prevented mammary tumors and precancerous forestomach lesions but also increased the activity of several key detoxifying enzymes. These beneficial compounds vary in potency, however. And which predominates in any given *Brassica* depends on how the veggie is prepared, the Canadian team reports in the September/October Journal of Agricultural and Food Chemistry.

The IG derivatives that predominated in cut or mashed raw vegetables were those that had proved the most potent tumor inhibitors in animals, the pair discovered. Moreover, they found that roughly half the IG derivatives that did form in boiled *Brassicas* escaped into the cooking water, never making it to the plate. The researchers conclude that *Brassicas'* role in preventing stomach and colon cancers "should be attributed primarily to the consumption of raw vegetables."

Technology

Fishing for current with an STM rod

In the arcane and microscopic world of quantum mechanics, electrons routinely vanish from one side of an energy barrier and reappear on the other. Things like that don't happen in more familiar realms. Scientists first convincingly demonstrated the electronic tunneling phenomenon in semiconductors in the late 1950s, and since that time it has become the basis of several electronic components – among them tunnel diodes, which are good for some amplification and high-speed switching applications. More recently, tunneling electrons have attracted attention because of their central role in scanning tunneling microscopes (STMs), which enable scientists to image surfaces and molecules with atomic-scale resolution.

Using an STM to probe how different microregions of a semiconductor's surface conduct electricity under a range of applied voltages, physicists working at Harvard University and the Rowland Institute for Science in Cambridge, Mass., report observing on an atomic scale the same odd electronic behavior that occurs in macroscopic tunnel diodes, which are millions of times larger. The findings could lead to faster electronic devices fitted with the tiny tunnel diodes, says Peter J. Bedrossian, one of the project's scientists. The researchers describe their work in the Nov. 16 Nature.

The *sine qua non* of a tunnel diode is an unusual behavior called negative differential conductivity, which means that for a particular range of increasing voltages (when applied across a diode's two terminals) there is a reduction in the current of electrons that tunnel through the energy barrier between the terminals. Normally, the current through electronic components such as resistors increases as the voltage goes up.

In their experiment, the researchers positioned the tip of an STM, which served as one terminal of a diode, over specific sites on a silicon surface that either hosted a boron atom or did not. With the tip over the site, which served as the second terminal, the researchers varied the voltage between the tip and the surface while monitoring the changing tunneling current. The results showed that boron-free sites flanked by boron-occupied sites behaved as atomic-scale tunnel diodes.

Sequencing DNA using remote Braille

Using the fine tip of a scanning tunneling microscope as a teensy surrogate finger for feeling and recording the atomic bumps and valleys of molecules, two chemists have reconstructed images of synthetic strands of DNA. In the Nov. 9 Nature, David D. Dunlap and Carlos Bustamante of the University of New Mexico in Albuquerque suggest they may be able to improve the technique enough to enable geneticists to directly determine the sequence of nucleotide building blocks that make up strands of DNA. They envision looking at graphic reconstructions of the strands and reading off the nucleotides like letters in a sentence. DNA sequencing presently involves time-consuming and less direct biochemical techniques.

In their experiment, the New Mexico scientists coated a specially prepared graphite surface with a single layer of polydeoxyadenylate molecules, or poly(dA) – chain-like DNA molecules composed solely of the nucleotide building block deoxyadenylate. The researchers produced images that clearly show the constituent nucleotides' two chemical rings attached to an equally visible molecular backbone of poly(dA) strands.

Impressive as the images are, the researchers say they still aren't clear enough to allow investigators to distinguish among all four nucleotides in the more complicated DNA molecules in cells. Other hurdles include rendering each of a DNA strand's many nucleotides completely accessible to the tip of the scanning tunneling microscope and preventing more complicated and often complementary DNA strands from forming into double strands once they deposit onto the graphite surface.