Biomedicine

William Stolzenburg reports from Washington, D.C., at the First World Congress on the Health Significance of Garlic and Garlic Constituents

Garlic medicine: Cures in cloves?

For the past four millennia, people have touted the medicinal magic of garlic. From tumor tamer to headache healer, dewormer to aphrodisiac, garlic is deeply rooted in the folk-medicine hall of fame. Now looking beyond the lore, scientists around the world are seriously exploring whether garlic might indeed help bolster human health by defending against heart disease, cancer and a variety of other maladies.

Garlic may drastically inhibit the body's synthesis of cholesterol and blood-clotting agents associated with heart disease, says biochemist Nilofer Qureshi of Advanced Medical Research in Madison, Wis. She and her colleagues fed aged garlic extract and s-allyl cysteine (a sulfur compound derived from garlic) to 60 chickens. After four weeks of daily garlic supplements at doses as high as 8 percent of body weight, the garlic-supplemented chickens showed cholesterol decreases of as much as 30 percent when compared to six chickens receiving no garlic. "More importantly, low-density lipoproteins [which transport cholesterol to clog-prone arteries] decreased by up to 50 percent," Qureshi says. Chickens, she notes, synthesize cholesterol much as humans do.

Garlic and other members of the onion genus *Allium* may also erect a barrier against human cancer, suggests William J. Blot of the National Cancer Institute in Bethesda, Md. Blot and his colleagues questioned nearly 4,000 people from regions of Italy and China—including areas with some of the highest rates of stomach cancer in the world—about their diets for the past 20 years. Those who recalled eating the most *Allium* vegetables showed the lowest incidence of stomach cancer by as much as 60 percent.

These results come as no surprise to Jos Kleijnen of the University of Limburg in the Netherlands. "Of course people with stomach cancer will eat less garlic," he says. "Garlic upsets the stomach." Kleijnen suggests that the cancer sufferers' current diet—likely low in garlic—would naturally bias their memory against dietary garlic in the past. He also questions the accuracy of long-term diet recall, asking, "Do you know what you ate 15 years ago? Do you know what you ate yesterday?"

In a comprehensive review of recent garlic experiments worldwide, commissioned by the Dutch Ministry of Welfare, Public Health and Cultural Affairs, Kleijnen and two colleagues from the University of Limburg addressed the reported effects of garlic supplements on heart disease risk factors. Among the 12 most recent controlled trials in humans, he found serious problems such as small sample size, misleading analyses and patients knowing what treatment they were receiving. And though nearly all the studies showed positive results, he suspects there may be unpublished studies that would shine a less flattering light on garlic.

Kleijnen calls for more garlic studies to measure medicine's bottom line: morbidity and mortality rates. One such report comes from Arun Bordia at Tagore Medical College in Udaipur, India. Bordia tracked 432 heart attack survivors for three years, during which half of the participants consumed the juice from six to 10 cloves of fresh garlic each day. (The average Indian eats one to two cloves, he says.) Many of the others took a garlic-scented placebo. Overall, the garlic eaters suffered 32 percent fewer recurrent heart attacks, and 45 percent fewer deaths from heart attacks, than the unsupplemented patients.

Bordia conceived the idea for his study about 20 years ago after observing an unusual Moslem community in Udaipur. Unlike neighboring groups, the community "had practically no incidence of hypertension, no heart disease, no cancer," he told Science News. What they did have, he says, was a casual lifestyle and a daily menu of boiled vegetables flavored with melted butter and about 10 cloves of garlic per diner.

Chemistry

Ivan Amato reports from Washington, D.C., at a meeting of the American Chemical Society

Armpit odor gets a chemical face

That warm, dark and moist alcove under our arms regularly hosts bacterial feeding frenzies. No sooner do the underarm's scent glands release a sweaty brew of organic compounds than mobs of bacteria convert the compounds into volatile varieties nasally recognized as B.O.

The essence of this infamous fume apparently has succumbed to chemical sleuthing. Henceforth, the underarm compound 3-methyl-2-hexenoic acid shall join the ranks of foul-smelling chemicals, according to George Preti at the Monell Chemical Senses Center in Philadelphia. Although an individual's aroma comes from several dozen, mostly unidentified odor compounds, Preti says 3-methyl-2-hexenoic acid is the don. Prior studies by others had awarded that distinction to steroids and isovaleric acid. To push his point at the American Chemical Society meeting, Preti let people sniff vials containing filter strips soaked with the compound. "It's like having an armpit in a jar," he says.

To unmask the odoriferous compound, Preti's team harvested sweat from absorbent pads worn by male volunteers. The scientists separated and identified the perspiration's compounds using gas chromatography, and sniffed each isolated compound as it emerged from the chromatograph.

Uncovering the chemical basis of underarm odor should enable deodorant makers to formulate more effective and lasting products, Preti suggests.

Using a similar gas-chromatography/nose technique, Terry E. Acree and Edward H. Lavin of Cornell University's New York State Agricultural Experiment Station in Geneva, N.Y., and colleagues at Kyoto University in Japan identified o-amino acetophenone as the chemical basis for the "foxy" smell of many Labruscana grape cultivars. The same compound provides the primary odor component of extract from the anal sac of a Japanese weasel, they report.

Oily end to leaf cuticle and algal walls

Through a process involving heat, pressure and millennia, a menagerie of carbohydrates from ancient plants and animals ultimately became natural gas and petroleum. Scientists still don't understand the intricacies of the process, nor do they know specifically which ancient molecules rearranged into these fuels — which in more recent times have spawned economic growth and international tension.

At least part of crude oil — the portion comprising long carbon chains — may derive from a previously unrecognized class of large, degradation-resistant biological molecules present in the cell walls of certain algae and in the protective coating, or cuticle, of many plant leaves. That's the conclusion of Erik W. Tegelaar and his colleagues at Delft University of Technology in the Netherlands. They compared these biomacromolecules with oil's solid molecular precursor, known as kerogen — an insoluble and varied mix of mostly huge and complex hydrocarbon molecules that makes up the largest reservoir of organic material on Earth.

When the researchers break up the large kerogen molecules by heating them and then analyze the molecular weights of the fragments with a mass spectrometer, they find fragment patterns that closely match the patterns from the leaf- and alga-derived macromolecules. The same cuticle molecules represent perhaps 1 percent of a living leaf but nearly all of the remaining material in fossil leaves, Tegelaar says. In addition, the researchers find the algal molecules—called algaenans—in living algae and in oil shale.

This and other evidence suggests that kerogen derives from "selectively preserved" macromolecules that resist degradation and that once played protective functions in organisms, says Tegelaar, now with Arco Oil and Gas Co. in Plano, Texas.