Biochemistry

Cashew oil may conquer cavities

Don't be surprised if a nut-flavored toothpaste makes its way to the drugstore shelf sometime in the next decade. Increased consumer demand for all-natural products has revived interest in tapping foods – edible plants in particular – for useful chemicals. In this quest, two organic chemists have discovered that the cashew may fight tooth decay and other bacterial infections, according to a report in the February JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY.

Cashew fruit: Will it join the fight against tooth decay?

In their research, Masaki Himejima and Isao Kubo tested various tropical fruits and vegetables for antimicrobial activity. The oil from the cashew nut shell, normally a waste product of the food industry, seemed to hold some potential, so the researchers extracted and tested 16 compounds from it. The oil and some of the extracts worked well against gram-positive bacteria, in particular *Propionibacterium acnes,* which causes acne, and *Streptococcus mutans,* which causes tooth decay.

When killing bacteria in the mouth, these compounds also appear to interfere with production of the microbes' enamel-eroding acids. "It has anti-plaque activity, too," says Kudo.

The shell oil is not edible, but Kubo notes that its bacteria-fighting components also exist in the nut and in the juice of the surrounding fruit. This fruit, called cashew apple, is eaten in tropical countries with no ill effects. Kubo thinks the cashew compounds may prove safe when mixed into toothpaste or mouthwash. And he sees another benefit of their commercialization: The cashew represents a renewable resource and potentially important product from tropical forests.

Keeping food fresh with bamboo

In the name of "natural," Japanese researchers have searched the chemical repertoire of another common plant, bamboo, and have found one component that might work as a preservative for foods and cosmetics. Atsuyoshi Nishina, a chemist with Nippon Oil and Fats Co., Ltd., in Tokyo, and four colleagues report in the February JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY that the bamboo extract inhibits bacterial growth. Asian cooks use bamboo and bamboo grass as tableware and for wrapping meat, sushi and candy. But until now, scientists had not thoroughly investigated the plant's potential as a preservative.

The chemists first pulverized bamboo bark and dissolved the bark powder in an alcohol mixture. Then they isolated four extracts from the liquid. They discovered that the extracts inhibited gram-positive bacteria, in particular a *Staphylococcus* species.

Food scientists say that using bamboo or its extract as a preservative holds special appeal. "The industry is wanting to not use any preservatives, and if they do have to add them, they want to use them from natural sources," explains Larry Beuchat of the University of Georgia in Griffin. "If it comes from plant material, they can claim these are natural."

The new work on bamboo is just the first step, adds P. Michael Davidson, a food microbiologist at the University of Tennessee in Knoxville. Researchers still need to show that the extract kills bacteria in foods and cosmetics under natural conditions and that it is not toxic to people.

Earth Science

CO_2: Where it goes, nobody knows

When carbon dioxide spews out of automobile tailpipes, not all of it stays in the atmosphere. Of the annual 5.3 billion tons of carbon pollution emitted each year in the form of carbon dioxide, only about 60 percent remains in the air, where it enhances Earth's greenhouse effect. The rest gets absorbed by "sinks" in the oceans and on land.

Such sinks play a critical role in limiting the pace of climate warming, but new research suggests that major errors plague scientists' estimates of carbon dioxide absorption around the world.

This disturbing conclusion emerges from a study of how tiny ocean plants called plankton affect the sequestering of carbon dioxide in the northeastern Atlantic. An intensive series of measurements revealed that the gas absorption varies greatly depending on the concentration of plant life in the surface waters, according to Andrew J. Watson from the Plymouth (England) Marine Laboratory and his colleagues. Over a distance as small as 20 kilometers, the carbon dioxide levels in the water could vary by as much as 10 percent, they report in the March 7 NATURE.

Because previous analyses of global carbon dioxide sinks have not considered such a dramatic biological influence on gas absorption, they may include significant errors, the researchers say. This finding has important implications for the ongoing debate over the location of the dominant sinks for carbon dioxide. For years, experts viewed the southern oceans as the major absorber, but evidence reported last year pointed to the land areas of the northern midlatitudes as a stronger sink than previously assumed. Watson's recent ocean studies don't refute the idea of a strong northern absorber, but they do indicate that scientists lack sufficient information to discern which deserves more credit, land or sea.

Soviets join the club

The Soviet Union agreed last month to take part in the international Ocean Drilling Program (ODP), becoming the 19th country to come aboard. The ODP explores the world's oceans by drilling holes into the seafloor, bringing up rock and sediments that offer glimpses of plate tectonics, evolution and climate change in previous periods of Earth's history.

The Soviets will pay $2.75 million a year for their participation in the program. The United States provides more than half of the $41 million annual ODP budget, with the rest paid by other member nations, says program director Philip D. Rabinowitz of Texas A&M University in College Station.

In 1987, the international scientific community invited the USSR to join ODP, but the Reagan administration scuttled the plan, reportedly because of concern over access to sensitive equipment on the program drillship.

Gaseous clue to impending eruption

Several days before a major volcanic eruption near the Japanese city of Ito, distant scientific instruments detected significant changes that could help in predicting future volcanic activity there. The eruption occurred July 13, 1989, on the underwater Teishi knoll just off the coast from Ito. Forty kilometers to the southeast of the knoll lies a separate volcano called Izu-Oshima, where scientists had set up instruments to monitor the temperature of escaping gas. The gas temperature began to decrease 10 days before the eruption, and then dropped precipitously three days before the event, Japanese researchers report in the February GEOPHYSICAL RESEARCH LETTERS. They suggest the two volcanic systems are linked, raising the possibility that monitors placed at one site could provide an early warning of future eruptions at a distant volcano.