CHEMISTRY

Julie Ann Miller reports from the joint meeting of the American Chemical Society and the Chemical Society of Japan in Honolulu

Spicing up a peppery issue

The safety of the spice cabinet has been questioned by a scientist from the University of Kentucky, to the dismay of the executive committee of the American Chemical Society's agricultural and food chemistry division. Members of that committee made a surprise visit to a press conference to "disclaim" the paper of Jose M. Concon. They objected to its "broad sweep."

Concon told the meeting that he suspects a wide variety of flavorings, including cinnamon, vanilla and anise, contain chemicals that may induce tumors. His research, thus far, focuses on black pepper. He reports many malignant tumors, sometimes in several organs, of mice treated with extracts of black pepper applied to their skin. He observed no malignant tumors in the controls. Robert F. Feeney, a food chemist from University of California at Davis and a member of the executive committee, objected that in his opinion the work is "too premature."

In other research dealing with potential hazards to the gourmet, Wayne T. Iwaoka of the University of Washington in Seattle investigated oven heating of frozen, prepared foods. Using a bacterial (Ames) test for genetic changes, Iwaoka finds that many foods browned longer than the instructions recommend contain an increased amount of mutation-causing chemicals. Iwaoka recommends that people avoid eating foods that have been excessively browned.

The chemistry of food browning is complex; Takayuki Shibamoto of Ogawa and Co. in Tokyo says more than 300 new chemicals can appear during the heat-initiated reaction of amino acids and sugars. Those chemicals, he finds, can either promote mutations in bacterial cells or inhibit such mutations. James R. Coughlin of the University of California at Davis works on a much simplified system. He finds that at least one intermediate of the browning reaction, when it reacts with nitrite as it probably does in the body, gives a compound that causes bacterial mutations. Coughlin plans to follow up this finding with animal studies.

At sea with hazardous wastes

Some of the nastiest organic compounds are particularly suited for incineration on the high seas. "It doesn't come back to haunt you," says Max Halebsky of Global Marine Development Inc. of Newport Beach, Calif. Halebsky reports that ocean incineration, which has been used in Europe for a decade, is economically and environmentally feasible for disposal of liquid wastes.

One major advantage of ocean incineration of organic compounds is that there is no need for a "scrubber." On land, caustic materials must be used to neutralize the hydrochloric acid vapor produced in the burning of chlorinated hydrocarbons. At sea the vapor dissolves in the water. As the vessel moves, the plume of vapor can be spread over a wide area, Halebsky says.

Since 1974 the Environmental Protection Agency has monitored several burns of chlorinated liquid organic wastes in the Gulf of Mexico and one of the U.S. stock of herbicide orange in the Pacific Ocean by the Dutch incineration vessel the *Vulcanus*. Observers found no significant deterioration of air and water quality, and the waste destruction was more than 99.9 percent complete. The EPA has approved ocean incineration as an acceptable waste disposal method and plans to issue regulations in accordance with the October 1978 code of the U.N. Inter-governmental Maritime Consultative Organization. One site for incineration has been designated in the Gulf of Mexico and others may be chosen off the Atlantic and Pacific coasts and Hawaii.

Federal regulations on land disposal of waste, expected to take effect in 1980, will boost the expense of land-based disposal. Halebsky calculates incineration on land costs $181 to $212 per ton, whereas incineration at sea would only cost $40 to $60 per ton. Even with the expense of transporting wastes to the shore, ocean incineration appears competitive, Halebsky says.

The Maritime Administration plans to take World War II T2 tankers out of mothballs for conversion into incineration ships. Halebsky reports that in 1977 the United States produced 349,000 metric tons of wastes suitable for ocean incineration. With the growth of organic chemical, pesticide and petroleum industries and stricter environmental controls, that quantity will be over 1 million tons by 1989, he predicts. Global Marine Development Inc. is seriously considering entering the ocean incineration business, Halebsky says.

Volcanic plumes by plane

Cadle

Getting up in the air is causing geochemists to revise their views of the volcano's contribution to the atmosphere. After leading a team that flew a specially equipped plane through the plumes of volcanos in Guatemala, Richard D. Cadle of the National Center for Atmospheric Research in Boulder, Colo., reports that estimates of worldwide volcanic sulfur production need to be increased by as much as a factor of ten. Another airborne study, of volcanos in Alaska and Washington state (SN: 9/16/78, p. 200), also indicated that volcanic sulfur production is greater than expected from previous ground measurements.

Volcanic eruptions may increase the rate of ozone formation in the stratosphere, according to Cadle and collaborators. Their samples showed that most of the sulfur emitted is sulfur dioxide, which reacts over a period of months with hydroxyl radicals to form sulfuric acid droplets. The resultant depletion of hydroxyl radical could increase ozone formation. The airborne scientists also photographed sequences of volcanic clouds for study of the growth characteristics.

Into onion: Tears and therapies

Onion, one of the first plants to be cultivated, has had an extensive culinary and medicinal history. Now biochemists are giving the pungent herb its due. Eric Block and co-workers at the University of Missouri are examining the compound responsible for onion's tearful aspects. That chemical, propanethial S-oxide (C_3H_6SO), forms sulfuric acid when dissolved in water. So the scientists suggest that a low concentration of irritating sulfuric acid may be produced in eyes of onion slicers. Common kitchen methods of avoiding onion tears are sensible, Block finds. Because the tear-inducing factor is water soluble, cutting the onion under water rinses the factor away, and chilling the onion reduces the factor's volatility. Block and Robert Penn used microwave spectroscopy to determine the geometry of the fragile, tear-inducing molecule.

Can onion fit in the medicine cabinet as well as in the kitchen? East Texas State University scientists are investigating onion's reputation as an agent to lower high blood pressure. In an onion extract, they have identified prostaglandin A_1, a compound known to reduce blood pressure. Moses and Katherine Attrep say their result is the first discovery of a prostaglandin in a plant. The onion extract successfully lowered blood pressure when injected in a rat, but the researchers are not certain whether the active ingredient would survive the human digestive system in sufficient concentrations to be an effective remedy.