CHEMISTRY

From our reporter at the national meeting of the American Chemical Society in New Orleans

A fabric for blood vessel repair

Implants of a new material are functioning successfully as small diameter blood vessels in dogs. Although most implant attempts fail in the first 96 hours, these implants have already been in place for eight months, reports Donald J. Lyman.

The University of Utah researcher designed the material, a polyurethane-type polymer, specifically for use in the body. One reason for the success, Lyman explained, is that the implant expands like natural vessels do. Other materials have failed as implants because they put too much mechanical stress on neighboring cells.

Lyman used recent information about how molecules interact to avoid the problem of blood clotting. He engineered the arrangement of chemical groups on the polymer surface so that they would specifically bind the protein albumen. In the body, that protein prevents blood coagulation and blockage of the narrow vessel. In dogs, which form blood clots much more easily than do people, Lyman and his colleagues have successfully implanted vessels as small as 3 millimeters in diameter, a significant improvement over the previous 6 to 8 millimeter limit.

Lyman emphasized that advances in implant capability would come through close interaction between bioengineering and surgical specialists.

Another molecule in ozone dilemma

A new compound has just been added to the roster of chemicals that may play significant roles in the ozone layer. In laboratory experiments at the Ford Motor Co., scientists have discovered a short-lived product of the reaction between two molecules important in ozone chemistry, HO_2 and nitrogen dioxide. Hiromi Niki, Paul Maker and co-workers identified the new compound as pernitric acid ($HOO\text{-}NO_2$) by its infrared spectrum.

Atmospheric scientist David G. Murcray of the University of Denver tentatively confirmed the presence of pernitric acid in the stratosphere. His conclusion was based on comparison of stratospheric infrared spectra with the new compound's spectrum. If pernitric acid is present in the atmosphere in sufficient quantity, it may act as a sink for nitrogen oxides and free radicals, thereby interrupting chemical chain reactions, Maker says. Further studies of the reactions of this molecule are underway.

Pollution flows underground

"Most Americans have become sensitized about water pollution, but almost everyone identifies this with rivers and lakes," an environmental scientist from the University of Wisconsin told a symposium on drinking-water quality. "The generally high quality ground water resources in the United States must be preserved."

Joseph J. Delfino described the long-term impact of contaminants allowed to enter ground water through careless land use practices or accidents. For example, when a railroad car derailed in southeastern Wisconsin, spilling liquid phenol (carbolic acid), the well water within the area remained contaminated for over 2.5 years, even though local authorities removed the soil containing crystallized phenol within a week.

Surface impoundments and landfills used to hold hazardous waste also contaminate ground water, according to geochemist Olin C. Braids of Geraghty and Miller, Inc., Port Washington, N.Y. That company's on-site investigations showed hazardous substances in ground water at 47 of the 50 industrial waste disposal sites sampled. Braids concluded that the soil alone is not an adequate absorber of contamination, and he proposed all disposal sites be monitored by wells located according to soil and geological characteristics of the area.

Ground water contamination, which eventually reaches the surfaces of lakes and rivers, is difficult to measure and difficult to clean up, Braids said. "If you've found it, it's already too late."

Fungicides, herbicides anchored

Polymers are being developed that can keep chemicals in their place. Researchers are synthesizing bound pesticides in an attempt to prevent dissipation of the toxic chemicals into the environment.

Fungicides that are usually added to paints to prevent mildew growth on house exteriors may eventually leach from the paint or evaporate. In research partially funded by the Paint Research Institute, Charles U. Pittman Jr. and Glen A. Stahl of the University of Alabama have bound four different fungicides to polymers. Preliminary tests indicate that the polymers then prevent growth of the mildew organism. The fungicide appears to act while still attached to the polymer.

Other researchers are taking a somewhat different approach by developing polymers that release herbicide after application to the soil. Etienne M. Schacht of the Rijksuniversiteit in Ghent and colleagues have synthesized two types of polymers incorporating herbicides. These molecules give up the herbicides in the presence of water or acid conditions. "If the herbicide release is promoted by water and heat, it is possible to generate the herbicide in pulses coincident with plant activity," Schacht said. "These polymeric formulations are designed to release herbicides continually without the risk of dumping large doses of free herbicides into the ecosystem."

Sorting the toxins of a mold

One type of red or yellow mold, which can contaminate a variety of grains, is an arsenal of poisons. *Penicillium islandicum* Sopp, a mold different from the medicinal penicillium, contains at least four potent liver carcinogens and several other toxic chemicals. This mold, originally isolated in Japan, has recently been detected by the U.S. Food and Drug Administration in 94 out of 385 samples of soybeans collected from 13 states. Research on the toxins of this mold has been limited because of difficulty in detecting the toxins and in obtaining sufficient quantities for testing. But recent research promises some progress.

A method for producing large amounts of luteoskyrin, one of the most potent toxins in *P. islandicum*, has been reported by Anil C. Ghosh and co-workers at SISA, Inc., in Cambridge, Mass., and at the Massachusetts Institute of Technology. The toxin was isolated from experiments in which the specific strain of the mold was grown on rice grains. The researchers have also developed the first simple method for detecting another toxin, cyclochlorotine, in the mixture of more than 25 metabolites produced by the mold. An unexpected result of this thin-layer chromotography technique, Ghosh says, was discovery of a formerly unknown toxic metabolite. These techniques may help the FDA to assess the public health hazard of the virulent mold.