chemistry

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

A pesticide turns 'double agent'

Chemical compounds that are added to pesticides to increase their effectiveness are called synergists. Only a handful of synergists have been commercially added to pesticides. Now it looks as if the widely used pesticide parathion may form its own synergist.

John Grunwell of Miami University (Ohio) has found that after parathion is sprayed, some of it changes in sunlight to form a substance called O,O,S-triethylthiophosphate. This substance magnifies the toxic effects of the remaining parathion and of succeeding parathion applications. Such synergistic potency is good as far as the pesticide's effectiveness against insects is concerned. However, the synergistic effect may endanger man and animals. Indeed, parathion has poisoned some farm workers quite a while after they had applied it. A long-range build-up of parathion and its synergist in the fields, Grunwell proposes, might be what afflicted the workers.

The double-edged swords of drugs

Drugs that help you today may do you in tomorrow. This is a disconcerting, but real possibility, at least where cancer is concerned. Recently the widely used antitumor drug 5-fluorouracil has been found to favor the growth of cancer if given in subtherapeutic doses. The cancer drug cyclophosphamide increased the incidences of malignancies in female mice treated with long-term high doses. Now, David R. Grassetti of the Arequipa Foundation Laboratories in Berkeley, Calif., reports that the tuberculosis drug rifampicin promotes the spread of certain cancers in mice. Tuberculosis patients receiving rifampicin, Grassetti believes, may face the possibility, if they also have cancer, of having that cancer spread.

Even more ironic, rifampicin inhibits the enzyme reverse transcriptase, which is part of RNA cancer viruses. Other recent studies indicate that inhibitors of reverse transcriptase may be useful in treating cancer.

Quicker detection of fetal diseases

Some 20 genetic diseases can be diagnosed in the human fetus by amniocentesis, the procedure by which amniotic fluid that surrounds the fetus is withdrawn from the womb during the third or fourth month of pregnancy. The fluid is placed in a culture dish, and the cells are allowed to grow for three to six weeks until there are enough of them to examine for genetic defects by available biochemical techniques. If this indicates that the fetus has a genetic disease, a couple may wish to abort it. The problem is that by the time they get a diagnosis, during the fourth or fifth month of pregnancy, abortion is risky. And the couple has had to suffer through a long period of uncertainty.

M. L. Moss and W. W. Harris of the Oak Ridge National Laboratory have devised a technique to allow quicker diagnosis. Because their method requires only one-thousandth the amount of amniotic fluid as do the other tests, the fluid can be withdrawn during the first several weeks of pregnancy, when there is still little fluid present. The fluid is then put under a microscope in glassware which itself is arranged under a microscope and manipulated by pneumatic controls. Individual fetal cells can be detected and assayed for diseases then and there. There is no need to culture cells and then assay them.

natural sciences

Blood of the mummy

Preserved red blood cells have been found in the veins of a 2,000-year-old mummy, adding evidence in addition to previous uncertain findings of supposed red blood cells in even older mummies.

The cells, erythrocytes, were found in the mummified body of a nine-year-old American Indian boy, discovered in Salts Cave, Kentucky. In some earlier reports, including one of two 2,600-year-old mummies from Egypt, identification of the cells had been uncertain for various reasons, such as (in the case of a Peruvian body from about A.D. 700) that the apparent erythrocytes were found not in the vascular system but in skeletal muscle tissue. In the American Indian mummy, however, according to Michael R. Zimmerman of the University of Pennsylvania in the April 20 SCIENCE, the cells were in the blood vessels. They also still showed the characteristic double-concave shape, were mixed with white blood cells, and when stained in the laboratory showed most of the color responses of red cells.

One researcher in the early 1920's reportedly studied hundreds of Egyptian mummies without finding any red cells, but the tentative finds of other investigators could be confirmed by comparison with the Indian results.

A swim with antifreeze

Fish in Antarctic waters are able to keep alive and swimming in temperatures that would freeze a temperate-water fish's blood solid in its veins, thanks to a form of natural antifreeze called a glycoprotein.

Seawater in temperate regions freezes at about 28.7 degrees F., which is just about the temperature at which the ice-laden waters of Antarctica manage marginally to stay liquid, reports Arthur L. DeVries of Scripps Institution of Oceanography. The blood of a temperate fish freezes at 30.6 degrees, he says, with most of the difference between that and the freezing point of fresh water due to sodium chloride —salt. An Antarctic fish's blood, however, will stay liquid down to 27.5 degrees, and indeed there is a slightly higher concentration of salts. DeVries' studies, though, suggest that less than half the credit for this lowered freezing point is due to salts. The rest is caused by the presence in the blood of glycoproteins, proteins containing carbohydrates.

These glycoproteins, the researcher says, are more effective in lowering the freezing point of water than either salts or ethylene glycol (automobile antifreeze). The effectiveness of the glycoproteins seems to depend not upon their concentration, but upon some sort of interaction between the glycoproteins and water or ice.

Living with acid

A plant related to the Biblical papyrus that thrives in acidic water has started a team of scientists studying its use as a possible means of rehabilitating waterways damaged by acid mine drainage.

The plant, called a needle rush (*Eleocharis*), has been discovered in putting-green-sized mats in streams so acid that even most weeds will not grow, according to Pennsylvania State University botanist Richard Wagner. The plant grows quickly—from seeds to shoots in less than a week in the laboratory—and Wagner envisions its possible use as food for certain acid-tolerant fish such as the black bullhead. Since acid streams, while not thriving, do harbor a few other plants and various kinds of algae, the researchers believe that large cultivated stands of needle rush might provide a meeting ground for food chains to restart.