Behavior

Pesticides may alter brain function

A recently released study funded by the Environmental Protection Agency indicates that there is a link between exposure to poisonous doses of agricultural pesticides known as organophosphates and a number of neuropsychological problems, including depression, irritability and difficulties in thinking, memory and communication.

Organophosphates such as parathion and malathion have been used in agriculture and other industries for several decades, says study director Eldon P. Savage of Colorado State University in Ft. Collins. This group of chemicals, he adds, accounted for at least one-quarter of hospitalizations for pesticide poisoning in the United States from 1971 to 1976.

Long-term effects of organophosphates on brain function are poorly understood, notes Savage, who worked with scientists at Colorado State, the University of Colorado Medical Center in Denver and Texas Tech University School of Medicine in San Benito. The study sample consisted of 100 people — mostly agricultural workers — who had been exposed to a poisonous dose of organophosphates at least once between 1950 and 1976, and 100 controls matched for age, sex, race and economic status.

No significant difference was found between poison cases and controls on physical examinations, hearing and eye tests, brain wave measures and blood tests. Poison cases scored markedly worse, however, on measures of depression, intellectual functioning, academic skills, abstraction and flexibility of thinking and simple motor skills. They also performed at a lower level on tests of reading recognition and comprehension, written verbal fluency, problem solving and spelling.

Furthermore, people in the exposed group reported more memory, language and thinking problems. These include difficulties in understanding the speech of others, recognizing printed or written words and remembering the names of objects. Poison cases, adds Savage, also reported slightly more paranoia, irritability, social withdrawal, anxiety and sensitivity to criticism.

Because exposed subjects were screened for diseases or injuries that might aggravate neuropsychological problems, in addition to being carefully matched with healthy controls, "it is likely that the excess deficits recorded [for poison cases] are due to organophosphate exposure," concludes Savage.

Psychiatric recovery: A family affair

Several recent studies suggest that when hospitalized schizophrenics are released to "emotionally expressive" families that are highly critical and overinvolved in the patients' lives, psychiatric symptoms are likely to worsen and rehospitalization often becomes necessary. But emotional expression has its advantages, say David Spiegel of Stanford University and colleague; a family that openly discusses feelings and problems without marked conflict, rather than one that avoids emotional topics altogether, has the most positive effect on former psychiatric patients.

The researchers contacted 108 psychiatric patients, most of whom had schizophrenia, depression or manic-depression, and one of their family members (parent, spouse or roommate) at three months and at one year after discharge from a hospital. Higher ratings of "family expressiveness" on a true-false scale (for instance, "We tell each other about our personal problems") strongly predicted fewer days of rehospitalization, while self and family ratings of adjustment since discharge did not. Advising patients to avoid their families or not talk about emotional topics probably will not cut down on returns to the hospital, conclude the researchers in the January AMERICAN JOURNAL OF PSYCHIATRY; families should be counseled in ways to express feelings without undue conflict and criticism.

Biology

Harvest of white blood cells

Although white blood cells are critical to the body's defense against disease, they are normally present only at low levels. Scientists who study the role of these cells in immunity must kill animals, or repeatedly draw blood from them, to obtain material for the research. Now a U.S. Department of Agriculture (USDA) researcher has developed a hollow sphere that can be implanted under the skin to collect white blood cells continuously for weeks without harming the animal.

The new collector is a plastic sphere with membrane-covered holes and two attached tubes. When it is implanted, white blood cells invade the area in response to the irritation. These cells then send chemical signals through the blood to recruit more of the migratory cells, which continue to enter the sphere. The scientists collect the cells by flushing a salt solution through the tubes that extend from the sphere to outside the animal's skin. In a day, the sphere collects millions of white blood cells, says the device's developer, Phillip H. Klesius of the USDA Parasite Research Laboratory in Auburn, Ala. It would take at least several days to collect as many cells by bleeding an animal.

Klesius implanted the device, 1.5 inches in diameter, beneath the underbelly skin of 20 cattle to collect cells for his own immunological research. "The best thing about this method is that the animal does not seem to miss the cells removed," Klesius says. He speculates that there may someday be a clinical need for such a device. For example, some current experimental procedures take blood from patients, treat the white blood cells with chemicals or radiation and then return them to the body (SN: 4/13/85, p. 229).

Tugging at the earstrings

The deepest part of the mammalian ear doesn't just sit around listening, according to new anatomical research. Scientists at the University of North Carolina in Chapel Hill now report finding tension-generating cells in the inner ear that contain the same contractile proteins found in muscle. "We think this opens up a whole new way of thinking about the changing mechanical properties of the inner ear," says O.W. Henson.

The unusual cells were first discovered in the ears of bats by Henson and his colleagues. The cells appear able to change the way structures in the inner ear vibrate when stimulated by sound. "We thought initially that these cells might be unique to bats because bats hear very high-frequency sounds," Henson says. But the cells also were found in laboratory mice, and the scientists found descriptions of similar cells, whose function had not been recognized, in human anatomy publications. The scientists suggest that the contractile proteins within these unusual cells pull on external fibers that are attached to the long, spiraling inner-ear structure called the basilar membrane. The motion of the basilar membrane, a crucial element in hearing, would be modified by the tension applied by the fibers. Henson likens the effect to that of pulling on threads attached to the sides of a waving ribbon.

Whole plants from adult tissue

A stumbling block in applying biotechnology to crops has been the limited number of types of plants in which whole plants can be regenerated from somatic (not seed) cells. Scientists recently reported two important additions to the list of successfully regenerated plants. Soy plants are now being regenerated by researchers at United AgriSeeds, Inc., in Champaign, Ill. And guayule rubber plants are being regenerated by David N. Radin of the University of California at Irvine. Radin says his new procedure may hasten the development of guayule as a domestic natural-rubber industry.