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COVER: This portion of the first successful photo ever taken from the Martian surface reveals part of the footpad of the Viking 1 lander that took it on July 20, 1976. Five years later, the lander is still on the job, but subsequent Mars missions may be considerably less elaborate. See p. 42. (Photo: NASA)

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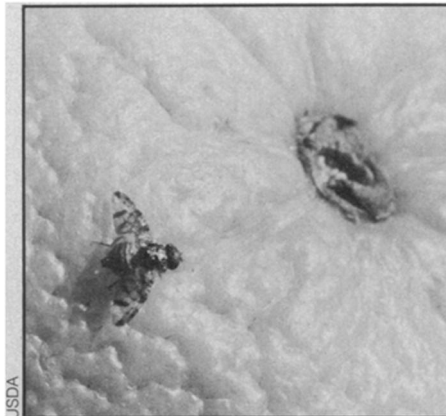
Malathion and the Medfly

As the first clouds of malathion droplets descended on the cars, sidewalks and fruit trees of northern California last week, physicians, toxicologists and health officials in the San Jose area and across the nation held their collective breath, but not all in fear of the pesticide. Some scientists, like Sumner Kalman, a pharmacologist at Stanford University, worried about what he called "the strong evidence for mutagenicity of malathion" in studies of animals and human cell cultures. But others, including Bruce Ames, the University of California at Berkeley biochemist who developed the commonly used test for mutations that signal potential carcinogenicity felt that the health risks associated with the pesticide had been overblown. The Medical Society of Santa Clara County, an area hit hardest by the overhead spraying, warned its members in a July 13 letter that an agitated public's fear about the spray could be worse for health than the spray itself. "Since the major health concern from this aerial application is acute anxiety, which could become epidemic in proportion," the Society said, "it is important that all physicians be aware of the symptoms of acute malathion intoxication so as to differentiate these from the more likely manifestations of anxiety."

As one of the organophosphates, the family of chemicals that brought nerve gas to World War II, malathion has enough malevolent relatives to make anyone anxious. By inhibiting an enzyme that breaks down acetylcholine at nerve terminals, organophosphates trigger an unnatural buildup of the neurotransmitter in the synaptic cleft. Because of this buildup, nerve cells along cholinergic pathways continue to fire, causing muscle spasms and glandular secretions throughout the body until ultimately the receptor is saturated, and electrical transmission stops. The progression of signs and symptoms of organophosphate poisoning range from headache, giddiness and blurred vision, to convulsions, respiratory arrest and death.

While malathion has been regarded as one of the organophosphates least toxic to human beings, it too can be dangerous in high enough doses, says Frank H. Duffy of the Harvard University Medical School. "The effects of taking, say, micrograms of nerve gas and a coffee cup of malathion are identical," he estimated.

Together with James L. Burchfiel, also of Harvard, Duffy tested the effects of more potent organophosphate pesticides on brain activity in rhesus monkeys and human beings (SN: 12/16/78, p. 424). In one of the few studies exploring the neurological effects of such pesticides on humans, the scientists found changes in the electroencephalograms (EEGs) of Army em-



Mediterranean fruit flies threaten the \$4.1 billion California fruit and vegetable crop. They lay eggs just under the skin of oranges, peaches, tomatoes and other produce, and hungry hatching larvae render the fruit mushy and unmarketable. Currently, fruit from a 2,000 square mile quarantine area is being fumigated with ethylene dibromide while 120 square miles receive aerial malathion.

ployees accidentally exposed to organophosphates that persisted more than a year after the exposure. While a follow-up of those exposed indicated that the EEGs returned to normal after several years, behavioral changes such as irritability, sleeplessness or memory loss, which might be associated with the exposure could persist, Duffy says.

The difficulty in isolating pesticide exposure as the trigger of such common symptoms as irritability and nausea has made broad-scale studies of the effects of malathion exposure prohibitive, according to Kenneth Melman of Stanford University, even though farmers have sprayed massive quantities on crops in Texas, Florida and other states for decades. As a member of Governor Jerry Brown's Medfly Health Advisory Committee, Melman reviewed the considerable data available on the possible carcinogenic or mutagenic effects of malathion and was convinced that the amounts dropped on 120 square miles in the San Jose area will pose no health risks to residents.

The small doses dropped (1.6 milligrams per square foot) and the method of application (500-micron-particulates that sink to the ground faster than easily inhaled spray) make the proposed treatment in California even milder than routine spraying in other states, Melman says. Considering that the present alternative to aerial spraying is fumigation of the fruit and vegetables with ethylene dibromide, "a known carcinogen," eradication of the fruit fly with malathion can come none too soon, Ames added. □