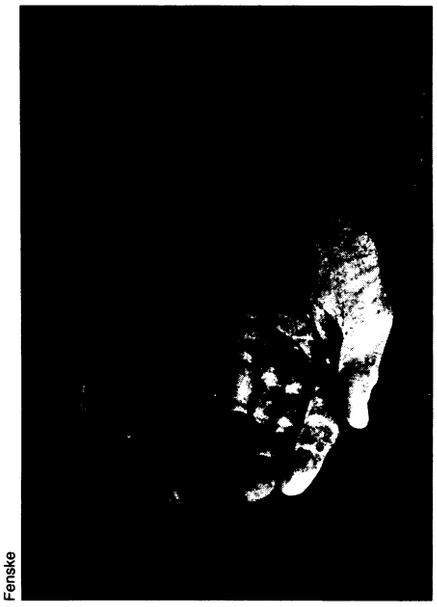
Picturing pesticide exposure patterns

Toxic chemicals used in manufacturing and agriculture have made skin disorders the leading occupational disease in this country. However, skin is not always the primary organ at risk from dermal exposure to these chemicals. Depending both on the compound involved and the body region contacted, certain substances will penetrate skin and enter the bloodstream almost as effectively as if the exposed individual had received an intravenous injection. And it's to help identify risks posed by this more insidious type of exposure that scientists at the University of California at Berkeley have developed a new computerized monitoring system.

UC's Richard Fenske describes the monitor as "a very sophisticated light meter" for detecting the presence of a fluorescent whitening agent that has been mixed with (not bonded to) the chemical in question. The whitening compounds, Fenske explains, "have the character of binding to the outer layers of the skin, so that very little, if any, will be absorbed." By binding with the skin they mark the spot where the toxic agent made skin contact and possibly entered the body.

Under illumination with ultraviolet (black) light, skin fluorescence patterns are recorded for display on a television monitor using an extremely sensitive television camera. The computer then digitizes patterns of fluorescence. Based on a 16-step gray scale, the system quantifies the amount of whitener present based on brightness. By knowing the proportion of whitener that had been mixed with the toxic chemical, researchers can gauge dermal exposures to the hazard. And because the television monitor has a touch-sensitive screen, users can outline specific regions of the image to quantify the dermal exposure received in a particular area, such as the forehead or wrists.



Fenske

Under ultraviolet illumination, bright spots mark where the toxic pesticide has penetrated a worker's protective clothing.

At the American Chemical Society meeting in St. Louis last week, the Berkeley researchers reported on results from their first field test of the system. They monitored exposures received by workers spraying the organophosphate pesticide diazinon with air-blast sprayers in California pear orchards. A colorless liquid that is toxic by skin absorption, diazinon works the same way nerve gases do, by deactivating the enzyme used by the body to break down acetylcholine, a neurotransmitter that at high levels interferes with normal nervous system activity. All workers had worn protective clothing, including rubber gloves, boots, a hat, respirator, T-shirt, long pants and long-sleeved coveralls.

"We have detected the penetration of spray through what is normally considered protective clothing," Fenske says. "Based on the type of pattern that we see, we can more or less determine how exposures occurred — whether it was from the spray or from an accident, whether it penetrated the clothing or resulted from a worker handling contaminated clothing."

Fenske says their goal is to characterize typical patterns of exposure so that appropriate types of protective clothing can be prescribed. But the technique is also effective in scaring workers into safer habits. Says Fenske, "We're finding that this ability to see the pattern of exposure is more powerful than any lengthy explanation that I could give in terms of micrograms of chemical" for getting workers to use protection appropriately.

Though the researchers had difficulty calibrating fluorescence levels in the field trial, they believe the monitor will ultimately provide sound quantitative readings. Moreover, Fenske notes, if the computer is programmed to account for the different permeabilities of various skin sites to the particular toxic chemical used, brightness readings could serve as a noninvasive test for estimating internal exposures. However, he points out, few such chemical-specific skin-permeability rankings exist yet. —*J. Raloff*

Fog in the Channel: Britain-CERN split?

The CERN laboratory in Geneva is a prominent example of inter-European cooperation. Owned by 12 European nations, it has developed over the last three decades into one of the world's foremost laboratories of particle physics. Now, however, there is a threat that Great Britain may withdraw. A committee has been empanelled to advise the British government whether to withdraw. If the decision is affirmative, departure could come in January 1986. Sir Keith Joseph, education secretary in the British government, has told interested physicists that Britain may have to pull out for financial reasons.

Such a move would be a severe blow to CERN, especially now that it is starting the construction of the Large Electron-Positron collider (SN: 10/1/83, p. 220). Britain is one of the major contributors to the organization. It is not clear the other members could or would make up the difference.

Withdrawal would also mean the virtual end of particle physics in Britain, according to British publications. Without access to a major laboratory there would be little or no incentive for British young people to take up particle physics. What the advisory committee is actually being asked to decide, some observers believe, is whether particle physics is worth supporting in competition with other sciences.

One might have to reach back to the fifteenth century for an explanation. It was then that England lost Gascony, the last piece of the continent under English rule. Of the half of France that English kings once governed, only the Channel Islands from the old Duchy of Normandy remain British. Since the fifteenth century the British attitude toward Europe has been ambivalent as British adventurers and expansionists turned their attention overseas. The attitude was beautifully (and unwittingly) satirized in a famous newspaper headline of years ago, "Fog in the Channel: Continent Isolated."

After 1945, it seemed that a new era had dawned, an era of European cooperation and involvement. CERN was one of the fruits of that spirit. However, from the British point of view, this minuet had its backward steps as well as its forward ones. The advisory committee is expected to report by the end of this year. If the government then decides to withdraw, it has to give the other signatories to the CERN treaty a year's notice. —*D. E. Thomsen*

Texas book rule changed

The Texas Board of Education voted last week to repeal a 10-year-old rule requiring that biology textbooks present evolution as a theory among several explanations of the origin of humans (SN: 1/28/84, p. 59). In another section of its textbook guidelines, the board added a clause requiring that theories be distinguished from fact in all texts, scientific or otherwise.

The vote was prompted by the Texas Attorney General's advisory decision last month that the book rule was unconstitutional because it had a nonsecular purpose. The board changed the rule in accordance to avoid possible legal controversies or funding problems in the future. □