Pesticides inhibit estuarine microbes

Farmers have used pesticides on food crops for decades. Although scientists synthesized and tested various chlorinated hydrocarbons in the laboratory, they are still discovering the wide-ranging and frequently damaging effects these chemicals can have on natural ecosystems.

Two Harvard microbiologists, Ralph Mitchell and Fraser Walsh, report in the June 14 NATURE on one possible effect.

Mitchell earlier studied microbial ecosystems in tidal regions of the eastern seaboard of the United States. Unlike heterogeneous animal or plant populations which can become unbalanced by the intrusion of a new species or a change in the physical environment, microbial populations have an ecological "righting" mechanism. Microbial predators, rather like a combination of tiny soldiers and miniature garbage men, weed out invaders, as well as the old and infirm members of the native population, to prevent imbalances from persisting. Mitchell found this cleanup operation functioning at full speed in areas where municipal sewage wastes are dumped into tidal pools.

He found that the intestinal bacterium *Escherichia coli*, carried by the billions in sewage, is parasitized by certain bacteria and consumed by certain amoebas. Sewage also carries infectious intestinal bacteria such as *Salmonella typhimurium* and these, too, are expunged from tidal basins by predatory bacteria.

Mitchell and Walsh also reported earlier that the cleanup bacteria recognize their prey chemically and move toward exudates given off by the intruders. This process is called chemotaxis.

In their current report, Mitchell and Walsh state that chlorinated hydrocarbons, which are appearing in the sea in greater and greater concentrations, inhibit the chemotactic mechanism of the predatory bacteria. This fact may "directly affect estuarine self-purification rates," they write.

They tested the percentage of *E. coli* killed by marine predators in the presence of different levels of the pesticide 2,4-D and o,o-Dichlorobiphenyl (a product of the interaction of pesticides with natural materials in waterways.) When the cultures were continually shaken (to simulate natural conditions) a significant decrease in the percentage of *E. coli* killed was observed. They suspect that the pesticide and pesticide-product interfered with the chemotactic response of the predators to the *E. coli*.

The concentrations of pesticides found in some estuaries are already within a factor of 20 of those which cause the inhibition, they state.

"What we have described," Walsh told SCIENCE NEWS, "is a generalized phenomenon. We chose *E. coli* as a model, and observed only certain predators, but any number of predators might use this system. In estuarine regions, if the levels of chlorinated hydrocarbons affect the interactions of predators and prey, then the food chain would be altered in some way. It would not necessarily be detrimental, though.

"Some species which depend on a very specific diet may be detrimentally affected, but where the organism is capable of adaptation, there might not be adverse effects. One thing that has been observed already is a die-off of diversity of species in 'polluted' regions and an increase in the populations of a single, adaptive life form. Whether this has been a result of chemotactic inhibition or direct toxicity from the pollutants is unknown."

Commenting on whether the disruption of the bacterial-predator system could lead to outbreaks in shellfish containing toxic concentrations of viruses such as infectious hepatitis, Walsh said, "If you take our research to be a model, although we didn't study viruses, they also might not be destroyed to the extent they should be." □

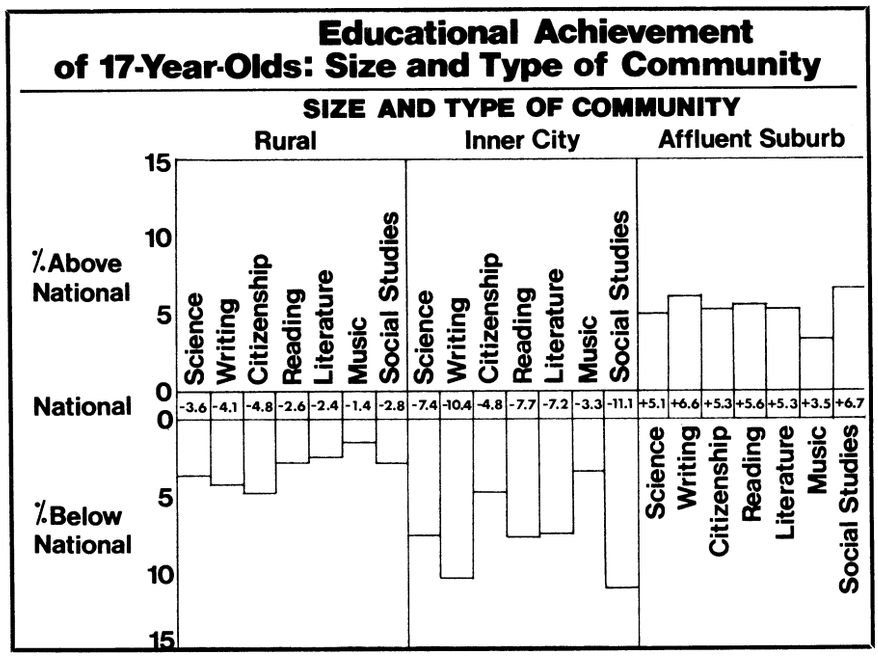
Science education slips in U.S.

How often do you read about science or scientists? In 1969-70, male students were 13.4 percent more likely than female students to indicate that they read such material outside of school. By 1972-73, the gap between the sexes had narrowed to three percent. But this is almost the only encouraging sign for science education in the recently released National Assessment of Educational Progress.

The report is part of an on-going attempt to measure growth or decline that takes place in education in the United States. The project began in 1969, and since then 500,000 students across the country have been tested. A second round of tests has now begun and results of the science tests indicate a general decline in scientific knowledge.

In addition to the fallout in science, the survey has found that students who are poor or black, who live in the inner city, in rural communities or in the Southeast are significantly below national levels in most of the subjects traditionally taught in the nation's schools. Most educators have suspected this but now it has been objectively documented. In contrast, young people who live in the Northeast or in suburban communities or whose parents have had the advantage of post-high school education, consistently demonstrate higher levels of skills and knowledge than does the nation as a whole.

By 1975, the second round of tests will have been completed in all learning areas being tested. Since these will be the first national data of their kind, educators and policy makers are evaluating the findings to determine whether achievement levels are satisfactory. What is already obvious and unsatisfactory, the report says, is the inequality in education that exists between different areas of the country. □



Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to Science News. www.jstor.org