The Pesticide Shuffle

By JANET RALOFF

Giesy/Mich. State Univ.

Spotty data hinder efforts to curb the spread of toxic pollutants

In 1992, 20 years after the United States imposed a ban on the use of DDT, U.S. manufacturers reported shipping more than 300 tons of the mosquito killer to Peru. That same year saw the export of at least 1,950 tons of other pesticides whose domestic uses had been banned, suspended, or discontinued.

In the succeeding 2 years, recorded exports of such domestically outlawed pesticides climbed another 46 percent—to an average of more than 9 tons per day.

These were not the only toxic pesticides legally leaving U.S. ports between 1992 and 1994. According to a new study by the Los Angeles-based Foundation for Advancements in Science and Education (FASE), shippers reported exporting some 4,950 tons of pesticides that had never been approved for use in this country, 11,000 tons of pesticides whose U.S. use was "severely restricted," and more than 100,000 tons of pesticides for which less stringent restrictions apply but which still hold potential for harm.

Carl Smith of FASE, who pored over public records for all U.S. ports to compile the tallies, discovered a significant qualifier in all these data: the word "reported."

Smith's breakdown covers a mere one-quarter of the roughly 250,000 tons of recorded pesticides leaving the United States in any year; shippers failed to identify fully the remaining three-quarters. Frequently, shippers also shielded their own identity, something that federal statutes permit when revealing the information would offer a firm's competitors confidential marketing information. Masking the specific identity of the pesticides, however, appears to violate a federal law that requires all shippers to publicly identify in customs records any hazardous exports, Smith says.

Spotty information on the international trade in pesticides hinders the efforts of public interest groups to alert users in importing nations to the particular risks posed by careless use of toxic compounds, Smith argues. Such gaps also diminish the value of export data as a gauge of the distribution and magnitude of the global release of these toxic chemicals into the environment.

One could try to fill in the data gaps using Environmental Protection Agency records, since shippers must also tell the agency what pesticides they are exporting and to whom. But even using the Freedom of Information Act, retrieving this "public" information can prove challenging at best, says Sandra Marquardt.

While working for Greenpeace in Washington, D.C., she filed two such requests for records on exports of unregistered pesticides. She received a response to one but found the data "next to useless." If a compound is not registered for use in the United States, EPA probably doesn't have its general recipe or a list of its "inert" ingredients—some of which can themselves prove toxic, Marquardt notes. Sometimes "they've given us information [listing a manufacturer] in a town that didn't exist," she told SCIENCE NEWS, or they referred her to a facility that claimed never to have made the pesticide.

She now expects even more difficulty in getting information. "EPA is downsizing, and the person who's in charge [of these data] is overwhelmed," she says.

Foreign farmers often assume that any compound coming from the United States—with its renowned product safety rules—must be relatively benign, says Jay Feldman, executive director of the National Coalition Against the Misuse of Pesticides in Washington, D.C. He notes, however, that most pesticides registered in the United States would be too toxic to license if EPA were not able to restrict their use.

For such chemicals, he points out, "the label is the law—explaining how a pesticide must be used to mitigate risk." The problem, Feldman says, is that foreign users may never see such labels. And who knows, he asks, how foreign distributors label imports whose use is not permitted in the United States?

One issue is the health of those foreign farmworkers. Beyond that, improperly applied pesticides needlessly contaminate the environment, either by being ineffective or by releasing excessive quantities. How far that contamination reaches depends not only upon the amount of a pesticide used but also on its persistence and volatility, notes chemist Donald Mackay of Trent University in Petersboro, Ontario.

Once released into the environment, many pesticides resist breakdown for years. Unless they get trapped in soil, tree bark, or other stable materials, persistent volatile pesticides—including the U.S.-banned DDT and toxaphene—begin a wind-driven leapfrogging around the globe.

In an attempt to understand the global spread of airborne pesticides, Frank Wania of the Norwegian Institute for Air Research in Tromsø described the cold condensation hypothesis at the Society of Environmental Toxicology and Chemistry meeting in Vancouver, British Columbia, last November. At its simplest, this widely accepted model suggests that the more volatile the chemical, the faster it hops and the less readily it enters the fat of any plant or animal it contacts.

The concept also explains why rest periods between a compound's hops from one place to another tend to lengthen as the ambient temperature falls: The compound becomes less volatile.

This implies that even if two forests were exposed to identical amounts of a volatile pesticide, trees in the colder one would become more heavily contaminated, Mackay points out.

The idea also explains why DDT, a relatively less volatile compound, "doesn't leapfrog very well," Mackay says. Every time it lands on the ground, "it tends to really get stuck." So where the very volatile pesticide lindane may rest a mere week or so between successive hops, he says, "it may be a year before DDT jumps again." That doesn't mean DDT sprayed in the tropics won't find its way into the United States and eventually the Arctic. "It's just going to take quite a long time," Mackay says.

Overall, he and Wania argue, this cold condensation model offers the best

explanation for how appreciable quantities of chlorinated pesticides and certain other volatile pollutants, such as polychlorinated biphenyls (PCBs), find their way into polar bears and the breast milk of Arctic Inuit—thousands of miles from where these compounds were manufactured or used. It might also explain how these compounds got into the albatrosses (see photo on previous page) being studied at nesting sites on the Midway Islands by John Giesy of Michigan State University in East Lansing.

Validating the predictions of that hypothesis—or any other models of pesticide migration—requires precisely the type of pesticide data that don't now exist.

The incompleteness of export data from industrialized countries such as the United States is just one problem that Canada is struggling with as it attempts to compile a global pesticide emissions inventory, explains Ann McMillan of Canada's Atmospheric Environment Service in Downsview, Ontario. She likens to "Swiss cheese" the international data on pesticides. While pesticide use in the United States is tabulated county by county, McMillan can find no data at all for many other major agricultural nations. "Putting together a picture of even these gaps would be a huge job," she laments.

The magnitude of these missing data, especially for developing countries, not only constrains the ability of scientists to study the fate and effects of these chemicals but also threatens to hamstring the efforts of United Nations negotiators who are working to curb the airborne trek of persistent volatile pollutants across national borders.

Ronald A. Hites and Staci L. Simonich of Indiana University in Bloomington learned about those data gaps the hard way during a recent study. They had hoped to test whether tree bark might serve as a good indicator of how much of a particular pesticide had been used locally. The task required bark samples from around the world, which they possessed, and pesticide use data from those same places, which they lacked.

"We quickly discovered that many countries don't keep track of this data and most countries [that do] don't report it to any central organization, such as the United Nations," Hites says.

In frustration, he and Simonich attempted to link residues in bark to far more indirect and less reliable indicators of pesticide use—the percent of land under cultivation, gross domestic product, or an index of how industrialized the country was.

Robert Repetto, an environmental economist with World Resources Institute in Washington, D.C., recounts similar problems that he and Sanjay S. Baliga encountered during quite different research over the past year. They were investigating suspected links between an individual's exposure to pesticides and susceptibility to infections—especially in developing countries, where pesticide exposures tend to be heavy and where good nutrition and health care are often lacking (SN: 3/9/96, p. 149).

Because different pesticides can have very different chemical effects, it's not terribly useful to identify some connection between immune system damage and exposures to unidentified compounds, Repetto says. Yet like the Indiana team, he couldn't find specific data on pesticide use for the countries of interest: You might know pesticides had been used, he says, but not which ones.

In some cases, however, even partial export data could be enlightening.

"We had a major pesticide company who gave us printouts on pesticide use in various developing countries—and these implied that organochlorine pesticides were not being used," Repetto recalls. Blood, tissue, and breast milk samples from local residents, however, exhibited detectable concentrations of the suspected organochlorines.

"Then you go into Carl Smith's data," Repetto says, "and find that even with only 25 percent of the data, [there were clear records] of organochlorine pesticides being exported to those countries."

While air pollution regulators tend to monitor closely the emissions from smokestacks, they have largely ignored agricultural releases of pesticides, McMillan observes. The reason, this atmospheric physicist suspects, is that "people haven't traditionally thought of them as being *emitted*." But things are changing, she notes. She points to new developments under the Geneva Convention on Long-Range Transboundary Air Pollution, a treaty created in 1979.

Last November, the U.N. Economic Commission for Europe (ECE)—which, despite its name, also includes Canada, the United States, and the former Soviet republics—took up the problem of persistent organic pollutants, or POPs. These compounds include not only dioxins and PCBs but also such notorious pesticides as DDT, toxaphene, and chlordane.

Working under the 1979 treaty, ECE set up a task force to draft new policies aimed at understanding and limiting the international spread of volatile pesticides and other long-trekking POPs. Last month, the treaty's negotiating body launched this new initiative in Geneva, the commission's headquarters.

Any resulting protocol, once ratified, would be legally binding—much as the Montreal Protocol compels its ratifiers to phase out the use of compounds that harm stratospheric ozone, observes Lars Nordberg, ECE deputy director for the environment. Though the nascent POPs program would directly affect only ECE countries, "what is done here on a regional scale could be used as a stepping-stone for global action under the United Nations," he says.

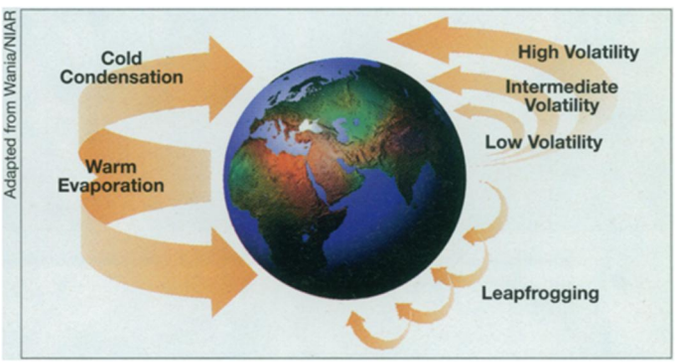
In the meantime, Nordberg told SCIENCE NEWS, "there will have to be some reliable emissions inventory among at least the [ECE] countries" to fill in those pesky gaps on who is using how much of what. "Otherwise, you couldn't link to reality any regulatory action on emissions."

Based on last month's meeting, he anticipates that trade will also be addressed, arguing that "it would be totally unacceptable that our 40 members in Europe and North America would agree to ban certain pesticides and then sell them for use elsewhere."

In an additional sign of growing concern over POPs, Australia and New Zealand sat in as observers during last month's meeting in Geneva. And last week the ECE provided a briefing on the Geneva talks at the U.N. Intergovernmental Forum on Chemical Safety, held in Canberra, Australia.

Nordberg suspects this U.N. forum could catalyze some of the first global measures to inventory volatile, leapfrogging pollutants.

The sooner the better, Mackay believes. He likens the current situation with POPs to the problem with chlorofluorocarbons prior to the 1987 Montreal Protocol. Until the treaty compelled its signatory nations to survey which domestic firms were making and using the environmentally damaging compounds, attempts to control their release proved politically impossible. □



This diagram illustrates how pesticides and other volatile pollutants emitted in warm, especially tropical, regions evaporate into the atmosphere and then begin condensing in cooler climates—much as moisture from warm room air can condense onto the cool interior of a frequently opened refrigerator.