



The preservation of biodiversity is often thought of as something that poor people are asked to do to fulfill the wishes of rich people living in comfort thousands of miles away.

Peter H. Raven

BioScience, November 1986

DRUG ABUSE

Unlawful Lab Leftovers

The last decade has seen the painfully rapid rise in the use of methamphetamine, an illegal and dangerous drug with unpredictable effects on users. Also known as speed, ice, or crystal, methamphetamine is a potent central nervous system stimulant that can be smoked, snorted, injected, or ingested. The toll it takes on users is high. However, the potential environmental health hazards from the labs that manufacture methamphetamine are also severe. For every pound of processed methamphetamine there are an estimated six pounds of waste.

The recipes that so-called meth cooks use to produce methamphetamine are relatively simple and available on the Internet. Methamphetamine can be produced using over-the-counter drugs such as cold remedies, household products, and other easily available chemicals. Ingredients may include ephedrine, sodium hydroxide, red phosphorus, sulfuric acid, lithium, aluminum hydride, chloroform, alcohols, ethers, mercuric chloride, and hydrochloric acid.

The by-products and contaminants associated with methamphetamine production vary,

depending upon how controlled and sophisticated the production process is. Over- or underheating or improper mixing can generate toxic by-products such as lead oxide, aluminum hydroxide, mercury vapor, iodine, phosphine, and yellow phosphorus. These chemicals become a threat to all who come in contact with them when they are released into the air, septic systems, streams, or soil, or when they permeate furniture, carpets, or air vents.

Since producing salable quantities of methamphetamine is not difficult, clandestine labs have been set up in houses, apartments, motel rooms, sheds, and motor vehicles. The latest (1999) national survey from the U.S. Drug Enforcement Agency showed over 7,500 clandestine lab seizures, with the largest numbers in western states such as California, Arizona, and Washington, followed by midwestern states such as Missouri, Iowa, and Arkansas. More labs are being found in previously little-affected regions such as New England. In addition, there has been a dramatic escalation in reported numbers since the 1999 survey, partially as a result of growing awareness and expertise among law enforcement officials. For example, Washington State officials seized 1,454 labs in 2000 (double the 1999 figure) and had seized that many again by October 2001.

When in operation, the clandestine laboratories present a high risk of fires and toxic gas releases. Many of the initial ingredients and combinations made from them are potentially explosive. The labs also expose the cooks, their children, and their neighbors to toxic substances.

When abandoned or seized, the labs pose new legal and health challenges. At the federal level, the U.S. Environmental Protection Agency has specialists that aid and train law enforcement, health, and environmental departments, but the U.S. Drug Enforcement Agency has primary responsibility for

response and overseeing the cleanup. Most of the hands-on cleanup work falls on state and local officials.

States that have felt the brunt of the epidemic of drug labs have developed the most comprehensive response. According to Sheryl Hutchison, director of communication and education at the Washington State Department of Ecology, dealing with most clandestine labs is a relatively straightforward task. "The law enforcement officials seal off the site, then the Ecology Department will remove any hazardous substances and materials, and test for contamination of soil," she says.

The sites commonly contain contaminated glassware, hypodermic needles, and other debris that must be properly disposed of. About 90% of the refuse can be disposed of in regular landfills, while the remaining 10% must go to hazardous waste treatment facilities. The scale of the waste problem may diminish, however; Darin Perrollaz, a senior project manager with Kleen Environmental Technologies, a contractor certified in methamphetamine cleanup operations, says, "The labs keep getting smaller as the cooks get more efficient and find ways to get more effective throughput."

Officials must wear protective clothing and respirators when entering labs in enclosed spaces such as homes or apartments. Perrollaz says the contractor must do a complete assessment of the property, including air vents, septic systems, and neighboring apartments. Extensive mold and mildew in the walls, caused by cooking in closed spaces without proper ventilation, is often one of the biggest structural issues. One of the greatest cleanup hazards is pressurized cylinders and containers used to hold anhydrous ammonia, a corrosive gas. Hutchison says, "We take them to an abandoned gravel pit, and law enforcement officials will shoot holes in them with high-powered rifles."

When the simple removal of hazardous materials is not enough to allow normal occupancy, then the site must be thoroughly decontaminated. The owner of the site is usually responsible for the cost, which can be so high that some landlords and homeowners choose simply to abandon the structure instead. "The really tough story is that many of the labs are in the homes of elderly people who have let their kids move back," says Perrollaz. "When the clandestine lab is discovered, the entire home may be declared uninhabitable." —W. Conard Holton



Bad home cooking. Explosions that can occur while "cooking" a batch of methamphetamine from relatively innocuous ingredients (inset) can destroy homes such as the apartment above, take lives, and create environmental waste sites that require specialized cleanup.

Darin C. Perrollaz

INFECTIOUS DISEASE

Rainfall Runoff and the Runs

In 1993 a period of heavy rainfall and subsequent runoff in Milwaukee, Wisconsin, caused a local water treatment plant to malfunction. Fifty-four people died, and public health officials reported 403,000 cases of intestinal illness in the largest waterborne disease outbreak reported to date. Six years later, rainwater apparently washed cow manure infected with *Escherichia coli* into a well at a fairground in New York State, causing the largest case of *E. coli* poisoning ever reported.

“There is increasing evidence that heavy rainfall runoff contributes to the risk of waterborne disease outbreaks,” says Jonathan Patz, director of the Program on Health Effects of Global Environmental Change at the Johns Hopkins Bloomberg School of Public Health in Baltimore, Maryland. In August 2001, Patz and three colleagues published a study in the *American Journal of Public Health* documenting that heavy rainfall was associated with more than half of the U.S. waterborne disease outbreaks occurring over the past 50 years. The team found that 24% of the 548 reported outbreaks from 1948 to 1994 resulted from surface water contamination and 36% from groundwater contamination.

The John Hopkins study highlights the importance of rainfall runoff as an environmental factor. “The impact of rainfall runoff is pervasive and affects both rural and urban areas,” explains Timothy Downs, a professor in the Department of Development, Community, and Environment at Clark University in Worcester, Massachusetts. “Runoff mobilizes chemical and pathogenic pollutants, often increasing the contact organisms have with them, increasing potential health risks.”

When rain falls to the earth, a part of it seeps into the land to replenish the earth's groundwater, but most of it flows downhill as runoff. In urban areas, when a downpour hits the pavement, sheets of rain wash off more than just oil and grease. A mix of metals—cadmium, lead, and copper, among others—is also carried to nearby waters.

Agricultural activity combined with rainfall runoff can also introduce many chemicals into water systems. “Animal feeds

often contain hormone supplements and natural plant steroids, and these substances enter the water system as waste, thanks to rainfall runoff,” explains Douglas Fort, president of Fort Environmental Laboratories in Stillwater, Oklahoma. “The waste contains endocrine-active chemicals, potential toxic chemicals, and other biological agents.”

Rainfall and spring meltwater runoff is furthermore the primary agent of soil erosion, especially in deforested areas. The result can be significant pollutant loads of soil particles and their associated contaminants, which may include heavy metals and toxic organics such as polychlorinated biphenyls.

Brian Oram, director of the Center for Environmental Quality testing lab at Wilkes University in Wilkes-Barre, Pennsylvania, points out that “the potential for the migration of nutrients is a function of watershed characteristics, land use, and engineering controls.” Watershed characteristics include rainfall frequency, rate of runoff, ground slope, infiltration capacity of the soil, and the nature and type of soil. “These factors can control or influence the degree to which the rainfall recharges [groundwater] or runs off,” Oram explains. “This will also control the rate of soil erosion and sedimentation.”

Many researchers believe global warming can increase rainfall and runoff intensity, a phenomenon that could result in more surface water and groundwater contamination and environmental health problems. Writing in the May 2001 issue of *EHP Supplements*, researchers led by Joan B. Rose of the Department of Marine Science at the University of South Florida in St. Petersburg wrote: “Knowledge about transport processes and the fate of microbial pollutants associated with rainfall and snowmelt is key to predicting risks from a change in weather variability.”

The rainfall runoff issue is important for public health officials, given the documented connection between rainfall runoff and disease and the continued major health threat that waterborne diseases pose. As Patz explains, “Many waterborne diseases are sensitive to climatic change, so to prevent further disease outbreaks we need to enhance monitoring and reporting, improve engineering measures, and strengthen watershed protection laws to protect source waters.” —Ron Chepesiuk



Stuff runs downhill. New research links heavy rainfall runoff with higher rates of human disease.

Death Sentence for Chinese Men

One-third of the young men in China, over 100 million men, could die within the next 30 years from tobacco-related illnesses, according to a new study conducted by Oxford University and the University of Hong Kong. Study researchers found that two-thirds of the young men in China smoke, and the number is growing.



The researchers extrapolated their risk estimates from a study that tracked all deaths in Hong Kong (where tobacco products were introduced 20 years earlier than in mainland China) for the year 1998. They found that for those between the ages of 35 and 69, 33% of the deaths among men and 5% among women were tobacco-related.

Managing Mexico's Municipalities

In early May 2001, experts from the Washington, DC-based Environmental Law Institute led a workshop in Guadalajara, Mexico, for officials from three Mexican municipalities to help them develop environmental management systems for their facilities. Municipalities can use such systems to better manage risks, reduce operations costs, aid in complying with environmental regulations, and improve communication with their customers.

The workshop was part of a two-year project that will also provide Web-based and onsite training and technical assistance. According to the U.S. EPA, one of the sponsors of the workshop, this project is an important part of the agency's efforts to bilaterally develop commonsense solutions to environmental problems in Mexico.

Oil Spills Threaten Ondo

Pollution from oil spills has contaminated most of the freshwater creeks—a main source of drinking water and food—in Nigeria's southern state of Ondo. In a 5 August 2001 *News of Nigeria* report, Ondo state environmental commissioner Sola Ebiseni said that he feared this could lead to an epidemic of waterborne diseases.



Nigerian vice president Atiku Abubakar said on 14 August 2001 that 4,647 oil spills, involving 2.4 million barrels of oil, had occurred in the Niger Delta region of Nigeria between 1976 and 1996. Abubakar spoke at a conference where he announced plans to direct multinational oil companies in Nigeria to provide reports to the government on the state of their pipelines and on their programs for pollution control.

WASTE DISPOSAL

Pollution 101

Some colleges and universities are paying stiff fines while others are voluntarily cleaning up their acts as regional offices of the U.S. Environmental Protection Agency (EPA) use education and enforcement to increase schools' compliance with federal environmental laws. Samantha Fairchild, director of the Office of Enforcement, Compliance, and Environmental Justice for EPA Region 3, says, "In general there seems to be a lack of understanding among colleges and universities that they are members of the regulated community, that oftentimes the things they are doing in these little villages are under the purview of environmental laws."

Colleges and universities, which do indeed function as self-contained mini-villages, conduct a wide range of operations that must comply with such laws as the Resource Conservation and Recovery Act, the Clean Water Act, and the Clean Air Act. Potential problems include hazardous waste produced by research labs, art studio supplies such as paints and thinners, leaks in underground storage tanks (which can spread oil and gasoline through soil and groundwater), and power plants and boilers (which can exceed allowable emissions of air pollutants such as particulate matter).

EPA Regions 1, 2, 3, and 9 are targeting college and university officials with an integrated strategy of speeches, press releases, and inspections. Enforcement varies among regions because states can choose to adopt regulations wholesale, or they can make them more stringent, says Peggy Bagnoli, an environmental engineer and co-lead for the College and University Sector of EPA Region 1.

Region 1, which covers the states of New England, began focusing on university compliance in early 1999 after inspectors found violations at Yale and the University of New Hampshire. Problems included failure to properly close or label hazardous

waste containers, failure to separate incompatible hazardous waste, and lack of necessary permits. "[In Region 3] we have done eight or nine inspections and found violations at all but two colleges," Fairchild says.

In one of New England's largest cases, the University of Rhode Island at Kingston agreed to a settlement valued at more than \$1 million for violations including those above. Joshua Secunda, senior enforcement counsel for EPA Region 1, reports in the August 2001 *National Environmental Enforcement Journal* that if incompatible wastes had been released together, a reaction could have generated toxic gases or an explosion.

Regional offices are encouraging schools to take advantage of the EPA's college and university self-audit initiative. Campuses can conduct a self-audit, and must notify the EPA of any violations within 21 days of discovery and correct the violations within 60 days or request an extension. There is no penalty for not self-auditing, but if a university meets nine self-audit criteria—which include, for example, that the reported violation has occurred only once in the past three years and poses no imminent threat to human or environmental health—any fines that would have been levied may be reduced by up to 100%. EPA regions across the country may offer additional incentives. In New England, for example, universities meeting the nine criteria will also be put on a low-priority inspection list for 18 months. So far, 140 schools have signed up to conduct self-audits.

As a direct result of its self-audit, Wesleyan University of Middletown, Connecticut, is pilot-testing nonchemical treatment of boiler water, says Harry Kinne, director of Wesleyan's facilities operations. Wesleyan's power plant foreman researched and suggested the idea. Kinne says, "The audit has reinforced that it is everyone's responsibility to help the university remain in compliance and come up with new ways to reduce our environmental impact." —Angela Spivey

TRADE/COMMERCE

Old Pesticides Pose New Problems for Developing World

For decades, stockpiles of obsolete, expired, and banned pesticides have posed significant health risks to people in developing countries. Now some observers are cautiously optimistic that the problem is beginning to be addressed.

The United Nations Food and Agriculture Organization (FAO) estimates that 500,000 tons of obsolete pesticides no longer usable for their intended purpose are scattered throughout developing countries. Africa is the best inventoried continent, and the problem there is severe, but pesticides also threaten health in Latin America, Asia, and the former Soviet republics.

Stockpiled products originate primarily in western Europe, but also come from the United States, China, India, and other countries. They may originally have been sold or donated, either directly or through aid

organizations. Among the pesticides of concern listed in *Baseline Study on the Problem of Obsolete Pesticide Stocks*, a 2001 report by the FAO, are persistent organic pollutants (POPs) such as aldrin, chlordane, DDT, dieldrin, and endrin. These can cause nausea, convulsions, liver damage, and death. DDT is also classified as reasonably anticipated to be a human carcinogen by the U.S. Department of Health and Human Services.

End users in recipient countries may be unable to read usage instructions and precautions (where they exist), and may use containers for carrying drinking water or food. Governments are often aware of the health threats posed by the pesticides, but



One man's trash is another man's environmental hazard. Obsolete pesticides sold to developing countries pose vast health and safety problems.

may be constrained by a lack of funding and knowledge of proper disposal procedures. Thus, many stockpiles are buried, burned in open containers, or simply left outdoors to migrate into soil and water from leaking containers. Some products decay into even more toxic compounds. For example, malathion can decay into mala-

oxon, which is 10 times more toxic than the original pesticide.

Tanzania's case is typical. According to Tanzanian registrar of pesticides Jonathan Akhabuhaya, a 1998 inventory funded by the Netherlands turned up 905 tons of obsolete pesticides, of which 200 tons were POPs. More than half the containers had no labels. Three-quarters will need to be repackaged for safe transport, although the money



Third World Network

The Third World Network (TWN) is a nongovernmental organization based in Palang, Malaysia, that brings together individuals and groups to focus on the economic, environmental, and social issues faced by developing countries. The TWN conducts research in these areas, publishes related books and periodicals, and works at international conferences to promote the interests of these countries. The TWN's Web site, located at <http://www.twinside.org.sg/>, is a guide to its many activities.

As most of the world's wealth of biodiversity is located in the developing countries along the equator, the preservation, ethical research, and equitable distribution of biodiversity and indigenous knowledge are a main focus for the TWN. The TWN site offers a number of books on these topics, current news items, and, under a menu titled Issues, links to pages with information on more specific topics, including Biodiversity, Access, Indigenous Knowledge, and IPRs (intellectual property rights).

From the Biodiversity, Access, Indigenous Knowledge, and IPRs page, the article "Biotechnology and Indigenous Peoples," accessed through the Indigenous Knowledge and Community Rights link, provides an historical background of the biodiversity debates going on between developing countries, multinational pharmaceutical companies, and researchers from developed countries from the perspective of a member of an indigenous group (in this case, the Igorot people of the Philippines). Other information available under Indigenous Knowledge and Community Rights includes attempts by various countries to develop legislation for the protection of indigenous and traditional knowledge as well as efforts to promote such legislation on an international level.

From the Biodiversity, Access, Indigenous Knowledge, and IPRs page visitors can also visit the Biopiracy and Appropriation of Traditional Knowledge section. Available here are articles on campaigns by nongovernmental organizations to raise awareness of the issue of biopiracy, actions taken by international bodies and national governments to limit biopiracy, and summaries of international meetings on the topic. —**Erin E. Dooley**



is not there to repackage these wastes, much less transport them.

Several international agreements have fostered efforts to deal with obsolete pesticides. The 1989 Basel Convention addressed transboundary movement of hazardous wastes. The 1998 Rotterdam Convention established the principle of prior informed consent, under which countries have the right to full disclosure of hazardous ingredients in pesticide donations or purchases. And in May 2001 the Stockholm Convention declared the international community's intent to ban certain POPs globally.

A comprehensive effort to clean up obsolete stockpiles called the Africa Stockpiles Project is being organized by the World Wildlife Fund and Pesticide Action Network UK in the hope of clearing the entire continent within a decade. The World Bank and the industry association CropLife International have endorsed the project. But CropLife International says that, while its members are committed to safe use and proper storage of their products, they will

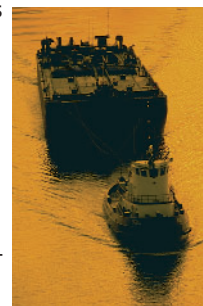
take responsibility only for the stocks they still own. Annik Dollacker, a member of CropLife International's Obsolete Stocks Project Team, says, "We need to know we are cleaning our products"—and not anybody else's.

Activists criticize this policy. When Andreas Bernsdorff recently led a Greenpeace team to clean up a stockpile in Nepal, he found that various brands were significantly cross-contaminated—the warehouse floor was covered with a thick layer of different pesticides that had leaked from their containers. Such mixtures make it impractical, Bernsdorff says, for a company to "go and get three barrels of their stuff" and leave the rest as is.

Still, many stakeholders are encouraged by the worldwide shift in awareness. Monica Moore, program director of Pesticide Action Network North America, says that even within the last 12 months awareness is growing, and there is "increasing recognition of the gravity of the situation and a willingness to do something about it." —**Valerie J. Brown**

Toxic Ship Paint Sails into Sunset

On 5 October 2001, representatives of the 159 member states of the International Maritime Organization signed a convention agreeing to ban harmful compounds known as organotins. Organotins have been used in ship paint to prevent algae and mollusks from binding to the hulls of ships, where they can slow down vessels and decrease their energy efficiency. These compounds can leach out of the paint into marine environments and persist in the water, often traveling far from the source of contamination. One of the compounds, tributyltin, has been found to impair the immune systems of some organisms. The compounds will be restricted beginning 1 January 2003, and a full ban will take effect in 2008, pending ratification by 25% of member states.



Informed Consent to Pesticides

In October 2001, delegates from 102 countries gathered in Rome to prepare for the entry into force of the Rotterdam Convention on the prior informed consent procedure for certain internationally traded hazardous chemicals and pesticides, and to evaluate the voluntary implementation of the procedures. United Nations officials predict that ratification of the convention will take place in 2003.

Seventy thousand chemicals are available on the world market, and many of these, though banned in richer countries, are still sold in the developing world. The convention is expected to be a major part of the framework for monitoring and controlling key chemicals. Delegates say progress was made on several points, but add that the lack of financial mechanisms for implementation of the convention, the lack of a framework of penalties for noncompliance, and the need for capacity building in developing countries are topics that require further action.

CO₂ Down in PRC

Despite a 36% growth in its gross domestic product, China has pulled off a 17% reduction in CO₂ emissions since the mid-1990s, according to researchers from Lawrence Berkeley National Laboratory in California. CO₂ is one of the greenhouse gases believed to cause global warming. The researchers cite the end of coal subsidies, energy conservation programs, and initiatives to reduce coal use as main factors in this achievement. Zhou Dadi, director of the Energy Research Institute of the Chinese central government, says, however, that there are still great improvements to be made in fuel energy efficiency.

