



Science is facts. Just as houses are made of stones, so is science made of facts. But a pile of stones is not a house, and a collection of facts is not necessarily science.

**Jules Henri Poincaré, French mathematician
(1854–1912)**

PEST MANAGEMENT

Bugged by Automatic Sprayers

Automatic insecticide dispensers are designed to keep restaurants, schools, and other public settings free from annoying and unsanitary flying insects. They may also do something else: sicken at least some of the people who are exposed to the insecticides that are sprayed.

According to a report in the 9 June 2000 issue of *Morbidity and Mortality Weekly Report*, between 1986 and 1999, 97 people who were exposed to insecticides sprayed by automatic dispensers developed a variety of acute ailments including eye, throat, and nose irritation, labored breathing, dizziness, and headache. The cases came to light following a report to the Florida Department of Health on 18 May 1999 that, in the week prior, three people had developed pesticide-related illnesses associated with improperly placed automatic insecticide dispensers. A follow-up investigation reviewed toxic exposure surveillance data collected by the U.S. Environmental Protection Agency (EPA) from a variety of sources, and uncovered that

many cases of pesticide-related illness had been associated with automatic insecticide dispensers.

Most of the dispenser-related cases involved pyrethrins, naturally occurring chemicals derived from the chrysanthemum. Three cases involved resmethrin, which belongs to the family of pyrethroids, synthetic derivatives of pyrethrins. Out of four acute toxicity categories, with I being the most toxic and IV being the least, the EPA has listed pyrethrins as acute toxicity category III compounds. Although these substances do not cause systemic toxicity in mammals, they may have irritant and sensitizing properties, and a study reported in the March 1990 issue of the *Journal of Steroid Biochemistry* concluded that the chemicals are endocrine disruptors. Resmethrin, too, is classified as an acute toxicity category III compound.

While 94 cases of illness over 13 years may seem a small number, report coauthor Geoffrey Calvert, a medical epidemiologist with the National Institute for Occupational Safety and Health, notes it is likely an underestimate. To be included in surveillance data, people must first go to a physician, says Calvert, and be accurately diagnosed as having a pesticide-related illness, and then the physician must report the illness to a state health agency. Even when reporting is

mandatory, health care workers often do not comply, says Calvert. “At each one of those steps, cases can get lost. So there might be a [larger] problem out there,” he says. The report also says that a lack of detailed information in the surveillance data may have precluded identification of additional cases of pesticide-related illnesses that actually were associated with dispensers.

The report says that many of the illnesses were the result of placing the dispensers, which resemble room air fresheners, incorrectly—too close to food handling, dining, or work areas, or where the spray could get picked up by the ventilation system. Jerome Blondell, a health statistician with the EPA Health Effects Division, says the dispensers carry explicit labels instructing users not to put them directly above or within 12 feet of food handling or dining areas. This is to protect food from being contaminated. Blondell says the EPA is considering mandating that manufacturers update dispenser labels to warn against exposing people directly to the insecticides’ spray.

There are also other methods to keep insect pests away. Caroline Cox, editor of the *Journal of Pesticide Reform*, published by the Northwest Coalition for Alternatives to Pesticides in Eugene, Oregon, suggests traps with ultraviolet light or a sex attractant to draw flies. The flies are killed by a low-voltage electric pulse and then caught in the trap by an adhesive.

The EPA, too, recommends a number of nonchemical pest management alternatives, says Blondell. These include sealing cracks and openings where mosquitoes and flies can enter buildings, regular cleaning and maintenance of plumbing to deny pests access to puddles of standing water, making sure trash containers are tightly sealed, and installing fans and screens to keep insects outside.

Greg Baumann, director of technical and field services of the National Pest Management Association, a Dunn Loring, Virginia-based trade group representing pest control specialists, agrees that such nonchemical methods can be effective and that the automatic insecticide dispensers can cause health problems if improperly installed and operated. Consequently, he suggests that such pest management be done by trained professionals to ensure that the units are properly installed and used according to instructions. —Harvey Black



An accident waiting to happen? Dispenser-related illnesses reported in *Morbidity and Mortality Weekly Report* resulted largely from mishaps during cartridge replacement or servicing of faulty units, or from dispensers being placed too near food handling and eating areas or ventilation currents.

PHARMACEUTICALS

New Antibiotics Put Bacteria in a Bind

For decades, antibiotics have enjoyed “miracle drug” status, but because overuse and improper use are leading to increased bacterial resistance, many of these wonder drugs no longer work. However, recent studies at The Scripps Research Institute in La Jolla, California, may offer new hope for effective antibiotics.

Antibiotics work by destroying either the proteins that build a bacterium’s cell wall or the protein-producing ribosomes. But resistant bacteria have altered their cell walls or ribosomes to withstand the drugs’ action. So Chi-Huey Wong, a chemist at The Scripps Research Institute, decided to foil bacteria in a new way, by stepping in to the process earlier and preventing the creation of proteins in the first place.

In the 31 May 2000 issue of the *Journal of the American Chemical Society*, Wong and colleagues describe how they achieved this by targeting bacterial RNA, which builds proteins using information from the DNA. By binding aminoglycoside antibiotics to bacterial RNA, Wong is disrupting the synthesis of proteins

at the point where resistance usually begins, and at the same time suppressing the creation of the bacterial enzymes that cause antibiotic resistance.

“We were interested in targeting the RNA, so we chose to study aminoglycosides since they are known to bind to RNA,” says Wong. The aminoglycoside family, first discovered in the mid-1940s, includes streptomycin and neomycin. These antibiotics are usually injected or applied topically. The aminoglycosides are highly toxic, and particularly affect the ears and kidneys, although the damage they cause is usually minor and reversible.

Wong and colleagues chose to work with neamine, the simplest of the aminoglycoside antibiotics, structurally speaking. The group created several different dimers of neamine and tested them for their antibiotic activity

and their ability to bind to RNA and disrupt protein synthesis. They identified several dimers of neamine that had high binding ability and were highly effective at killing bacteria such as *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*.

According to Wong, the new antibiotics inhibit the bacterial enzymes acetyltransferase and phosphotransferase, which modify the aminoglycoside antibiotics, allowing bacteria to withstand their threat. “When the antibiotic attaches to RNA in the ribosome, all enzymes and proteins in the bacteria can not be made properly, as the ribosome is the bacterial protein-making machinery,” he says.

Wong also says that some of the new dimers are 1,000 times more effective than the original antibiotic. This means that not only will resistance development be suppressed, but also a much smaller dose of the drug will suffice for treating an infection.

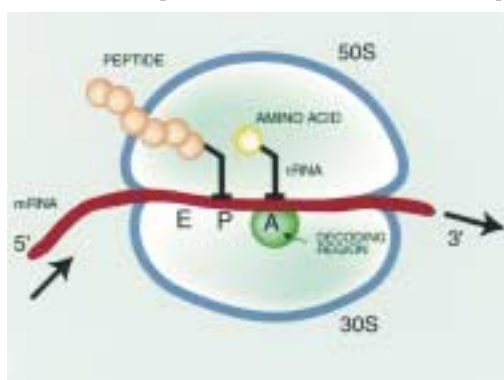
Antibiotics have been the foundation for infectious disease therapy since the 1940s. In 1954, 2 million pounds of antibiotics

were produced in the United States; today, more than 50 million pounds are produced. Two of the factors that contribute to antibiotic resistance are the overuse of these drugs in humans, animals, and agriculture, as well as failure to finish taking a prescribed course of antibiotics. Both long-term exposure to low doses and failure

to finish a prescription encourage more resistant bacterial strains to flourish. Doctors prescribe more than 133 million courses of antibiotics each year to nonhospitalized patients.

The new dimers of neamine will soon be tested in humans. Wong says that the solution to antibiotic resistance will always be a temporary one, however, because it’s just a matter of time before bacteria will evolve once again to survive. For now, though, Wong’s research offers great promise in terms of providing a new direction for the development of novel antibiotics. What’s more, says Wong, “There are more than a hundred antibiotics used to fight infections, and we might be able to exploit the same approach to develop any one of those to fight infections and even cancer cells.”

—Lindsey A. Greene



The heart of the matter. Dimers of neamine have shown a high affinity for the A site of the ribosomal RNA in the 30S subunit. Once they bind to this site, they interfere with protein synthesis by causing the misreading of genetic code.



PhotoDisc

Organic Farming Flourishes in Cuba

With the dissolution of the former Soviet Union, which once provided Cuba not only with fertilizers, insecticides, and pesticides, but also with tractors and the oil necessary to run them, the island nation has become a major center for organic agriculture, with over half of its non-sugarcane fields being farmed using organic methods.

Cuba’s Institute for Crop Protection (INISAV) has become a magnet for agronomists from other Latin American countries, who come to learn about growing food organically. INISAV has also developed organic herbicides and pesticides that are sold in Cuba and other countries, and has 222 local centers devoted to producing natural agricultural weapons such as insects and larvae that eat other pests, and viruses that attack crop-damaging strains.

Canada Funds Toxics Research

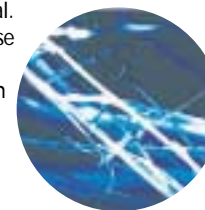
On 11 July 2000, Canadian health and environment officials announced that \$13.5 million would be invested in the Toxic Substances Research Initiative (TSRI) in FY 2001. The TSRI supports toxicology research by funding collaborative projects in five categories: urban air quality and human exposure to airborne pollutants, cumulative effects of toxic substances, endocrine-disrupting chemicals, persistent organic pollutants, and metals in the environment.

The TSRI renewed 77 ongoing projects and approved 20 new studies for FY 2001, including one on the effects of ozone on the health of children with asthma and another on the presence of pharmaceuticals in surface waters of the Great Lakes basin and how these drugs affect fish.

WTO Upholds French Asbestos Ban

On 22 July 2000, the World Trade Organization (WTO) ruled in favor of a French ban on the import of chrysotile asbestos from Canada, the leading exporter of the mineral. Canada, which brought the case before the WTO in 1999, can appeal the ruling, even though by 2005 new European Union regulations banning chrysotile asbestos from its markets will have come into effect.

The WTO panel decided that France has the right to maintain its ban under a clause in WTO rules allowing for actions instituted for the protection of public health. The final ruling on the case shows that the panelists considered scientific information on the toxicity of asbestos and its effects on human health before making their decision.



TC Harrison et al. EHP 107:607-611 (1999)

INDOOR AIR QUALITY

Healthy Indoor Painting Practices

Most paints contain solvents—volatile organic compounds (VOCs) such as benzene, toluene, naphthalene, and formaldehyde—which serve as spreadability enhancers, biocides, and fungicides. During and after painting, these VOCs outgas and can cause adverse short-term health effects such as headache, nausea, dizziness, and eye, throat, and lung irritation. Oil-based paints release more VOCs than water-based (latex) paints, but even latex paints still emit vapors that can cause adverse effects.

The U.S. Environmental Protection Agency (EPA) and the Consumer Product Safety Commission (CPSC) have worked together to create a brochure titled “Healthy Indoor Painting Practices,” which advises residents, property managers, and paint contractors of potential health concerns associated with paint vapors, and recommends simple ways to help minimize exposures. The EPA and the CPSC have also released a Spanish-language version of the brochure.

The new brochure is based on a pamphlet originally developed and issued in 1998 by the Montgomery County, Maryland, Department of Environmental Protection as part of its Healthy Indoor Painting Practices campaign. (This campaign went on to receive a National Association of Counties Achievement Award in 1999.) “We liked what Montgomery County had done, and decided it was important for information that describes healthy indoor painting practices to reach a national audience,” says Christina Cinalli, a chemist at the EPA’s Office of Pollution Prevention and Toxics. “We want citizens to know how to create good ventilation when using paints in their homes in order to safeguard their health and well-being.”

Vapors can travel through cracks and gaps around pipes and electrical outlets, and through the ventilation systems of apartment and office buildings with central units, affecting people far from the source of the fumes. The chemicals released cannot be filtered by mechanical air conditioning or heating systems. “Most homes have a closed system that doesn’t bring in fresh air; it just keeps recirculating,” says Joe Keyser, the director for public education for the Montgomery County Department of Environmental Protection. “These systems do filter particulate matter—dust—but not gaseous material.” Currently, there are no federal or state regulations concerning the use of indoor paints.

The brochure stresses the importance of proper ventilation during and after painting. “People didn’t realize that even though paint dries within 4–5 hours after application, VOCs can linger 48–72 hours after the paint job is finished,” Keyser wrote in the November 1998 issue of *MDEnvironment*, a monthly publication released by the state Department of Environmental Protection. Even after the smell of new paint has diminished, VOCs may still be outgassed by the fresh coat. The brochure recommends keeping windows open wide during painting and for at least 2–3 days afterward, mounting box fans in windows to draw fumes out of the work area, and planning painting

projects for the spring and fall, when it is more feasible to keep windows open. The brochure also recommends using the low-VOC paints that are now available from many manufacturers.

Free copies of “Healthy Indoor Painting Practices” are available in English or Spanish by calling the EPA’s Indoor Air Quality Information Clearinghouse at 1-800-438-4318 (1-800-638-8270 for hearing- or speech-impaired callers), or the CPSC at 1-800-638-2772. Downloadable versions of the brochure in both English and Spanish are also available on the EPA’s Web site at <http://www.epa.gov/opptintr/exposure/docs/publication.htm>. —Lindsey A. Greene

Tips for Healthy Indoor Painting

- ✦ Schedule painting for dry periods in the fall or spring, when windows are more easily left open for ventilation.
- ✦ If you live in or manage an apartment building, provide advance notice to neighbors in adjacent units that painting is to begin.
- ✦ Be sure to select paints that are intended for indoor use. Do not use exterior paints indoors.
- ✦ Always read and follow all the instructions and safety precautions on the label. Do not assume you already know how to use the product. The hazards may be different from one product to another, and some ingredients in individual products may change over time.
- ✦ Keep windows wide open, as weather permits, for about 2–3 days after painting to avoid unwanted exposure to paint vapors and to return to acceptable indoor air quality.
- ✦ Use window-mounted box fans to draw vapors from the work area. Make sure the fans cannot fall out of the window. If fans cannot be used, make sure that rooms being painted have adequate cross-ventilation.
- ✦ Take frequent fresh air breaks while painting. Avoid freshly painted rooms for 2–3 days whenever possible. Keep young children and people with breathing problems from freshly painted rooms. Leave painted areas if you experience watery eyes, headache, dizziness, or breathing problems.
- ✦ Follow directions on the can for the safe cleaning of brushes and other equipment. Never use gasoline to clean paint brushes.
- ✦ Buy only as much paint as you will use right away. If you have leftover paint, be sure to close the container tightly. Follow the directions on the can for disposing of the product. In some communities, there are special recycling programs for paints.



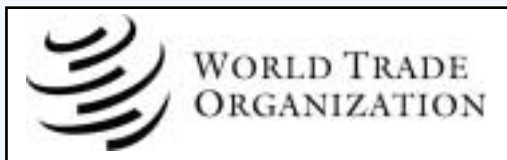
Image: PhotoDisc; digital composition: Christopher Reuther

Adapted from: U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics, Healthy indoor painting practices [brochure]. EPA 744-F-00-011. May 2000.



World Trade Organization Trade and Environment Section

The World Trade Organization (WTO) was established in 1995 to negotiate the settlement of trade disputes between its member countries. With a current membership of 139 countries, the Geneva, Switzerland-based body has been in the media spotlight after large-scale demonstrations protesting issues ranging from the existence of the WTO itself to its policies on labor



and the environment were staged during its November 1999 meeting in Seattle, Washington. Environmental groups are worried that the WTO places the interests of free trade above all else, even

above laws enacted by member countries to protect endangered species and resources and to reduce pollution. These groups are concerned that the policies of the WTO could lead to the reduction of environmental regulations, especially in countries in the developing world, in order to compete successfully in a globalized economy.

To clarify the WTO's position on environmental topics and provide in-depth information on the organization's decision-making procedure for ruling on the environmental issues brought before it, the WTO recently added a Trade and Environment section to its Web site located at <http://www.wto.org/>. This section can be accessed by clicking on the A-Z List link on the home page and then selecting the Environment link.

The main trade and environment page introduces the visitor to the history of the debate within the WTO on environmental protection versus trade, and provides guides to pages discussing the issues mediated by the WTO that fall under the trade and environment classification. The page is organized under broad headings such as how issues are discussed in the WTO and committees within the WTO. Under each heading are links to more specific topics within each area.

Clicking on the WTO and Its Committee on Trade and the Environment (CTE) link brings the visitor to a page devoted to the main body within the WTO that addresses environmental issues. The CTE, which comprises all WTO members as well as observers from intergovernmental organizations, has been instrumental in bringing environmental issues to the forefront of the WTO agenda. The page provides information on the CTE's guiding principles and its background since its inception in early 1995. The page states that the committee's mandate is "to identify the relationship between trade measures and environmental measures in order to promote sustainable development . . . [and] to make appropriate recommendations on whether any modifications of the provisions of the multilateral trading system are required."

The Trade and Environment Bulletins link on the home page directs the visitor to a directory of bulletins issued by the CTE. The bulletins list the discussion points of each CTE meeting and presentations made before the committee by member countries on topics such as traditional medicine and biological diversity. They also provide more detailed background information on selected discussion points.

Another topic on the main trade and environment page is the October 1999 WTO special study titled *Trade and the Environment*. By following the WTO Special Study on Trade and the Environment link, the visitor can download the full 109-page report, view a summary of the report, or access information on each of 22 main points addressed by the study. The study examines serious questions about the impact of trade on international environmental policies, many of which were at the center of the Seattle demonstrations.

Back at the main trade and environment page, the visitor can select the Frequently Asked Questions link or one of the links under this heading, such as 10 Misunderstandings about the WTO, to read a discussion of common misperceptions about the WTO. —Erin E. Dooley

Oxygen Mix Saves Lives

Doctors at Toronto General Hospital have invented a device that can eliminate carbon monoxide (CO) from the body three times faster than conventional treatment. Conventional treatment calls for giving the patient pure oxygen, but the Toronto researchers found that delivering a mix of oxygen and carbon dioxide clears CO from the body faster. The new device requires only simple modifications to the regular oxygen masks and tanks already found in ambulances and hospitals.

Researcher Joseph Fisher says that CO is the leading cause of fatal poisoning in the industrialized world. Because symptoms of poisoning can swiftly progress to coma and even death, it is critical to eliminate CO from the exposed patient's body as soon as possible.

Eating Great Lakes Fish May Affect Conception

Researchers at the University of Buffalo say that a woman's chances of becoming pregnant may be lowered by 25% if she regularly eats fish caught in Lake Ontario, the most polluted of the Great Lakes, which is known to be contaminated with polychlorinated biphenyls and other endocrine disruptors. The study is thought to be the first epidemiologic assessment linking consumption of contaminated fish to decreased human fecundity.

Although the study results, published in the July 2000 issue of *Epidemiology*, are preliminary, study director Germaine Buck says they reinforce the importance of teaching women of childbearing age about the risks of eating contaminated fish. A 1997 survey of people in the Great Lakes area found that only half were aware of such warnings, which have been issued by New York State since 1976.

Biodiesel Passes Muster

Members of the U.S. House Energy and Power Subcommittee announced on 22 June 2000 that biodiesel has become the first alternative fuel to pass the health effects testing requirements of the Clean Air Act Amendments of 1990. Use of biodiesel, made from products such as soybean oil, has now been shown to result in a 90% decrease in air toxics compared to conventional fuels. Nontoxic biodiesel is biodegradable and can be used in regular diesel engines with few or no modifications.

Representative John Shimkus (R-Illinois), who cosponsored 1998 legislation recognizing biodiesel as an official alternative fuel for meeting Energy Policy Act requirements, said that biodiesel helps communities comply with the act in a cost-efficient manner, provides a market for American farm products, and enhances the nation's energy security.



Digital Stock