We should no longer think of water as a gift of nature but an industry which needs investment.
Thawat Vichaidiji, Thai water official quoted in the *Bangkok Post*, 17 March 1991

WATER POLLUTION

Drugged Drinking Water

Drugs and personal care products that are excreted from or washed off the body naturally end up in the sewage that flows into sewer systems and septic tanks, but where do they go from there? Scientists are beginning to monitor the extent of pharmaceutical and personal care products (PPCPs) in the aquatic environment and their consequences. What they're finding is that, through leaching from septic tanks and escaping intact through sewage treatment processes, some of these substances are ending up back in the drinking water.

Germany has been at the forefront of PPCP monitoring. Studies conducted there during the past 10 years confirmed the presence of PPCPs in treated and untreated sewage effluent, surface water, groundwater, and drinking water. Most commonly found were anti-inflammatory and pain-killing drugs, cholesterol-lowering drugs, anticonvulsants, and sex hormones from oral contraceptives. Samples from 40 German rivers and streams turned up residues of 31 different PPCPs, according to a report presented at the March 2000 American Chemical Society meeting in San Francisco, California, by Thomas Ternes, a chemist at the Institute for Water Research and Water Technology in Wiesbaden.

Researchers worldwide have discovered more than 60 different PPCPs in water sources, according to Christian Daughton, chief of the Environmental Chemistry Branch of the U.S. Environmental Protection Agency (EPA) Environmental Sciences Division in Las Vegas, Nevada. In addition to the drugs noted above, the list includes antineoplastics, beta-blockers, bronchodilators, lipid regulators, hypnotics, antibiotics, antiseptics, X-ray contrast agents, sunscreen agents, caffeine, and fragrances such as synthetic musks. Most PPCPs are detected at concentrations ranging from parts per trillion to parts per billion, and originate in treated and untreated sewage, says Daughton, who coauthored an article on PPCPs in the December 1999 issue of *EHP Supplements*.

North American researchers are just beginning to look at the issue of PPCPs. Studies presented at the June 2000 Emerging Issues Conference sponsored by the National Ground Water Association, held in Minneapolis, Minnesota, indicate that the problem exists here, too. For example, environmental scientist Chris Metcalfe of Trent University in Peterborough, Ontario, detected the drugs aspirin, ibuprofen, indomethacin, bezafibrate (a cholesterol regulator), and carbamazepine (an anticonvulsant) in 10 pre- and post-treatment samples from sewage treatment plants in eastern Canada. The sewage treatment process in place removed some drugs that were easily biodegradable or more amenable to removal by activated charcoal, degradative microbes, or sand filtration, but others were resistant to degradation.

Metcalfe is just beginning to analyze the effects of cholesterol-lowering drugs, estrogens, and anticonvulsants on fish in the Great Lakes. All three drug types can potentially interfere with normal reproduction and development in fish living downstream from sewage treatment plants. His laboratory studies show that estrogen compounds at parts-per-trillion exposures feminize male fish and disrupt the development of the circulatory system, eyes, and bladder. He says it's too soon to know whether PPCPs adversely affect wild fish populations.

In one of the first studies in the United States to report the occurrence of drugs in drinking water, environmental engineer Glen Boyd had his students at Tulane University in New Orleans, Louisiana, sample water from the Mississippi River, a local lake, and city tap water. Their preliminary experiment targeted the pain reliever naproxen, the sex hormone estrone, and clofibric acid, a major bioactive metabolite from certain anticholesterol drugs. All three were detected at varying concentrations in most of the samples. "The big unknown," says Boyd, "[is whether PPCPs] present a health concern now or in the future." He notes that, although the number of peer-reviewed papers on the topic is limited, government agencies concerned with water quality in the United States and professional organizations serving the water and wastewater communities are beginning to acknowledge PPCPs as an emerging environmental issue.

The long-term outcome of humans ingesting subtherapeutic doses of numerous drugs as well as any dose at all of substances not meant to be ingested remains a major unaddressed issue. "In areas of water scarcity, we'll see more and more reuse of treated sewage to meet drinking water needs," predicts Daughton, thereby increasing the likelihood that PPCPs will end up in drinking water. Extensive monitoring of the occurrence of PPCPs and their concentration trends over time is required to ensure safe water supplies in the future. Then toxicologists need to determine if the kinds and amounts of PPCPs that occur affect people and other living creatures. This subject will require collaboration between the Food and Drug Administration and the EPA, says Daughton, since the former usually does not address environmental concerns and the latter generally does not deal with drug issues.
–Carol Potera

CONSERVATION

Controversy Swirls around Toilet-to-Tap Project

California officials are receiving a tidal wave of reactions to a proposition to reclaim wastewater for drinking purposes. Although officials insist their "toilet-to-tap" program is a safe solution to California's water shortage problem, several opponents have voiced concern about health and safety issues.

The project was designed to reduce Los Angeles's dependence on water from the Mono Lake watershed, and homes in the North Hollywood area would be the first to receive the reclaimed water. The proposed project would include a three-year trial period, during which about 9 million gallons of wastewater per day would be processed at the Donald C. Tillman Water Reclamation Plant in the Sepulveda basin and spread for percolation into potable water aquifers. Five years after the project begins, after being naturally filtered, the wastewater would begin to be withdrawn. It would be mixed with groundwater pumped from wells to be chlorinated and then piped to consumers. The wastewater would make up about 20% of what pours from the tap.

Supplementing potable water with reclaimed water is not a new concept for California. Some 40 cities now use reclaimed wastewater for urban nonpotable purposes, but not for human consumption. Finding new methods to reduce water consumption has become Los Angeles's main focus following a particularly severe drought in the early 1990s. State officials reduced the city's allotment of water a few years ago, forcing city planners to seek alternative sources to meet its growing demands. Incentives such as volume-based water rates and rebates on low-flow toilets have helped to reduce the heavy water consumption considerably, but with the population growth forecasted for California's future, state officials continue to look for alternate water resources.

Supporters of the controversial potable reclamation method say that California was the fourth fastest growing state in the nation as of 1999, and is expected to continue to have high growth rates, placing heavy demands on its drinking water supply. Supporters also claim that natural filtration and chemical disinfection used together provide reclaimed water that is cleaner than regular tap water. Paul Gagliardo, the water research and development manager for the San Diego Water Department, notes too that existing water supplies have risks of their own, including contamination with pesticides, heavy metals, and pathogens such as *Giardia*. "There has been no evidence showing any increased incidence of disease on other successful water reclamation projects," he says.

Those who don't support reclaimed wastewater projects aren't convinced. Daniel A. Okun, a professor of environmental engineering at the University of North Carolina at Chapel Hill, says, "Epidemiological studies are not sufficiently robust to reveal the connections between the contamination and disease, which takes decades to show up. [Opponents'] greatest objection is increased health risk." Okun also remarks that the proposed method does not include any processes specifically directed at removing trace organic contaminants, a dangerous omission in the opinion of many opponents.

The County Sanitary Districts of Los Angeles County conducted a study of the health impact of drinking reclaimed water from the Whittier Narrows Water Reclamation Plant, which has been used to recharge an aquifer in the Montebello Forebay area since 1962—a project similar to the proposed Los Angeles project. The study was evaluated by a scientific advisory panel created by the state of California to advise its regulatory agencies. In their 1987 *Report of the Scientific Advisory Panel on Groundwater Recharged with Reclaimed Wastewater*, the panel concluded, "[B]efore recharge projects are undertaken, other alternatives such as nonpotable reuse, conservation, other nonstructural measures, and modifications to water rights regulations should be thoroughly evaluated."

Public reaction to the proposal has been mixed. Some people support it, while others cannot ignore their unease about the origins of the water. For now, the project is on hold.

To help solve Los Angeles's high water demand, Okun suggests alternatives such as using reclaimed wastewater for nondrinking purposes including irrigation, toilet flushing, and industrial processing. Okun says such uses would save the same volume of water while eliminating the human health risk. He also suggests diverting water that is currently being wastefully used in agricultural irrigation to urban use. **–Lindsey A. Greene**

Linking Lead to Alzheimer Disease

Scientists from Case Western Reserve University and University Hospitals presented evidence at the April 2000 annual meeting of the American Academy of Neurology that people who have held jobs with high levels of lead exposure have a 3.4 times greater likelihood of developing Alzheimer disease.

The researchers also examined exposures to a variety of other substances, including aluminum, copper, iron, mercury, zinc, and solvents, but only lead exposure was found to increase the risk of Alzheimer disease. People can be exposed to lead on the job either by breathing in lead dust or through direct skin contact. Coauthor Elisabeth Koss noted, "Lead exposure remains a major public concern because of its adverse effects on brain development and health in general, even with low exposure levels."

Robowell Polices Groundwater

An automated groundwater monitoring system nicknamed "Robowell" has been patented by USGS scientists in Massachusetts. The system automatically measures water levels and groundwater quality at regular intervals and then transmits the findings to a human supervisor through radio, modem, or satellite.

Using the same sampling methods as human crews, Robowell is stationed at a well cluster, where it can test the water frequently. It can also monitor other sources of known or potential contamination, such as landfills and industrial sites. The USGS has tested the technology in several situations, including a sewage treatment facility and an experimental groundwater cleanup test site.

Indonesia Implements Emissions Test

In a step toward alleviating Indonesia's serious air pollution problem, the country's State Ministry of Environment has mandated annual exhaust emission tests on all drivable vehicles. Until now, only public buses were required to be inspected. Currently, most Indonesian cars are still fueled with leaded gasoline. According to an InterPress Third World News Agency article dated 13 April 2000, officials hope the emissions test will increase public awareness about the dangers of leaded gas and encourage automobile owners to switch to unleaded fuel.

In Jakarta, lead pollution has reached a level of 1.3 μg/m^3, exceeding the 0.5–1.0 μg/m^3 recommended maximum set by the WHO. Vehicular emissions cause 60–70% of the air pollution in Indonesia's cities.

INFORMATION TECHNOLOGY

Responsible Care Goes Online

As environmental, health, and safety progress reports become standard for corporations, trade associations are demonstrating their members' progress in unique ways. For the year 2000, the American Chemistry Council (ACC; formerly the Chemical Manufacturers Association) has published its *Responsible Care Progress Report 2000* on the Internet at http://rcprogress.cmahq.com/ in an interactive multimedia presentation that explains the initiative's guiding principles, its codes of management practice, and recent changes and additions to its goals. Dick Doyle, vice president of Responsible Care at the ACC, believes the electronic format is in keeping with the industry's commitment to innovation and the environment. "The industry is changing, and our commitment to innovation and the environment must reflect this," he says.

The Responsible Care initiative is a voluntary environmental, health, and safety performance improvement initiative begun by the ACC in 1988. After a 1984 industrial accident in Bhopal, India, that killed nearly 3,000 people, says Lisa Scholik Grepps, a manager for strategic communications for Responsible Care at the ACC, the U.S. chemical industry realized that two factors played a major role in the severity of the incident: a lack of community awareness about chemical hazards and inadequate emergency response planning. The Responsible Care initiative is a means for the U.S. chemical industry to meet public concern about preventing such an occurrence in the United States.

By carefully reviewing current procedure within the industry, offering recommendations, and initiating new standards through education and other means, Responsible Care aims for a goal of zero accidents, injuries, or harm to the environment. Toward that end, Responsible Care participants are charged with implementing six codes of management practice: promotion of emergency response planning and ongoing dialogue with local communities; commitment to safe management and the reduction of wastes; prevention of fires, explosions, and accidental chemical releases; reduction of employee and public risks from exposure to chemicals during transportation, storage, handling, transfer, and repackaging; protection of employees and visitors at company sites; and implementation of health, safety, and environmental protection measures as part of the design and manufacturing of products.

Responsible Care receives external guidance from a national public advisory panel, a diverse group of individuals from outside the industry including scientists and members of environmental groups, unions, and academia. In an open letter in the 2000 report, the panel challenges Responsible Care participants to go beyond current regulations to increase safety factors within procedures. Some suggestions include incorporating toll-free numbers and informative labels on products for easier and safer disposal of chemicals. The letter also encourages taking steps toward sustainability, which in the case of the chemical industry entails considering the long-term economic and social ramifications of corporate decisions.

In the 12 years since its birth, Responsible Care's 188 members (chemical manufacturers) and 98 partners and partner associations (companies that handle chemicals) have demonstrated improvement in environmental, health, and safety performance, says the report. The report notes that from 1988 to 1997, member companies reduced emissions of chemicals on the U.S. Environmental Protection Agency's Toxics Release Inventory by 58% while increasing productivity by 18%. The report also says that by following Responsible Care guidelines, ACC member companies provide a workplace that is 4.5 times safer than all other manufacturing industries. **–Lindsey A. Greene**

HAZARDOUS WASTE

Minimizing Mercury in Medicine

The American Medical Association (AMA) has adopted a policy urging hospital administrators to eliminate mercury-containing devices such as blood pressure monitors from their facilities. "Elemental mercury and mercury compounds are known to be hazardous to human health and the environment," said Hilary O'Herlihy, a cardiologist from Glen Burnie, Maryland, and an assistant professor of medicine at The Johns Hopkins University in Baltimore.

O'Herlihy, who uses nonmercury blood pressure devices in his practice, said the AMA should back policies to minimize the use of such equipment. "There are widely accepted alternatives to mercury and mercury-containing devices for medical use," he said. O'Herlihy introduced the matter for debate at the June 2000 annual meeting of the AMA's policy-making House of Delegates in Chicago, Illinois.

During the debate, John Malcolm, Jr., a pathologist with Evangelical Community Hospital in Lewisburg, Pennsylvania, said that in nonpatient-care areas, particularly in laboratories, mercury-containing devices continue to be the gold standard. For example, Malcolm said, blood gas analysis devices are calibrated using barometers that contain mercury. Replacing those devices with quartz crystal machines would be costly for a hospital—and in order to calibrate the new machinery, a mercury-containing device is still required. "I think we should be a little cautious before we eliminate all mercury-containing instruments," Malcolm said. "If you use reasonable care, you can get around problems with the environment. Let's not go overboard with this idea."

Diana Dell, chair of the AMA committee that heard the debate, noted, "We heard persuasive testimony about the health risks of mercury and the need to minimize exposure, but heard conflicting testimony regarding the ability or need to eliminate all uses of mercury in health care facilities." Dell, an assistant clinical professor of psychiatry and behavioral sciences at Duke University in Durham, North Carolina, said her committee decided in the end that the adverse health risks of mercury are well documented, and that exposure should be minimized. "Our AMA should work with appropriate groups to identify available options and suitable alternatives to mercury use," she said.

O'Herlihy said that the incineration of medical wastes containing mercury—including broken medical equipment and mercury-containing salts used in a variety of practices—has been cited by the U.S. Environmental Protection Agency as a major source of mercury contamination. He said the AMA policy has only persuasive power with hospital administrators, who would be the ones to make the decision and take the steps to eliminate mercury-containing devices.

Bruce Scott, an otolaryngologist from Louisville, Kentucky, and a member of the AMA Board of Trustees, said the AMA's stance takes a prudent approach to risk reduction while not affecting devices that do not have an effective mercury-free alternative. "I don't believe [the policy] goes so far as a mandate in those areas where [mercury-containing devices] offer a health benefit," said Scott. **–Ed Susman**

The General Accounting Office

The General Accounting Office (GAO) is an independent federal agency working to improve federal government accountability by alerting policy makers and the public to emerging problems throughout the government. The GAO gathers information to help Congress determine how well Executive Branch agencies are doing their jobs. The GAO provides oversight in such areas as evaluating how well government policies and programs are working, auditing agencies to determine if federal funds are being spent effectively, investigating illegal activities, and issuing legal decisions and opinions. Reports are generated on topics ranging from air pollution to automated teller machines.

The GAO has published more than 1,000 reports and each year issues hundreds of reports of testimony before Congress. Most of these publications are available online at the GAO home page located at **http://www.gao.gov/**. Publications are available in both summary and full text files, and are often posted within 24 hours of their release. By clicking on the GAO Reports link on the home page, visitors can select from Today's Reports to keep up to date on the latest GAO studies, New Testimony to access reports that are up to five days old, or Recent Reports and Testimony for reports older than five days. Most are searchable by title or subject and are updated daily.

From the GAO Reports page, visitors can get the best overall picture of the agency's work by selecting a month under the Month in Review heading to see abstracts of each report published during that month. There is also an option to search the GAO archives database. This includes all publicly released GAO reports from fiscal year 1995 to the present. To view the *GAO Strategic Plan, 2000–2005*, browsers can select that title under the Special Collections heading. Also included under Special Collections are GAO performance and accountability series reports, high-risk updates (listed by various departments such as agriculture, education, energy, labor, and justice), and reports on different agencies' implementation of the Governmental Performance and Results Act.

Back on the home page, visitors can click on Other Publications to see listings of special policy and guidance reports, such as *Community Development: Local Growth Issues—Federal Opportunities and Challenges*. Additional links include an opportunity to request copies of reports, as well as access to Fraudnet, a means for reporting fraud, waste, abuse, and mismanagement of federal funds to the GAO online.

Under the GAO Legal Products link, visitors can find reports on various federal agency rules, as well as decisions and opinions of the GAO comptroller general in areas of federal law including bid protests and appropriations. The Market Mechanisms for Student Loans link provides meeting notes, background reports, and proposals produced by a study group sponsored jointly by the GAO and the Department of Education. **–Lindsey A. Greene**

The Beat

Kentucky Clamps Down on Factory Farm Pollution

In February 2000, Kentucky adopted emergency regulations to address the potential pollution problems of large-scale confined animal feeding operations in the state. The regulations, which took effect immediately, contain siting requirements for barns, waste lagoons, and spray areas for animal waste. They also require that meat companies paying producers to raise animals be held jointly liable with farm owners for any environmental violations that may be incurred by the farms.

The rules affect farms with more than 2,500 hogs, 100,000 chickens, or 1,000 cattle, and came in response to an initiative launched last year by the USDA and the U.S. EPA. The cabinet has filed a notice of intent to have permanent regulations enacted to replace the emergency ones.

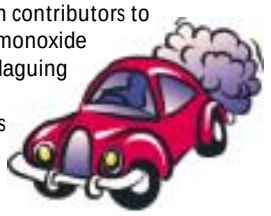
Asia Warned of Environmental Disaster

At a June 2000 conference titled Third Dialogue on Building Asia's Tomorrow, experts outlined the environmental threats faced by the region. Said delegate Chia Siow Yue of the Institute of Southeast Asian Studies in a 19 June 2000 Agence France-Presse article, "If Asia's environment is to survive the next century without completely collapsing, governments in the region must make environmental issues equal in priority to economic development."

One attendee noted that even when resources are allocated for environmental projects, they typically have been squandered, and added "Environmental policies and laws in Asian countries are entangled with widespread corruption at all levels of government, cronyism, and money politics." Those present went further to state that regional disputes combined with the corruption have weakened the abilities of regional governments to effectively manage their environment.

Driving U.S. Pollution South

Environmentalist Marco Gonzalez of the Salvadoran Center for Appropriate Technology stated in an April 2000 Reuters news article that older cars imported into Central America from the United States are main contributors to the high levels of carbon monoxide and other air pollutants plaguing the region.



The cars, which are less fuel-efficient and have fewer pollution control devices, have become popular with public transportation companies as well as private car owners because they are much cheaper than new cars. During an interview in Tegucigalpa, Honduras, Gonzalez said, "Central America has become a junkyard for cars from the United States."