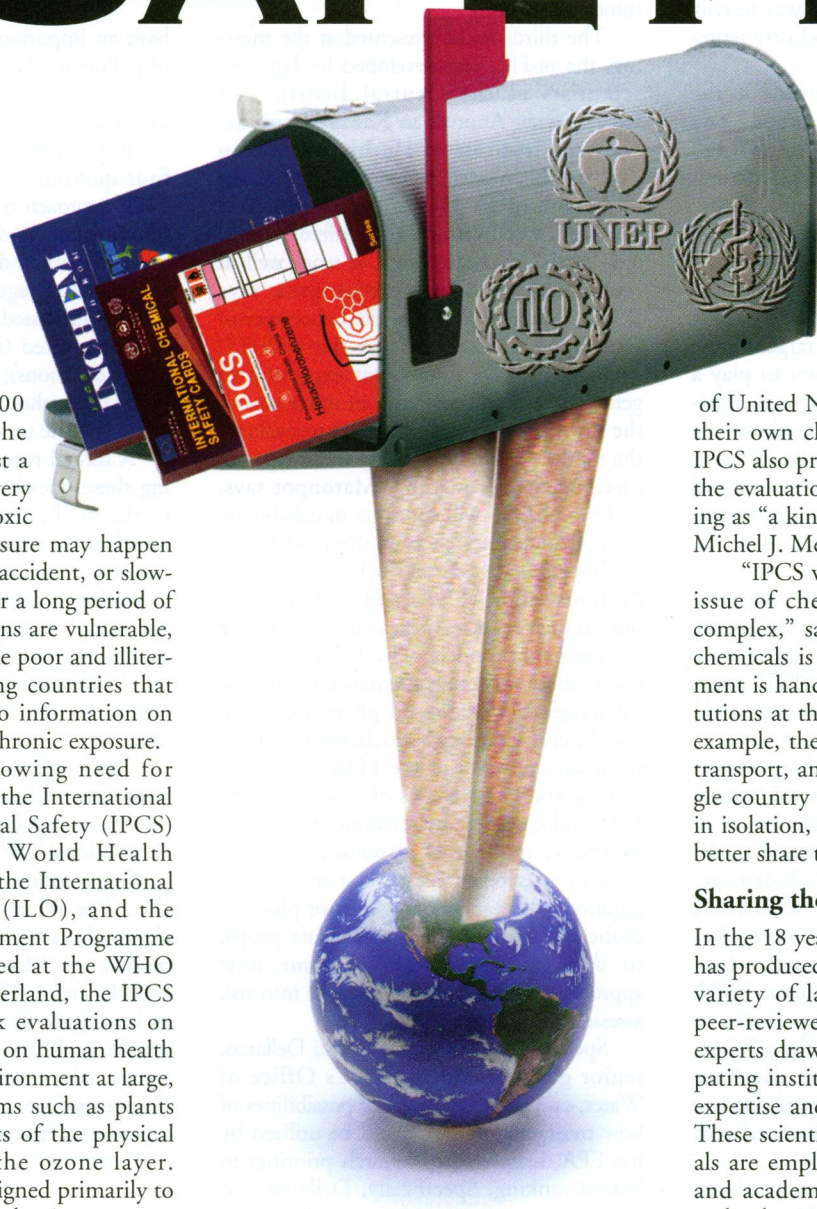
MESSENGER OF SAFETY



With nearly 100,000 chemicals on the global market and at least a thousand more added every year, the potential for toxic exposures is rising. Exposure may happen quickly, as in a chemical accident, or slowly, through low levels over a long period of time. While all populations are vulnerable, those most affected are the poor and illiterate citizens of developing countries that have little or no access to information on how to prevent acute or chronic exposure.

To address the growing need for information worldwide, the International Programme on Chemical Safety (IPCS) was founded by the World Health Organization (WHO), the International Labour Organization (ILO), and the United Nations Environment Programme in 1980. Headquartered at the WHO offices in Geneva, Switzerland, the IPCS publishes chemical risk evaluations on acute and chronic effects on human health as well as risks to the environment at large, including living organisms such as plants and animals, and aspects of the physical environment such as the ozone layer. These evaluations are designed primarily to help the governments and private sectors of United Nations member states develop their own chemical safety measures. The IPCS also provides guidance on how to use the evaluations most effectively, functioning as "a kind of information broker," says Michel J. Mercier, director of the IPCS.

"IPCS was created in part because the issue of chemical safety has become so complex," says Mercier. "The number of chemicals is now huge and their management is handled by a wide variety of institutions at the country level, including, for example, the health, environmental, labor, transport, and agricultural sectors. No single country could handle those problems in isolation, so we needed to find a way to better share the burden."

Sharing the Burden

In the 18 years since its creation, the IPCS has produced hundreds of publications in a variety of languages. Each document is peer-reviewed and finalized by a team of experts drawn from a network of participating institutions, each chosen for their expertise and geographical representation. These scientists and health care professionals are employed by government agencies and academic and research institutions, and volunteer to work on IPCS projects as

independent scientists. The IPCS pays only their travel and per diem expenses. Specialists from nongovernmental organizations and from industry are also invited onto projects as observers. In addition, says Mercier, the inclusion of experts from developing countries can "help to reinforce the needs of those countries. The process helps train them on how to assess chemicals and how to use the results. IPCS is committed to serving all countries irrespective of their level of development."

"The scientists are the engines that drive the program," says Terri Damstra, team leader of the IPCS's Interregional Research Unit located in Research Triangle Park, North Carolina. "IPCS doesn't have a fixed structure; every project varies depending on its needs. To me, this is healthy because we get the participation of different people, always new input. The scientists take existing expertise and give it a global perspective. They don't try to reinvent the wheel."

With a small staff of 20, the IPCS relies on these additional scientists and health professionals to help write and review risk evaluations and other documents to develop health-based guidelines for exposure to chemicals, as well as to participate in the development of risk methodologies and training activities. Twenty percent of the program's $5 million annual budget comes from the WHO, and the remainder comes from donations from governments and participating institutions in the member states. Such donations may range from cooperative agreements to providing grants or short-term staff support, hosting a meeting, or translating documents into local languages.

"IPCS provides an international platform to address global environmental health problems as they emerge," says Damstra. "But it has no regulatory or legal authority. It provides the scientific information to develop guidelines and chemical safety policies. And the peer review of all the documents is rigorous and global."

The IPCS participating institutions in the United States include the EPA, the National Institute for Occupational Safety and Health, the CDC, the FDA, and the NIEHS. International participating institutions include the International Agency for Research on Cancer and the International Register for Potentially Toxic Chemicals. Intergovernmental collaborators include the Organisation for Economic Co-operation and Development (OECD), the Food and Agriculture Organization, the United Nations Industrial Development Organization, and the United Nations Institute for Training and Research, among many others.

"All of the scientists who work on IPCS projects do so on a *pro bono* basis," says Roger O. McClellan, president and CEO of the Chemical Industry Institute of Toxicology in Research Triangle Park, North Carolina, a participating institution since the 1980s. "There is no compensation and it does involve a substantial commitment of time. But scientists are willing to participate because it is a valuable international effort. We get to develop the agenda for reports and identify the world's experts to prepare input material. Then comes the fun of sitting around the table and jawboning to make sure everyone has a comfort level. The whole process can take several years."

Chemicals to be evaluated are selected from a priority list made up by teams of independent scientists. The information used is drawn primarily from existing reports and compiled into documents that focus on a specific chemical or related hazard. The IPCS has prepared a variety of international consensus documents featuring updated information on risk assessment methodology, the scientific basis for health risk assessment and approaches to their application, the principles of assessment of toxic effects in various organs such as the kidneys and the nervous and reproductive systems, and the principles for the evaluation of health effects in susceptible population groups such as infants, young children, and the elderly.

When bringing together so many specialists from different countries and professions, the potential for differing opinions and viewpoints is considerable. Disagreement may range from the interpretation of a single term to approaches to test methods in laboratories. For example, the terms "risk evaluation" and "risk assessment" are often used interchangeably, leading the IPCS to start working on a document that will harmonize—rather than standardize—terminology, according to Mercier.

"There is still a need for better coordination between international organizations," says Mercier. "Each organization has its own capability and there can be some overlaps. But so far we have established a mechanism for coordinating among the major organizations, and we're starting an in-depth review to improve on that."

"The IPCS is superbly placed in the international arena because of its association with WHO," says Bernard Goldstein, director of the Environmental and Occupational Health Sciences Institute in Piscataway, New Jersey. "But coordination is absolutely needed. There are . . . many organizations involved in environment issues and that leads to a lot of overlap. But the 'alphabet soup' [of agencies involved in the IPCS] is really no more fragmented than in agencies in the U.S."

In addition to promoting agreement on terminology, the IPCS has been working to advance the development, validation, harmonization, and use of generally acceptable, scientifically sound methodologies for chemical risk evaluations on a global level. Harmonization is defined by the IPCS as an understanding of the methods and practices used by various countries and organizations so as to develop confidence in and acceptance of assessments that use different approaches. Harmonization involves a willingness to work toward convergence of approaches and methods as a long-term goal. By contrast, standardization is defined as a prescribed set of rules or measurements to which such countries or organizations conform or by which the accuracy and quality of assessments are judged.

The harmonization of approaches to risk assessment is critical and has global implications, according to Damstra. To address this issue, the IPCS has embarked on a project aimed at harmonizing methods to assess the risks posed by chemicals to various organs and systems, says Mercier.

The IPCS has also conducted several interlaboratory validation studies to evaluate evolving methodologies for risk assessment of given end points such as mutagenicity, neurobehavior, and immunotoxicity. In the case of mutagenicity, 97 laboratories volunteered to conduct more than 50 short-term tests on a number of chemicals. When methodologies and results were compared, they were found to agree. A neurobehavioral validation study also provided data to allow the United States and the OECD to develop test guidelines.

"The IPCS continues to make strides to address key chemical and methodologic issues in an open and participatory manner," says William H. Farland, director of the National Center for Environmental Assessment at the EPA. "Its work is critical for ensuring efficient use of limited resources, for chemical assessment work around the world, and for making the results of this work available to both developed countries and economies in transition. These efforts foster collaboration and avoid duplication of efforts."

Getting the Word Out

IPCS documents are designed for a broad range of users on the national level, from a cabinet minister, for example, to an illiterate worker in a rural factory. Published for-

mats include booklets, pamphlets, and information cards. The IPCS has also published monographs on poison information, and chemical safety cards. Countries may use the information as a basis for establishing their own chemical safety policies and regulations.

"These documents have served a very valuable role around the world as a source of information on various toxic agents," says McClellan. "They serve as valuable input for the activities of local and national governments as well as the private sector. The documents also frequently identify research that may be conducted to reduce uncertainties in the information base, thereby leading to improvement in future reports."

To date, the IPCS has fully evaluated about 200 chemicals and published the findings in its series of *Environmental Health Criteria Documents*, which Damstra calls "redbooks that are known throughout the world." Each criteria document is devised, drafted, and reviewed by teams of experts from participating institutions around the world. "This can mean a criteria document takes a long time to complete," says Damstra. "And after the United Nations conference in Rio in 1992, international organizations were told to speed up the number of chemicals evaluated. And that is what the IPCS is trying to do."

So far, the IPCS has provided guidance on acceptable levels of about 110 chemicals in drinking water, about 35 chemicals in air, 1,205 food additives, and 655 pesticides and 30 veterinary drug residues in food. The IPCS has also produced guidance on how to diagnose and treat toxic exposures to about 150 chemicals. Information may also include ways to treat the harmful effects of chemicals and manage chemical emergencies. And the program's 1,300 *International Chemical Safety Cards*, each one a translated summary of the risks involved with a particular chemical, are posted in factories and workshops around the world. Many of the safety cards feature graphic symbols to warn illiterate workers of potential hazards.

"All the documents are objective and very authoritative," says Mercier. Although he admits the program has been criticized as being influenced too much by industry, he asserts that "nobody would question the quality of our documents."

Once the documents are ready, the IPCS begins the process of distributing them to those who need them. Most of the program's publications are distributed through the regional and local offices of the WHO, UNEP, and the ILO in a variety of formats including CD-ROM. The next step involves multisectoral training to help governments and the private sector develop their own national capacity to handle safety issues and be prepared in the case of an emergency.

"We have to make sure the documents are properly used in the countries," says Mercier. "And we want to help countries create their own infrastructure. We also help train people on how to assess chemicals and how to translate those results into decisions. Before beginning a training seminar, we send several people to assess the situation, then adapt the course for the needs of each country."

The IPCS collaborates with other international organizations to conduct training in such areas as poisoning prevention, the safe handling of chemicals, and ways to spread information to the public, particularly for the protection of women and children. Women and children are considered especially susceptible to a variety of chemicals, including heavy metals and persistent organic pollutants.

"IPCS often trains the trainers," says Damstra. "Because of cultural and language differences, local people need to talk to local people to improve public awareness. It's very sad to see tapes and movies of people using pesticide containers to collect their drinking water."

The Future

A major area of concern in environmental health is the prevalence of endocrine disrupters in the environment. In collaboration with several other international agencies, the IPCS has been charged with taking a global inventory of all the research on endocrine disrupters and providing an international assessment of the state of the science on these chemicals. The first meeting on that topic was held in March, and Damstra anticipates the inventory will take about two years to complete.

Another future project is to integrate health risk assessments and ecological risk assessments. The EPA is planning a conference on this topic for April. "It's very futuristic," says Damstra, "and some people believe the field of science may not be ready for integrated risk assessment quite yet, but it's important to start addressing the topic."

The IPCS is also interested in researching and validating alternative test methods to reduce the number of animals used for laboratory tests. "This is the goal in the U.S. and is even stronger in Europe," says Damstra. "The international community is very interested in this topic."

In the meantime, the IPCS continues to seek ways to make countries aware of the negative human health and environmental effects that may result from the unsafe use of chemicals. By the year 2000, the IPCS hopes all countries will make chemical safety an integral part of their health promotion and prevention programs.

Rebecca Clay

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