Hazardous Substances & Public Health
Protecting the Public Health

Volume 6, Number 2, Summer 1996

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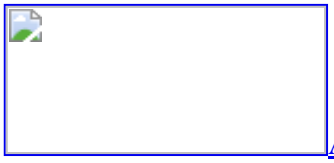
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# FEATURES

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# Mercury Contamination of Residential Building Is Linked to Past Industrial Use

In January 1995, workers renovating a condominium unit in Hoboken, New Jersey, found a large amount of elemental mercury in the subflooring. The condo was in a five-story factory building that had been converted to residential use. Mercury exposure can cause serious and lasting health problems, including tremors, central nervous system damage, and kidney disease (1). The discovery was a serious problem for the building's owners, a group of artists and architects who had banded together to purchase the building. Most of them planned loft studios, and poured their time, money, and talent into designing their units. "These were their dream homes," said Sharon Kubiak, a health educator with the New Jersey Department of Health. "For them, it was an ideal situation." The discovery of the mercury threatened to destroy what they had worked for.

In March 1995, after a private consultant found high levels of mercury vapor on three of the building's five floors, the building owners hired a private contractor to remediate the contamination, but did not notify health officials. Approximately 200 gallons of debris contaminated with mercury was removed from the unoccupied fifth-floor unit, but the problems persisted.

***Workers in protective gear examine mercury under floorboards at residential building.***
**Photo by Jim Pasqualo, New Jersey Department of Health.**

Late in 1995, fourth-floor residents reported seeing drops of mercury in their living spaces, including on stove and countertop surfaces. In November, they hired a consultant to conduct a mercury air survey in their units and in common areas of the building. Mercury vapor levels in breathing zone air samples in the third-floor unit ranged from 7 to 21 micrograms per cubic meter ($\mu g/m^3$) and from 14 to 26 $\mu g/m^3$ at wall and floor openings. In common areas of the third and fourth floors, mercury vapor was detected at levels of 12 to 18 $\mu g/m^3$. At other residential properties contaminated with mercury, the Agency for Toxic Substances and Disease Registry (ATSDR) has recommended that mercury levels in indoor air be no higher than 0.3 $\mu g/m^3$ to protect public health (2, 3). Through their private physicians, these residents had urine mercury tests in late November and early December 1995. Test results ranged from 11 to 65 micrograms of mercury per liter ($\mu g/L$) of urine. The residents notified local health officials of the problem.

## The Public Health Response

After the local health department was notified, regulatory and county officials contacted the state, which requested assistance from the Environmental Protection Agency (EPA) and ATSDR. The New Jersey Department of Health (NJDOH) and ATSDR regional representatives, health consultants, and other staffers arranged for medical evaluations and lab tests, performed a public health consultation, and issued a public health advisory. ATSDR also arranged for residents to receive medical evaluation and testing and crisis counseling. "ATSDR did an exceptional job," said Gary Garetano of the Hudson Regional Health Commission.

Two air surveys, one by NJDOH and one by EPA, confirmed that mercury vapor was present at dangerously high levels. Even after residents were encouraged to increase ventilation and lower heat to reduce concentrations of mercury vapors, levels in nine units were as high as 13 $\mu g/m^3$, and elemental mercury was reportedly visible in a fifth-floor unit.

By December, the health agencies were urging residents to relocate. Urine testing for mercury was the next step. Urine concentrations of mercury in unexposed adults are usually less than 20 µg/L urine; samples taken from residents of the building ranged from 5.7 to 102 µg/L. Twenty residents, including the 6 children tested, had urine mercury levels of 20 µg/L or higher. Eight residents had urine mercury concentrations greater than 56 µg/L.

Although the discovery of such high levels of mercury alarmed health officials, residents were unprepared for the relocation order. After having dealt with the situation for nearly a year, they could not understand the urgency now being insisted upon by the health authorities. On January 9, they were told that the building had been declared unfit for habitation. They were given 4 days to leave the building.

EPA quickly established a relocation program that placed residents in temporary housing, helped them find new workplaces and homes, and located storage facilities for some of their possessions. "The relocation was very difficult for the residents," noted Jerald Fagliano of the NJDOH. Said EPA relocation specialist Pat Seppi, who works with the building's former residents, "Normally, in such a situation, you have a few months' advance notice, and it helps people adapt." Because immediate dissociation of the residents from the mercury was necessary, the relocation order was issued before the usual preparations could be made.

Work continues at the site. EPA remediation specialists are trying to determine whether the building can be made safe for occupancy, and some former residents continue to hope that it can. In the meantime, new troubles have arisen in the neighborhood. A commercial property across the road that houses several businesses has also been found to be contaminated with mercury.

*References*

1. CDC. Mercury exposure among residents of a building formerly used for industrial purposes New Jersey, 1995. MMWR 1996;45(20):422-4.
2. CDC. Mercury exposure in a residential community Florida, 1994. MMWR 44(23):436-43; June 16, 1995.
3. CDC. Acute and chronic poisoning from residential exposures to elemental mercury; Michigan, 1989-1990. MMWR 40(23):393-5; June 14, 1994.

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# Newly Designed Gene Can Remove Heavy Metal Pollutants From Soil

***Arabidopsis plants hold promise for cleaning up outdoor areas contaminated with heavy metals.***

Scientists from the University of Georgia (UGA) have designed a gene that, when inserted in test plants, can remove heavy metal pollutants from soil and render them harmless. The plants show a dramatic ability to remove toxic mercury and convert it to a relatively inert form.

The research findings were published April 15, 1996, in the Proceedings of the National Academy of Sciences. Heavy metal contamination is a serious and growing problem worldwide. Metals such as mercury and lead have reached toxic levels from pollution in the air, land, and water; in some places, soil is contaminated with naturally occurring toxic metals.

"The problems with heavy metals are really widespread, and they don't ever convert into something that is easy to break down," said Rich Meagher, PhD, a professor of plant molecular genetics at UGA. "They will probably be leaching out of the soil in some places for the next 100 years."

The results in all laboratory tests so far have been dramatic. Meagher and his colleagues inserted a bacterial gene called merA into the commonly used test plant arabidopsis. The new transgenic plants not only grow on toxic mercury, they thrive. The product of the merA gene, mercuric ion reductase, catalyzes the detoxification of ionic mercury and reduces it to a less toxic form.

"The results were just astounding far better than what we had expected," said Meagher. "This finding could have a huge environmental impact on any site contaminated with heavy metals."

The laboratory plants are now producing seeds that retain the ability of the parent to consume and change mercury.

The gene, found in soil-borne bacteria, is well known. These bacteria are found at every site on earth polluted by heavy metals. Although they help detoxify the metals in a minor way, they do nothing for serious problems because they aren't effective at large-scale sequestration (stopping the normal ion behavior) of the metals, nor are they active more than a few inches into the soil.

Although tests so far have been done only with arabidopsis and yellow poplar, Meagher believes the gene could be inserted successfully into many different plants, which could then help remove heavy metals from the environment. For instance, the gene might be inserted in a marsh grass called spartina to help clean up pollution caused by paper mills.

"There is agricultural land in Florida, for example, that is heavily contaminated with mercury that was part of formerly used fungicides and bactericides. This land is in orange groves that are often right next to wetlands,"said Meagher.

A fringe of transgenic plants might be planted around such areas to prevent any contaminated runoff from reaching the wetlands. Currently, the problem can become systemic when fish ingest the mercury, then birds eat the fish.

Some years ago, mercury-contaminated fish in Japan caused a major outbreak of associated neurological illnesses. And the neurological damage caused by heavy metals is usually irreversible.

Human health problems and environmental damage are serious threats. Evidence of mercury has been found as far as 50 miles downstream from pulp-bleaching facilities, Meagher said, and "significant" groundwater and soil contamination with heavy metals may extend for 5 miles or more. Dredging of shipping channels sometimes brings up metals that have settled there and puts them back into the ecosystem.

Meagher also reported that the wind-borne residue of volatile metals has contaminated lands at great distances from smelting operations.

Theoretically, the gene could be altered to sequester any heavy metal, from cadmium to lead, although experiments have not yet been attempted.

Success in the lab has been obvious, but several years may pass before plants are available for planting. Meagher said that different soil varieties and growing conditions may necessitate adjustments in the gene's design, but he no longer doubts that it is possible. Concern has been expressed from some about the release of genetically engineered plants into the environment; however, Meagher said the release could be carefully controlled.

For more information about this research, contact Dr. Rich Meagher, professor of genetics, University of Georgia; telephone (706) 542-1444; e-mail meagher@bscf.uga.edu.

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# ATSDR Announces Child Health Initiative

Children are not just small adults. Children who live near hazardous waste sites often have greater exposures, greater potential for health problems, and less ability to avoid hazards. Exposure to hazardous substances can cause learning disabilities and growth and development problems in children. Recognizing these special vulnerabilities, the Agency for Toxic Substances and Disease Registry (ATSDR) has launched an initiative to emphasize child health in all agency programs and activities. The Child Health Initiative, which responds to direct calls by both the US Department of Health and Human Services and the US Environmental Protection Agency for policies that promote child health, was introduced by ATSDR Assistant Administrator, Barry L. Johnson, PhD, to the ATSDR Board of Scientific Counselors (BSC) in April 1996.

The board plans to appoint a child health workgroup, composed of nationally recognized experts in child health and environmental medicine, that will examine available data (from ATSDR and other sources) on the impact of hazardous waste sites on children's health, identify key information gaps, and propose further prevention activities.

"A critical first step is compiling information from past and current ATSDR projects that have relevance to child health," said Robert W. Amler, MD, senior medical advisor, is coordinating the Child Health Initiative. "There is an equally compelling need to educate children and their parents, as well as child health providers and child health advocates, to prevent hazards to child health from site-related substances."

For more information about ATSDR's Child Health Initiative, please contact Dr. Robert W. Amler, 1600 Clifton Road, Mailstop E28, Atlanta, Georgia 30333; telephone (404) 498-0004.

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### From the States

# Mercury Awareness for the Public

Mercury has been recognized as one of the primary pollutants of concern by the Michigan Department of Public Health (MDPH). Even a very small amount of mercury in the environment can be converted to a form (methylmercury) that builds up in the muscle tissue of fish and may ultimately appear on your dinner table.

Mercury contamination has resulted in the MDPH's issuing a record number of statewide fish advisories in 1995. Most of the mercury in the Great Lakes was deposited through the atmosphere by rain, snow, or dirt particles. Mercury poisoning can cause central nervous system, kidney, and liver damage in humans, and can impair child development.

To inform the public about the health effects of mercury exposure, elevate mercury awareness, and encourage voluntary pollution prevention activities, the MDPH developed "MERC CONCERN," a mercury awareness program. The program teaches people how to identify sources of mercury, products containing mercury, and provides advice on safe, cost-effective ways to prevent mercury pollution.

A MERC CONCERN brochure was developed by the MDPH for Michigan citizens and describes how a person may be exposed to mercury and the symptoms associated with long- and short-term exposure. Fish consumption is the most common environmental route of exposure, so the brochure provides information on how to choose safer fish to eat.

The following information can be found in the MERC CONCERN brochure.

## Release Into the Environment

Although mercury can be emitted from both natural and man-made sources, man-made sources account for the majority of all mercury emissions. Most natural mercury emissions occur from soil or forest fires. Some sources of mercury released into the environment can be controlled: cement and lime kilns, electrical products--manufacturing and disposal (switches, fluorescent lights, some headlights and batteries), industrial wastewater discharge, coal and oil burning, crematories, preparation/disposal of dental amalgam, evaporation of mercury from landfills, medical waste from incinerators, residential boilers, garbarge incinerators, wastewater treatment plants and sewage, wood burning, and hazardous waste incinerators.

## Health Effects

Short-term exposure from inhaling high concentrations of mercury vapors can cause nausea, shortness of breath, pneumonitis, and bronchitis. Long-term exposure at extreme levels can result in shakiness, tremors, numbness in the fingers and toes, loss of muscle control, memory loss, and kidney disease. Unborn children and children under the age of 6 are most sensitive to mercury poisoning.

## Consuming Fish Safely

Although the primary route of exposure to methylmercury is from eating contaminated fish, fish is a good source of protein so don't stop eating it altogether. Small pan fish, such as perch, rock bass, crappies (if less than 9 inches), bluegill, and sunfish are very low in methylmercury and safer to eat. The MDPH recommends that the general public limit fish consumption to once a week; nursing or expectant mothers, women who plan to become pregnant, and children under the age of 15 limit fish consumption to once a month.

## What Consumers Can Do

Consumers can help reduce the amount of mercury released in the environment by purchasing alternative products that do not contain thimerosal, phenylmercuric acetate, or mercuric oxide. Send mercury-containing items such as thermometers and batteries to a household hazardous waste collection facility, and conserve electricity. Burning less coal and oil (that naturally contain mercury) for electricity will cause less mercury to be released into the environment. All of us have a role to play in reducing mercury emissions. Individual actions can make a surprising difference.

For more information about the MERC CONCERN project or to get a copy of the brochure, please contact the Michigan Department of Natural Resources' Environmental Assistance Center at (517) 373-9400.

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# Health Studies Available to the Public

Environmental health scientists at ATSDR conduct health studies at Superfund sites nationwide to evaluate the health effects of hazardous substances on exposed populations. The following health studies are available to the public through the National Technical Information Service (NTIS):

- Madison County Lead Exposure Study, Illinois Department of Public Health, Springfield, Illinois (April 1995), NTIS no. PB95-209631. Cost: $47 (paperback), plus $3 shipping and handling.
- Multisite Lead and Cadmium Exposure Study with Biological Markers Incorporated (April 1995), NTIS no. PB95-199188. Cost: $44 (paperback), plus $3 shipping and handling.
- Symptom and Illness Prevalence with Biomarkers Health Study for Calvert City and Southern Livingston County, Kentucky (May 1995), NTIS no. PB95-222808. Cost: $21.50 (paperback), plus $3 shipping and handling.
- Missouri Respiratory Study: Forest City and Glover, Missouri, Technical Assistance to the Missouri Department of Health, Jefferson City, Missouri (May 1995), NTIS no. PB95-212742. Cost: $21.50 (paperback), plus $3 shipping and handling.
- Analytic Study To Evaluate Associations Between Hazardous Waste Sites and Birth Defects, Bureau of Environmental and Occupational Epidemiology, New York State Department of Health and Health Research, Inc. (June 1995), NTIS no. PB95-199196. Cost: $28 (paperback), plus $3 shipping and handling.
- Development and Evaluation of a Statewide Surveillance System: Hazardous Waste Sites and Cancer Incidence in New York State (June 1995), NTIS PB95-230553. Cost: $49 (paperback), plus $3 shipping and handling.

To order these health studies and others prepared by ATSDR, contact NTIS, Sills Building, 5285 Port Royal Road, Springfield, Virginia 22151; telephone (703) 487-4650; fax (703) 321-8547. For more information on health studies activities, contact Sharon Campolucci, deputy director, Division of Health Studies, ATSDR, 1600 Clifton Road, NE, Mailstop E31, Atlanta, Georgia 30333; telephone (404) 639-6200.

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# Check Out New Lead Web Site

The National Lead Information Center (NLIC), sponsored by the National Safety Council, now has information available on the Internet. This new web site summarizes newspaper articles that describe successful, positive actions taken by individuals, groups, and communities to address lead as an environmental and public health hazard. It provides information about lead in dust, soil, water, and paint and how it can affect human health. It also cites cases and reports on lead poisoning from the Centers for Disease Control and Prevention which can be downloaded and printed.

The Internet address is http://www.nsc.org/ehc/lead.htm. For more information about NLIC, contact Daphne Pierre at (800) 424-LEAD or (800) 424-5323.

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## Children and the Environment

# Pesticide Risk Seen for Children of Agricultural Families

Children from agricultural families are exposed to higher levels of pesticides than those whose parents do not work in agriculture and do not live close to farms, according to a study by researchers from the Department of Environmental Health at the University of Washington, Seattle.

Although these exposure levels do not appear to pose an acute or chronic health risk to children, the findings do identify new pathways of pesticide exposure for children and indicate a need for further research, according to Richard Fenske, PhD, associate professor of environmental health and principal investigator.

The study "Pesticides In Household Dust and Soil: Exposure Pathways for Children of Agricultural Families," published in the December 1995 issue of Environmental Health Perspectives, involved analyzing dust and soil samples from near and inside homes for the presence of four common pesticides. Approximately 59 families (26 farming, 22 farmworker, and 11 nonfarming) living in the greater Wenatchee, Washington, area participated in the study. Samples were gathered from outdoor child play areas, as well as indoor entryways and play areas, and were analyzed for four organophosphate insecticides (azinphosmethyl, phosmet, chlorpyrifos, and ethyl parathion) commonly used in apple orchards.

Overall, pesticide levels in household dust were significantly higher than those found in soil. Results showed detectable levels of all four pesticides in dust samples from 62% of agricultural households. Only one nonfarming household contained detectable levels of all pesticides. Excluding ethyl parathion, the levels were three to five times higher in agricultural homes than in non-agricultural homes.

Pesticides may be brought into homes on shoes or clothing. Because pesticides brought into the home are not exposed to outdoor elements, such as wind or sun, they remain active for a longer period of time. Young children can come into contact with these substances by playing on the floor and putting hands and objects into their mouth.

"This research does indicate that pesticide exposure can occur through pathways other than diet and that these exposures are likely to be higher for children of agricultural families," Fenske said. "Further studies are needed to determine levels of pesticide exposure in children and what health problems, if any, may be linked to this environment."

Fenske and his colleagues are currently analyzing results of their most recent study, which monitored children in agricultural and non-agricultural homes by collecting hand wipes and urine samples to test for pesticide exposure.

For more information about this study, contact Dr. Richard Fenske, associate professor of environmental health, University of Washington, C301 Health Sciences Center, SC-60, Seattle, Washington 98195; telephone (206) 543-0916.

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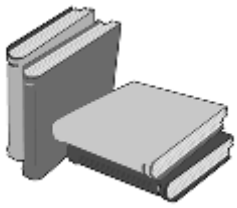

## Courses

### The Deep South Center for Occupational Health and Safety Presents Safety and Health Continuing Education Courses

**Effective Management of Occupational Health and Safety Programs, August 12-16, 1996,** Atlanta, Georgia. This 3-day course will cover the scope and responsibilities of occupational health and safety managers. Management Theories and Total Quality Management techniques will be discussed, as will planning, implementing, and evaluating financial aspects of comprehensive safety and health programs. Cost: $475.

**Fundamentals of Industrial Hygiene, August 12-16, 1996**, Atlanta, Georgia. This 5-day program covers the basics involved in industrial hygiene for anticipating, recognizing, evaluating, and controlling potential health hazards at the worksite. This course is geared to those with minimal formal training in industrial hygiene. Cost: $590.

**Worker Training: Guidelines and Practices for the Safety and Health Professional, October 21-22, 1996,** Birmingham, Alabama. This 2-day workshop is devoted to problem-solving activities, guided practice, and hands-on practice in worker training skills. Topics include organizing worker training; setting goals and measuring achievements; developing training lessons and training skills; and evaluating your training program. Cost: $375.

For more information about these and other available courses, contact Cherie Hunt, The Deep South Center for Occupational Health and Safety, University of Alabama at Birmingham, School of Public Health, Birmingham, Alabama 35294-2010; telephone (205) 934-7178.

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## Harvard School of Public Health Holds the Third Annual Summer Institute for Public Health Studies in Quantitative Methods

**The Third Annual Harvard School of Public Health Summer Institute for Public Health Studies in Quantitative Methods, July 29-August 16, 1996.** Course areas include basic and advanced epidemiology, biostatistics, and clinical quality measurements, as well as limited enrollment courses in clinical epidemiology, clinical research, health services research, clinical trials, outcomes measurement, and health policy. The Summer Institute is designed for health professionals who are in training or are considering a mid-career change into public health and feel the need to strengthen their skills in quantitative assessment, analysis, and evaluation, and to understand the basic principles of epidemiology and biostatistics. Courses are offered for academic credit.

For more information, contact the Summer Institute for Public Health Studies, Admissions Office, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115-6023; telephone (617) 432-1052; fax (617) 432-2009.

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## North Carolina Occupational Safety and Health Educational Resource Center Announces Hazardous Waste Training

**Forty-hour Hazardous Waste Training, September 30-October 4, 1996.** This course is designed to address the health and safety issues Superfund clean-up workers need to follow during remediation as outlined in 29 CFR 1910.120. Regulations, measurements, protective clothing, confined space, decontamination, medical surveillance, site safety and health plans, and respiratory protection will be reviewed.

For more information about this and other available courses, contact Occupational Safety and Health Educational Resources Center, University of North Carolina, 109 Conner Drive, Suite 1101, Chapel Hill, North Carolina 27514; telephone (919) 962-2101; fax (919) 966-7579.

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# The University of New England Offers Low Literacy Communication Skills for Health Professionals

**Low Literacy Communication Skills for Health Professionals, July 14-17, 1996.** In this 4-day hands-on workshop, you will learn the principles of effective writing and graphic design to develop low cost, easy-to-read, and culturally appropriate health materials. Each participant will leave with material ready to be produced and field-tested. Instructor: Jane Root, PhD. Cost: $359.

For more information contact the University of New England College of Professional and Continuing Studies, Hills Road, Biddeford, Maine 04004-9599; telephone (207) 283-0171, ext. 2440; fax (207) 282-6379.

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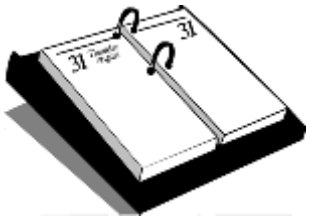

# Calendar of Events

## July/August

***July 27-30, 1996; National Medical Association 101st Annual Convention and Scientific Assembly,*** Chicago, Illinois. Contact: NMA, 1012 Tenth Street, NW, Washington, DC 20001; telephone (202) 347-1895, ext. 27; fax (202) 842-3293.

***August 25-26, 1996, National Association of Community Health Centers, Inc.*** San Francisco, California. Contact: NACHC, 1330 new Hampshire Avenue, NW, Suite 122, Washington, DC 20036; telephone (202) 659-8008; fax (202) 659-8519.

***August 26-30, 1996; Blacks in Government,*** Atlanta, Georgia. Contact: Jacquise Beatty, BIG, 1820 11th Street, NW, Washington, DC 20001-5015; telephone (202) 667-3280.

# September/October

***September 4-7, 1996; Aspen Environmental Medicine Conference,*** Aspen, Colorado. Contact: Karen Hardesty, Allergy Respiratory Institute, 5800 East Evans Avenue, Denver, CO 80222; telephone (303) 757-4507; fax (303) 757-1518.

***October 26-30, 1996; American Academy of Pediatrics,*** Boston, Massachusetts. Contact: AAP, 141 Northwest Point Boulevard, PO Box 927, Elk Grove Village, Illinois 60009-0927; telephone (708) 228-5005; fax (708) 228-5097; Internet http://www.aap.org.EXIT

***October 26-29, 1996; World '96: World Environmental Congress "Promoting the Science, Technology, and Business of the Environment,"*** Cincinnati, Ohio. Contact: Dr. Hussain Al-Ekabi, Science and Technology Integration, Inc., UWO Research Park, Suite 110, 100 Collip Circle, London, ON N6G 4S2 Canada; telephone (519) 858-5055; fax (519) 858-5056; e-mail sti.ekabi@info.london.on.ca.

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