

# LEAD ASTRAY: THE POSONING

We've long known that our air and soil are poisoned by lead. But new studies show that the metal also contaminates the food we eat, the dust in our homes, and the water that 42 million of us drink.

BY MICHAEL WEISSKOPF

wife, Judy Southerland, were worried. Their tenmonth-old daughter Olivia was having problems. She had virtually stopped growing, dropping from the thirtieth to the fifth percentile of her age group in height and weight; she suffered from constinution, insomnia, and crankiness. At first doctors couldn't account for her condition. Then a routine blood test in October 1985 yielded a surprising result: Olivia was suffering from lead poisoning.

Her parents were shocked. Wasn't lead poisoning an affliction striking inner-city children who chew on peeling lead paint? How had their child, growing up in an affluent part of Washington, D.C., become contaminated?

Sanders and Southerland spent \$4,500 to strip and repaint their house and replace the drywall ceilings, just in case any lead-based paint had

aurice Sanders and his ever been used. They tossed out newspapers and magazines because lead pigments are used on color pages, which a baby might nibble. But Olivia's high lead count persisted.

Nearly a year after their daughter's first blood test, Sanders and Southerland decided to have their tap water checked. Several separate samplings showed lead levels nearly four times higher than the 50 parts per billion the Environmental Protection Agency (EPA) considers

The family had suddenly become part of a silent epidemic of alarming proportions. According to a growing body of medical research, millions of Americans, most of them children, are suffering from low-level lead poisoning. New studies have uncovered evidence of serious physical and intellectual impairment in children with

only small amounts of lead in their blood-amounts far below the 24 micrograms per deciliter officially considered the maximum safe level by the Centers for Disease Control (CDC). In fact, a March 1986 report from the EPA's Clean Air Scientific Advisory Committee suggests lowering the maximum safe blood lead level from 24 micrograms per deciliter to 9.

And this widespread contamination springs not just from crumbling paint, aging factories, or common tap water, but from such sources as the food we eat and the dishware we use, the dust in our homes and the dirt in our

The body doesn't need lead, yet everyone absorbs it in varying amounts; some of us tolerate it better than others. (For example, Olivia Sanders's fraternal twin, Abigail, who was found to have the same elevated blood

lead levels, exhibited no physical or emotional problems.) Lead isn't excreted but is stored for many years in tissue, chiefly in the bone, from which it is released back into the bloodstream to wreak cellular havoc. Especially vulnerable to lead overload, according to the EPA report, are millions of Americans in three groups. For middleaged men, the risk of hypertension rises along with blood lead levels. According to a 1985 study by the CDC, levels as low as 5 micrograms per deciliter can increase blood pressure. A second group at risk is pregnant women, for whom lead means a greater chance of miscarriage, premature delivery, and still-

Perhaps most disturbing is the danger to children between the ages of five months and six years. According to a report about to be submitted to Congress by the Agency



# Innocent-looking dinnerware, fired at insufficient temperatures, can release atoms of toxic lead.

for Toxic Substances and Disease Registry of the Public Health Service, an estimated 17 percent of preschool children have blood lead levels exceeding 15 micrograms per deciliter. At that level children are susceptible to a range of psychological, neurological, kidney, and blood abnormalities, including partial hearing loss; slower neural transmission; hyperactivity; learning disability; lower IQ scores; impaired ability to metabolize vitamin D, absorb iron, and use calcium in any bodily processes; disturbances in the formation and maintenance of red blood cells: decreased muscle tone; and

interference with the creation and function of certain enzymes and amino acids. And new studies show that high maternal lead levels can damage a child prenatally, lowering birth weight and causing later deficits in physical and intellectual development.

Historically, the federal government has avoided regulating a metal of such commercial and military importance, although its toxic effects have been known for millennia. (Some historians theorize that lead led Rome to ruin. Poisoning from exten-

sive use of the metal in utensils, weapons, cosmetics, wine vessels, and water pipes may have been responsible for imperial madness and for infertility and miscarriage rates that kept the ruling classes from replacing themselves. See "The Leaden Road to Ruin," page 76.)

The leading of America began in earnest with the Industrial Revolution. Smelters and manufacturing plants spewed fumes with abandon, and workers toiled unprotected from the mid-1800s until early in this

century, when occupational regulations were instituted. In the 1920s, who knew that adding lead to gasoline would backfire? Adding it to paint for longer-lasting freshness seemed like another great idea, and lead solder looked to be a dandy sealant for handy canned foods.

It took the social activism of the 1960s and early 1970s to bring about controls. The Lead-based Paint Poisoning Prevention Act banned the manufacture and sale of leaded paint and directed the Department of Housing and Urban Development (HUD) to develop a strategy for removing old paint from old housing. In the mid-1970s the



After tracing their lead poisoning to a set of dishes, Don and Fran Wallace collected other examples of lead-contaminated tableware.

Food and Drug Administration (FDA) pressured the food industry to remove lead solder from the seams of baby-food and baby-formula cans. According to the EPA. more than 161,000 metric tons of lead tainted the air in 1975. In an effort to lower this atmospheric pollution the agency ordered oil companies to start phasing out lead additives in gasoline beginning in 1977. By 1984 the count had fallen by 75 percent, to 39,000 metric tons. Each year since, the levels have continued to fall.

he effect of these reductions on blood lead levels was dramatic. In 1982 the National Health and Nutrition Examination Survey recorded a 37 percent drop in average U.S. blood lead levels between 1976 and 1980. But even more dramatic was the discovery of how big a problem still remained.

The survey showed that. even with the drop, unexpectedly high levels of lead were coursing through the veins of an unexpectedly high percentage of the population. About half the adult U.S. population surveyed had blood levels above 10 micrograms per deciliter. Eightyeight percent of the preschool children tested had blood levels at or above that level, and 9.1 percent of them met the current CDC criteria for lead poisoning. The numbers were even more alarming for black children: nearly a quarter were lead poisoned, and 97.5 percent reached or exceeded 10 micrograms per

deciliter. The hunt for the cause of this persistent contamination has touched all the usual places. In 1985 gasoline still spewed close to 20,000 metric tons of lead into the air, enough to cause an estimated



pressure a year. In 1987 lead paint still covers 25 million housing units. Solder in cans still accounts for up to 24 percent of low-level lead poisoning. The amount of lead in ash generated by the nation's 73 resource recovery incinerators—ash often hauled to disposal facilities in open trucks-will soon dwarf the amount of lead used in gasoline even as lead levels in gas fall. The popularity of incineration as a method of waste disposal continues to rise. And in July of this year the Occupational Safety and Health Administration cited and fined the Chrysler Corporation for 811 job-safety infractions, including willfully exposing autoworkers to lead

123,000 cases of high blood

and arsenic. Two years ago the EPA decided to survey the nation's tap water, and last December it reported surprisingly high levels. Tap water, it found, represents 15 to 40 percent of the lead to which Americans are exposed, depending on local conditions. According to the author of the report, EPA economic analyst Ronnie Levin, 42 million people-one out of every five Americans served by public water systems-consume dangerous amounts of lead in their household drinking water.

The problem seems to lie

not in municipal treatment plants or public distribution lines, but in residential plumbing systems, where water collects small particles corroded from lead pipes or. more often, lead solder in copper pipes. More lead enters the taps of communities with soft water (low in magnesium and calcium) or acidic water, both of which are corrosive, and more is found in new homes, because freshly applied solder dis-

solves easily.

Another newly considered source of low-level lead poisoning is plain old dirt. Auto emissions, flaking paint, and smelters left a legacy of 4 million to 5 million metric tons of lead in dust, soil, and sediment. Children encounter it in backyards, fields, and playgrounds, especially those located near highways or smelting plants. When Denise Wadleigh of Jersey City, New Jersey, was pregnant with her fourth child, she and her husband bought a home in a middle-class residential neighborhood not far from a major highway. Less than a year later a routine blood test showed that Wadleigh's twoyear-old son, though asymptomatic, was suffering from lead poisoning. A scientist from Rutgers University analyzed the backyard dirt and found lead levels as high as 1,800 parts per million—100

times higher than average world soil levels. "We had to spend six thousand dollars to cover the backyard with concrete, for the safety of my children," Wadleigh reports.

Elsewhere the problem of lead-poisoned soil has become so severe that whole towns are affected. In October health officials uncovered 28 cases of lead poisoning among children living in a low-income section of Thompson, Connecticut. In all of Thompson in the previous 18 months a staggering 21 percent of children tested positive for lead poisoning. Investigators have traced the source of the problem to Thompson's soil, but no one has yet determined how the metal got there.

Powder-fine outdoor dirt sifts inside to become household dust, presenting a danger to children who crawl on the floor and gnaw on furniture. Such dust can also contaminate fresh vegetables and fruits, especially those grown near highways. though a thorough washing ought to remove about half the lead.

ther, less widespread contributors to the problem include lead cooking utensils and lead-containing fertilizers and pesticides. Even dinner plates, cups, and glasses pose a danger. Atoms of toxic lead can dissolve from the glaze of imported ceramicware that hasn't been fired at the high temperatures legally required in the United States. Don and Fran Wallace of Seattle learned that the hard way. In 1978, when Don was an Air Force lieutenant colonel stationed in Italy, the couple bought a charming set of terra-cotta dishes in a small village. Soon after the purchase Don became uncharacteristically

irritable and aggressive. He lost more than 30 pounds and suffered from insomnia and pains in his wrists and forearms. By 1981 the Wallaces had moved to Seattle, where Fran became gravely ill with body aches, anemia, and dehydration. After searching through medical books, Don insisted they be tested for lead poisoning. The two were found to be severely poisoned. By the process of

elimination Wallace traced the source to the Italian dishes, especially two coffee mugs that, tests showed, released over 300 times more lead than FDA standards

Imports account for more than 60 percent of U.S. ceramic dinnerware sales, and the FDA has stepped up inspection of foreign-made dishes, stopping more than 1,000 shipments last year

after they were discovered to release lead. Most violations were found in products from developing countries.

How much lead is harmful? Until 1970, contamination was considered dangerous only at blood levels associated with extreme symptoms of poisoning: convulsions, brain swelling, and acute kidney disease in children who registered 80 micrograms or more of lead per

deciliter of blood; stomach pains, hallucinations, and wrist weakness in factory workers with the same elevated blood lead levels. But as Olivia Sanders's case shows, low-level lead poisoning can cause symptoms that, while subtler, are no less serious.

When doctors began identifying symptoms at significantly lower blood levels in the 1970s, the Centers for

### **GETTING THE LEAD OUT OF YOUR LIFE**

Most experts see government intervention as a solution to the lead problem: regular blood screening for children and pregnant women at high risk; injection of chemicals into public drinking water to reduce corrosiveness: elimination of lead additives from gasoline; and removal of polluted topsoil from playgrounds and school yards Each of these steps, however, requires that the government take direct action. something it generally does slowly, at best. As usual, therefore, the first and fastest line of defense is consumer awareness Here's what you can do:

- Check for chipping, flaking, or cracking paint in your home Have the chips tested by your local county health department If the chips contain lead remove and replace the paint immediately If you remove the paint yourself, use a sander and wear a surgical-type mask. Don't use a heat gun, which torches the lead into toxic fumes
- Since lead pollution of water occurs most often in residential plumbing and in service linesthe pipes that link residences to the municipal water supply—it's important to test water directly from the tap (And before you buy a house, have the water tested

from a first draw—water that's been sitting in the pipes all night and again during the day.)

Homeowners unable to get their city or county water departments to do the testing can pay to have a private laboratory test the water usually by mailing in a sample. WaterTest Corporation (1-800-426-8378), a mail-order laboratory based in Manchester, New Hampshire, charges \$19.95 plus \$2 shipping and handling to test two draws of water in plastic bottles provided by the company If analysts find a high lead count, they notify the customer by

phone, then send a computerized report and a brochure recommending remedies. Similar services are available from Suburban Water Testing Laboratories of Temple, Pennsylvania (1-800-433-6595; fee \$25, including postage) and National Testing Labs of Cleveland, Ohio (1-800-458-3330; fee \$29, including postage).

If there is lead in the line, a stopgap remedy is to run the tap water for three minutes before using it, to flush out accumulated contaminants. This must be done for every drinking faucet; taking a



One lead-poisoning victim is now marketing his own home test for measuring the lead content of dishes. A single kit can test 100 dishes.

shower will not flush your kitchen tap. Also be sure to use water only from the cold water tap for drinking, cooking, and especially for making baby formula. Hot water is likely to contain more dissolved lead. The installation of carbon filters, sand filters, or cartridge filters is generally not helpful since these devices remove some water contaminants but not lead. More-effective cures include replacement of lead joints and pipes with ones made of copper (be sure to use lead-free solder), and the use of bottled water. After a lengthy battle with municipal officials, the Sanders-Southerland family was happy to find that the municipality, not the homeowner, was responsible for replacing service lines.

■ Overseas travelers, especially in Third World countries, should beware of ceramic dinnerware; its lead glaze may not be fired at the high temperatures required to prevent chipping, flaking, and leaching of lead particles into food. The same caution should be extended to dishes manufactured in the United States before the 1970 government crackdown on poorly fired domestic and imported dishware, Lead-poisoning victims Don and Fran Wallace have marketed a simple home test for lead content of dishware (available for \$24 50 from Frandon Enterprises, 511 N, 48 St. Seattle, Wash., 98103). One kit is good for 100 items.

## An estimated 17 percent of preschool children have dangerous blood lead levels.

IO range of 125 or above, while 5 percent of children who were virtually unexposed to lead did score this high.

Disease Control kept lower-

ing the point at which pa-

tients should be treated for

lead poisoning. Today many

physicians consider the cur-

rent CDC standard of 25 mi-

crograms per deciliter to be

The most influential early

study of lead's low-level

effects was published in 1979

by Herbert Needleman, then

at Harvard, now professor of

psychiatry at the University

of Pittsburgh Medical

School. Testing first- and sec-

ond-grade students in the

Boston area, he found the

lowest IQ, academic achieve-

ment, language skills, and at-

tention span among children

with the highest body bur-

dens of lead. None of their

lead levels exceeded the

CDC's toxicity threshold.

"Until then it was generally

thought that a child had to be

sick to lose intellectual func-

tion or have behavior disor-

nstead of testing blood

samples, which was the

norm at the time. Needleman

measured lead levels found in

the children's baby teeth. He

found that children with den-

tal lead levels of 10 parts per

million or less had IQs averaging four points higher than

those with levels of 20 parts

per million or more. Worse,

he found that the children

with higher lead levels were

nearly four times more likely

to have IQ scores below 80

and seven times more likely

to suffer learning disabilities.

No children with lead levels

between 15 and 35 parts per

million scored in the superior

ders," says Needleman.

medically obsolete.

"If that five percent were to be lost, too," Needleman says, "it would be an enormous social loss.'

The small amount of research done so far on lead's long-term effects suggests

that intellectual impairment may be irreversible. When the first-graders in Needleman's study were retested five years later, those who had originally shown higher lead levels still exhibited significant IO deficits and required more special-education classes than did the children who had been considered virtually unexposed.

The latest evidence suggests that lead can imperil unborn children who absorb the metal from mothers exposed to even small doses. A study reported in the New England Journal of Medicine in April of this year by Needleman and others found that children who had absorbed the most lead while in the womb performed significantly worse on developmental tests in their first two years of life than did children with low exposures.



Lead from auto exhausts, factories, and paint contaminates soil, water, and air. Creeping up the food chain, the metal may poison much of what we eat and drink.



# "If you had children with scarlet fever or whooping cough at these numbers, you'd have a mutiny in the streets."

Not surprisingly, the lead industry refutes new findings about the sources and effects of low-level lead poisoning. Werner Meyer, Lead Industries Association president, notes that although lead causes measurable physical changes, there's no proof those changes are harmful. He bristles at "nonscientific accusations by extremist environmentalists intent on grabbing headlines," and claims "the amount of lead in water, the latest hue and cry by pseudoscientists, is vastly overblown." Most lead in the environment, he adds, comes not from man, but from eons of volcanic eruptions.

The global record of lead emissions, as revealed in polar snow strata, ocean sediments, tree rings, and skeletal remains, tells a different story, however. It shows two big leaps in atmospheric lead levels—one at the start of the Industrial Revolution, another in the 1920s, when lead was first added to gasoline.

In some cases the treatment for low-level lead poisoning can be as simple as removing the victim from the source of pollution. For Olivia Sanders, that was enough. Her symptoms began to abate two months after she stopped drinking tap water: she began eating and sleeping better, became less irritable, and stopped losing weight. After six months she'd gained height and weight and become more outgoing. No one knows what the long-term effects of lead poisoning may be for Olivia or her twin.

Nor does anyone know how to ensure that lead victims like Olivia have been entirely removed from the source of contamination. In-

deed, it's often impossible to predict just what water will be safe. Jeanne Briskin of the EPA reports that in uncounted schools across the country, the tanks used to store drinking water for fountains may be entirely lead lined. Even the child whose parents have removed the lead threat at home may still be taking great gulps of the metal dozens of times every school day.

Children with blood lead levels higher than Olivia'susually above 35 micrograms per deciliter—and acutely poisoned adults are treated with chelating drugs, chemicals that speed the excretion of lead from the system but have dangerous side effects. Denise Wadleigh's son required chelation, as did the Wallaces.

Early detection is vital says the American Academy of Pediatrics, which recommends regular screening for pregnant women and young children; men at risk for hypertension should also have their blood levels tested regularly. Prevention is even more important. For the individual that means testing potential household sources of pollution (see "Getting the Lead Out of Your Life," page 72) and eating right: a diet with adequate protein, low in saturated fats, and rich in minerals like iron, zinc, and calcium helps protect against lead poisoning.

Is it possible to lead leadfree lives? "If we cleaned up the environment and optimized nutrition," says Needleman, "blood levels could drop as low as three to five micrograms per deciliterwhat they are in primitive cultures."

Public health specialists

have intensified efforts to control the pollutant. The EPA plans to reduce by 60 to 80 percent the amount of lead permitted in drinking water, from 50 parts per billion to no more than 20. In early October the agency ruled that most water companies must inform customers of lead levels in their drinking water and of the dangers posed by the metal. The leaded-gas phaseout is supposed to continue, and the agency's Superfund is to provide \$15 million for a demonstration project to test the feasibility of soil cleanup. The FDA is pressing for further reductions in lead solder in cans, and HUD has finally come up with plans to survey lead paint in federally insured, owned, and subsidized housing.

Some physicians are surprised that this silent epidemic hasn't caused more of a stir. "I think people still see it as a disease of minorities,' says Needleman. "But we've known about the gross effects of lead for centuries."

Paul Mushak, adjunct professor of environmental pathology at the University of North Carolina School of Medicine and a principal coauthor of the Agency for Toxic Substances report, agrees with Needleman and confesses impatience with people who quibble over the magnitude of the problem. "Is it tolerable that our kids aren't as bright as they could be? If it doesn't put people in the hospital, it isn't a serious threat. If you had children, with scarlet fever or whooping cough at these numbers, you'd have a mutiny in the streets. Our children and people in risk groups shouldn't be held hostage to a preventable disease."

Michael Weisskopf has the "poisons" beat at the Washington Post.