

## Dangers of Lead Still Linger

by Dixie Farley

The hazardous substance lead was banned from house paint in 1978. U.S. food canners quit using lead solder in 1991. And a 25-year phaseout of lead in gasoline reached its goal in 1995.

As a result of such efforts, the number of young children with potentially harmful blood lead levels has dropped 85 percent in the last 20 years, as shown in National Health and Nutrition Examination Surveys conducted by the National Center for Health Statistics. Interested in measuring the impact of lead solder's removal from food cans, the Food and Drug Administration funded collection of the data during the 1976-1980 period and has continued to support the survey efforts.

Similarly, FDA's 1994-1996 Total Diet Studies showed that, since 1982-1984, daily intakes of lead from food dropped 96 percent in 2- to 5-year-olds (from 30 micrograms a day to 1.3) and nearly 93 percent in adults (from 38 micrograms a day to 2.5).

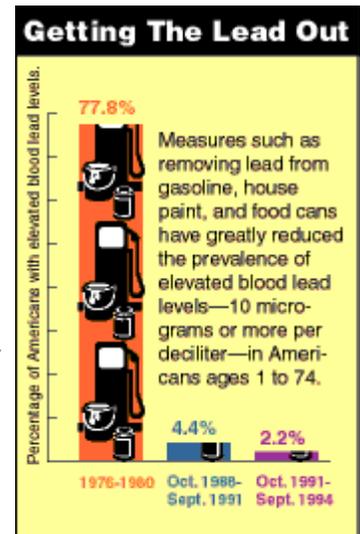
Yet in 1997, FDA approved a new, portable blood lead screening test kit for health professionals to use. In the face of so much success, why is another screening tool even necessary?

The answer: Lead is still around.

Lead paint abounds in older housing. The deteriorating paint exposes youngsters indoors to lead-laden dust and paint chips and outdoors to exterior paint lead residues in nearby soil--residues that remain unless removed. Lead particles emitted by the past use of leaded gasoline are also in the soil, especially near major highways. Lead persists at some work sites and, occasionally, in drinking water, ceramicware, and a number of other products.

"The risk of lead exposure remains disproportionately high for some groups, including children who are poor, non-Hispanic black, Mexican American, living in large metropolitan areas, or living in older housing," the national Centers for Disease Control and Prevention noted in its Feb. 21, 1997, Morbidity and Mortality Weekly Report. Indeed, CDC reports that nearly a million children under 6 still have blood lead levels high enough to damage their health. While CDC considers the blood lead level of concern in adults to be 25 micrograms per deciliter (mcg/dL) of blood, this level in young children is only 10 mcg/dL.

Based on CDC's levels, FDA's "tolerable" daily diet lead intakes are 6 mcg for children under age 6, 25 mcg for pregnant women, and 75 mcg for other adults. However, some risk exists with any level of lead exposure, says toxicologist Michael Bolger, Ph.D., chief of FDA's contaminants branch in the Office of Plant and Dairy Foods and Beverages.



And harmful levels need never occur, according to Sheryl Rosenthal, M.S.P.H., R.D., a lead educator at FDA's Center for Food Safety and Applied Nutrition. "Lead poisoning is preventable and just should not happen today," she says.

## **Lead Absorption**

While adults absorb about 11 percent of lead reaching the digestive tract, children may absorb 30 to 75 percent. When lead is inhaled, up to 50 percent is absorbed, but less than 1 percent of lead is absorbed when it comes in contact with the skin. The body stores lead mainly in bone, where it can accumulate for decades.

"Anyone in poor nutritional status absorbs lead more easily," adds Cecilia Davoli, M.D., a pediatrician with Kennedy Krieger Institute's Lead Poisoning Prevention Program, in Baltimore. Calcium deficiency especially increases lead absorption, as does iron deficiency, which can also increase lead damage to blood cells. A high-fat diet increases lead absorption, and so does an empty stomach.

## **The Risks of Lead**

Lead disrupts the functioning of almost every brain neurotransmitter, says David Bellinger, Ph.D., a psychologist and epidemiologist at Children's Hospital in Boston. Neurotransmitters are chemical messengers between the body's nerve cells. The messenger calcium, for example, is essential to nerve impulse transmission, heart activity, and blood clotting, but if it doesn't work right, affected systems may also be askew.

"Lead fits into binding sites that calcium should," Bellinger says, "so it can disturb cellular processes that depend on calcium. But there's no unifying theory that explains in detail what lead does to the central nervous system, which is where lead typically affects children."

Bellinger estimates that each 10 mcg/dL increase in blood lead lowers a child's IQ about 1 to 3 points.

"Evidence is less clear," he says, "on whether mild blood lead elevations in pregnancy cause permanent effects on the fetus. Studies have tended not to find that early developmental delays related to minor fetal exposure carry through to school age, when IQ is measured." Studying middle- and upper-middle-class children exposed before birth to mild lead levels, Bellinger and colleagues found delays in early sensory-motor development, such as grasping objects, but did not find such effects by school age.

However, he adds, "When lead exposure in the uterus is quite high, the impact can be devastating on the fetus, causing serious neurological problems."

High lead exposures can cause a baby to have low birth weight or be born prematurely, or can result in miscarriage or stillbirth.

"Symptoms of lead poisoning can be highly variable depending, in part, on the age of the child, the amount of lead to which the child is exposed, and how long the exposure goes on," says pediatrician Randolph Wykoff, M.D., FDA associate commissioner for operations. Children exposed to lead may have no symptoms, he says, or may report sometimes vague symptoms, including headache, irritability or abdominal pain.

While a child's chronic exposure to relatively low lead levels may result in learning or behavioral problems, Wykoff says that "higher levels of exposure can be associated with anemia and changes in kidney function, as well as significant changes in the nervous system that may, at extreme exposures, include seizures, coma and death."

In adults, lead poisoning can contribute to high blood pressure and damage to the reproductive organs. Severe lead poisoning can cause subtle loss of recently acquired skills, listlessness, bizarre behavior, incoordination, vomiting, altered consciousness, and--as with children--seizures, coma and death. Poisoning without severe brain effects can cause lethargy, appetite loss, sporadic vomiting, abdominal pain, and constipation.

By the time symptoms appear, damage is often already irreversible.

"The most important thing for families to do," says Baltimore's Davoli, "is to learn what steps they can take to prevent lead poisoning. We don't want to get to treatment. And they should take their children to the doctor regularly for checkups and, if the children are at risk, get blood lead tests done."

Critical to prevention is focusing on the important lead sources. FDA's Rosenthal says, "Dealing with sources of lead means recognizing them in your family's environment, knowing which ones contribute significant exposures, and eliminating or avoiding those exposures."

### **Top Contaminator: Lead Paint**

America's No. 1 source of lead exposure in children is deteriorating lead paint in older housing. Because young children frequently put their thumbs and fingers and objects they handle in their mouths, they are easily poisoned from chronic ingestion of lead paint chips and house dust or soil that may have lead particles in it.

The Consumer Product Safety Commission (CPSC) banned house paint having more than 0.06 percent lead in 1978. But housing built before then, particularly before 1950, may contain lead paint. The Environmental Protection Agency and Department of Housing and Urban Development require owners of pre-1978 housing to give prospective buyers or renters federally approved information on the risk. Buyers must have 10 days to inspect for lead-based paint before being obligated by a contract.

Improper housing renovation increases exposure. The riskiest practices are sanding, scraping or removing lead paint with a heat gun, which taint the air with lead paint dust. CPSC warns: There is no completely safe method for do-it-yourself removal of lead paint. Only experts should remove lead paint.

For more information about lead paint, see ["Protect Your Family from Lead Poisoning."](#)

### **Occupational Hazards**

Clark Carrington, Ph.D., of FDA's dairy foods and beverages contaminants branch, names workplace exposure as the next major potential source of lead. Besides their own exposures, workers may bring lead dust home on clothes, hands or hair, exposing children in the household.

Occupations that may expose workers to lead include painting, smelters, firearms instruction, automotive repair, brass or copper foundries, and bridge, tunnel and elevated highway construction.

To help protect workers from such exposure, the Occupational Safety and Health Administration calls for removal of workers from the workplace if their blood lead levels reach 50 mcg/dL. EPA limits lead emissions from certain industries.

### **Keeping Drinking Water Safe**

Certain drinking water systems can also pose a lead risk.

Under EPA rules, if lead exceeds 15 parts per billion (ppb) in more than 10 percent of public water taps sampled, the system must undergo a series of corrosion control treatments. The main culprits are corroded lead plumbing, lead solder on copper plumbing, and brass faucets. Lead is highest in water left in pipes for a long time--for example, when the faucet isn't used overnight.

FDA's quality standard for bottled water requires that lead not be present at 5 ppb, the lowest concentration that generally available methods for water analysis can reliably measure. If bottled water contains lead above this level, it is subject to regulatory action, including removal from the marketplace.

## **Lead in Ceramicware**

Some ceramicware has lead in the glaze and may introduce small amounts of lead in the diet, which the body can tolerate, says Carrington. "The major problem with ceramicware is the rare poorly made piece with very high levels of leaching lead."

Bolger adds that even with these pieces, risk varies. "A plate coming in brief contact with food is not an issue," he says, "but storage of food in such a bowl or pitcher is a risk." It's especially wise to avoid storing acidic foods like juice and vinegar in ceramicware, as acids promote lead leaching.

FDA has established maximum levels for leachable lead in ceramicware, and pieces that exceed these levels are subject to recall or other agency enforcement action. The levels are based on how frequently a piece of ceramicware is used, the type and temperature of the food it holds, and how long the food stays in contact with the piece. For example, cups, mugs and pitchers have the most stringent action level, 0.5 parts per million, because they can be expected to hold food longer, allowing more time for lead to leach. Also, a pitcher may be used to hold fruit juice. And a coffee mug is generally used every day to hold a hot acidic beverage, often several times a day.

Michael Kashtock, Ph.D., chief of FDA's Office of Plant and Dairy Foods and Beverages enforcement branch, says, "FDA allows use of lead glazes because they're the most durable. But we regulate them tightly to ensure their safety. Commercial manufacturers ... employ extremely strict and effective manufacturing controls that keep the lead from leaching during use." Small potters often can't control the firing of lead glazes as well, he warns, so their ceramics are more likely to leach illegal lead levels, although many do use lead-free glazes. "The best advice is to stick to commercially made products. If you are going to buy something hand-made or hand-painted, get assurance that lead-free glazes were used," he says.

Antique ceramicware may leach high levels of lead. Consumers can use a lead test kit from a hardware store on such pieces and on other hand-painted ceramicware they may already own. Avoid using such items--particularly cups, mugs or pitchers--if the glaze develops a chalky gray residue after washing.

"And you want to make sure," says Rosenthal, "that you know whether an item is for food use, or if it's for decorative use only." FDA requires high-lead-leaching decorative ceramicware to be permanently labeled that it's not for food use and may poison food. Such items bought outside the United States may not be so labeled, potentially posing serious risk if used for food.

## **Other Lead Sources**

### **Tin-coated lead foil capsules on wine bottles:**

FDA banned these capsules in 1996 after a study by the Bureau of Alcohol, Tobacco and Firearms found that 3 to 4 percent of wines examined could become contaminated during pouring from lead residues deposited on the mouth of the bottle by the foil capsule.

U.S. winemakers stopped using lead foils before the ban, but older bottles with the foils may still be around. "Remove the entire foil before using such wines," says attorney Martin Stutsman, a consumer safety officer in FDA's dairy foods and beverages enforcement branch. "Then before uncorking the bottle, wipe its neck and rim and the top of the cork with a clean wet cloth."

#### Lead-soldered food cans:

Despite U.S. food canners' voluntary elimination of lead solder and a 1995 FDA ban on lead-soldered cans, requiring their removal from shelves by June 1996, this source of lead in the diet hasn't been fully eliminated. Some countries still use lead-soldered cans for food, and these food items may still occasionally be imported, albeit illegally, into the United States. Also, some small vendors may still stock old inventories of food in lead-soldered cans. In fact, a 1997 FDA investigation found more than 100 such cans in ethnic grocery stores in California alone.

#### Glassware:

Lead crystal glassware may leach lead. "The crystalware industry has established voluntary lead-leaching limits for crystalware," says Kashtock, "that most foreign and domestic manufacturers follow." As a precaution, children and pregnant women should avoid frequent use of crystal glassware. Lead crystal baby bottles should never be used.

Also, FDA intends to issue industry guidance in 1998 to prohibit use of lead-based (and cadmium-based) pigments for decorating the lip rim area of glassware, says Kashtock. "Use of the pigments may pose only a negligible risk, but it is avoidable."

#### Calcium products:

Some people have expressed concern about lead in calcium supplements. Lead is a common contaminant in calcium from such natural sources as dolomitic limestone and oyster shells, but levels vary considerably from trace amounts to higher levels. However, FDA's Carrington says, "Since calcium intakes decrease lead absorption, supplements that correct low calcium intakes may reduce lead absorption, even though they contain small amounts of lead."

Lead is also found in other calcium sources. For example, lead in milk is usually too low to measure, but FDA's yearly Total Diet Study of foods in grocery stores sometimes detects lead in milk, says Carrington.

FDA has been petitioned to establish a tolerance level for lead in calcium sources used in dietary supplements. According to Robert Moore, Ph.D., of the agency's Office of Special Nutritionals regulatory branch, two petitions propose different tolerance levels--one similar to current industry standards and one considerably lower. FDA is reviewing the issues raised in the two documents.

#### Progressive hair dyes:

Applied over time to gradually color the hair, these dyes contain lead acetate. After studying information on their safety, FDA found that lead exposure from these dyes was insignificant and that the dyes could be used safely, says John Bailey, Ph.D., director of FDA's Office of Cosmetics and Colors. "But we restricted how much could be in the product, and we required specific labeling instructions, including a warning to keep it out of the reach of children."

#### Kajal and surma, or kohl:

These unapproved dyes in certain eye cosmetics from the Middle East contain potentially harmful amounts of lead. A 7-month-old in 1992 had a 39 mcg/dL blood lead level due to surma applied to the lower inner eyelid. Bailey says, "They are sold in stores specializing in Middle East products or brought into the country in personal luggage." He stresses that people using these cosmetics "need to understand the potentially serious health risk."

### Foreign digestive remedies:

Certain unapproved foreign digestive remedies containing lead include Alarcon, Azarcon, Coral, Greta, Liga, Maria Luisa, or Rueda. Greta, for example, is 99 percent lead oxide.

FDA orders the detention at U.S. borders of items known to possibly contain potential harmful levels of lead, including the Middle East eye cosmetics, the foreign digestive remedies, lead crystal baby bottles, and many other prohibited items. Lead sources outside FDA's purview include lead-based artists' paints, lead solder used in electronics work and stained glass, fishing weights, lead toy soldiers, and old painted toys and furniture.

Reflecting that these many lead sources are not all in every family's environment, new CDC screening guidance calls for state lead-poisoning prevention programs to identify communities at risk of high exposure and recommend appropriate screening. (See the accompanying article, "Screening and Treatment.") To this end, CDC funded 30 state and 10 local programs in 1996.

When announcing the new guidance, Health and Human Services Secretary Donna E. Shalala said, "Lower lead levels for America's children constitute a public health achievement of the first importance. But a significant number of children are still at risk for high lead exposure, and we have to finish the job on their behalf."

For a quick reference guide, see our [one-page summary of some sources of lead poisoning](#) (a 77K PDF file).

*Dixie Farley is a staff writer for FDA Consumer.*

*(Source for the graphic at the beginning of the article: National Health and Nutrition Examination Surveys, National Center for Health Statistics)*

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## Screening and Treatment

Decisions about who needs lead screening should be made by individual doctors as well as state health departments, who can examine local lead hazards and conditions to determine which children are at risk of lead exposure, according to 1997 guidance issued by the national Centers for Disease Control and Prevention.

A new screening test is especially suited for use in isolated U.S. rural areas and in developing countries. In September 1997, FDA approved the LEADCARE In Office Test System, a portable blood lead screening kit for health professionals' use in areas lacking refrigeration and other complex equipment needed with previously approved tests. Manufacturers developed the quick, easy and reliable kit in conjunction with CDC.

FDA has approved three drugs that bind to, or chelate, lead molecules so the body can remove them in urine and stool. Calcium Disodium Versenate (edetate calcium disodium) requires injections or intravenous infusion in the hospital. Along with this drug, BAL (dimercaprol), also injected, may be used. The pediatric oral drug Chemet (succimer) may be taken at home, but it's important to eliminate the lead sources. Like other chelator drugs, Chemet should not substitute for effective environmental assessment and removal of the source of lead exposure.

These drugs may have side effects, however, so doctors closely monitor their patients during treatment.

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## Want More Information?

Centers for Disease Control and Prevention  
Childhood Lead Poisoning Prevention Program  
<http://www.cdc.gov/nceh/lead/lead.htm>

Consumer Product Safety Commission  
1-800-638-CPSC  
TDD: 1-800-638-8270  
<http://www.cpsc.gov/>

Environmental Protection Agency's Safe Drinking Water Hotline  
1-800-426-4791  
<http://www.epa.gov/opptintr/lead/index.html>

National Lead Information Center  
1-800-LEAD-FYI  
clearinghouse: 1-800-424-LEAD  
TDD: 1-800-526-5456  
<http://www.nsc.org/ehc/lead.htm>

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