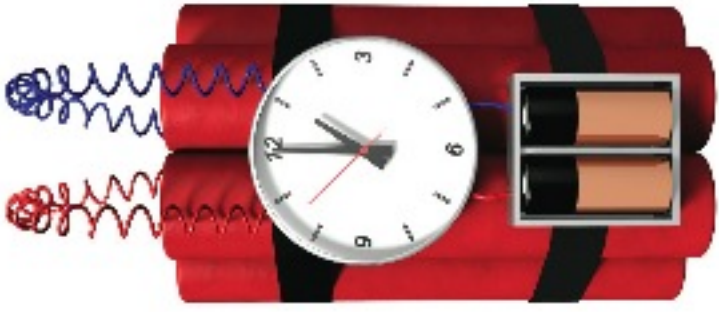
ENVIRONMENTAL

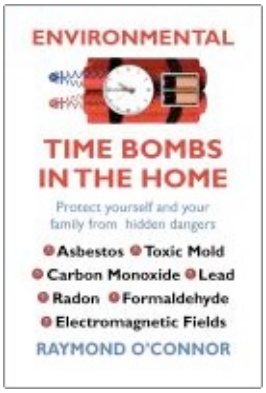


TIME BOMBS IN THE HOME

Protect yourself and your family from hidden dangers

- Asbestos
- Toxic Mold
- Carbon Monoxide
- Lead
- Radon
- Formaldehyde
- Electromagnetic Fields

RAYMOND O'CONNOR



A truly unique book that presents, in plain language, the most current evidence that adverse health effects can result from lead, asbestos, carbon monoxide, formaldehyde, mold, radon, and wireless networks and devices in a home. Some of these effects may not show up for years--even decades--after exposure. This book describes methods for detecting and evaluating these hazards, and reducing or eliminating them.

Environmental Time Bombs in the Home

ENVIRONMENTAL TIME BOMBS IN THE HOME

RAYMOND O'CONNOR

SHAMROCK PRINT MEDIA
Santa Barbara, California

WARNING – DISCLAIMER

This book is intended to provide information about the potential health risks in the home environment that are known to be associated with a number of chemicals, a living organism, and a form of radiation generated by electric current and cordless phones. Every effort has been made to insure that the information is correct and current as of the date of publication.

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-ONE-
OSTRICHES BEWARE!

ON A WINTRY NEW YORK FRIDAY in 1993, a terrorist's bomb hurled death and destruction from its hiding place in the bowels of the World Trade Center. It claimed the lives of six innocent people, sickened more than a thousand, and evoked a national chorus of fear and outrage. Politicians demanded that those responsible be swiftly tracked down and punished, and law enforcement agencies complied with dizzying speed, announcing the first arrests even as teams of specialists were still sifting the rubble.

More than two years later, the economic aftershocks were still being felt. Structural repairs, business losses, and law-enforcement costs had passed the $50 million mark and were still climbing. The bombing was a disaster in every way.

However, monstrous and devastating as it was, it doesn't begin to match the carnage caused by bombs of another sort: environmental time bombs hidden in our homes. By some estimates, on a single day they are responsible for more than seventy deaths and they mark several hundred more persons for future illness. They may already have retarded the physical, intellectual, or emotional development of every fourth child under the age of seven. And the long-term economic impacts resulting from these hazards may exceed the direct damage caused by Hurricane Katrina.

Like time bombs, these hazards give no warning to their unsuspecting victims, and some of them may do their dreadful work after decades of lying silent and hidden.

Their possible effects include cancers of the lungs, blood, and brain; nerve and kidney damage; hearing, sight, and IQ losses; increased infant mortality; and retarded physical, mental, and emotional development.

What are these hazards? They are:

- ***asbestos***
- ***carbon monoxide***
- ***formaldehyde***
- ***lead***
- ***radon***
- ***molds***
- ***electromagnetic fields (EMFs)***

Where are they? They may be hiding in the food we eat, the water we drink--even the very air we breathe. They may be lurking in materials used to build, repair, remodel, or furnish our dwellings. There may even be danger from the earth that supports and surrounds our homes, and from energy fields that come from electrical appliances, nearby power lines, and wireless phones. In other words, that part of the environment that lies in and around our homes may be as threatening to us as a time bomb.

"Wait!" you say. "Surely, if all this is true, there would be a public outcry and warnings on television; public service announcements like the ones about smoking, drug use, or driving while drunk; demands for action; lawsuits. After all, look at the furor that followed the World Trade Center bombing, where only six people died."

Ah! But federal and some state agencies *have* issued warnings about these potential hazards (although not nearly enough), and *have* used their regulatory powers to reduce or eliminate exposure to lead, formaldehyde, and asbestos. And there *have* been lawsuits. Class action suits filed by persons exposed to asbestos have driven giants like PABCO and Manville Corporation into bankruptcy. Yet most citizens are either unaware of, or poorly informed about, potential health hazards that may exist in their own homes.

Some people may put the risks from lead or asbestos exposure on a par with dust mites and pet dander, but they are by no means equivalent. Radon, asbestos, and formaldehyde have been proven to cause cancer; lead and carbon monoxide are insidious poisons.

There are a number of reasons why you may not know as much as you should about these potential threats to your health. The following are some of the important ones that prompted me to write this book:

BAD NEWS IS POLITICALLY UNPOPULAR. The party in power must retain its popularity or lose its power. Even when the bad news can't be avoided, the federal government is very reluctant to deliver it all at once, as shown by its constant revision of unemployment figures, the size of the budget deficit, and the ongoing costs of the occupation of Iraq and the war in Afghanistan.

The last thing the government wants to tell us is that we are in the midst of an environmental plague. That may be one of the reasons that the Environmental Protection Agency delayed for years, and scrapped after a few showings, a series of public service announcements featuring television personality Felicia Rashad of *The Cosby Show,* that were intended to alert the public to the possible presence of lead in their homes and its potentially devastating effect on small children.

GOVERNMENTS HAVE GIVEN ECONOMIC FACTORS TOO MUCH WEIGHT WHEN HARD CHOICES HAVE TO BE MADE. Example: federal and state governments depend heavily on tax revenue from the sale of tobacco products and alcoholic beverages. (The Treasury Department's Alcohol, Tobacco Tax and Trade Bureau's budget Website included the fiscal year 2008 goal: "collect roughly $15 billion in excise taxes." So what happened when Washington had to choose between loss of revenue and warning people of the hazards of smoking and tippling? Let's look at the record.

Studies showing a clear link between smoking and lung cancer were published in *1950* by Wynder and Graham, and were followed by other studies that confirmed the connection. Tobacco companies denied that cigarettes were to blame and called for more studies; meanwhile the government did nothing.

By 1952 even the popular press had become involved in the dispute, and *Reader's Digest* carried an article called "Cancer by the

Carton." By this time the government had mastered the art of doing nothing, so it did nothing for another twelve years.

Finally, in 1964, the Surgeon General decided that that it was time to tell the American people that **cigarette smoking can cause cancer.** ***Yet, despite this announcement, warning labels weren't required on tobacco products until January 1966! And it took the government an additional twenty-seven years to declare that we are also at risk from secondhand smoke!***

If anything, it's possible that the government deserves even less credit for its handling of **fetal alcohol syndrome, which is a collection of defects and deficiencies found among babies whose mothers had consumed alcohol during pregnancy. A 1967 study suggested the connection,** ***but warning labels weren't required on alcoholic beverages until 1989!***

The really sad thing is that the warning had been given by the Greeks more than two thousand years earlier. They were aware that drinking during pregnancy might result in the birth of children with defects and, in the Greek city of Carthage, a bride and groom were prohibited from drinking alcohol on their wedding night.

As will be shown in later chapters, *observations linking asbestos with health problems were made hundreds of years ago, and suspicions about lead surfaced even earlier.* While other governments took steps to lessen these dangers, ours has often fiercely resisted doing anything that would put restrictions on businesses.

It would be unfair, and untrue, to say that the government hasn't tried to inform the public about *some* of the hazards that are the subject of this book. For example, the 1995 Federal Lead-based Paint Poisoning Prevention Act requires the owner of a house built before 1978 to disclose to potential buyers or tenants that lead-based paint may be present. And most states now require that real estate transactions include a disclosure about the possible presence and potentially harmful effects of radon.

However, warnings about the dangers of lead and radon have frequently been presented as news items and tend to get lost between reports of terrorist bombings, astronomical deficits, and the misbehavior of politicians. The few articles that *have* been published seem designed to alert, but not to inform the public, and are usually too fragmentary to be of any real value. And, when, if ever, have you seen on TV one of the EPA's public service announcements about radon? They may be viewed on the Internet (I'll tell you later where to find them) and one of them (*Take the National Radon Test: Man on the Street) w*as awarded an Emmy in 2001, but your chances of seeing one are slim to none.

THE COST OF REDUCING OR ELIMINATING THESE HAZARDS WILL BE STAGGERING. It will cost billions of dollars and require drastic changes in industries that account for about one-fifth of our gross national product. Asbestos, for example, was used in more than two thousand products, from hair dryers to automotive brake linings, and finding satisfactory substitutes for it has been both difficult and expensive. Here's just one example: despite advances in materials science, asbestos-free brake linings are noisier and wear out sooner. Even after studies have shown a connection between an agent and a disease, changes take place with agonizing slowness. Unfortunately, banning the use of asbestos and lead hasn't made the problem go away. We've incorporated mountains of asbestos into our buildings and scattered millions of tons of lead over the land. It is still necessary to find and eliminate *all* sources of lead in existing homes and to screen children for possible damage—and that has been neither cheap nor easy.

PROVING THAT THERE'S A DIRECT LINK BETWEEN A POTENTIAL HAZARD AND A DISEASE IS OFTEN DIFFICULT. For example, in many cases symptoms of respiratory disease didn't show up until 30 to 40 years after asbestos fibers were inhaled. When that much time has passed, it's almost impossible to go back and get accurate exposure data. It's like trying to prove a connection between a current parasitic infection and possibly-contaminated water that you drank five years ago.

Further complicating the results is the fact that all humans are not alike, and that many of the people who have had the greatest

exposure never do get sick. Although there is now little doubt that long-term exposure to high levels of asbestos or radon can cause cancer, wrangling continues over the risk associated with shorter exposures or lower levels.

The debate over the dangers of electric and magnetic fields (EMFs) that are produced by the passage of electric current through a conductor began 30 years ago, after studies showed an association between exposure to magnetic fields surrounding power lines and childhood leukemia. This association has been verified by a number of later studies.

Today, there are more questions about EMFs than answers. Despite these studies, and researchers' inability to explain observed effects of low-energy EMFs on isolated cells, tissues, and even whole organisms, some scientists continue to insist that, from a theoretical standpoint, EMFs from mobile phones can't be the cause of these effects.

Even though the experts don't agree, the Swedish government decided that it was time to do something. Based on its own long-term study of cancer rates in relation to nearby power lines, Sweden has made expensive changes in its electrical distribution system.

The Swedish study didn't *prove* that magnetic fields from power lines cause cancer, so isn't this all a bit premature? Well, like you, when confronted by strong evidence but no actual proof, the Swedish government had three choices:

- Like an ostrich, it could have figuratively "put its head in the sand" and ignored the possible danger. Doing nothing would be praised as a wise decision if it turns out that EMFs aren't harmful, but condemned as a stupid and dangerous one if they are.

- The government could have chosen to make changes that were cheap and easy, and to delay others in the hope that they wouldn't be necessary.

- As you will see, the Swedish government chose the third option, that is, to reduce the exposure to EMFs because of the risk that was implied by the results of its own, and other, studies.

When it comes to your own living space, it is you who must decide how great the risks are and what, if anything, you are going to do about them. The purpose of this book is to provide information that will help you make your decision. It will summarize most of what is known about these potential hazards, explain how to determine whether they exist in your home, and describe steps you can take, and help you can get, to reduce or eliminate them.

WHAT'S AHEAD IN THIS BOOK?

THE NEXT SIX CHAPTERS deal with two chemical elements (lead and radon), two compounds (formaldehyde and carbon dioxide), a living organism (mold), and a mineral (asbestos).

The chapters have a similar pattern: an overview of the history, sources, characteristics, and probable locations of the hazard in the home environment; techniques for detecting and measuring the hazard; health problems (diseases and symptoms) associated with it and exposure levels at which symptoms are likely to occur; and a summary of the evidence that supports the inclusion of the hazard in this book. Each chapter also contains information about methods to remove or reduce the hazard.

Each chapter is followed by an appendix that lists some of the books, government reports and publications, articles from scientific journals, and other references used in preparing that chapter; numbers for telephone hotlines, or contact information, for federal or state agencies that can help you locate qualified and certified professionals to test for or deal with the hazard.

The final chapter presents some of the evidence regarding electromagnetic fields (EMFs) and their possible harmful effects. These are invisible forms of energy that are given off by many electrical sources, such as power lines, microwaves, and both cell

and cordless phones. There is persuasive evidence that EMFs can alter essential chemical processes, not only in cultured cells and tissues, but in whole organisms as well. Despite the release in 2009 (after a delay of four years) of a long-term study with significant funding by European cell phone industries that seems to exonerate cell phones, the shortcomings of the study, and the contrary evidence, just can't be dismissed, nor can the actions of other countries which, like France, have taken steps to reduce the exposure of children to radiation from cell phones.

The term "sick-building syndrome" was invented to describe a cluster of health problems that have been attributed to suspected mold infestations or other environmental factors. Although many studies have concluded that mold is a likely cause of some particular symptoms, few have been designed to rule out the possibility that the symptoms are caused by mold in combination with some other environmental factor.

However, as with the other potential hazards in this book, the present state of our knowledge will be presented, and the decision will be left to you.

Although it might seem more logical to arrange the hazards in alphabetical order and make the first chapter about asbestos, I've chosen to start with lead for three reasons: because there is increasing evidence that lead is unsafe in the body at *any* level; because it can have devastating long-term effects (especially in young children); and because lead is found in and around so many homes.

Offsetting these gloomy findings is the fact that the threat from lead *can* be readily assessed, and usually eliminated or reduced to acceptable levels.

At the end of this book there is an appendix devoted to things like measurement units and those pesky abbreviations (mistakenly called acronyms)—such as EPA, FDA, and CPSC.

Instead of an index, bold headings are used throughout each chapter to identify the topics, so that a reader can skim through the headings to locate topics that they want to know more about.

-TWO-
LEAD: DECADES OF BENEFIT, BUT CENTURIES OF HARM

LEAD IS A DENSE, SILVERY-GRAY METAL that is soft enough to cut with a knife and can be melted on a burner of your kitchen stove. It is generally not affected by chemicals other than strong acids and, unlike most metals, is a poor conductor of electricity.

Chemists have determined that lead is an element, which means that it can't be changed into any simpler material by chemical processes but it can combine with other elements (such as sulfur) to make various compounds. The compound of lead and sulfur is called *galena*, and is the most abundant naturally-occurring form of lead. Lead is a dense metal, like gold, mercury and chromium.

Lead was one of the first metals to be extracted from an ore, and a small lead-containing statue found in Turkey has been dated at about 6500 BC. Egyptians in 4000 BC used lead in glazes for pottery. Lead frames were used to hold together the stained glass pieces that formed medieval church windows.

Lead is easily rolled and molded. More than twenty centuries ago, the Romans formed it into dishes and coins, and made pipes of it to bring drinking water into their homes. Their name for lead was *plumbum*, and the word "plumbing" still refers to the water supply and waste systems in a building, although lead is no longer used for this purpose. Modern chemists use the symbol *Pb* to represent lead.

The Romans also favored lead-lined kettles over copper for boiling crushed grapes because this made the wine sweeter. They even added small amounts of lead acetate (also called "sugar of lead") to foods to sweeten them.

MORE RECENT USES OF LEAD & ITS COMPOUNDS

DURING MANY DECADES OF THE LAST CENTURY, lead or lead compounds were found in the following materials:

- foil wrapping in cigarette packages and foil capsules that covered the corks in wine bottles
- automobile batteries
- anti-knock additives for gasoline
- water and waste pipes and fittings
- solder for joining pipes and for sealing food cans
- bearings
- ammunition
- shields against x-rays and atomic radiation
- brass plumbing fixtures
- crystal and pewter tableware
- ceramic glazes
- paint pigments
- plastic mini-blinds
- vinyl siding
- vinyl lunch boxes
- shower curtains
- rain jackets and boots
- garden hoses
- weights in piano keys
- cosmetics and hair dyes
- folk remedies
- Mexican candies
- candle wicks
- curtain weights
- sinkers or weights for fishing gear
- crayons
- paints or finishes on children's toys
- artificial Christmas trees
- the coating of wires in Christmas tree lights
- flake white oil color; used to prepare canvas for oil painting
- tattoo inks

(So-called “lead” pencils don't really contain lead: they're made of a kind of carbon called graphite.)

Despite the bans on lead in gasoline and paint, we continued to use astronomical amounts of lead. In its 1980 report *Lead in the Human Environment*, The National Academy of Sciences estimated that lead use in this country amounted to 11.3 million tons per year (which translates to 11 pounds per person!) **and many of the products on this list are still available.**

It is very important to understand that the lead used in these products never goes away or changes into something else besides lead. I'll try to explain this using the example of carbon, another element that is very much in the news. Coal, oil, wood, and natural gas all contain carbon. When these fuels burn, they release energy as they combine with oxygen (an element found in the air) to form carbon dioxide. When the amount of oxygen is limited, some of the carbon may end up as carbon monoxide (the subject of a later chapter) or as tiny particles of pure carbon (the black stuff called soot); but the total weight of the carbon in the various products of combustion (assuming that none of the fuel escapes unburned) will equal the weight of the carbon in the fuel before it was burned. **In the same way, this means that those 11.3 million tons of lead used in 1980 are still around!**

WHY IS LEAD SO DANGEROUS?

IF LEAD WERE A CRIMINAL, it would be a crime wave all by itself. Unlike quick-acting chemicals such as cyanide, snake venoms, and strong acids, lead can accumulate in the body.

The lead in the body is not in the form of the metallic element, which doesn't dissolve in water and thus would not travel through the blood; it is in soluble forms that result when lead reacts with certain other chemicals. For the sake of simplicity we will still use the word “lead” to refer to these forms as well as to its solid elemental form, both of which are incredibly toxic.

Lead's toxic effects were recognized 2000 years ago by the Greek physician, Dioscerides, (who observed that lead “makes the mind give way”) and, in 14 BC, Roman architect Vitruvius noted pale complexions and various ailments in workers who used lead. Two hundred years ago, in a letter to a friend, Benjamin Franklin

described the “dry gripes” (colic–like symptoms) and “dangles” (wrist drop) observed in tinkers, painters, and typesetters, whose work brought them into contact with lead.

Modern industries chose to ignore these clear lessons from the past, and workers have paid the price. In 1921, three GM engineers discovered that the addition of tetraethyl lead to gasoline boosted performance and reduced “pinging” or “knocking”. Two years later, the severe illness of one of those engineers was traced to lead. During the following year, 15 refinery workers in New Jersey and Ohio suffered from mental derangement before they died from lead poisoning. *During the next six decades, lead was responsible for the deaths of 5000 Americans per year according to EPA estimates!*

Some of lead's toxic effects can be traced to the fact that the body treats lead in much the same way that it treats calcium and magnesium--both of which are elements that the body needs. Just like these essential elements, when lead enters the body it is delivered by the circulatory system to every organ and tissue, and is even incorporated into the structures of bones and teeth.

The body's inability to distinguish between lead and essential nutrients can have disastrous consequences. For example, lead can cause anemia (a condition in which the tissues don't get enough oxygen) by preventing the formation of hemoglobin molecules, the main carriers of oxygen in the blood. Anemia weakens the immune system. When this happens in children, they become vulnerable to infection. Lowered immune response may also contribute to the development of certain types of cancer.

Lead can also have a delayed effect. Calcium and magnesium in bones is constantly being changed, just as the money in your wallet changes as you spend and replace it. But, when the body's supply of calcium is low, either as a result of poor nutrition or certain hormonal changes (as in pregnancy or old age), these minerals leave the bones faster than they are put back. When this happens, some of the accumulated lead also spills out of the bones into the bloodstream and is carried to all parts of the body.

Because the bodies of infants and young children are growing and developing so rapidly compared with adults, they absorb lead about four times faster, and incorporate more of it into their tissues. *Thus, lead is much more harmful for children than it is for adults at the same blood levels.*

HOW MUCH LEAD ARE WE TALKING ABOUT?

THE AMOUNT OF LEAD IN THE BLOOD that can cause health problems is so small that it is expressed in units which are unfamiliar to most people. The two units most commonly used in scientific studies and reports, and in governmental rules and standards, are parts per million (ppm) and parts per billion (ppb). The relationship between them is 1 ppm =1000 ppb. If a regular-strength aspirin is dissolved in about 750 gallons of water, its concentration would be 10 ppb (or 0.01 ppm). *At a concentration of 10 ppb, if the total amount of lead in a 155-pound person were in the form of a solid, it would be harder to see than the period at the end of this sentence.*

It might be less confusing to use just one of these units, but I decided to avoid errors in calculation by retaining the same unit as was used in any source from which I obtained information.

At the present time, the EPA says that a child with more than 100 ppb of lead in their blood is considered lead-poisoned, and immediate steps should be taken to find and remove the sources of lead. However, it is becoming apparent that there is probably no safe level of lead in the body of a child!

Because their tissues and organs are fully formed, adults are generally not considered to be lead-poisoned until their blood level exceeds 450 ppb; however, this statement has many qualifiers and exceptions.

WHAT ARE THE HARMFUL EFFECTS OF LEAD?

WHY ALL THIS CONCERN over this minuscule amount of lead? While it may seem like nothing to worry about, irreversible damage can be caused by lead levels in children that are far below the

government's action level of 100 ppb; and adults are not exempt from lead's toxic effects, some of which are shown in this list:

- kidney damage and kidney failure
- ovarian or testicular damage
- increased blood pressure and subsequent heart disease (especially among middle-aged white males)
- anemia and immune system damage
- weakness in the hands and feet (the wrist drop that Benjamin Franklin wrote about) caused by damage to the myelin covering that acts as insulation on nerve cells
- damage to the brain and nervous system leading to permanent mental and motor retardation
- injury to the digestive system
- attention deficit disorder and hyperactivity
- premature births, impaired fetal blood synthesis, and delivery complications
- IQ losses
- even very low levels of lead can cause headaches, joint and muscle pain, mood changes, sleep disturbance, and decreased fertility in men.

POSSIBLE SYMPTOMS OF LEAD POISONING

Although some of the same symptoms can occur in both adults and children, some of the earlier symptoms in children may easily be mistaken for common childhood illnesses; nausea, headache, irritability, vomiting, nosebleed, and dizziness. If not treated, they could result in convulsions, coma, and death.

Testing should be also be considered for children who fail to grow; are fatigued; or have anemia, sleep problems, hearing loss, or speech, language or attention deficits.

Symptoms that usually occur in adults can include changes in mood, tremors, weight loss, peripheral neuropathy (pain and muscular weakness in the feet and lower legs), memory loss, and seizures.

SOME OF THE EVIDENCE

ACCORDING TO A 1989 SCOTTISH STUDY, children with lead levels below 100 ppb were slightly, but measurably, hyperactive and likely to have behavioral problems in later life.

Recent studies have also implicated lead in attention deficit disorder (ADHD) in young children. ADHD is a brain disorder estimated to affect between 4%-12% of school-age children, or as many as four million youngsters. A report co-authored by Dr. Bruce Lamphear, an authority on lead's effects on children, states, *"Children with blood lead levels of more than 20 ppb were 4 times more likely to have ADHD than children with levels below 8 ppb."*

A 1992 Australian study confirmed that exposure to low lead levels during infancy caused a measurable drop in intelligence as measured by IQ tests. For children whose blood lead levels were between 100 and 350 ppb, IQ scores fell an average of 5% by the time they were 7 years old.

A study published in 2003 showed that blood lead levels, even those below 100 ppb, are inversely associated with the IQ scores of children at 3 and 5 years, which means that declines were greater at these concentrations than at higher levels. ***The study concluded that more children may be affected by environmental lead than previously estimated.***

A 2004 study by the National Institute of Environmental Health Sciences concluded that low-level long-term exposure may increase the risk of developing cataracts.
And, if all of this weren't bad enough, a 2002 article in the Archives of Internal Medicine reported the finding that people who had elevated blood lead levels early in life have a 46% increased rate of mortality from all causes later on, indicating that children may carry a legacy of lead toxicity as they age.

SOURCES OF LEAD IN THE HOME ENVIRONMENT

OCCUPATIONAL SOURCES

IT HAS BEEN SAID THAT AMERICAN WORKERS have higher productivity than their counterparts in most industrialized countries possibly, in part, because they "bring their work home with them". That may not seem to be relevant to the topic of lead poisoning but, if a person happens to work in certain industries and brings home *their work clothes*, it may be extremely relevant. They may also be bringing home lead that they pick up at work and unknowingly sharing it with family members. (This was the way that persons living with asbestos workers were exposed.) Here is a brief list of occupations that might put workers and their families at risk:

- iron and steel production
- painting (if old paint must be removed)
- auto battery manufacture and recycling
- welding
- firing range instruction
- remodeling and refinishing older homes
- foundry work
- scrap metal recycling
- making stained glass panels with lead channels
- making ceramics that have lead glazes
- auto repair
- cable splicing

DON'T THINK you're safe just because the above list doesn't apply to you. The most common (and most significant) exposure to lead is likely to come from sources already *in* your home.

NON-OCCUPATIONAL SOURCES

Although the government forced oil refiners to begin a phased changeover to unleaded gasoline in 1978, phased out lead-containing paints the same year, and banned lead solder in food and beverage cans and in home plumbing systems in 1987, most of the lead found in and around the home has its origin in paint, water

supply lines, and leaded gasoline. *Remember that lead doesn't go away!*

Soil contaminated by leaded gasoline

Leaded gasoline may turn out to be a greater threat to public health than the combined wastes from all of our factories, with the radioactive debris from all our nuclear reactors thrown in.

In 1970 Congress passed The Clean Air Act, and by 1975 automakers began using catalytic converters to help rid the air of unburned fuel. However, lead additives in the gasoline inactivated the catalyst, so lead had to go; but, as usual with the government, not too quickly. During 1977 alone, refineries turned more than 225,000 tons of lead into anti-knock additives, which is enough to kill every creature who ever lived. Seven years into the planned phaseout of leaded gasoline, the figure had fallen only to 79,000 tons. But, for once, we were ahead of the curve; the European Union didn't ban leaded gasoline until 2000. Leaded fuel is still being made by U.S. companies for export to Third World countries, where it is still permitted because of the large numbers of older vehicles that don't have catalytic converters.

In a March 20, 2000 article in T*he Nation* entitled "The Secret History of Lead", Jamie Kitman declared that, in this country, an estimated seven million tons of vaporized lead compounds remain in the environment. Spread by wind and rain, lead has contaminated our farms and yards and polluted our water supplies. If lead glowed in the dark, we probably wouldn't need lights within miles of a major highway, or a busy street.

Soil that is contaminated with lead poses a special threat to babies and very young children: first, because it is common for them to play on the ground, put dirty fingers in their mouths, and even eat dirt; second*, because of their more rapid growth, they absorb lead at a rate four times that of an adult.*

Many crops that are grown in contaminated soil absorb lead along with other minerals. Our water supplies can also pick up lead by

contact with contaminated soil, so water from a well or lake may carry a high burden of lead.

Paint

Lead compounds were used in oil-based paints as pigments and to speed up the hardening of the paint film. By the 1920s, nearly all European countries had banned lead-containing paint, but the US lagged behind until 1978 when the government limited the amount of lead in paints for most domestic uses to 0.06% of the weight of the dried film, which is about 600ppm. With the increasing popularity of water-based paints, and the substitution of titanium dioxide for lead pigments, lead use further declined.

Of course, this had no effect on the leaded paint already applied to millions of buildings. By 1992 the extent of this potential hazard had become apparent, and George H. Bush signed the Residential Lead-Based Paint Hazard Reduction Act, which was aimed at reducing the threat posed by this source of lead. This act also ushered in the massive screening of children for lead in their bodies.

Differing estimates by different agencies make it almost impossible to accurately assess the extent of the problem. An October 1991 estimate put the number of homes that have possible problems from lead paint at 57 million. In 1996, the EPA said that more than 64 million homes (about 80% of U.S. Housing built before 1978) had some lead paint. However, in 2000, the U.S. Department of Housing and Urban Development (HUD) put the figure at about 38 million pre-1978 homes, and said that *every* home built before 1950 was almost certain to have leaded paint.

Since 1996 federal law has required that sellers and lessors of residential housing built before 1978 must:

- *Disclose the presence of known lead-based paint or lead-based paint hazards,*
- *Provide buyers and lessees with any available records or reports pertaining to these hazards,*

- *Provide buyers or lessees with a federally-approved lead hazard information pamphlet notifying them that lead-based paint could expose young children to the risk of lead poisoning.*

In addition, sellers must provide buyers with a 10-day opportunity to conduct an inspection for the presence of lead before the buyer is obligated under any purchase contract.

After several years of exposure to sunlight, air, and moisture, paint films begin to break down, releasing the pigments as an almost invisible dust. The process is called "chalking". Ironically, the more the paint is vacuumed or scrubbed, the greater the problem will become. Scrubbing only loosens more pigment, and vacuuming makes it airborne. Children breathe and swallow the dust and sometimes chew on interior painted surfaces such as windowsills or cribs. The dust from chalking of exterior paints mixes with soil and becomes a danger to children because of their hand-to-mouth tendency.

On its Web site, the Wisconsin Department of Natural Resources says, "Exposure to air containing one microgram of lead per cubic meter (about 30 cubic feet) is associated with a 50 ppm increase in blood lead; thus long-term exposure to air containing more than 20 ppm could cause a child to become lead-poisoned."

Moisture trapped under paint can cause paint to blister and peel. Children sometimes eat flakes of lead-containing paint because of its slightly sweet taste (remember the Romans and the lead compound that sweetened their wine!), and sometimes because of a craving for unnatural foods, a condition called *pica.*

Water: the supply system

The earth's crust averages a half ounce of lead (about 15 grams) per cubic yard in the form of the minerals, galena and cerussite, enormous deposits of which are found throughout the western states. Thus, it's very possible that lakes, streams, and wells in these areas will also contain lead, even though they are not near any highways.

Water: the home plumbing system

Lead pipes were used for water systems in houses until about 1930, when lead began to be replaced by galvanized (zinc-coated) iron. More recently, copper lines have been favored because they are more resistant to corrosion.

Galvanized pipes are joined by threaded fittings, while copper connections are soldered. Before 1987, plumber's solder was a 50-50 mixture of lead and tin; since the ban on lead solder, it is 95% tin and 5% antimony.

Lead is readily leached from solder by water that is either acidic or contains little if any iron, magnesium or calcium. Leaching is also encouraged by raising the temperature, or by increasing the time of contact.

This information can often be used to determine whether a positive test for lead in water is due to the plumbing *in* the house, or to the system bringing water *to* the house. If the lead source is in the *indoor* plumbing, water from the hot tap will usually have more lead than the cold water; and cold water that has been allowed to run for several minutes (a process called "purging") will be virtually lead-free. When the water arriving at the house is already tainted, purging the line before sampling may reduce the lead level slightly, but it won't get rid of it.

The EPA has established Maximum Contaminant Levels (MCLs) for drinking water. An MCL is the level of a contaminant below which there is no known or expected health risk. The MCLs are enforceable standards. ***Although the current MCL (and action level) for lead is 15 ppb, the goal is 0 ppb.***

Crystal and ceramic tableware

The same factors that cause lead to leach from solder also help to extract it from glazes and crystal. For example, there can be a significant transfer of lead when acidic liquids such as wine or citrus juices are in contact with crystal or with ceramics whose glazes contain lead.

The brilliance of crystal decanters, bowls, and glasses is due to lead oxide, which may account for as much as half their weight. The shiny smooth finish of a piece of china, or the colors of its patterns, may also depend on lead compounds in the glaze.

The federal government prohibits the sale of dinnerware that releases lead in amounts greater than 2000 ppb (or 2 ppm). California's limit is 0.226 ppm.

Firing a lead-containing glaze at a very high temperature tends to harden it so that leaching is essentially eliminated. However, many imported ceramics are fired at lower temperatures to save money on energy, so lead in their glazes will leach. The FDA singles out pottery from India, Mexico, and China as the most probable risks. But even lead glazes that are properly fired will probably wear down and leach after repeated washing.

For crystal or dinnerware that you have had for more than a few years, testing is the only way to be certain of its safety. Until December 3, 2009, the Environmental Defense Fund maintained a website called "Shopper's Guide: List of Low-Lead Patterns" at which prospective buyers could find a manufacturer's test results for the dishes they were selling. Several search engines still direct you to this address, but there's nothing there except the announcement that the list is no longer maintained.

Folk remedies

Among immigrants from Asia and Latin America, it is fairly common to treat illnesses in children with folk remedies that contain lead, such as Azarcon, a Mexican remedy for chronic indigestion, and Pay-loo-ah, an Asian remedy for fever. Azarcon is also called Greta, Coral, Rueda, and Maria Luisa. Lead-containing East Indian remedies for digestive problems include Ghasar, Bala Goli, and Kandu. In Arabic countries, it is common to sterilize the umbilicus of newborns with alkohl (or kohl), a lead preparation that is also used to treat skin infections. **Obviously, *despite customs or beliefs, none of these should be used to treat any kind of suspected medical condition!***

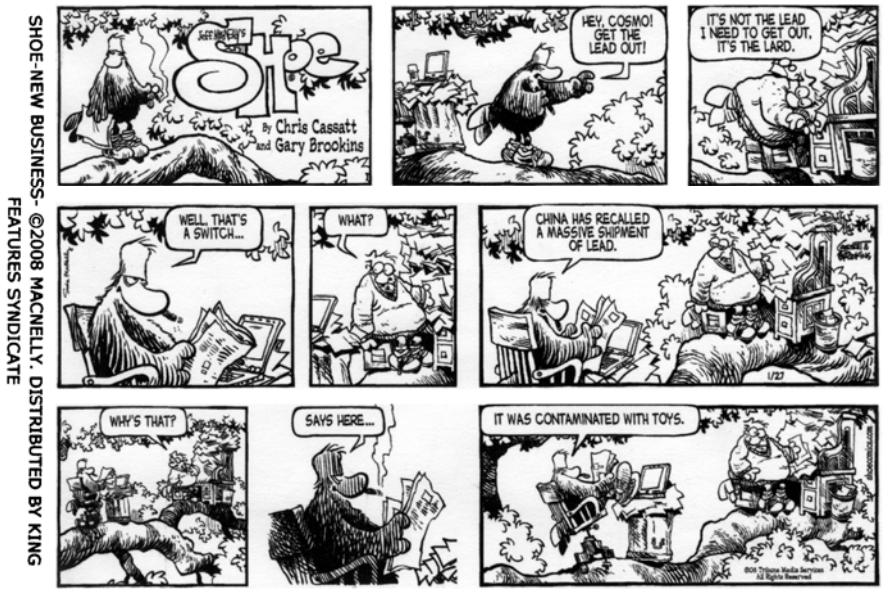
Miscellaneous sources of lead

Lead compounds are used to make vinyl plastic flexible and to stabilize the colors in white PVC pipes and fittings, shower curtains, artificial Christmas trees, the wires of holiday lights, phone cords, rain jackets and boots, vinyl siding ("certified" siding has only traces of lead), and mini-blinds (especially those made prior to 1997). Lead is also likely in flake white oil color used by artists, fishing weights, some hair dyes and tattoo inks, and garden hoses. It is ironic that some hoses now come with a warning not to drink from them and to wash your hands after using them**. *This precaution should be followed after handling any of the materials just listed.***

Hobby activities, such as glazing ceramics, reloading cartridges, soldering jewelry or leaded glass, can be sources of lead. Indoor gun ranges are especially likely to have high levels of both lead vapor and particles. And, be especially wary of eating birds or game that has been killed with shotgun pellets, unless the pellets are made of a material other than lead.

In May 2007, three years after Mars Inc. said it had stopped producing them, lead-containing Mexican candies were still available in California. The candies are favored by Hispanics and were sold under the names Tama Roca Banderilla and Lucas Limon, among others. State and federal regulators have known about the candies for a decade, but failed to publicize the danger and allowed makers to voluntarily remove them from shelves. Obviously, neither Mars nor the government took appropriate action.

Within the last three years, we have imported millions of lead-containing toys from China. Between March 2007 and January 2008, there were 60 separate recalls of tainted toys! This was a potential catastrophe because the toys were destined for children in the age group that studies have shown are most likely to suffer



serious long-term health problems from lead. (Fisher-Price was fined $3.2 million in June 2009 for selling toys with unsafe lead levels.)

In 2005, the Consumer Product Safety Commission tested 60 soft vinyl lunch boxes imported from China, and reported that they found no instances of hazardous levels. However, a year later the Associated Press filed a request under the Freedom of Information Act and, in February 2007, learned that 1 in 5 of the lunch boxes had exceeded the federal safe limit of 600 ppm, and some had as much as 9600 ppm! In its defense, CPSC said that they had tested those parts most likely to come into contact with food during normal use.

Attempts to keep children from encountering lead may be a case of too little--too late. The Consumer Product Safety Commission Improvement Act of July 2008 essentially outlawed lead, beyond minute levels, in products for children 12 years old, or younger. ***Yet, a little over one year later the same agency disclosed that, while 30,000 new cases of lead poisoning in children***

***are detected yearly, as many as 240,000 may go undiagnosed**.*

HOW SEVERE IS THE PROBLEM?

"Lead poisoning is the number one environmental threat to the health of children in the United States."
Secretary of the Department of Health & Human Services. 1991
(Federal Register vol. 59, No. 46)

"**There is no acceptable level of a lead exposure for a child."**
Centers for Disease Control spokesperson Bernadette Burden.

IN OCTOBER 1991, THE GOVERNMENT ESTIMATED that 1 child in 6 already had too much lead. (*This estimate has since been revised to every 4th child under the age of 7).* Citing studies showing the adverse effects of lead concentrations in the range of 100 to 190 ppm, the Centers for Disease Control (CDC) called for testing of every child, medical treatment for anyone with a blood level higher than 190 ppm, and a program to identify and eliminate lead sources responsible for such levels. The agency further recommended dropping the maximum acceptable level in blood from 240 ppm to 10 ppm.

In September 1992, the federal agency which supervises the Medicaid program for low-income families instructed state Medicaid officials to start testing all children between the ages of 6 months and 6 years to determine their blood lead levels. However, the CDC's 2002 guidelines called for testing every Medicaid-eligible child at 1 and 2 years, while the EPA calls for initial testing at 1 year and re-testing every 3 years until age 7.

Federal agencies can't seem to agree on a testing schedule, so, in light of the discovery that extremely low lead levels may have serious effects, you might want to consider the state of Wisconsin's recommendation that all children should be initially tested at 6 months, thereafter every 6 months until age 2, then yearly until age 6.

Currently, when a child's blood lead level exceeds 100 ppm, it is recommended that corrective measures be taken, including finding and removing the lead source, whenever possible. If the level exceeds 450 ppm, medical intervention is required, and this applies to adults as well.

Unfortunately, efforts to remove lead sources haven't always reduced blood-lead levels, as shown by the results of an EPA five-year study tracking 152 children from 3 Boston neighborhoods. One full year after the contaminated soil in their neighborhoods was replaced, their blood lead levels had declined, but not enough to put them out of danger. The study concluded that lead poisoning can only be reduced by a comprehensive approach in which other lead sources, such as air, water, and paint, are also removed.

Recent reports have confirmed that America's poorest children are most at risk; but they are not being properly screened despite laws designed to protect them. A 1998 report by The General Accounting Office said that children receiving care under Medicaid were more than 3 times more likely to have high blood lead than non-Medicaid children. *Because Medicaid children made up about half of the children aged 1 to 5, they represented 60% of the estimated 890,000 children with elevated lead levels.*

Thanks to the government's bans on lead in paint, gasoline, pipes, older, and other products, lead levels in the general population have declined rather dramatically. Between 1978 and 1994, the mean blood-lead level dropped by 78%, and the number of Americans with levels above 100ppb was slightly above 2% according to a 1999-2000 report by the CDCP. *However, before you conclude that we're out of the woods, stop and consider that 2% of the current population is still 600,000!*

You also have to realize that there are several factors that can skew these estimates dramatically. There are an estimated 15 to 20 million illegal immigrants, many of whom have limited English skills and try not to draw attention to themselves, so they are less likely to be informed about the risks associated with lead or to have their children tested for lead. Second, there is no program for testing adults, except government-mandated periodic tests for those few

who work in high-exposure jobs, so estimates based on the adult population are shaky at best. **Finally, and most important, is the growing body of evidence that *there may not be a safe level of lead.***

HOW CAN YOU TELL WHETHER YOUR HOME HAS A LEAD PROBLEM?

ALTHOUGH IT IS UNLIKELY that a home built after 1978 will have lead paint, or that one built after 1987 will have lead solder, it is still possible.

The only way to be absolutely sure that you don't have a lead problem is to test the paint, water, ceramics, and crystal in your home and the dirt outside it.

A number of companies sell do-it-yourself kits to test for lead in paint, soil, ceramics, solder, etc. There are labs that will analyze paint chips or water samples that you collect and send to them, and there are also companies that will quantitatively measure lead in your home with a portable device that uses x-rays.

In October 2007, the CPSC announced the results of a special evaluation of do-it-yourself lead test kits that contain either rhodizonate ion or sulfide ion, and the report was *not* favorable. Of 104 total test results, more than half missed the lead when it was there (false negatives) and about 2% indicated lead was present when it was not (false positives). **Based on this study, CPSC recommends that consumers should not use lead test kits to evaluate materials for potential lead hazards.**

The study also tested the accuracy of x-ray fluorescence for detecting lead, and the results were much more encouraging. Twelve of 13 samples containing lead were detected. These portable machines cost more than $35,000, so the survey will probably cost several hundred dollars—but the results will be far more accurate than any other method that is presently available—especially on paint. A large home will probably require about 250-300 readings to insure accuracy and would take about 2 hours. To find a testing

company in your area, call the National Lead Information Center: 800.424.5323.

Testing of water must be left to a reputable laboratory until such time as kits become available that are able to give clear and reliable results when the lead concentration is below 15 ppb, the current limit recommended by the EPA. You collect the samples following the kit's instructions and send the samples to a lab for analysis

TESTING FOR LEAD IN THE BODY

IN RESPONSE TO THE ACCUMULATING EVIDENCE that even low blood lead levels may produce irreversible damage in children, the government initially set a national goal to reduce every child's blood lead level to less than 100 ppb by 2010. ***However, the current goal is zero ppb, and the CDC defines an elevated blood level as 10 ppb.***

It is estimated that fewer than 25% of children were being tested because most labs didn't have enough personnel certified for the moderately complex tests required by federal law. So, samples had to be sent to reference labs off-site, and clinics risked losing track of the child while waiting for results.

All of this may have changed with the unveiling of the first point-of-care testing device that can be used in a physician's office, mobile clinic, health fair, or community health center. The test can be performed either on blood from a finger stick or from a vein. The device uses a procedure called anodic-stripping voltammetry to produce accurate results in less than 3 minutes from only 2 drops of blood! And, it is so simple and reliable that operators do not have to be trained or certified. **It is strongly recommended that a positive test on a finger-stick sample be followed up with blood from a vein.**

It is also important to realize that lead in the blood only reflects *recent* exposure. Tests to measure the lead that has accumulated in the shinbone will provide a fairly accurate record of the total past exposure.

REDUCING LEAD EXPOSURE: GENERAL RECOMMENDATIONS

BECAUSE HOME ENVIRONMENTS VARY SO MUCH, no single plan of attack will be appropriate; yet, there are some steps that should be taken immediately, even before having your home tested for lead:

- **Every pregnant woman should be tested early in the pregnancy. Any measurable amount of lead is cause for concern. For state and local health department assistance, call the Centers for Disease Control's emergency response line at 770.488.7100.**

- **Every child should be tested by the age of 6 months. Then you should follow up with regular testing, probably until the child is at least 6 years old. Children with levels above 450 ppb should be treated.**

- **If you have infants or small children, try to discourage hand-to-mouth behavior. Wash their hands before giving them food, and wash pacifiers and teething rings frequently.**

- **Anyone with potential occupational exposure to lead should be tested. To find out whether your workplace may expose you to lead, contact the National Center for Environmental Health. (See appendix for contact info.)**

- **If you are exposed to lead in your workplace, shower before going home, especially if there is a pregnant person or children there. Work clothes should not be brought home for laundering.**

- **Do not use any folk remedies that may contain lead: consult the earlier listing.**

- **Do not burn painted wood in a stove, fireplace, or barbecue pit. If the paint contains lead, both the smoke and the ashes will be especially hazardous, so don't put the ashes around plants or trees any part of which will be eaten.**

- **If you drink wine, be aware that vintages from the 70s and 80s (and even later for imported wines) may have a lead foil capsule over the cork. After the capsule is removed, the neck of the bottle should be wiped with a damp paper napkin or towel. You should also consider the fact that leaded gasoline may have been used in farm machinery in Central European countries into the early 90s, and that the grapes grown in these areas may have picked up lead from the soil.**

- **Home hobbyists should avoid the use of lead glazes in making ceramics, and make sure that solder used in jewelry or leaded glass products is lead-free. Even then, the leaded channels used in windows or glass panels create toxic vapors when being soldered, so this so this should only be done in well-ventilated spaces. This precaution also applies to reloading of gun cartridges or molding lead fishing weights.**

- **Make sure that children get enough calcium and iron in their diet: these minerals slow absorption of lead. Milk products and cooked greens are rich in calcium, and iron is found in fortified cereals, liver and cooked beans and peas.**

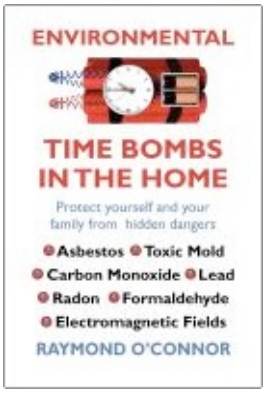
- **If you are uncertain about whether dishes, crystal, or other objects may contain lead, stop using them until they have been tested.**

REDUCING LEAD EXPOSURE FROM SPECIFIC SOURCES

AS EXPLAINED EARLIER, tests can detect lead in your home environment from paint, the soil, the water supply, or other sources. The following sections tell you what can be done to reduce or eliminate these sources.

Water

Unless the lead in your water is more than about 6 times the EPA's current recommended limit of 15 ppm, it can be effectively removed



A truly unique book that presents, in plain language, the most current evidence that adverse health effects can result from lead, asbestos, carbon monoxide, formaldehyde, mold, radon, and wireless networks and devices in a home. Some of these effects may not show up for years--even decades--after exposure. This book describes methods for detecting and evaluating these hazards, and reducing or eliminating them.

Environmental Time Bombs in the Home