CHAPTER 1

What is lead? Where is it found?

Learning objectives

In this chapter you will learn about

- what lead is
- why lead was used
- where lead is found today
- how you can be exposed to lead
- what jobs and hobbies can expose you to lead
- the lead-based paint problem in the United States

True / False quiz

This is an exercise to see how much you already know about lead. It is *not* a test. Please take a few minutes to read the statements, then circle T for "True" or F for "False." Your instructor will go over the answers when everyone in the class is finished.

1. Lead is dangerous only to children under six. T F

2. We have known for thousands of years that lead is dangerous. T F

3. Experts can identify lead-based paint just by looking at it. T F

4. Lead exposure can affect a person's ability to have children. T F

5. Lead is so dangerous that there is no way you can protect yourself from it. T F

6. The law says that if you find lead-based paint in a building, you must remove it as soon as possible. T F

What is lead?

Lead is a heavy, soft, flexible, blue-gray metal. It generally occurs in nature in the form of ores, and was recovered in early times as a by-product of smelting silver. Once lead is mined, processed and introduced into our environment, it can be a potential problem forever. Nearly all the lead to which we are exposed is due to people's activities.

Lead is a heavy, soft, flexible, blue-gray metal.

The chemical symbol for lead is Pb. The symbol comes from the Latin word for lead—plumbum. The word plumber also comes from plumbum, because plumbers used large amounts of lead.

People used lead even before history was recorded. Egyptians used lead in solder, cosmetics, and building materials. Greeks and Romans used lead in plumbing. The first methods of transporting water into Rome were through aqueducts made from lead that carried water into the city from seven miles away. The Romans used lead to line food containers. They added lead to wine to sweeten it and to prevent spoiling.

Lead has been used for thousands of years.

Why was lead used?

Lead was put in products for many reasons:

- **Prevents corrosion.** Lead will not crack easily with wear, weather, or temperature change.
- **Kills mold and mildew.** Lead is used in areas with high moisture.
- **Easy to shape.** Lead is a soft metal and melts at a low temperature (620° F).
- **Is strong.** Lead has a lot of mechanical strength.
- **Blocks radiation.** Lead is used in products designed to block radiation, such as the lead aprons used when X-rays are taken.
- **Blocks sound.** Lead was sometimes used for soundproofing.
- **Helps paint dry.** Lead was added to paint to quicken the drying process.
- **As a pigment.** Different compounds of lead were used to add color, to whiten, or to brighten paint.

Lead is dangerous

Lead is a dangerous poison. You cannot see or feel the lead that can make you sick. Lead is most dangerous when it is in the form of dust or fumes.

Lead dust particles can be **very** small—so small that they may not be visible. They are easy to swallow if they are on anything you put in your mouth—such as food, cigarettes, or fingers. Lead dust tends to settle on flat surfaces. When you touch those surfaces, you get lead on your hands. If you put your hands to your mouth, you will swallow lead dust. Because young children frequently put their hands in their mouths, they are at a high risk for lead poisoning. You can also breathe in lead dust.

Lead is poisonous when you swallow it or breathe it.

Lead poisoning was recognized 2,000 years ago.

Lead causes health problems

The health problems associated with lead have been known for a very long time. Ancient Egyptians knew that lead could kill people if they swallowed too much of it. In the Middle Ages, doctors realized that some of the health problems of painters, miners, and artists were caused by exposure to lead on the job. In 1786, Ben Franklin wrote to a friend about work-related lead poisoning cases.

In the early 1900s, doctors found that lead-based paint caused reproductive problems for workers and their families. Doctors from all over the world began to study lead-based paint as a cause of childhood diseases. Many doctors in the United States studied and wrote articles about childhood lead poisoning. In 1913, Dr. Alice Hamilton—an American occupational health doctor—wrote about painters and the hazards of their work. She documented their exposure to lead and their health problems.

Where is lead found?

Lead can be found almost anywhere today. Some of the places where we may find lead include the following:

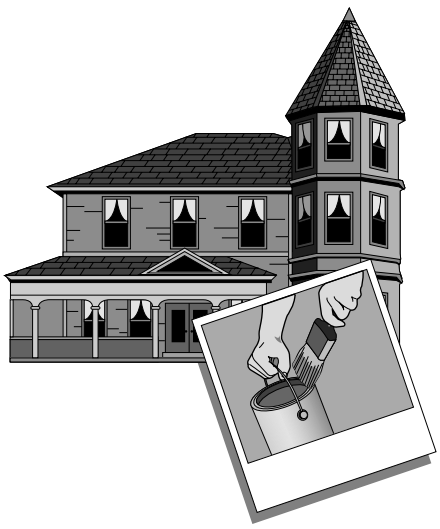
Paint

"Lead-based paint" is defined in the Residential Lead-Based Paint Hazard Reduction Act (also known as Title X) as "paint, varnish, shellac, or other coating on surfaces that contain 1.0 mg/cm^2 or more of lead or 0.5 percent or more lead by weight." Chapter 3 will cover ways to identify lead-based paint.

Lead was used in paints for color and durability. When lead was added to paint, the paint was better able to stand up to wear and tear and weather changes. Lead was also added to paints to speed up the drying process.

In many ways, lead-based paint was an ideal product. However, as lead-based paint ages or becomes damaged, dust and chips are created.

Lead dust pollutes the air, soil, household dust, and any surface it settles on. It contaminates floors, counter tops, furniture, toys, shelves, books, pets, and people. It can get on children's hands when they play on the floor. When lead-based paint gets old or damaged, it creates lead dust and chips. Lead dust can be a health hazard. Many lead-poisoned children are exposed to and poisoned by lead dust. Even when the floor looks clean, there may be harmful amounts of lead dust. Lead dust and lead-contaminated soil can be tracked indoors (e.g., by pets or on shoes) where it becomes another source of exposure for children. It is normal for children to put their hands and toys in their mouths and then swallow lead dust. The action called "hand-to-mouth contact" is the most common way for children to ingest lead.



House paint

Lead-based paint is believed to be a major source of lead poisoning. Any home built before 1978 may contain lead-based paint. Homes built before 1950 are more likely to contain higher levels of lead because the use of latex paints became more common during the 1950s.

When lead-based paint gets old or damaged, it creates lead dust and chips.

Lead dust is a health hazard.

Most children are exposed to lead by ingesting lead dust.

Lead-based paint can be found on any painted surface—inside or outside.

Lead-based paint was used inside homes on woodwork, walls, floors, windows, doors, and stairs because it resisted wear and tear. It was also used on the outside of homes, porches, windows, and doors because it can withstand extreme weather changes.

Lead-based paint kills mold and mildew. Because mold and mildew typically grow in high moisture areas, lead-based paint was often used in places where moisture is found (such as kitchen and bathroom walls and on windows and doors).

Industrial use of lead-based paint

Sand blasting paint off a bridge can pollute the community.

Lead-based paint is still used on bridges and on steel structures to prevent rust and corrosion. These are "industrial uses" of lead-based paint. There are no restrictions on the use of lead-based paint for industrial purposes.

About 90,000 bridges in the United States are coated with lead-based paint. Blasting or grinding lead-based paint off steel structures and even performing routine repairs creates huge amounts of lead dust. Doing this type of work can be harmful to workers and the surrounding community. The lead dust gets into the air and nearby soil, plants, and water.

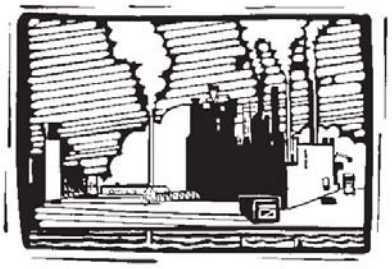
Leaded gasoline

Exhaust from leaded gas polluted the air and soil.

Until the late 1970s, lead was added to gasoline as an antiknock agent. The car exhaust released the lead into the air and because lead is heavy, this lead polluted not only the air but also the soil.

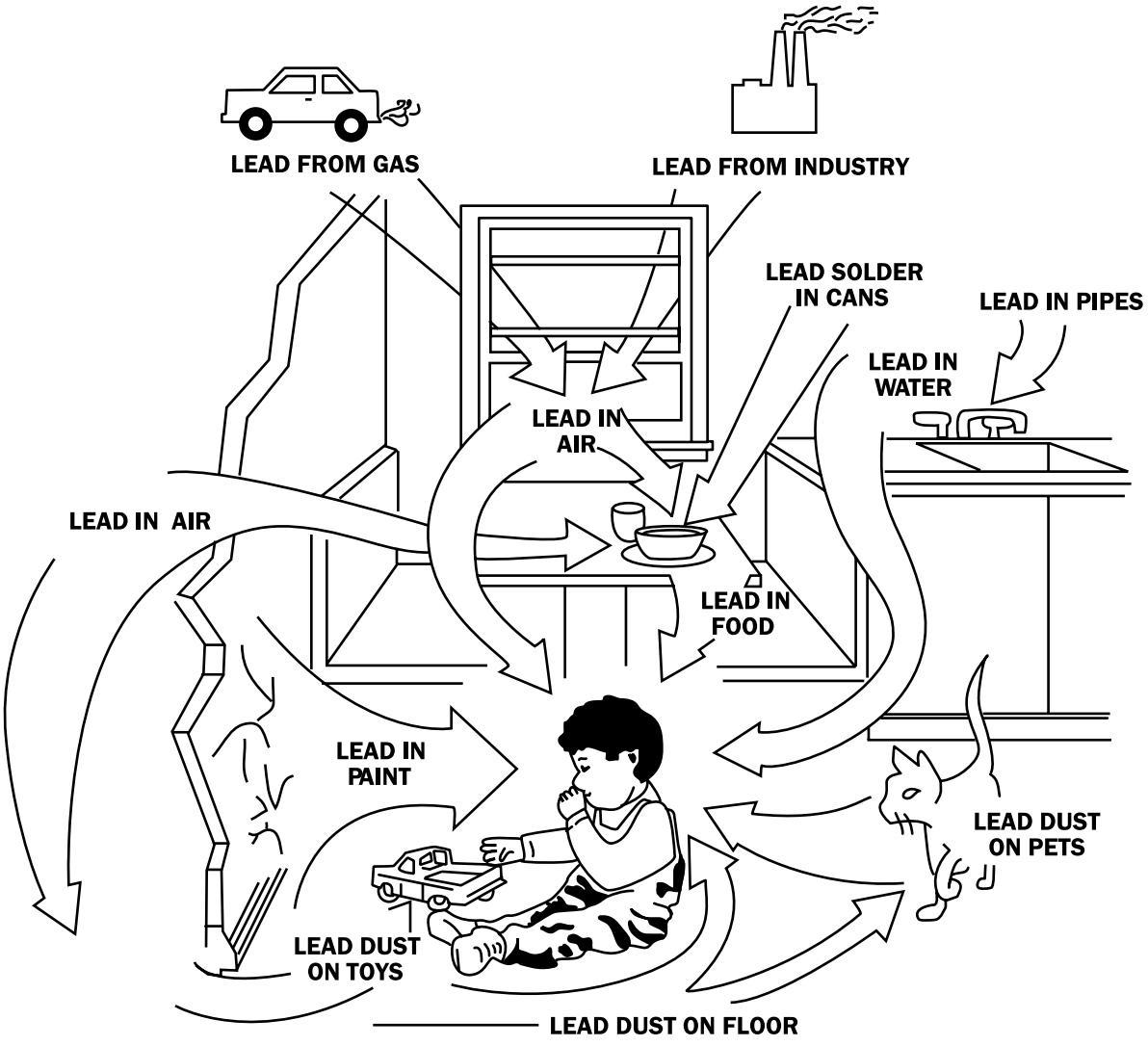
In 1978, the Environmental Protection Agency reduced the amount of lead that could be added to gasoline. By 1982, the U.S. national average level of lead found in the typical person's blood dropped by 37 percent. Today the amount of lead permitted in automobile gasoline is limited to 0.05 grams per gallon of gasoline. A higher amount of lead is still allowed for farm vehicles and equipment. Leaded gas is still used in other countries including Mexico, Korea, and Ireland.

Industrial releases



Many industries use lead in their products. For example, lead is used in batteries, ceramics, lead crystal, and bullets. When these items are produced, lead can be released into the air. The production and use of these materials can pollute soil, water, and air.

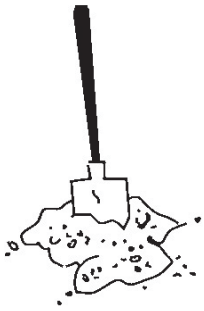
SOURCES OF LEAD EXPOSURE



Adapted from "Preventing Lead Poisoning in Young Children," Centers for Disease Control January 1985

Soil

Soil can have high levels of lead.



High levels of lead in soil may come from paint dust, leaded gas exhaust, and industrial releases. Naturally-occurring traces of lead are found in most soil.

Some playgrounds may have soil that contains very high levels of lead. Such playgrounds are very dangerous to children who play there because of the risk of ingesting the lead during normal hand-to-mouth contact.

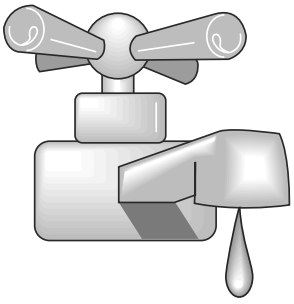
Food

Food and drinking water can be sources of lead.

Food grown in soil that has lead can also contain lead. Ceramic ware, pottery and glassware may contain lead which can leach into foods cooked in or eaten from these items.

Lead-soldered cans are no longer produced in the United States, but lead-soldered cans are permitted in some countries that export food to the United States. Food cans imported from other countries may contain lead in the solder holding the cans together. Any can containing lead must have a label on the can which states the amount of lead used in the solder.

Drinking water



Lead was used in pipes and solder—even in water coolers! Because lead can easily expand without cracking, it was ideal for use in plumbing systems where freezing is possible. The Safe Drinking Water Act (1986 and 1988) made it illegal to use lead in household plumbing. However, old lead pipes and lead soldering can still contaminate drinking water. Lead is rarely a naturally occurring contaminant in water.

Hobbies

Some hobbies can expose you to lead.

Many people can be exposed to lead in their hobbies. Activities that may expose you to lead are

- home remodeling
- glazed pottery making
- target shooting at firing ranges
- electronics
- car and boat repair

- refinishing furniture
- painting—some art paints have lead pigments
- making lead fishing sinkers or lures
- stained-glass window making

Many workers are exposed to lead on the job.

Occupational exposure

Many jobs or occupations can expose people to lead. These workers are in danger of lead poisoning and may also contaminate their cars and homes by bringing lead dust home on their clothes, shoes, hair, or skin.

If workers don't clean up properly before leaving a worksite, they could poison their own families.

Some jobs that have a high risk of lead exposure include

Construction trades

- Lead abatement workers
- Carpenters
- Remodelers
- Renovators
- Demolition workers
- Ironworkers
- Steel welders and cutters
- Sheet metal workers
- Painters
- Plumbers and pipe fitters

Industry

- Lead miners
- Lead smelter workers
- Lead refinery workers
- Lead crystal makers
- Ceramic glaze manufacturers
- Plastic manufacturers
- Wire and cable manufacturers
- Electronics makers

Others

- Firing range employees
- Police officers
- Artists
- Radiator repair workers
- Car mechanics
- Printers
- Scrap yard workers and recyclers

The lead-based paint problem in the United States

In 1978, the U.S. banned the use of lead-based paint in homes.

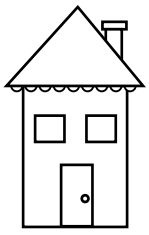
Lead is a known poison. Other countries limited the use of lead-based paint as early as 1840. The United States did not act until the 1970s. The U.S. Government banned the use of lead-based paint in houses, hospitals, schools, parks, playgrounds, and public buildings in 1978. Although the government banned the use of lead-based paint in 1978, it allowed stores to sell-out their existing stock until 1980. Typically, we do not expect to find lead-based paint in houses built after 1980.

Lead-based paint can still be used on cars, boats, metal furniture, industrial steel, farm equipment, and on roads as traffic paint.

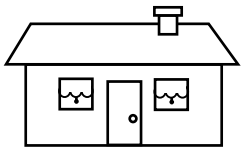
Millions of homes in the U.S. have lead-based paint.

Today about 38 million U.S. homes contain lead-based paint. This number includes houses and apartments in the cities, in suburbs, and in the country. It includes the homes of wealthy people as well as the homes of middle-class and lower-income people. Homes built prior to the 1950s are more likely to contain lead-based paint. After the 1950s, latex paints became more popular, and many people chose them instead of lead-based paints.

There have been some reports of childhood lead poisoning that occurred during or after renovation in homes with lead-based paint. Many homes with lead-based paint are occupied by families with children under age six. Children under six are easily hurt by lead because their nervous systems are still developing. How children get poisoned by lead and what lead does to their bodies is discussed in the next chapter.



87 percent of homes built before 1940 have lead-based paint.



24 percent of homes built between 1960 and 1979 have lead-based paint.

Adapted from

U.S. HUD. 2001. The National Survey of Lead and Allergens in Housing.

Key facts for Chapter 1

What is lead?

Lead is a heavy metal.

Lead has been used for thousands of years. It prevents corrosion and kills mold and mildew. It is durable and easy to shape.

Lead is a poison. It can make you sick if you breathe or swallow it.

Lead-based paint is "paint, varnish, shellac, or other coating on surfaces that contain 1.0 mg/cm^2 or more of lead or 0.5 percent or more lead by weight."

Sources of lead exposure

lead-based paint

leaded gasoline

industrial releases

soil, food, and water

pottery, crystal, glassware

some jobs and hobbies

Lead dust

Lead-based paint is a health hazard when it chips or becomes dust or fumes.

Lead dust is created when

- lead-based paint gets old and deteriorates;
- lead-painted surfaces are broken, damaged, or disturbed;
- lead-painted surfaces are sanded or scraped;
- household dust becomes contaminated by other sources of lead (e.g., soil).

Lead dust and particles tend to stick to surfaces.

Lead dust particles can be so small, you can't see them.

Lead-based paint in the home

Lead-based paint in the home is a major cause of childhood lead poisoning.

The United States banned the use of lead-based paint in homes in 1978.

An estimated 38 million American homes still contain lead-based paint.

For more information

These publications have more information on the topics covered in this chapter. Your instructor has a copy of the publications marked with a star (*). You can order your own copy by calling 1-800-424-LEAD.

* Environmental Defense Fund, *The Hour of Lead: A Brief History of Lead Poisoning in the United States over the Past Century and of Efforts by the Lead Industry to Delay Regulation* (June 1992).

* EPA, *Lead: Identification of Dangerous Levels of Lead; Final Rule*, 40 CFR Part 745 (January 2001)

* EPA, *Reducing Lead Hazards When Remodeling Your Home* (September 1997).

* EPA, *Lead in Your Drinking Water* (April 1993).

* EPA, *Home Water Treatment Units: Filtering Fact from Fiction* (September 1990).

* EPA, *Toxics Information Series on Lead* (Pamphlet TS-793).

* EPA, HUD, and CPSC, *Protect Your Family From Lead in Your Home* (June 2003).

National Lead Information Center, *Lead: Some Questions and Answers* (April 1993).

National Lead Information Center Hotline: 1-800-424-LEAD