Health Consultation

Post-Removal Action

PHILLIPSBURG COMMUNITY PARK
(PHILLIPSBURG PARK LEAD SITE)
VILLAGE OF PHILLIPSBURG, MONTGOMERY COUNTY, OHIO

EPA FACILITY ID: OHN000510290

Prepared by the
Ohio Department of Health

JUNE 11, 2009

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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SUMMARY

The Community Park in Phillipsburg, Ohio was previously used as a trap shooting range from 1925 to 1988 and now consists of three baseball fields, tennis courts, picnic shelters, and a playground. The Ohio EPA collected soil samples in May 2008 at the park and found elevated levels of lead throughout much of the park, including in some areas within the baseball diamonds. The Ohio EPA asked for U.S. EPA assistance in conducting a potential time-critical removal action at the park. In June 2008 the U.S. EPA asked the Health Assessment Section (HAS) of the Ohio Department of Health to review and evaluate the results of Ohio EPA sampling of surface soils at the park for lead contamination, give a recommendation regarding clean-up levels for the site, and help answer any health questions that might come from area residents.

In this earlier health consultation (HAS 2008), HAS concluded that that bare, lead-contaminated soils at the Phillipsburg Community Park posed a public health hazard to park visitors, especially children, and recommended removal of lead-contaminated soils. As part of a Superfund time-critical removal action, U.S. EPA identified and removed all of the lead-impacted soils from the park and disposed of these soils at a nearby regulated landfill. In this second health consultation, HAS reviews the U.S. EPA confirmation soil sampling results from the site following the lead removal action. Based on these new data, HAS concludes that lead in soils at the Phillipsburg Community Park no longer poses a public health hazard to residents using the park.

BACKGROUND AND STATEMENT OF ISSUES

Site Location and Description

Phillipsburg is a village of about 600 people in Montgomery County, Ohio, about 15-20 miles northwest of Dayton, Ohio. The Phillipsburg Community Park consists of three baseball fields, tennis courts, picnic shelters, and a playground. The site occupies approximately 13 acres in a mixed agricultural and residential area on the west edge of Phillipsburg. It had been previously used as a trap shooting range from 1925 to 1988. The shooting stations, where the shooters stood and fired, were still evident at the site at the time of the lead removal action.

Ohio EPA Sampling

Soil sampling at the park conducted by the Ohio EPA in 2008 indicated lead contamination above U.S. EPA removal guidelines (400 ppm) in the areas around the current ball diamonds, including parts of the infield of one baseball diamond and the outfield of another diamond (Figure 1). Ohio EPA had requested U.S. EPA assistance in conducting a potential time-critical removal action at the park in a letter dated May 21, 2008.

HAS/ATSDR Involvement

The Health Assessment Section (HAS) of the Ohio Department of Health was asked by the U.S. EPA On-Scene Coordinator (OSC) to review and evaluate the results of Ohio EPA sampling of surface soils at the park for lead contamination and give a recommendation regarding a removal action. The HAS issued a letter public health consultation to the U.S. EPA OSC on July 29, 2008 concluding that these soils, if exposed at the surface, could pose a public health hazard to area children using the park. The HAS recommended that U.S. EPA fully delineate the extent of the lead contamination at the site and that U.S. EPA mitigate future exposure to lead at the site through the removal of all lead-contaminated soil with lead levels greater than 400 ppm. Along with the U.S. EPA OSC, HAS discussed the nature of the lead contamination at the site and answered questions about the possible health effects from exposure to the lead in the soil at a public meeting October 16, 2008 in Phillipsburg. HAS planned to review and evaluate post-removal contamination sampling results following completion of the time-critical removal action.

U.S. EPA Lead Removal Action

The U.S. EPA investigated the full extent of the lead contamination of soils at the Phillipsburg Community Park in June 2008 and confirmed high levels of contamination in surface soils. The U.S. EPA initiated a removal action on October 14, 2008, mobilizing personnel and equipment at the site. U.S. EPA divided contaminated portions of the park into 90 50-foot by 50-foot grids (Figure 2). Soils in each grid were excavated until lead levels below the 400 ppm action level were observed. Excavated soils were initially stored on site and partially treated prior to being transported for disposal at a licensed solid waste landfill. Excavated “clean” grids were backfilled with clean topsoil. Perimeter air monitoring insured that lead-contaminated soils did not leave the site as dusts. A total of 11,755 tons of lead-contaminated soil were excavated from 90 50-foot by 50-foot grids (Figure 2). The site was seeded to finalize the EPA removal action with a completion date of March 16, 2009 (U.S. EPA 2009).

DISCUSSION

Potential Exposure Pathways

The main exposure routes with regard to lead poisoning are by ingestion (eating or drinking) or inhalation (breathing it in). The major route of exposure, especially for infants and toddlers, is by incidental ingestion of lead-contaminated soil/dusts resulting from repeated hand-to-hand mouth activity. In addition, small children and infants are closer to and spend more time on the ground where they may come into contact with lead-contaminated soil and dust. Therefore, it was determined that a potential exposure pathway existed for people who use the contaminated portion of the park to come into contact with the lead in the soils. The U.S. EPA removal action eliminated this potential exposure pathway.

Exposure Evaluation

The Ohio EPA had taken 140 soil samples and analyzed them by XRF (X-ray Fluorescence). The recommended 400 ppm lead screening level was exceeded in 36 (26 %) of the 140 surface soil samples collected at a depth of 0 to 6 inches below ground surface. The elevated lead detections were primarily found between the middle and eastern ball diamonds, where the average lead level in this area (shot drop zone) was 1,600 ppm and the highest level found was 5,979 ppm. Soil sampling results also indicated that lead contamination had reached the farthest baseball diamond west of the former shooting stands.

U.S. EPA collected ten surface soil samples for total lead analysis on June 16, 2008 and confirmed previous soil sample results in the park. All samples indicated surface soil levels greater than 400 ppm, with a high total lead of 4,010 ppm (U.S. EPA 2009). After the excavation of soils from 90 grids (each 50 by 50 feet) on the site, all but Grid H13 had soil levels below 400 ppm. This grid was further excavated and resampled, resulting in a lead level below 400 ppm for lead. After the removal action was completed, lead levels in the excavated area of the park ranged from 14 to 290 ppm (Weston Solutions Inc. 2009). The average lead level now present in the excavated area was calculated to be 66 ppm.

Health Evaluation

Discussion

Lead is a heavy, low melting, bluish-gray metal that occurs naturally in the Earth's crust. However, it is rarely found naturally as a metal. It is usually found combined with two or more other elements to form lead compounds. Once lead falls onto soil, it sticks strongly to soil particles and remains in the upper layer of soil. Some lead compounds are changed into other forms of lead by sunlight, air, and water; however, elemental lead cannot be broken down. The lead in the Phillipsburg Community Park was due to the use of lead shot when the park was used as a shooting range from about 1925 until 1988. Following this time, the accumulated lead remained in the soil.

Lead contaminated soil can pose a risk through direct ingestion, uptake in vegetable gardens, or tracking into homes. Naturally-occurring soils typically contain lead at concentrations less than 50 ppm but soil lead levels in many urban areas can exceed 200 ppm. The EPA’s clean-up standard for lead in bare soil in residential play areas is 400 ppm by weight and 1,200 ppm for non-play areas. This regulation applies to cleanup projects using federal funds (ATSDR CSEM 2007).

Lead exposure in the general population (including children) occurs primarily through ingestion, although inhalation also contributes to lead body burden and may be the major contributor for workers in lead-related occupations. Because of their behavior and physiology, children are more affected by exposure to lead than are adults. Children absorb more ingested lead than do adults. Children generally ingest lead-contaminated soil and house dust at higher rates than adults

because of mouthing and hand-to-mouth behaviors. Children who exhibit pica, a compulsive hand-to-mouth behavior and repeated eating of nonfood items, are at greatest risk. Children have a higher breathing rate than adults, breathing in a greater volume of air per pound. Being shorter than adults are, children are more likely to breathe lead-contaminated dust and soil as well as fumes close to the ground. In addition, the percent of lead absorbed in the gut, especially in an empty stomach, is estimated to be as much as five to 10 times greater in infants and young children than in adults. (ATSDR CSEM 2007).

Public Health Assessment

ODH HAS used EPA's Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) to determine if there was a probability that a blood lead level above CDC's level of concern, 10 micrograms per deciliter (µg/dL), could have occurred from exposure to lead in soil at the Phillipsburg Community Park. At the maximum soil lead level (5,979 ppm) found in the drop zone at the park by Ohio EPA, a blood lead level of 30 µg/dL is predicted for a child up to 7 years old. Using an average lead concentration of 1,600 ppm found in the drop zone by Ohio EPA, a blood lead level of 15 µg/dL is predicted for children in the age range of 2 to 3 years. Therefore, exposure to lead detected in soils on-site could result in blood lead levels above 10 µg/dL. However, according to Public Health - Dayton & Montgomery County, there have been no reports of lead poisoning due to lead contamination at the park. HAS advised fencing off contaminated sections of the park temporarily, pending the removal action. However, city officials decided to close the park entirely, which kept the park out of use for the season.

The time-critical removal action removed the lead-contaminated soils detected at the park and was completed on March 16, 2009. The average lead level in the backfilled and graded soil, based on the confirmation sampling results, was 66 ppm, which is below the 400 ppm screening level for lead in soil. This current level of lead in these soils at the park is not predicted to elevate blood levels above the 10 µg/dL level of concern.

Acute effects

An acute high exposure to lead can lead to high short-term blood lead levels (BLLs) and cause symptoms of lead poisoning. In children, acute exposure to very high levels of lead may produce encephalopathy and other accompanying signs of coma, convulsions, death, hyperirritability, lack of coordination and stupor. The BLLs associated with encephalopathy in children vary from study to study, but BLLs of 70-80 µg/dL or greater appear to indicate a serious risk. Even without encephalopathy symptoms, these levels are associated with increased incidences of lasting neurological and behavioral damage (ATSDR CSEM 2007).

Acute health effects described above would not be expected to occur from exposure to lead-contaminated soil at the Phillipsburg Park site either before or after the removal action. Incidental ingestion of soil containing the highest level of lead originally found at the park would not be expected to raise a child's blood lead level to a dangerous level. However, if a small child found and swallowed a piece of lead shot, this could cause an acute case of lead poisoning.

Chronic effects (Noncancer)
Children are more sensitive to the effects of lead exposure than are adults. Neurological effects in children may begin at low BLLs, at or below 10 micrograms per deciliter (µg/dL) in some cases. Studies have found a measured decrease in IQ as blood lead levels increase. There is also evidence that attention deficit hyperactivity disorder (ADHD) and hearing impairment in children increase with increasing BLLs, and that lead exposure may disrupt balance and impair peripheral nerve function (ATSDR 2007).

CDC considers children to have an elevated level of lead if the amount of lead in the blood is at least 10 micrograms per deciliter (µg/dL). Ohio considers children with blood lead levels equal to or greater than 10 µg/dL as lead-poisoned [OAC 3701-30-01 (N)]. EPA requires that the concentration of lead in air that the public breathes be no higher than 1.5 micrograms per cubic meter (µg/m3) averaged over 3 months.

The Agency for Toxic Substances and Disease Registry (ATSDR) has not derived Minimal Risk Levels (MRLs) for lead, and the EPA has not developed a Reference Dose (RfD) for chronic oral exposure for lead. The EPA has decided that it would be inappropriate to develop a reference dose for inorganic lead (and lead compounds) because some of the health effects associated with exposure to lead occur at blood lead levels as low as to be essentially without a threshold (IRIS 2004).

The EPA's standard for lead in bare soil in residential play areas is 400 ppm by weight and 1,200 ppm for non-play areas. This regulation applies to cleanup projects using federal funds (ATSDR CSEM 2007). Soil samples collected by the Ohio EPA at the Phillipsburg Community Park indicated an area around the middle and eastern ball diamonds that was above this 400 ppm level. Following the time-critical removal action, soil levels in the park are now significantly below the 400 ppm clean-up standard.

Cancer risk
The International Agency for Research on Cancer (IARC) classifies inorganic lead compounds as *probably carcinogenic to humans (Group 2A)*, based on limited evidence of carcinogenicity in humans and sufficient evidence in animals. In the 11th Report on Carcinogens, the National Toxicology Program (NTP) of the U.S. Department of Health and Human Services concluded that "lead and lead compounds are *reasonably anticipated to be human carcinogens*" (NTP 2005). In arriving at its conclusions, the NTP relied upon studies on laboratory animals and workers exposed to high levels of lead. The laboratory animals developed brain, kidney, and lung cancer. The workers inhaled high levels of lead fumes or accidentally ingested lead dust. The worker studies did not account for diet, smoking, and exposure to other cancer-causing agents. The worker study showed weak evidence for increased risk for lung, stomach, or bladder cancer. The workers were exposed to lead at 50 to 5,000 micrograms per cubic meter (µg/m^3) in air and had 40 to 100 µg/dL in blood. These above exposures greatly exceed the expected types of exposures that could potentially occur with regard to use of the Phillipsburg Community Park by nearby residents.

The U.S. EPA has not established a cancer slope factor to estimate cancer risk due to lead exposure and recommends that a numerical estimate not be used (U.S. EPA 2004). Although we cannot estimate cancer risk, cancer health effects would not be expected from recreational exposure at Phillipsburg Community Park lead either before or after the removal action.

Child Health Issues

Children (especially infants and toddlers) are the primary concern when it comes to exposure to lead because their bodies tend to absorb more lead than adults. While adults will absorb only a few percent of the lead that they may swallow, children absorb about 50% of ingested lead. Children are also more sensitive to the effects of lead exposure than are adults. Even at low levels, lead can affect a child's mental and physical development, in part because their brains and nervous systems are still developing. The effects of lead are the same whether it enters the body through breathing or swallowing. The major adverse health effect from exposures to excessive amounts of lead is damage to the nervous system potentially resulting in lower intelligence and behavioral effects that persist into adulthood (ATSDR, 2007).

CONCLUSIONS

The HAS's recommendation to remove lead-contaminated soil greater than 400 ppm at the Phillipsburg Community Park to eliminate future exposures to lead has been successfully carried out by the U.S. EPA. Post-excavation sampling of formerly contaminated soil grids indicate that the lead levels in these soils are now significantly below the 400 ppm residential clean-up standard. Lead-contaminated soils no longer pose a public health hazard, and the park is now safe for recreational use.

RECOMMENDATIONS

No further recommendations are made at this time.

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CERTIFICATION

This Lead Contamination Health Consultation was prepared by the Ohio Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun. Editorial review was completed by the Cooperative Agreement Partner.

Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

for Greg Ulirsch

Team Lead, Cooperative Agreement Team, CAPEB, DHAC, ATSDR

TABLES

Table 1. Post-Excavation Lead Levels at Phillipsburg Community Park

Grid Location	*Lead (ppm)*	*Grid Location*	*Lead (ppm)*	*Grid Location*	*Lead (ppm)*	*Grid Location*	*Lead (ppm)*
A5	19	C14	41	E9	86	G9	62
A6	19	C15	71	E10	53	G10	150
A7	31	C16	51	E11	130	G11	65
A8	18	C17	68	E12	170	G12	64
A9	50	C18	47	E13	30	G13	200
A10	51	C19	120	E14	71	G14	28
B4	16	C20	66	E15	26	H9	290
B5	17	D7	25	E16	31	H10	230
B6	52	D8	34	E17	54	H11	110
B7	32	D9	40	E18	24	H12	150
B8	35	D10	170	F7	41	H13 (1)	610
B9	23	D11	30	F8	50	H13 (2)	82
B10	28	D12	16	F9	52	H14	100
B17	37	D13	70	F10	74	I10	30
B18	27	D14	44	F11	130	I11	160
B19	75	D15	54	F12	85	I12	33
C7	29	D16	69	F13	200	I13	47
C8	19	D17	60	F14	68	I14	35
C9	49	D18	110	F15	25	L20	47
C10	120	D19	49	F16	38	P1	25
C11	44	D20	14	F17	41	P2	16
C12	18	E7	87	G7	15	P3	66
C13	27	E8	160	G8	69		

Source: Weston Solutions, Inc. 2009. The confirmation sample from grid H13 was above 400 ppm - that grid was further excavated and the subsequent sample was below 400 ppm. The sample from grid C18 was combined with the sample from grid L20.

ppm – parts per million (dry)

FIGURES

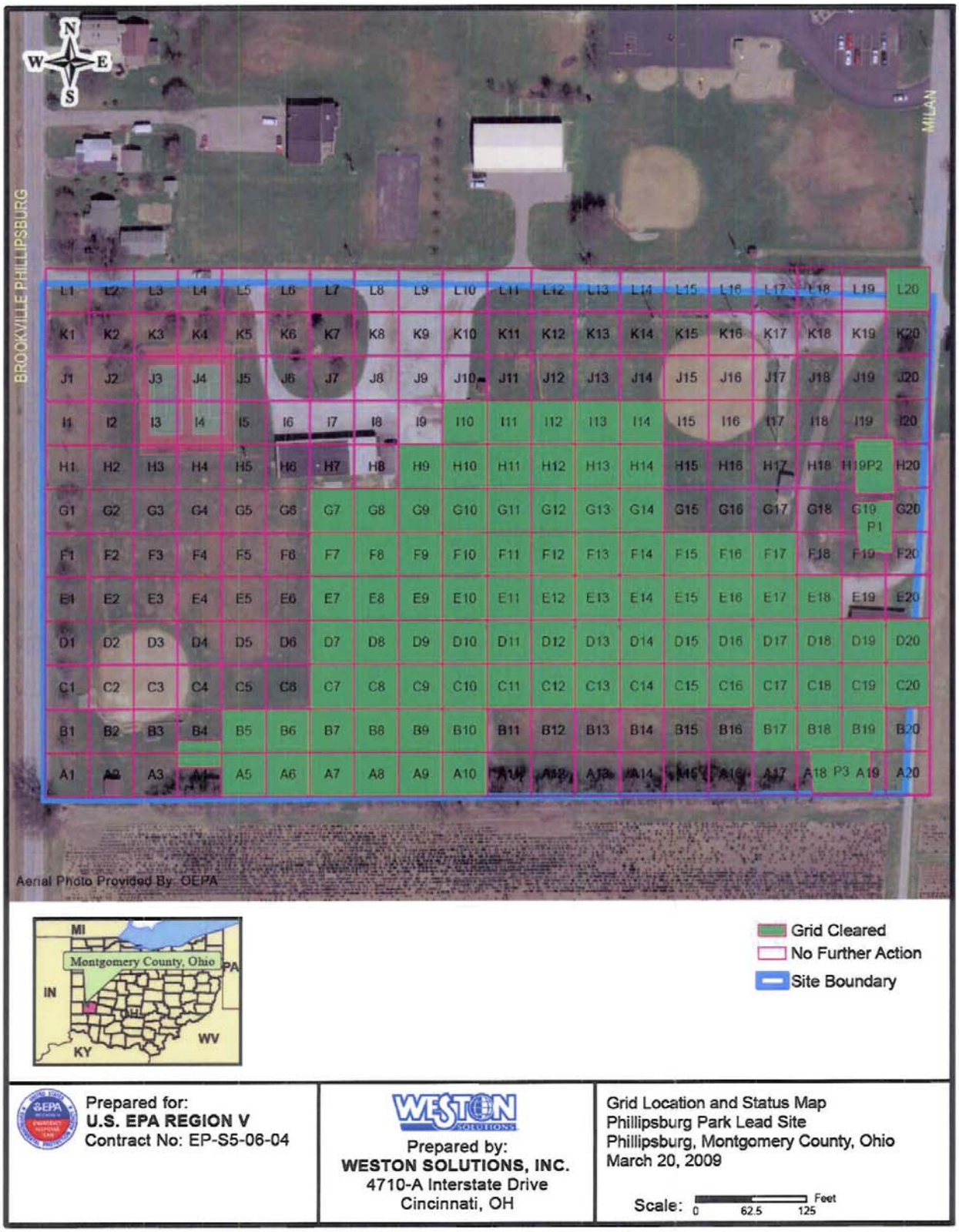
Figure 1. Soil Sampling Results > 400 ppm at Phillipsburg Park Lead Site

Source: Ohio EPA May 2008

● Total Lead >400 ppm

N

Figure 2. Excavation Grids at Phillipsburg Park Lead Site



Source: U.S. EPA 2009

Appendix A. Fact Sheet

Bureau of Environmental Health
Health Assessment Section

"To protect and improve the health of all Ohioans"

Lead

Answers to Frequently Asked Health Questions

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts of the earth's crust. Prior to our current knowledge of the health hazards of lead, it was widely found in many of the products we used every day. Products such as gasoline, paints, batteries, metal products and ammunition just to name a few. Because lead is toxic, its use has been dramatically reduced since the 1980's.

Lead in the environment:

Lead does not break down in the environment. And although lead occurs naturally in the environment, most of the high levels of lead found come from human activities.

Once lead falls on to soil, it usually sticks to the soil particles. If the soil is uncovered and open to the air or becomes disturbed, lead-contaminated dust is created and carried by the wind. This dust is easily breathed in or swallowed. With construction activities, the possibility of lead-contaminated dust is an important concern.

Gardens grown in lead-contaminated soils may contain lead. Produce of fruits, grains and vegetables (especially root vegetables such as beets, carrots, parsnips, radishes, turnips, and rutabagas) absorb some of the lead through their roots. There is also the possibility of lead-contaminated dust falling onto crops.

Inside the house, lead can be found in lead-based paint, lead-contaminated dust, older lead pipes that carry water and some glazed pottery. A child can easily eat lead paint chips, breathe or ingest the dust on their fingers.

How does lead get in your body?

You may be exposed to lead by breathing (inhalation), eating/drinking (ingestion) or by skin contact (dermal contact). However, only very small amounts of lead can get into your body through dermal contact. Inhalation and ingestion of lead-contaminated dust and soil are the main health concerns.

How does lead affect your health?

The harmful effects of lead are the same whether it is breathed or swallowed. The main target for lead toxicity is the nervous system, including the brain. But lead can negatively affect every organ of the body.

Children are most vulnerable to lead poisoning because they play outside, close to the ground or in the dirt. Small children also put their fingers in their mouths. Compared to adults, a bigger proportion of the amount of lead swallowed will enter the blood in children. About 99% of the amount of lead taken into the body of an adult will leave in the waste within a couple of weeks. But only about 32% of the lead taken into the body of a child will leave in the waste.

Lead exposure in the womb, in infancy, or in early childhood may also slow mental development and lower intelligence later in childhood. Lead can cause irritability and aggressive behavior in children. If pregnant women have high levels of lead in their bodies, fetuses exposed to lead in the womb may be born prematurely and have lower weights at birth. In some cases, pregnant women with high levels of exposure to lead may have miscarriages.

Some other harmful health effects of lead include damaged kidneys, damaged male reproductive system, severe "stomachaches," a poor appetite, sleep disorders, and hearing problems. Lead can also decrease reaction time and affect the memory.

Is there a medical test to determine whether I have been exposed to lead?

Yes, there is a test to see if you have been exposed to lead. The primary screening method is the measurement of total lead in the blood. This test can tell if you have been recently exposed to lead.

Also, exposure to lead can be evaluated by measuring the erythrocyte protoporphyrin (EP) in the blood sample. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). For this reason, total lead is the primary method of screening.

Lead can also be measured lead in teeth or bones by X-ray techniques. These tests can tell about long-term exposure but are not widely available..

How can families reduce the risk of exposure to lead?

The most important way a family can lower exposures to lead is to avoid exposure to lead-contaminated soil and dust sources, avoid lead-based paint chips, avoid water from lead-lined pipes and avoid some plastic products made outside the United States.

The swallowing of lead-contaminated soil or dust is a very important exposure pathway for children. This problem can be reduced in many ways. Regular hand and face washing to remove lead dust and soil, especially before meals, can lower the possibility that lead on the skin is accidentally swallowed while eating. Families can lower exposures to lead by regularly cleaning the home of dust and tracked-in soil. Door mats can help lower the amount of soil that is tracked into the home and removing your shoes before you enter the house will also help. Planting grass and shrubs over bare soil areas in the yard can lower contact that children and pets may have with soil and the tracking of soil into the home. Also, wash all produce grown in lead-contaminated soils before eating.

Families whose members are exposed to lead-contaminated soil and dust can minimize the exposure to children by changing and bagging their work clothes before they are brought into the home for cleaning. Also, they should immediately wash their hands or shower.

It is important that children have proper nutrition and eat a balanced diet of foods that supply adequate amounts of vitamins and minerals, especially a diet high in calcium and iron. Good nutrition lowers the amount of swallowed lead that passes to the bloodstream and also may lower some of the toxic effects of lead.

The Ohio Department of Health has a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), Public Health Service, U.S. Department of Health and Human Services.

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Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) considers children to have an elevated level of lead if the amount of lead in the blood is at least 10 µg/dL. Medical evaluation and environmental investigation and remediation should be done for all children with blood lead levels equal to or greater than 20 µg/dL. Medical treatment may be necessary in children if the lead concentration in blood is higher than 45 µg/dL.

The Environmental Protection Agency (EPA) requires that the concentration of lead in air that the public breathes be no higher than 1.5 micrograms per cubic meter (µg/m^3) averaged over 3 months. EPA regulations no longer allow lead in gasoline. The Clean Air Act Amendments (CAAA) of 1990 banned the sale of leaded gasoline as of December 31, 1995.

The EPA regulations also limit lead in drinking water to 0.015 milligrams per liter (mg/L). The 1988 Lead Contamination Control Act requires the Consumer Product Safety Commission (CPSC), EPA, and the states to recall or repair water coolers containing lead. This law also requires new coolers to be lead-free. In addition, drinking water in schools must be tested for lead, and the sources of lead in this water must be removed.

To help protect small children, CPSC requires that the concentration of lead in most paints available through normal consumer channels be not more than 0.06%. The Federal Hazardous Substance Act (FHSA) bans children's products containing hazardous amounts of lead.

The EPA has also developed standards for lead paint hazards, lead in dust, and lead in soil. To educate parents, homeowners, and tenants about lead hazards, lead poisoning prevention in the home, and the lead abatement process, EPA has published several general information pamphlets. Copies of these pamphlets can be obtained from the National Lead Information Center or from various Internet sites, including http://www.epa.gov/opptintr/lead.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological profile for lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ATSDR
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