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# Protecting Your Children and Your Food from Lead in Soil

Good food is important to the health of our families. Gardening can be great way to increase your supply of healthy food. If you have lead in your soil, you may need to take precautions in order to garden safely and to protect your family from exposure to lead.

**The Problem:** Although lead poisoning of children has decreased both statewide and nationally over the last 20 years, it is still a serious problem.

Lead is highly toxic, particularly to children under the age of six. Young children exposed to even low levels of lead can have permanent damage to the nervous system and the brain, resulting in learning disabilities, behavioral problems, poor muscle coordination, decreased muscle and bone growth, and hearing loss. Research continues to find effects of lead on the IQ and brain development of children at very low levels, down to 2 micrograms per deciliter of blood (ug/dl). There is no known safe level of lead for children. Lead poisoning may have no early symptoms, or it may have mild symptoms easily confused with other illnesses. The only way to diagnose lead poisoning is to have a blood test.

The most common ways people are exposed to lead in the home are from lead-based paint, lead dust, and lead in soil. Lead was an ingredient in paint before 1978, and lead paint can still be on any painted surface, such as doors, windows, or furniture. Lead dust can come from chipping or peeling paint, from scraping or sanding painted surfaces when remodeling, or from opening and closing painted windows and doors. Lead in soil can come from paint chips, from car exhaust during the use of leaded gasoline (from the 1920s until being phased out from 1973 to 1995), from the use of lead arsenate as a pesticide (from the 1890s until the 1960s), or from pollution from industrial sources. Soil contaminated with lead can be tracked into the house, where it becomes dust.

People can also be exposed to lead in other ways – through work or hobbies that involve working with stained glass, ceramics, metals or leaded paint, in water from pipes or other plumbing fixtures with lead, in food and water in contact with glass or ceramics glazed with lead, and in some “home remedies.”

Lead is affecting the children of Connecticut. Of the 77,423 children under the age of 6 who were tested for lead poisoning in Connecticut in 2011, 4,984 (6.5%) had blood lead levels above 5 micrograms per deciliter (ug/dl), 619 (0.8%) had blood lead levels above 10 ug/dl, 264 (0.3%)

had blood lead levels above 15 ug/dl, and 111 (0.1%) had blood lead levels above 20 ug/dl (1). Blood lead levels as low as 5 ug/dl have been shown to decrease IQ and school performance.

New Haven has the highest number of cases childhood lead poisoning in Connecticut. In 2011, there were 113 cases in New Haven (2.4 % of all children tested) out of 619 in the state with a blood lead level above 10 ug/dl (1). The Greenspace program of Urban Resources Initiative has been testing for lead before remediating and planting in front yards all over New Haven since 2006. Data from driplines of houses are presented in Table 1, and from the middle of front yards in Table 2. These data show that soil lead levels above the residential standard of 400 ppm are widespread in neighborhoods throughout New Haven.

Although most other cases of elevated blood lead levels in 2011 were in the cities of Bridgeport, Waterbury, Hartford, Meriden, and New Britain, there was at least one child with a blood lead level above 10 ug/dl in half of the towns in the state (1).

Lead does not break down over time. Because lead is tightly bound to soil, it generally does not move except when the surrounding soil is moved either by digging, by erosion, or by soil moving into the air as dust. If a barrier is laid down and the soil is covered and protected from movement, the lead will remain in place.

According to current research, lead in the soil has become a major source of lead in the blood of children. Some researchers say it is now more important than interior lead paint because much of the older lead paint has been removed or encapsulated over recent decades.

**Testing for Children.** The Connecticut Department of Public Health Testing mandates blood testing for elevated levels of lead of all children each year between 9 months and 36 months of age. If a child has not previously been tested by 36 months, testing is mandated between 36 months and 72 months (2). Testing is also mandated for older children with delays in development. If a child has an initial positive test (level higher than 5ug/dl), additional follow up testing is also mandated. Yale-New Haven Hospital and St. Francis Hospital in Hartford have Regional Lead Treatment Centers.

**Environmental Inspections**. By state law, local health departments are required to conduct environmental investigations of the homes of children under 6 years old with lead poisoning (defined as 20 ug/dl in blood tests). Towns can also require inspections at a lower threshold, or inspections may be triggered by a tenant complaint or unit turnover.

The inspection includes testing samples of walls, floors, windows, exterior surfaces, and soil for lead content (3). It may also include water analysis. If a source of lead is found, and a child under 6 with a blood level of 20 ug/dl lives there – or in a multiunit building, if any child under 6 lives there – the owner must abate the sources of lead. This applies to interior and exterior lead paint and also to lead in the soil (3).

**Soil Tests.** If soil tests are not required by law, the property owner has the option to decide whether to test the soil. If the soil test result is above the residential standard for lead, the owner may be required to disclose that information, along with information about any efforts at remediation, at the time of sale.

The University of Connecticut Soil Nutrient Analysis Laboratory (UCSNAL) routinely tests all soil samples for lead. The test costs $8. Instructions for collecting samples and mailing them are here: http://soiltest.uconn.edu/factsheets/HomeGrounds.pdf

Private laboratories also test for lead in dust, paint chips, and soil. The Connecticut Department of Public Health has a list of laboratories accredited by the Environmental Protection Agency for lead testing here:
http://www.ct.gov/dph/lib/dph/environmental_health/lead/pdf/lead_nllap_list(2).pdf

In Connecticut, the standard used by the Department of Energy and Environmental Protection (DEEP) for remediation of lead in soils in residential areas (which includes playgrounds, outdoor recreation areas, hospitals, schools, and day care centers as well as homes, apartments, and condominiums) is 400 parts per million (ppm) (3).

**General suggestions if you have lead in your soil:**

1. According to UCSNAL, lead levels between 0 and 60 parts per million (ppm) are normal for our region. Levels between 100 ppm and 400 ppm should be treated with caution. You may want to add clean soil and compost to your garden, and do further testing to make sure there are no "hot spots" with higher lead levels. Keep the paths covered with mulch, especially if children are in the garden. Consider growing only fruits and fruiting vegetables. (4).
2. Above 400 ppm, cover the garden area with landscape fabric, bring in clean soil and compost for gardening, and cover paths with mulch (4).
3. Fruit (apples, grapes, strawberries, melons) and fruiting vegetables (tomatoes, peppers, beans, corn, squash) have much lower levels of lead than roots, stems, and leaves grown on soils contaminated with lead (5).
4. Make sure any soil and compost you bring in have also been tested for contaminants.
5. Minimize digging in the soil – it exposes the soil and creates dust. If you need to dig, keep the soil moist to reduce dust.
6. Keep soil covered. You want to have a durable cover over the soil to keep the leaded soil undisturbed and in place. Pavement (concrete or asphalt) is a durable cover. Grass can be a durable cover where grass grows well. For areas where grass does not grow well (high traffic areas, shade, poor soil), you can put down a durable landscape fabric and then cover with several inches of mulch (wood chips, leaf mulch) or with clean soil.
7. It is especially important to cover the soil in areas where children play. Cover the ground with landscape fabric and then add mulch approved for playgrounds on top.
8. It is also especially important to cover the soil around the dripline of any building, since that is where the lead contamination is likely to be highest. Plant long-lived shrubs. Cover the soil with a thick layer (several inches) of mulch. Don't grow food plants or annuals within 4 feet of buildings.

9. Avoid bringing soil into your home. Leave shoes and boots outside. Have a mat for wiping feet just inside the door. Leave clothes used for gardening by the door. Clean up dust frequently with a wet mop.

**Table 1.** Concentration of lead in parts per million in soil samples (3 samples, 1-2" deep) from the dripline (4 ft. from the house foundation) of residences in New Haven, listed by neighborhood. Data from the Greenspace program, Urban Resources Initiative.

**Lead at Dripline (along front edge of house) in ppm**

| Neighborhood | Number of tests | Average lead | Range |
|---|---|---|---|
| Beaver Hills | 25 | 2478 | 85 - 7740 |
| Cedar Hill | 1 | 3301 | 3301 |
| City Point | 5 | 1815 | 636 - 3769 |
| Dixwell | 18 | 673 | 33 - 2142 |
| Dwight | 6 | 3653 | 844 - 11700 |
| East Rock | 7 | 2099 | 263 - 5797 |
| Fair Haven | 22 | 2173 | 63 - 6680 |
| Fair Haven Heights | 3 | 6475 | 3347 - 9564 |
| Hill | 10 | 1378 | 83 - 3214 |
| Newhallville | 34 | 1399 | 34 - 7410 |
| Prospect Hill | 6 | 948 | 274 - 1518 |
| Westville | 2 | 1074 | 317 - 1830 |
| Wooster Square | 1 | 1969 | 1969 |
| **Grand Total** | **140** | **1872** | **33 - 11700** |

**Table 2.** Concentration of lead in soil samples (3 samples, 1-2" deep) from the middle of the front yard (mid-way between the dripline and the curb) of residences in New Haven, listed by neighborhood. Data from the Greenspace program, Urban Resources Initiative.

**Lead in Yard (midway between dripline and curb) in ppm**

| Neighborhood | Number of tests | Average lead | Range |
|---|---|---|---|
| Beaver Hills | 25 | 409 | 70 - 1306 |
| Cedar Hill | 1 | 1169 | 1169 |
| City Point | 5 | 815 | 316 - 1603 |
| Dixwell | 18 | 357 | 28 - 1026 |
| Dwight | 6 | 956 | 185 - 2740 |
| East Rock | 7 | 732 | 94 - 2046 |
| Fair Haven | 22 | 1332 | 104 - 7790 |
| Fair Haven Heights | 3 | 542 | 308 - 706 |
| Hill | 10 | 601 | 49 - 1588 |
| Newhallville | 34 | 574 | 43 - 1810 |
| Prospect Hill | 6 | 539 | 190 - 1066 |
| Westville | 2 | 345 | 152 - 538 |
| Wooster Square | 1 | 1334 | 1334 |
| **Grand Total** | **139** | **676** | **28 - 7790** |

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