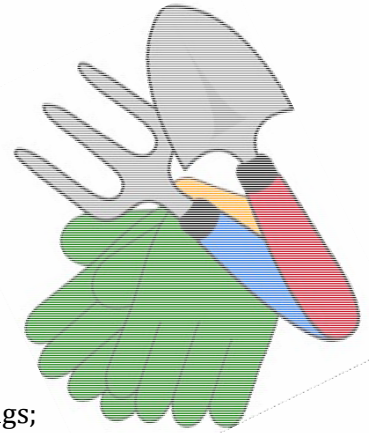
Gardening and Lead Hazards



How does lead get into the soil?

Lead (Pb) is a heavy metal that occurs in low levels in all soils. Natural concentrations of lead in most soils range from 10-30 parts per million (ppm). However, some soils have higher concentrations of lead due to contamination from various pollution sources, including:

- Chipping, sandblasting, and peeling of exterior lead-based paint from older buildings;
- Automobile emissions from combustion of leaded gasoline (lead was added to gasoline as an anti-knock ingredient, but this practice was stopped by 1986 in the US and subsequently in many countries, although leaded gasoline is still available in some parts of the world);
- Disposal of scrap containing lead, such as old lead pipes, roof flashing, or lead-acid batteries

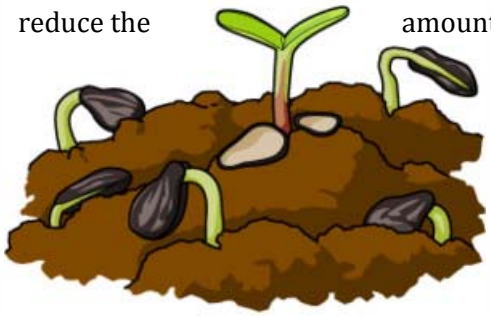
Recent studies show that the lead content of some urban soils may range from 100 ppm to over 1,000 ppm. Elevated lead concentrations in soils in urban areas are often directly related to their distance from highly traveled roads and older buildings painted with lead-based paints. Houses close to freeways and other highly used road or located in industrial zones may have soil lead concentrations of 1,000 ppm. The soil next to older buildings painted with lead-based paint that is flaking or has been scraped or blasted may have lead concentrations exceeding 3,000 ppm.

What are the hazards associated with lead?

Lead is toxic to humans, and poisoning can either occur through ingestion of lead or by breathing in lead dust. Both long-term low-dose and short-term high-dose exposure can permanently damage the nervous, renal (kidney), and hematopoietic (blood-forming) systems. Lead may also harm the reproductive, endocrine (hormonal), hepatic (liver), cardiovascular, immune, and gastrointestinal systems. Young children (less than 6 years of age) are more sensitive to the toxic effects of lead than are adults. For more information on the health effects of lead, contact the Toledo-Lucas County Health Department Lead Prevention staff at 419-213-4100 ext 3.

Will plants grow in lead contaminated soil?

Yes. Unlike many other heavy metals such as cadmium, copper, and nickel, moderate concentrations of lead in the soil (<500 ppm) have no noticeable harmful effect on plant growth. Therefore, ornamental plants can be grown safely in lead-contaminated soil. In fact, it is a good idea to grow a ground cover over lead-contaminated soil to reduce the amount of lead-laden soil dust that can become airborne with windblown topsoil.



TOLEDO-LUCAS COUNTY HEALTH DEPARTMENT
Stay informed. Stay healthy.

Adapted from University of California Agriculture and Natural Resources

MAIN OFFICE
635 North Erie Street
Toledo, Ohio 43604
419.213.4100

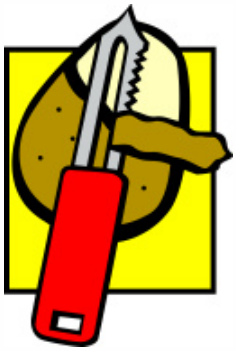
WESTERN CLINIC SITE
330 Oak Terrace Blvd.
Holland, Ohio 43528
419.213.6255

Is it safe to eat plants that have been grown in lead-contaminated soils?

The answer is not a simple yes or no: it depends on the soil concentration of lead and type of crop grown. The greatest exposure to lead in soil is from soil dust, which is why the US Environmental Protection Agency (EPA) set a standard for lead in bare soil in play areas of 400 ppm and 1,200 ppm for non-play areas. The greater risk to children, and some adults, is not through ingestion of vegetables, but through direct ingestion of lead-contaminated soils, especially by children who may intentionally eat soil (pica).

Plants do not readily absorb large amounts of lead, and the amount they do absorb depends on the species and variety of plant, the chemical composition of the soil, the amount of lead in the soil, and the soil temperature. Because so many factors influence how much lead a plant absorbs, it is difficult to predict how much lead a plant will contain based on the amount of lead in the soil. However, lead is generally slow to move within a plant (from roots to leaves) and most of the lead that does enter a plant accumulates in the fine roots and secondarily in the leaves, though there are some exceptions. Fruits such as tomatoes, peppers, melons, okra, apples, and oranges, and seed such as corn, peas, and beans, generally have the lowest lead concentrations and are the safest portions of the respective plants to eat if grown in lead-contaminated soil

What precautions should I take before eating plants grown in lead-contaminated soils?



Recent studies of leafy greens (collard greens) grown in urban gardens contaminated with lead estimated that ingestion of these greens would provide only 25% of the intake from water containing a safe level of lead (4 ppm). While this amount is small in comparison to water, it is still significant and should be minimized. It can be safe to eat plants grown in soils contaminated with lead if you follow some simple, low-cost precautions:

- Do not grow leafy vegetables or root or tuber crops (carrots, potatoes, beets, turnips) in lead-contaminated soils. Grow them in raised beds filled with clean soil, where the clean soil cannot be contaminated with paint flakes, chips, or dust.
- Fruits that are marketed as vegetables, such as tomatoes, peppers, beans, cucumbers, and squash, may be grown in lead-contaminated soils will not accumulate significant concentrations of lead.
- The primary risk of lead consumption from eating a plant grown in lead-contaminated soil is from ingesting lead-rich soil that adheres to the surface of the plant. Therefore, washing and peeling greatly reduces the risk of ingesting lead deposited on surfaces of vegetables and fruits.
- Root and tuber vegetables, such as potatoes, beets, turnips, and carrots, may have lead-rich soil particles attached to their skin. It is essential to peel these vegetables if grown in lead-contaminated soils.
- Peeled root and tuber vegetables should also be washed with tap water after they are peeled, in order to rinse away any contaminants transferred to the outer flesh during the peeling process.

Adapted from University of California Agriculture and Natural Resources

MAIN OFFICE
635 North Erie Street
Toledo, Ohio 43604
419.213.4100

WESTERN CLINIC SITE
330 Oak Terrace Blvd.
Holland, Ohio 43528
419.213.6255

Can I do anything to reduce the amount of lead my vegetables take up from the soil?

Yes you can. You can reduce the amount of lead uptake by plants by providing amendments that promote binding of the lead with other components of the soil, and also manage the soil acidity (pH):

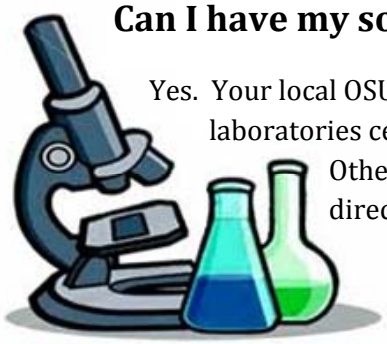
- Organic matter has proven to bind and hold effectively, making it less available to plants. However, organic matter eventually breaks down, so the soil should be frequently amended with organic matter (compost, decomposing leaves, or well-rotted manure)
- Composts rich in phosphorus are especially able to lower lead uptake into the edible parts of the plants. Applying additional phosphorous using any garden fertilizer containing phosphate to the soil surface when adding organic matter increases the phosphorus content and does not hurt the plants even if the compost is rich in phosphorus
- For vegetable gardening, maintain the soil pH in a range close to neutral (pH 6.5 to 7.5). You may need to add limestone to increase the pH in acidic soil. Generally, plants take up less lead as the soil pH increases. However, the soil pH should not be raised beyond 7.5, otherwise elements necessary for healthy plant growth and development will also become unavailable to the plants. Although garden pH meters are readily available at garden centers, it may be more accurate to have the soil tested for pH at a local commercial soil laboratory.

Can I reduce or remove the lead in my soil?

Not easily. Unless the soil is removed or diluted, the lead concentration in the soil does not change over time. If the soil has not been disturbed, the highest concentration of lead will be in the upper few inches. The lead concentration of many roadside soils remains elevated even through lead has not been added to gasoline in the US for more than 30 years.

- Inhalation of lead-laden dust while gardening is generally a greater risk than consuming well-washed vegetables grown in low to moderately contaminated soil. Consider covering contaminated soil with 8-12 inches of uncontaminated soil, which limits lead absorption by plants and reduces the hazard presented by inhaling and ingesting soil dust containing lead.
- You can also minimize the hazard from lead dust by applying a 4-6 inch thick layer of mulch around your plants. Mulching has the added benefits of maintaining moisture in the soil and reducing weed growth. Also, maintaining a dense stand of a ground cover (lawns, etc.) that covers the soil entirely reduces dust an mud problems and lower the risk of lead inhalation significantly.

Can I have my soil tested for lead content?



Yes. Your local OSU Extension office may have a list of commercial laboratories certified to do soil analyses. Otherwise, check the telephone directory or internet for such a list.

Adapted from University of California Agriculture and Natural Resources

TOLEDO-LUCAS COUNTY HEALTH DEPARTMENT
Stay informed. Stay healthy.

MAIN OFFICE
635 North Erie Street
Toledo, Ohio 43604
419.213.4100

WESTERN CLINIC SITE
330 Oak Terrace Blvd.
Holland, Ohio 43528
419.213.6255