

## LEAD IN SOIL

Potentially toxic metals include cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), and zinc (Zn) among others. All these metals are trace elements, which means that each exists in all soils at some normal range of background levels. Background levels usually do not pose a risk to plants, animals, or people. Some of these metals are even essential (at low levels) for proper plant and animal nutrition.

Human habitation and activity over time tend to elevate the concentration of some of these metals in soils to levels which may pose a toxicity risk under some circumstances. At some (often loosely defined) level above normal background, the soil is said to be contaminated. Some metals are of concern more because of their toxic effects on plants and some because of their potential toxic effects on animals and humans.

Chromium, copper, nickel, and zinc are more of a toxicity concern with plants than with animals. This is because most plants would die from the toxic effects of one of these metals long before accumulating a high enough concentration to pose a health risk to an animal (or person) eating that plant. This is not the case with cadmium, mercury, or lead. With these metals it is conceivable that a plant could accumulate enough of the metal to pose a health risk with little or no detrimental effect to the plant. These three are usually the metals of most concern regarding human health.

Lead is by far the most common contaminant of soils. The most common source of lead contamination is lead-based paint which has been chipped or scraped off building exteriors over several decades or centuries. This will produce a "halo" of contaminated soil near buildings. Other sources of lead include:

- \* Old orchards (lead arsenate was in heavy use until WW II)
- \* Scrap metal (discarded roof flashing, lead pipes)
- \* Auto exhaust (leaded gas fallout on roadsides)

Lead in soil is virtually a permanent resident. Organic matter, especially, will bind and hold lead and other metals very effectively. In some circumstances this can be advantageous, as will be explained shortly. However, with a heavily contaminated soil (greater than 300 to 500 parts per million total lead content) the only effective ways to eliminate the contamination are to cover it with fresh soil or remove it completely.

Moderate levels of lead contamination can be actively managed to minimize the risk of lead intake. Normal background levels of lead in Maine soils ranges up to 50 parts per million (ppm). Contamination is considered to be moderate up to 300 to 500 ppm, depending on the situation. Lead intake occurs either by eating contaminated plants, eating the soil itself, or breathing soil dust. Several steps can be taken to minimize intake.

The natural tendency of soil to bind metals can be enhanced and used to advantage when garden soil is moderately contaminated:

\*Maintain the pH of the soil between 6.5 and 7.0.

\*Maintain a soil organic matter level near 8 % .

Lime the soil as needed to maintain the pH near neutral (7.0). Yearly additions of manure, compost, or leaves will maintain an ample organic matter level. Bear in mind that too high a pH or too much organic matter can cause nutrient availability problems, so don't overdo it. Keeping the soil in this condition will maximize its ability to bind metals in a chemically inactive form. This minimizes any incidental uptake into plants.

Once uptake inside the plant is minimized, then the greatest potential contamination is from surface dust or soil. Surface contamination is the normal result of cultivation, rain spatter, or from just walking through the garden. Surface contamination can be removed by thorough washing. For those vegetables with smooth surfaces, like tomatoes or peppers, a thorough washing is relatively easy. For vegetables with rough surfaces, like leafy vegetables, it is much more difficult if not impossible to do a thorough job of removing the film of surface dust and grit. Root vegetables and tubers can actually be more thoroughly cleaned than leafy vegetables, if they are peeled. It is possible for the peeling process to transfer some surface contamination to the rest of the vegetable, however, so wash before peeling. Seed vegetables, like corn and peas, will have no surface contamination problem since there is a physical barrier. It is best, therefore, to avoid growing leafy vegetables in moderately contaminated soils. Concentrate on fruiting and seed vegetables instead.

At high levels of contamination (above 500 ppm total soil lead content) it is usually best to move your garden to an area with less contamination. If this is not feasible, then a new garden can be built on the same site with fresh soil. The existing soil can be excavated and new soil brought in. In this situation, however, the likelihood of contaminating the new soil is quite high since contaminated soil surrounds the new soil at the same level. A better idea is to build a raised garden with fresh soil on top of the old, being careful not to physically mix old and new soil during deep cultivation. To avoid inadvertent mixing, a porous barrier such as woven plastic landscape or weed cloth should be put down over the old soil, underneath the new bed. This will allow water to drain through while preventing any physical mixing of old and new soil.

Play areas near older buildings should be tested to be sure that not even a moderate level of lead exists. Because of the risk of direct intake of soil particles on small fingers and the inhalation of dust and because of the greater sensitivity of children to lead toxicity, play areas should be moved away from the contaminated site or the soil removed and replaced. If fresh fill or sand is brought in, be sure it cannot mix with contaminated soil underneath. In areas of moderate contamination, a continuous grass cover can serve as an effective barrier against intake of lead from direct ingestion or dust inhalation.

The key to effectively dealing with soil metals is to determine the level present in the soil by testing. Once informed you can decide to either put the concern to rest, take steps to minimize potential intake, or remove the soil completely. Lead screening is part of the routine soil fertility test at the Maine Soil Testing Service for all soils from gardens, ornamental beds, and turf areas.