K-STATE Research and Extension | Wildcat District

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The Lead in Our Soils

The vast majority of the time heavy metals in soil are not an issue and homeowners do not need to be concerned. However, when getting outside this spring to work in gardens and flowerbeds, there can be a risk in this area of Kansas, Missouri, and Oklahoma. Our history of mining has left many well-known, and some unknown, areas of heavy metal concern.

Most risk of heavy metals to gardeners, at least the ones around here, aren't from vegetables themselves. In fact, plants are really good at filtering out many heavy metals. While vegetable metal uptake can still be a factor, most heavy metal ingestion comes directly from the contaminated soil being eaten or breathed when gardening. This risk increases for young kids who put everything in their mouths. This article is not in any way medical advice, as I'm a soil chemist and agronomist, not a doctor, but it's important for gardeners and parents in this area to understand how our mining history has created an increased risk of heavy metals.

Areas of Increased Concern

Those of us who grew up in the tristate area of Kansas, Missouri and Oklahoma know that this area has a history of mining. Back 100 years ago, this area was an industrial center of coal, zinc, and lead mining. We mined and made the bullets in WWI and WWII. Huge quantities of lead and then zinc ore were mined, extracted, and then sent to nearby refineries that used coal and natural gas-fired furnaces to melt the metals. The resulting 'slag, chat, or tailings' (the rock material after separating/melting ore) that was still contaminated with lead and zinc was piled up and hauled around the area. There wasn't much concept of the health hazards nor environmental regulations at the time, and much like glitter, the stuff got everywhere. While zinc can be an issue in major quantities, it's the lead that can cause health and development problems in much smaller quantities. However, zinc and lead were often mined together and were part of the same parent material ore.

The towns most at risk are where the ore was mined and purified, and also in the areas where it was refined. Since the 80s the EPA and KDHE have been working to identify and remediate the

areas most contaminated. Well known places such as Iola, Pittsburg, Galena and Pitcher are obvious where huge piles of chat and slag were covered or removed. Many towns in southeast Kansas have a mining or refining history. Some refining towns such as Pittsburg, Caney, and Cherryvale have had programs where entire yards of soil removed and replaced. Other towns with refining history include Altoona, Neodesha, Coffeyville, Chanute, La Harpe, Caney, Cherryvale, Girard, Cherokee, and Dearing. In fact, the KDHE has identified 33 former smelters in Kansas and they are still working today to remediate the contamination. However, keep in mind that living in these towns don't automatically mean high lead potential or that these are the only areas of concern possible. There can also be some risk along the railroad tracks where the ore was hauled along, though most railways here have long since been decommissioned.

Risk Levels

Lead occurs naturally in the soil and typically below 50 ppm, but is also the most common type of urban soil contaminant. At this level, it is perfectly safe to use as garden soil. According to the EPA, anything below 150 ppm is a very low concentration of lead, 150 to 400 is low, 400 to 1,000 is medium, over 1,000 is high to very high. At 5,000 ppm, it is recommended that topsoil around a home is removed and replaced. It is likely that it was these extreme levels that resulted in yard removals in some of the towns in Southeast Kansas. It is advised to not garden in soil lead concentrations above 1,000 ppm, and to not grow root vegetables in soil lead concentrations above 300 ppm. According to the EPA, around 400 ppm is around where children shouldn't be allowed to play in the soil but some studies suggest lower limits.

Controlling Lead

Plant lead bioavailability is controlled by soil pH. Acidic soil below 6.0 pH, lead is less tightly held in various compounds and its solubility is increased. Soil above 6.5 pH, lead is more likely to be complexed onto clay surfaces and organic matter. Lead bioavailability can also be reduced by adding organic matter to the soil. Lead will complex onto organic surfaces but also form compounds with some of the elements in compost, like phosphorus. All of this reduces bioavailability not only in plant uptake but also in people if direct ingested. Adding organic matter also just directly reduces the concentration of lead by simply adding more material. However, the complexing of lead in higher pH, fertile, and organically rich soil begins to become overwhelmed when lead concentrations get very high. Soil between 1,000 to 5,000 ppm is still recommended to be covered up with permeant vegetation. Raised garden beds with well-mulched paths between them can be used in higher contaminated soil to reduce direct soil lead contact and plant uptake.

Lead From Other Sources

Beyond industrial or mining possibilities, lead was a common ingredient in paint, pesticides, and gas back before the 70s and 80s. One area of concern are directly around the base of older homes due to lead paint being scraped or chipped off over the decades. This could have created a zone of higher soil lead a few feet around an older house. Higher lead could also be found around old driveways where pre-1980s gas could have been leaked. Lead can be tested with a regular soil

test sent to a soil testing lab like K-State. Lead is immobile in the soil and is likely concentrated in the top two inches. If the soil is in the risk zone, mitigation efforts could include adjusting soil pH, limiting kid and garden activity, and planting perennials with mulch or grass so the soil won't be disturbed.

Testing for Lead

If you live in an area with a known history of lead or zinc processing or mining, or have some other reason for soil lead concern, testing soil for lead is easy. Take 3-inch soil cores in 10 places around the suspected area and put them into a plastic bag. This can be done with a shovel or spade, but it is more accurate with a soil probe, which can be borrowed from an extension office. Bring them into your local state extension office and we'll mail them off for testing. The cost for a lead test is $13.50. Contact any Wildcat Extension District office if you have questions about getting your soil tested.

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