

~~~~~ *Lead in Gardens* ~~~~~

Springtime brings to mind the joy of gardening and the promise of fresh vegetables grown in a family's own back yard but there are precautions you should take if you live in urban areas. The ground under your feet may contain large amounts of lead from the emissions of cars using leaded gasoline and houses painted before 1978. The normal wear and tear of the twenty five years since has mixed in the paint chips and dust with soil along with the heavy metal from car exhaust—this heavy dust does not wash away with rain and snow but remains in the top six inches of soil in yards. Any patch of dirt with no plants (grass or gardens) to anchor it may be stirred up, and moved within the reach of children playing outdoors or tracked onto the floors of homes nearby. Recognizing the threat posed by poisoned soil, environmental scientists have warned that growing edible plants in soils near streets or within several feet of homes and other painted structures risks bringing lead out of the soil and on to the dinner table.

But there are ways to help your homegrown vegetables be safer. Engineers at Northwestern University now report that even in dirt with large amounts of lead, most of the metal usually becomes trapped in the parts of plants that few people eat, such as roots and stems. Indeed, the new data indicate that intentionally using inedible plants to absorb lead could prove a low-cost strategy for detoxifying backyards and school grounds, making them safer for kids.

Scientists sampled edible plants that home gardeners had been growing in two densely populated neighborhoods in Chicago. One community was made up of mostly brick apartment buildings. The other community consisted of mainly painted frame homes. The team collected whole plants, so the researchers could compare lead deposition in roots, stems, leaves, and fruit. Sampled plants included apples, cantaloupe, corn, cucumbers, strawberries, tomatoes, zucchinis, cilantro, mint, peppers, rhubarb, carrots, radishes, and basil. The researchers also tested small quantities of the soil in which each plant was grown.

The researchers tested produce after it had been washed, to simulate the cleaning a home grower would do at home. Northwestern's team used either a water rinse or a mild detergent solution. The idea was to remove any lead-tainted dirt that had clung to the plant.

Even after washing, many of the plants exhibited notable concentrations of lead—evidence that they had accumulated the toxic metal in their cells. "From a scientific standpoint, that's interesting, because lead is molecularly sticky," Dr. Kimberly Gray, head researcher observed. "That is, it's not very mobile. So, to get it from the soil into a plant isn't easy." Yet, once it did enter a plant, her data indicated, it could be transported upward into the shoots, leaves, and, occasionally, the fruit.

Invariably, roots showed the highest lead concentrations, followed by successively lower accumulations in stems, leaves, and the typically edible portions. Root concentrations varied widely, even within a given species. For instance, her team



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reports that one sample of soil with a lead concentration of 1,600 parts per million (ppm) produced no measurable lead anywhere in a grape plant. In another case, the roots of grapes grown in soil with 944 ppm lead showed lead contamination of 480 micrograms per gram ($\mu\text{g/g}$)—though there was no measurable accumulation higher in the plant.

Most sampled plants accumulated at least some lead in their roots. The good news: In only a few species did the lead move higher into the plant. In almost every case, these were leafy crops, such as cilantro, collard greens, lemon balm, chard, and mint, or root crops such as carrot, onion, and radish. Overall, lead concentrations in the edible produce ranged from 12 to 60 $\mu\text{g/g}$ of tissue.

The Environmental Protection Agency considers 400 ppm lead as the upper concentration that might be safe for open patches of dirt in which children play. The Northwestern engineers found that more than 75 percent of the garden soils they sampled had contamination exceeding this concentration. In many of the tested gardens, lead tainting ranged from 1,000 to 4,500 ppm.

Moreover, the researchers had suspected that soil adjacent to painted, wood-exterior homes would have higher lead concentrations than soils around brick apartment buildings do. In fact, they found no difference. They now suspect that this is because even brick buildings have substantial painted trim and their yards are subject to lead fallout from gas fumes of cars before 1978.

Gray's team calculated that eating as little as one tablespoon (1.75 gram) of cilantro tainted with the lead concentration found in the new study—49 $\mu\text{g/g}$ —would result in an intake of 85.75 μg of lead. Ingesting that amount daily, a child could build up a blood-lead concentration of roughly 10 μg per deciliter of blood, which other studies have linked to several neurological deficits, including reduced IQ.

To reduce the level of lead in vegetable grown in urban areas:

- Researchers recommend, if possible, that gardeners line the bottom of the new soil with a barrier that permits water drainage but prevents root crops from penetrating to potentially tainted soil.
- Any crops brought in from the garden should be washed carefully. For leafy produce, outer leaves should be sacrificed, and root vegetables peeled.
- City gardeners should plant their crops in containers or raised beds, using new topsoil.
- Scientists say the best move would be to clean lead from urban soils, perhaps by trapping it in ornamental grasses or other inedible plants with substantial roots.

