



# A&L EASTERN LABORATORIES, INC.

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## INTERPRETING SOIL HEAVY METALS

### INTRODUCTION

Soils normally contain low background levels of heavy metals. Excessive levels of heavy metals can be hazardous to man, animals and plants. Heavy metals regulated by the EPA are arsenic (As), cadmium (Cd), copper (Cu), lead (Pb), nickel (Ni), selenium (Se), and Zinc (Zn). Information about typical sources of heavy metals and safe soil levels are provided below:

### ARSENIC (As)

Component in manufacture of bronze materials, fireworks, ammunition, agricultural chemicals, laser materials, glass, semiconductor materials, wood preservatives, copper and lead alloys and insecticides (most of which are obsolete)

### CADMIUM (Cd)

Component in manufacture of solder, electrical supplies, batteries, barriers to control nuclear fission, anticorrosive coatings for metals, bearing alloys, amalgam in dentistry and worm treatments for swine and poultry. Regular consumption of plants containing 3.0 ppm Cd can poison man and animals. It interferes with enzymes and other proteins. In livestock, it accumulates in the kidneys, spleen and liver. In humans, Cd interferes with the metabolism of calcium and phosphorus, causing a painful bone disease.

### LEAD (Pb)

Component in manufacture of older paints, older plumbing hardware, ammunition, solder, metals, storage batteries, sound and vibration absorbers, lead gasoline, obsolete insecticides (lead arsenate), lead crystal and flint glass. Pb can cause health problems, particularly in children. It accumulates in the body and can build to toxic levels under continuous exposure. Concerns about Pb poisoning resulted in the elimination of Pb from gasoline, paint and plumbing lines.

### NICKEL (Ni)

Component in manufacture of stainless steel, other corrosion-resistant alloys, coins, nickel steel for armor plates, burglarproof vaults, vegetable oils, ceramics and greenish glass, Al-Ni-Co magnets and Ni-Cd batteries. Plants containing more than 100 ppm Ni develop symptoms of toxicity. Toxicity in grasses or other monocots closely resembles iron deficiency.

### SELENIUM (Se)

Essential nutrient in animal nutrition; component of dandruff shampoos and fungal infection treatments; used in manufacture of ruby-colored glasses and enamels, photoelectric cells, resistors, photographic emulsions, stainless steel, pigments, rubber, metal alloys, textiles, petroleum and medical therapeutic agents. Se benefits crop production and is essential to animal nutrition. Deficiency causes muscular dystrophy in livestock, known as "white muscle disease," and loss of hair.

### ZINC (Zn) & COPPER (Cu)

Cu—Component in metal alloys, electrical wiring, some water pipes, preservatives for wood, leather and fabrics; and some agricultural fungicides. Zn—Widely used in industry to make dye, paint, rubber, wood preservatives and ointments. Cu and Zn are essential plant micronutrients. However, at high levels, they may be toxic to plants.

Table 1. Typical and unsafe heavy metal soil levels.

Heavy Metal	Typical Background Levels for Non-Contaminated Soil	<sup>1</sup> Unsafe for Leafy or Root Vegetables	<sup>1</sup> Unsafe for Gardens and Children Contact
Arsenic	3 to 12 ppm	>50 ppm	>200 ppm
Cadmium	0.1 to 1.0 ppm	>10 ppm	>50 ppm
Copper	1 to 50 ppm	>200 ppm	>500 ppm
Lead	10 to 70 ppm	>500 ppm	>1,000 ppm
Nickel	0.5 to 50 ppm	>200 ppm	>500 ppm
Selenium	0.1 to 3.9 ppm	>50 ppm	>200 ppm
Zinc	9 to 125 ppm	>200 ppm	>500 ppm

<sup>1</sup> Unsafe levels are general guidelines; actual toxicity will be affected by soil texture, organic matter, and pH.