

Cadmium

Exposure:

Found in soil.
Food primary source in people.

Plants uptake Cd from soil.
Pipes soldered with Cd-containing materials.
Pottery with Cd-containing pigments.
Smoking
Low in breast milk.
Industry.

Health Effects:

Lung cancer
May contribute to emphysema and chronic bronchitis
Chronic Exposure:
heart disease
anemia
skeletal weakeneing
depressed immune system
kednet and liverr disease

Highly contaminated food:
vomiting
diarrhea
shock

High concentrations in air:
chest pains
coughing
lung problems
chills
muscle aches
nausea
vomiting
diarrhea

Environmental Effects

bioaccumulates with no change
few species hshow adverse health effects except in areas of high concentration

Chromium

Exposure:

Cr(III)

Food
Lesser extent in water

Cr(VI)

Drift from cooling towers
Refuse incineration
Sewage sludge from plating

Health Effects:

Cr(0) appears to be biologically inert.

Cr(III) required for health; all ordinary exposures considered safe

Cr(VI)

liver and kidney damage
internal hemorrhage
dermatitis
respiratory damage
lung cancer

Long term exposure:

perforated and ulcerated nasal septa
inflammation of the nasal passages
frequent nosebleeds
skin ulcers
allergic contact dermatitis
genetic damage

Environmental Effects:

does not bioaccumulate
associated with soil infertility in areas of high concentration
Cr(VI) toxic to plants
toxic to aquatic life
Rapidly transformed to Cr(III); hazard only in vicinity of direct discharges

Nickel

Exposure:

- Food, but not a health hazard when ingested
- Skin contact
- Inhalation
- Smoking and second hand smoke
- Hairsprays and shampoos

Health Effects:

- Cancers of the lung, nasal passages, and possibly the larynx
- asthma
- loss of the sense of smell
- perforated nasal septa
- chronic sinus infections
- contact dermatitis
- possible developmental and reproductive effects at very high levels
- genetic effects in experimental animals and bacteria

Environmental Effects

- algae and invertebrates more sensitive than fish
- bioaccumulates
- plant life destroyed in vicinity of metal smelters, but not clear if nickel or another metal

Lead

Exposure:

Food

- Crops
- Dry fallout
- Cooking water
- Contamination during processing
- Solder from cans
- leaching from storage materials

Inhalation

- burning leaded gasoline (decreased >97% from vehicles)
- burning solid waste

Water

- leaded pipes
- solder in pipe joints

Children

- soil, dust and lead-based paints

Health Effects:

- nervous system
- production of blood cells
- kidneys
- reproductive system
- behavior

Chronic

- pallor
- vomiting
- abdominal pain
- constipation
- listlessness
- stupor
- loss of appetite
- irritability
- loss of muscular coordination

Children and pregnant women at greater risk

children

- greater ingestion
- effects begin at lower levels

Pregnant women

- lead crosses placenta
- damage to fetal nervous system
- miscarriage

Synergism

An additional problem that is hard to assess is the synergism between the heavy metals put into the river by Oxford, the petroleum contamination from Total and the organics produced by Velsicol. There is very little in the way of studies that look at the combination of more than one contaminant and the resultant effect on health. Because Oxford is upstream of Velsicol, the wastes in the river from Oxford have moved downstream and mixed with the wastes in the mill pond in St. Louis from Velsicol. This produces a mixture of unknown toxicity. However, several bioremediation firms have offered to attempt to clean up the mix using their techniques. In each case, the sample provided has killed all of the organisms used to attempt to treat the waste. This means the mixture of pesticides (Velsicol), petroleum (Total) and heavy metals (Oxford) is not nice stuff.

Data Summary

Element	Default Background	Residential Water	Industrial soil	Water residential	Groundwater contact
Cr(III)	18	1×10^6	100×10^6	0.1	2.9×10^5
Cr(VI)	NA	30	9000	0.1	460
Cd	0.0012	6	2000	0.005	190
Pb	21	NA	900	0.004	NA
Ni	20	NA??	1.5×10^5	0.1	7×10^4

Values in ppm or mg/mL