

Metals Health and Environmental Effects

Metals are elements that readily lose electrons to form cations and are typically good conductors of electricity, chemically-reactive, lustrous, ductile, and malleable. Metals comprise over 80% of elements on the periodic table, including all elements of the alkali, alkali-earth, inner-transition, transactinides and transition series, and some metalloid elements.

	1											Non-metals						18
1	H																	He
2	Li	Be											B	C	N	O	F	Ne
3	Na	Mg											Al	Si	P	S	Cl	Ar
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra	Ac	Rf	Ha	Sg	Ns	Hs	Mt	Unn	Unu							
	Lanthanide Series		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
	Actinide Series		Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

Figure 1: Periodic Table Showing Metal, Metalloid, and Non-metal Elements

Hazardous air pollutants (HAP)

Hazardous air pollutants (HAP) are defined by the U.S. Environmental Protection Agency (EPA) as “pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.”

HAPs in urban areas are of special concern because of the large number of people and the variety of pollution sources e.g., cars, trucks, large factories, gasoline stations, and dry cleaners. Eight of the below metals and their compounds (arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, and nickel) are included in EPA’s list of 33 HAPs identified as posing the greatest potential environmental health threat in urban areas.

To date, EPA has compiled a list of 188 HAP which include the following metals and metal compounds:

Antimony Compounds

Lead Compounds

Arsenic Compounds (inorganic including arsine)

Manganese Compounds

Beryllium Compounds

Mercury Compounds

Cadmium Compounds

Nickel Compounds

Chromium Compounds

Selenium Compounds

Cobalt Compounds

Metals have been associated with a wide range of environmental and health effects including respiratory and pulmonary disorders, neurotoxicity and cancer. High concentrations of metals in the environment, especially near industrial facilities, are thus a cause for concern. For example, in 2001, the Missouri Department of Health and Human Services found that 28% of the town's children ages 6 and under had lead poisoning due to emissions from Doe Run's Herculaneum lead smelter. Within ¼ mile of the smelter, lead poisoning occurred in 56% of children in this age group. Negative health effects from lead poisoning include learning disabilities, behavioral problems, and, at very high levels, seizures, coma, and even death. In addition to their potential health effects, metals are especially hazardous because they will not biodegrade; once released into the environment, they will always be available for re-introduction into the air, water and food chain. Exposure pathways include: breathing contaminated air, eating contaminated food products, drinking contaminated water, ingesting contaminated soil, and touching contaminated soil, dust, or water.

Every month we will focus on a different HAP metal summarizing the potential health effects, sources, and exposure pathways for as described in EPA's Health Effects Notebook for Hazardous Air Pollutants.