First Nations Environmental Health Innovation Network

SELENIUM

Fact Sheet

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Selenium is a naturally occurring element that is distributed widely in nature in most rocks and soils. Traces of selenium are naturally found in most waters and soils. Selenium is released to air when coal and petroleum fuels are combusted and during **metal smelting** and **refining (especially copper)**.

USES

- Metal alloys
- Petroleum
- Rubber
- Pigments in glass, dye, and paint
- Electronic components
- Explosives
- Batteries
- Animal and poultry feeds
- Fungicides

SELENIUM AND MINING

- Selenium typically does not occur in pure elemental form.
- It is a trace element found in natural deposits such as ores containing other mineral, having no true geologic deposits and occurs in sulfide ores of heavy metals.
- Selenium occurs in natural waters in trace amounts as a result of geotechnical processes, such as the weathering of rocks and erosion of soils.
- Selenium is obtained from the flue dusts for the roasting of sulfide ores and from the anode mud formed bentonite, and coal mining.
- Soils, surface waters, and ground waters around mining operations can become contaminated.
- Mining operations increase the element's mobility and solubility.

WHERE IS SELENIUM FOUND?

AIR: Selenium dust is airborne and settles out on land/water. Selenium particles may bind to other particles or fly ash.

SURFACE WATER: Selenium in fresh water is usually 0.02ppm. Selenium content is greatly influenced by pH.

SOIL: Volatizes from soil upon conversion by microorganisms to volatile selenium compounds.

GROUNDWATER: Can be contaminated with leached selenium.

ENVIRONMENTAL IMPACT

- Selenium cannot be destroyed, and is found in both soluable and insoluble forms.
- Less toxic to plants and invertebrates then vertebrates.
- Causes congenital deformation and death in birds and fish.
- Selenium bioaccumulates up the food chain in living tissues; may biomagnify in aquatic organisms.

(See *Bioaccumulation of Contaminants* Factsheet)

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Human Health Effects

It is difficult to make conclusions about toxic levels of selenium because there are many other factors that affect its impact on health.

For example, the amount and type of protein in the diet, as well as the levels of Vitamin E can modify the toxicity of selenium.

Too much or too little selenium in the diet has adverse effects for most people.

Chronic & Short term effects include:

- Damage to peripheral nervous system Hair & fingernail loss and changes
- Fatigue
- Irritability
- Skin lesions
- Keshian Disease (a form of juvenile cariomyopathy, limited to certain areas in China) = too little selenium
- Kashin-Beck Disease (a form of abnormal bone growth) = too little selenium

Little is known about health effects from exposure to selenium through skin and lungs. Industrial exposure has been known to cause:

- Pallor (paleness of face)
- Nervousness
- Depression
- Dermatitis
- Gastrointestinal disturbances
- Garlic odour breath

There is not enough agreement among scientists on whether or not selenium is **carcinogenic** (cancer-causing). Overall, health risks come from both levels that are too low, and too high in humans.

Environmental Management Criteria for Selenium

At present, Canada's Metal Mining Effluent Regulations do not identify a limit for selenium.

A maximum acceptable concentration of 0.01 mg/L for selenium in drinking water has been established on the basis of health considerations.

Food is the main source of intake of selenium for those that are not exposed to it in the workplace. Health Canada recommends a safe and adequate range of 0.05 to 0.3 mg per person per day for adults, with lower ranges for infants and children.

If drinking water contains the maximum limit of selenium, this would make up between 10 and 25 per cent of total selenium intake.

For More Information

Health Canada
http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/selenium/selenium-eng.pdf

Safe Drinking Water Foundation
http://www.safewater.org/PDFS/resourcesknowthefacts/Mining+and+Water+Pollution.pdf

Agency for Toxic Substances & Disease Registry
http://www.atsdr.cdc.gov/

CSP2 Fact Sheets Health & Environmental Effects of Trace Elements in Metal Mining Wastes
http://209.85.173.104/search?q=cache:5H-msLUonlIJ:www.csp2.org/reports/Fact_Sheets--Trace_Elements_in_Mining_Waste.pdf+CSP2+FACT+SHEETS&hl=en&ct=clnk&cd=2&gl=ca&client=firefox-a

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