

*Ministry of the Environment programs and initiatives*

## Nickel in the environment

### What is nickel?

Nickel is a naturally occurring element that exists mainly in the form of sulphide ores found underground, and in silicate minerals, found on the surface. In the environment, nickel is found primarily combined with oxygen (oxides) or sulphur (sulfides). Canada is rich in sulfide ores containing nickel and is consequently the second largest producer of nickel in the world.

The earth's crust is estimated to contain an average of 0.009 per cent nickel distributed in sulfide, arsenide, antimonide, oxide and silicate ores. Nickel is also dispersed in particulate dust in the atmosphere as a result of both human and natural activity including volcanoes, forest fires and meteorites that have burned up in the upper atmosphere.

Pure nickel is a hard, silvery-white metal that is widely used to make strong, durable metal alloys. It is found in many consumer products such as stainless steel pots and pans, coins, and rechargeable batteries.

### How much nickel is there in our soil?

Nickel is a natural component of the soil. In Ontario, the background concentration of nickel is up to 43 parts per million of soil. In some areas of Canada, much higher natural levels of nickel in the soil may occur.

### Is nickel harmful?

The effects of exposure to any substance depend on the type of exposure, concentration of the substance, and the length of time of exposure. Additional factors that must be considered are age, gender, diet, family traits, lifestyle, and health status. In the general population, most people are not

affected adversely by nickel at the typical levels encountered. In fact, studies have shown that small amounts of nickel are essential to maintain proper health in animals and are probably important in human nutrition as well.

However, some individuals are particularly sensitive to nickel; the scientific literature suggests that about 2 per cent of men and about 10 per cent of women and children have such a sensitivity. A smaller fraction of sensitive individuals may develop a skin rash, known as nickel dermatitis, at the site of contact with an object (usually jewelry) containing nickel. Some individuals will develop a rash known as hand eczema, although the site of direct contact may not necessarily have been the hands.

### How is one exposed to nickel?

The exposure to nickel for the general public takes place via inhalation of dust, ingestion of food and water, and by contact with objects containing nickel such as money and jewelry. Most people are exposed to nickel by ingestion of food and water. All foods grown in Canada and almost all water supplies in Canada will contain small quantities of nickel. Foods such as chocolate, soy beans, nuts, and oatmeal contain naturally higher levels of nickel. The amount of nickel absorbed from ingested food and water is between 1 and 10 per cent depending on the diet and the solubility of the nickel compound. Studies show that up to 35 per cent of inhaled nickel is absorbed by the body depending on the solubility of the nickel compound.

It should be noted that only refined nickel and some solutions of nickel at a high concentration can cause an adverse reaction

upon skin contact. Contact with soils containing nickel will not normally cause an adverse skin reaction. Generally, water-soluble compounds (nickel nitrate, nickel chloride) will be more readily absorbed while water-insoluble compounds (nickel oxide, nickel subsulphide) are not absorbed to an appreciable extent. Most health studies pertaining to the effects of nickel, other than dermatitis, are based on exposure in the workplace.

No matter how one is exposed to nickel, almost all of the absorbed nickel will be excreted in urine. However, it does take the body a longer period of time to remove nickel deposited in the lungs in comparison to ingested nickel.

## Can nickel exposure occur through backyard vegetables?

Increased exposure to nickel by eating backyard vegetables is not likely. This is because garden soils are typically deeply cultivated through the addition of cleaner soil as well as compost, manure, peat moss and other soil conditioners. This then decreases the natural acidity of the soil leading to a decrease of heavy metals uptake. The addition of fertilizers will also reduce plant absorption of heavy metals.

## How can I reduce my exposure to nickel?

Although no special measures are needed to reduce exposure, one can follow simple steps to reduce exposure to nickel by:

- Washing children's hands and faces before they eat if they have been outdoors.
- Covering contaminated soil with clean soil or sod, paving stone or a deck.
- Cleaning your home regularly with a damp mop/cloth.
- Using removable rugs at entry points to the home, and cleaning them outside to reduce dust getting into the house.
- Cleaning forced air ducts regularly, using

better quality furnace filters, and changing or cleaning furnace filters more frequently.

- Brushing pets often and outside if possible, to reduce dust.
- Thoroughly cleaning garden vegetables and peeling the outer skin from root crops.

## How can I get more information?

If you suspect your soil is contaminated with nickel or other metals, contact your local Ministry of the Environment office for information specific to your area. The number is listed in the blue pages of your telephone directory.

Contact your local health unit or your medical doctor if you are concerned about being exposed to nickel or have questions about health effects.

## Sources

**Toxicological Profile for Nickel (1997)** U.S. Department of Health and Human Services, Public Health Service. Agency for Toxic Substances and Disease Registry (ATSDR).

**Nickel and its compounds (1994)** Priority substances list assessment report. Canadian Environmental Protection Act. Government of Canada.

**Guideline for Use at Contaminated Sites in Ontario**, revised (1997). Ontario Ministry of the Environment. Queens Park, Toronto, Ontario.