Environmental Health Fact Sheet

Strontium

What is Strontium?

- Strontium occurs naturally in the form of minerals and is about 0.02% - 0.03% of the earth's crust. Minor amounts occur in other mineral deposits.
- Strontium is present in four stable forms (SR^{84}, SR^{86}, SR^{87}, & SR^{88}). SR^{88} is the most common form comprising about 83% of natural strontium.
- Strontium can also exist in sixteen major radioactive forms.
- Radioactive SR^{90} is formed in nuclear reactors or during the explosion of nuclear weapons.

Are there commercial uses for strontium?

- Strontium has a variety of commercial and research uses.
- Strontium compounds are used in making ceramics and glass products, paint pigments, fluorescent lights, fireworks, signal flares, optical products, and medicines.
- Some forms of strontium are being studied to possibly treat and prevent bone loss.
- Strontium chloride hexahydrate is added to toothpaste to reduce pain in sensitive teeth.
- Strontium chloride is commonly found in dietary supplements.
- Radioactive SR^{85} has medical and industrial uses.
- SR^{90} has been used as an energy source in research and to produce electricity for weather stations, navigational buoys, and satellites.

Is strontium present in the environment?

- Naturally occurring strontium is found in rocks, soil, coal, and oil.
- In addition to the four naturally occurring stable strontium forms, radioactive SR^{90} is present in surface soil as a result of fallout from past nuclear weapons tests and radioactive SR^{89} can be found around reactors.
- SR^{90} in soil is relatively mobile and can enter groundwater.
- Radioactive decay and decontamination are the only ways of decreasing the amount of SR^{90} in the environment.

- It takes 29 years for SR^{90} to decay or release its radiation.

How are people exposed to strontium?

- Exposure to strontium may occur when people ingest contaminated food or beverages. Ingestion is the most common way strontium enters the body.

- Exposure to strontium may occur through the use of strontium containing medicines or other commercial products.

- Occupational exposure can occur through direct contact with strontium in the workplace.

- Exposure to strontium may occur environmentally through contact with contaminated air, soils, and water.

What happens to strontium once it enters the body?

- About 30% of ingested strontium is absorbed into the blood through the gut.

- The amount of strontium absorbed tends to decrease with age, and is higher (about 60%) in children in their first year of life.

- Once strontium is absorbed into the blood, most of it ends up in bone; the remainder goes to soft tissues or is excreted in urine, feces, and sweat.

- The absorption and retention of strontium is higher in children during bone development.

- Absorption from the lungs is rapid for strontium compounds that can dissolve in liquids but slow for other strontium compounds.

- Absorption of strontium from the skin is slow and in most cases unimportant.

- Ingested strontium that is not absorbed into the bloodstream is eliminated through feces during the first day or so after exposure.

- About 8% of ingested strontium remains in the body after 30 days, and this decreases to about 4% after 1 year.

- Strontium can be transferred from the mother to her unborn baby during pregnancy and to the infant in breast milk during lactation.

- The typical amount of strontium in adults is about 0.3 – 0.4 grams with 99% in the skeleton.

How harmful is exposure to strontium?

- Stable strontium concentrates in the bone and can interfere with normal bone growth and development in children.

- Radioactive strontium is a health hazard only if it is taken into the body. SR^{90}, like stable strontium, also concentrates in the bones and causes bone tumors and tumors of the blood-cell forming organs.

Can exposure to strontium cause cancer?

- The International Agency for Research on Cancer (IARC) has determined that radioactive strontium causes cancer in humans.

- Leukemia has been observed in people exposed to high amounts of radioactive strontium.

- Leukemia and cancers of the bone, nose, lung, and skin have also been observed in laboratory animals.

- The only stable strontium compound that may cause cancer is strontium chromate, but this is due to chromium not strontium.

Is there a medical test to show whether I've been exposed to strontium?

- All people have small amounts of stable strontium in their bodies. There are tests to measure the level of strontium in blood, hair, feces, and urine. These tests are most useful for people exposed to high levels and cannot determine the exact levels of strontium that people were exposed to or predict how the levels will affect their health.

- If a person has been exposed to radioactive strontium, special tests can be used to measure it in blood, feces, urine, or bone.

Has the federal government made recommendations to protect public health?

- EPA has set a limit of 4000 micrograms strontium per liter (μg/L) or 4 milligrams per liter (mg/L) of drinking water.

- EPA has set an average annual drinking water limit of 20 picocuries per liter (pCi/L) for SR^{89} and 8 pCi/L for SR^{90}.

- The Nuclear Regulatory Commission has set limits for radioactive strontium in workplace air for a 40-hour work week of 6×10^{-8} microcuries per milliliter (μCi/ml) for SR^{89} and 8×10^{-9} μCi/ml for SR^{90}.

What can I do to prevent or lessen exposure to strontium?

- Avoid exposure to air, food, or drinking water contaminated with stable or radioactive strontium.

- Avoid exposure to hazardous waste sites since strontium is present in air and soils at many of these sites.

- Insure a balanced diet with sufficient vitamin D, calcium, and protein. This will be aid in reducing the amount of ingested strontium that is absorbed.

Where can I get more information?

For more information, contact:

The Pennsylvania Department of Health, Division of Environmental Health Epidemiology, P.O. Box 90, Harrisburg, Pennsylvania, 17108. Telephone number: 717-787-1708 or visit the following websites:

U.S. Department of Health and Human Services: http://www.hhs.gov

U.S. Food and Drug Administration: http://www.fda.gov

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

Centers for Disease Control and Prevention: http://www.cdc.gov

U.S. Environmental Protection Agency: http://www.epa.gov

Consumer Product Safety Commission: http://www.cpsc.gov

References

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Agency for Toxic Substances and Disease Registry (ATSDR), 2004. Toxicological Profile for Strontium. Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

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Concise International Chemical Assessment Document 77. Strontium and Strontium Compounds. World Health Organization, (WHO), 2010.

Content last modified on 03/28/11