RADIOISOTOPE BRIEF

Cesium-137 (Cs-137)

Half-life: 30.17 years
Mode of decay: Beta and gamma radiation
Chemical properties: Liquid at room temperature, but readily bonds with chlorides to form a powder.

What is it used for?

Cs-137 is used in small amounts for calibration of radiation-detection equipment, such as Geiger-Mueller counters. In larger amounts, Cs-137 is used in medical radiation therapy devices for treating cancer; in industrial gauges that detect the flow of liquid through pipes; and in other industrial devices to measure the thickness of materials, such as paper, photographic film, or sheets of metal.

Where does it come from?

Cs-137 is produced by nuclear fission for use in medical devices and gauges. Cs-137 also is one of the byproducts of nuclear fission processes in nuclear reactors and nuclear weapons testing. Small quantities of Cs-137 can be found in the environment from nuclear weapons tests that occurred in the 1950s and 1960s and from nuclear reactor accidents, such as the Chernobyl power plant accident in 1986, which distributed Cs-137 to many countries in Europe.

Beta particles: electrons ejected from the nucleus of a decaying atom. Although they can be stopped by a thin sheet of aluminum, beta particles can penetrate the dead skin layer, potentially causing burns. They can pose a serious direct or external radiation threat and can be lethal depending on the amount received. They also pose a serious internal radiation threat if beta-emitting atoms are ingested or inhaled.

Gamma rays: high-energy electromagnetic radiation emitted by certain radionuclides when their nuclei transition from a higher to a lower energy state. These rays have high energy and a short wave length. Gamma rays penetrate tissue farther than do beta or alpha particles, but leave a lower concentration of ions in their path to potentially cause cell damage. Gamma rays are very similar to x-rays.

What form is it in?

Because it readily bonds with chlorides, Cs-137 usually occurs as a crystalline powder, rather than in its pure liquid form.

What does it look like?

Small amounts of Cs-137 are incorporated into Lucite disks, rods, and seeds. Larger Cs-137 sources are enclosed in lead containers (such as long tubes that are closed at each end) or small round metal containers. If the lead containers of Cs-137 are opened, the substance inside looks like a white powder and may glow. Cs-137 from nuclear accidents or atomic bomb explosions cannot be seen and will be present in dust and debris from fallout.

How can I be exposed to Cs-137?

Small amounts of Cs-137 are present in the environment from weapons testing in the 1950s and 1960s, so people are exposed to some Cs-137 every day. However, Cs-137 is dangerous in the large, concentrated amounts found in radiation therapy units and industrial gauges. The sources in these devices are designed to remain sealed and keep people from being exposed; however, if these canisters are intentionally or accidentally opened, the Cs-137 inside could be dispersed.

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How can it hurt me?

External exposure to large amounts of Cs-137 can cause burns, acute radiation sickness, and even death. Exposure to Cs-137 can increase the risk for cancer because of exposure to high-energy gamma radiation. Internal exposure to Cs-137, through ingestion or inhalation, allows the radioactive material to be distributed in the soft tissues, especially muscle tissue, exposing these tissues to the beta particles and gamma radiation and increasing cancer risk.

For more information about Cs-137, see the Public Health Statement by the Agency for Toxic Substances and Disease Registry at http://www.atsdr.cdc.gov/toxprofiles/phs149.html, or visit the Environmental Protection Agency at http://www.epa.gov/radiation/radionuclides/cesium.htm.

For more information on protecting yourself before or during a radiologic emergency, see CDC's fact sheet titled "Frequently Asked Questions (FAQs) About a Radiation Emergency" at http://www.bt.cdc.gov/radiation/emergencyfaq.asp, and "Sheltering in Place During a Radiation Emergency," at http://www.bt.cdc.gov/radiation/shelter.asp.

For information about possible countermeasures for internal contamination with Cs-137, please see CDC's fact sheet on Prussian blue.

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

For more information, visit www.bt.cdc.gov/radiation, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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