



RADIOISOTOPE BRIEF

Iodine-131 (I-131)

Half-life: 8.06 days

Mode of decay: [Beta particles](#) and [gamma radiation](#)

Chemical properties: I-131 can change directly from a solid into a gas, skipping the liquid phase, in a process called sublimation. I-131 dissolves easily in water or alcohol. I-131 readily combines with other elements and does not stay in its pure form once released into the environment.

What is it used for?

I-131 is used in medicine to diagnose and treat cancers of the thyroid gland.

Where does it come from?

I-131 is produced commercially for medical and industrial uses through nuclear fission. It also is a byproduct of nuclear fission processes in nuclear reactors and weapons testing.

What form is it in?

In medicine, I-131 is supplied in capsules or liquid of a specific activity designed to be swallowed by patients. As a product of nuclear fission, it is a dark purple gas that can be inhaled, or absorbed through the skin. I-131 in fallout from nuclear weapons or reactor accidents can occur in particle form, which can be ingested in food or water.

What does it look like?

Pure I-131 is a non-metallic, purplish-black crystalline solid. However, because it readily binds with other elements, I-131 usually is found as a compound rather than in its pure form. For medical purposes, the I-131 capsules contain small granules of I-131 sodium iodide that are designed to be swallowed by patients. Liquid I-131 sodium iodide used to diagnose and treat thyroid disease is a clear liquid.

How can it hurt me?

[External exposure](#) to large amounts of I-131 can cause burns to the eyes and on the skin. [Internal exposure](#) can affect the thyroid gland, a small organ located in the neck near the Adam's apple. The thyroid gland uses iodine to produce thyroid hormones and cannot distinguish between radioactive iodine and stable (nonradioactive) iodine. If I-131 were released into the atmosphere, people could ingest it in food products or water, or breathe it in. In addition, if dairy animals consume grass contaminated with I-131, the radioactive iodine will be incorporated into their milk. Consequently, people can receive internal exposure from drinking the milk or eating dairy products made from contaminated milk. Once inside the body, I-131 will be absorbed by the thyroid gland exposing it to radiation and potentially increasing the risk for thyroid cancer or other thyroid problems.

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 radiation: 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.

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For more information about I-131, see the Public Health Statement by the Agency for Toxic Substances and Disease Registry at <http://www.atsdr.cdc.gov/toxprofiles>, or visit the Environmental Protection Agency at <http://www.epa.gov/radiation/radionuclides/iodine.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 I-131, please see CDC's fact sheet on [Potassium Iodide \(KI\)](#).

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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