

Get the facts about exposure to

I-131

Radiation



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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During the Cold War in the 1950s and early 1960s, the U.S. government conducted about one hundred nuclear weapons (atomic bomb) tests in the atmosphere at a test site in Nevada. The radioactive substances released by these tests are known as “fallout.” They were carried thousands of miles away from the test site by winds. As a result, people living in the United States at the time of the testing were exposed to varying levels of radiation.

Among the numerous radioactive substances released in fallout, there has been a great deal of concern about and study of one radioactive form of iodine—called iodine-131, or I-131. I-131 collects in the thyroid gland. People exposed to I-131, especially during childhood, may have an increased risk of thyroid disease, including thyroid cancer. Thyroid cancer is uncommon and is usually curable. Typically, it is a slow-growing cancer that is highly treatable. About 95 out of 100 people who are diagnosed with thyroid cancer survive the disease for at least five years after diagnosis.

The thyroid controls many body processes, including heart rate, blood pressure, and body temperature, as well as childhood growth and development. It is located in the front of the neck, just above the top of the breastbone and overlying the windpipe.

Although **the potential of developing thyroid cancer from exposure to I-131 is small**, it is important for Americans who grew up during the atomic bomb testing between 1951 and 1963 to be aware of risks.



This brochure is designed to provide information about I-131 and its possible effects on the thyroid gland. A companion brochure offers a decision-making aid to help determine personal risk.

How Americans Were Exposed to I-131

During the Cold War, the United States developed and tested nuclear weapons in an effort to deter and to be fully prepared for nuclear attacks from other nations. Most of the aboveground U.S. nuclear tests were conducted in Nevada from 1951 to 1963. As a result of these tests, potentially health-harming radioactive materials were released into the atmosphere and produced fallout.

I-131 was among the radioactive materials released by the atomic bomb tests. It was carried thousands of miles away from the test areas on the winds. Because of wind and rainfall patterns, the distribution of fallout varied widely after each test. Therefore, although all areas of the U.S. received fallout from at least one nuclear weapons test, certain areas of North America received more fallout than others.

Scientists estimate that the larger amounts of I-131 fell over some parts of Utah, Colorado, Idaho, Nevada, and Montana. But I-131 traveled to all states, particularly those in the Midwestern, Eastern, and Northeastern United States. Some of the I-131 collected on pastures and on grasses, where it was consumed by cows and goats.

When consumed by cows or goats, I-131 collects in the animals' milk. Eating beef from cows exposed to I-131 carried little risk. Much of the health risk associated with





I-131 occurred among milk-drinkers—usually children. From what is known about thyroid cancer and radiation, scientists think that people who were children during the period of atomic bomb testing are at higher risk for developing thyroid cancer.

In addition to nuclear testing in Nevada, Americans were exposed to I-131 through:

- *Nuclear testing elsewhere in the world (mainly in the 1950s and 1960s)*
- *Nuclear power plant accidents (such as the Chernobyl accident in 1986, also known as Chernobyl)*
- *Releases from atomic weapons production plants (such as the Hanford facility in Washington state from 1944 to 1957)*

Scientists are working to find out more about ways to measure and address potential I-131 exposure from other sources. Scientists are also working to find out more about other radioactive substances released by fallout and about their possible effects on human health.

The Search for Answers

Congress directed government health agencies to investigate the I-131 problem many years ago, and to make recommendations to Americans who might have related health risks. Gathering information turned out to be very complicated. Record-keeping was incomplete at the time of the bomb testing. Much of the information needed to calculate an individual's dose of I-131 and associated risk is either unreliable or unavailable.

Despite such challenges, government agencies organized expert scientific teams that have devoted many years to learning more about I-131. Reports were published in 1997 and 1999. This brochure continues the effort to educate the American people about the potential health risks from exposure to I-131 from the Nevada Test Site during the Cold War years.





I-131's Rapid Breakdown

The “active” in “radioactive” means that unstable substances produced in nuclear reactions break down and change, so that they eventually become stable and no longer release radiation. The rate of breakdown can occur quickly in some radioactive substances, often within a few days. Half of the I-131 released during each atomic bomb test was gone in about 8 days. Almost all of it was gone (less than 1 percent remained) 80 days after the test.

Like all radioactive substances, I-131 releases radiation as it breaks down. It is this radiation that can injure human tissues. But I-131's steady breakdown means that the amount of I-131 present in the environment after a bomb test *steadily decreased*. Therefore, farm animals that grazed in fields within a few days after a test would have consumed higher levels of I-131 than animals grazing later.

The Milk Connection

People younger than 15 at the time of aboveground testing (between 1951 and 1963) who drank milk, and who lived in the Mountain West, Midwestern, Eastern, and Northeastern United States, probably have a higher thyroid cancer risk from exposure to I-131 in fallout than other people. Their thyroid glands were still developing during the testing period. And they were more likely to have consumed milk contaminated with I-131. The amount of I-131 people absorbed depends on:

- ***Their age during the testing period (between 1951 and 1963)***
- ***The amount and source of milk they drank in those years***
- ***Where they lived during the testing period***

Age and residence during the Cold War years are usually known. But few people can recall the exact amounts or sources of the milk they drank as children. While the amount of milk consumed is important in determining exposure to I-131, it is also important to know the source of the milk. Fresh milk from backyard or farm cows and goats usually contained more I-131 than store-bought milk. This is because processing and shipping milk allowed more time for the I-131 to break down.



About Thyroid Disease

There are two main types of thyroid diseases: noncancerous thyroid disease and thyroid cancer.

Noncancerous Thyroid Disease

Some thyroid diseases are caused by changes in the amount of thyroid hormones that enter the body from the thyroid gland. Doctors can screen for these with a simple blood test.

Noncancerous thyroid disease also includes lumps, or nodules, in the thyroid gland that are benign and not cancerous.

Thyroid Cancer

Thyroid cancer occurs when a lump, or nodule, in the thyroid gland is cancerous.



Thyroid Cancer and I-131

Exposure to I-131 may increase a person's risk of developing thyroid cancer. It is thought that risk is higher for people who have had multiple exposures and for people exposed at a younger age. Thyroid cancer accounts for less than 2 percent of all cancers diagnosed in the United States. Typically, it is a slow-growing cancer that is highly treatable and usually curable. About 95 out of 100 people who are diagnosed with thyroid cancer survive the disease for at least five years, and about 92 out of 100 people survive the disease for at least 20 years after diagnosis.

The cause of most cases of thyroid cancer is not known. Exposure to I-131 can increase the risk of thyroid cancer. But even among people who have documented exposures to I-131, few develop this cancer. It is known that children have a higher-than-average risk of developing thyroid cancer many years later if they were exposed to radiation. This knowledge comes from studies of people exposed to x-ray treatments for childhood cancer or noncancerous head and neck conditions, or as a result of direct radiation from the atomic bombings of Hiroshima and Nagasaki.

The thyroid gland in adults, however, appears to be more resistant to the effects of radiation. There appears to be little risk of developing thyroid cancer from exposure to I-131 or other radiation sources as an adult.





There is no single or specific symptom of thyroid cancer. Doctors screen for thyroid cancer by feeling the gland, to check for a lump or nodule. If a doctor feels a nodule, it does not mean cancer is present. Most thyroid nodules found during a medical exam are not cancer.

If thyroid cancer is found, it is treated by removing the thyroid gland. People who undergo surgery will need to take thyroid hormone replacement pills for the rest of their lives. Although this is inconvenient and expensive, cancer survival rates are excellent. In fact, the cause of death among people who once had thyroid cancer is rarely the result of the return or spread of the same cancer.

Living with a serious disease like thyroid cancer isn't easy. A cancer diagnosis can be devastating. Some people find they need help coping with the emotional and practical aspects of their disease. Doctors and other health professionals can help with concerns about treatment and managing side effects. Support groups can help also. The National Cancer Institute's Cancer Information Service can help put you in touch with support groups in your community. Call 1-800-4-CANCER for more information.

Who's at Risk

How can people reach a sound decision about their risk of thyroid cancer? When is it time to visit a doctor?

Scientists estimate that about 25 percent of the radioactive materials released during atomic bomb testing in Nevada reached the ground somewhere in the United States. But information about where the wind carried these materials is not precise. In addition, most adults cannot remember exact details of their milk-drinking habits in childhood.

Still, scientists and doctors think that I-131 exposure is a potential risk factor for thyroid cancer, and that some Americans have a higher risk than others. A “personal risk profile” includes four key points that may influence a person’s decision to visit a doctor or other health professional for evaluation:

- **Age**—*People who are now 40 years of age or older, particularly those born between 1936 and 1963 and who were children at the time of testing, are at higher risk.*
- **Milk drinking**—*Childhood milk drinkers, particularly those who drank large quantities of milk or those who drank unprocessed milk from farm or backyard cows and goats, have increased risk.*





- **Childhood residence**—*The Mountain West, Midwest, East, and Northeast areas of the United States generally were more affected by I-131 fallout from nuclear testing.*
- **Medical signs**—*A lump or nodule that an individual can see or feel in the area of the thyroid gland requires attention. If you can see or feel a lump or nodule, it is important that you see a doctor.*

How Do Doctors Diagnose and Treat Thyroid Cancer?

There are two methods of investigating a thyroid lump or nodule:

1. **Ultrasound**—to locate and describe the lump, and
2. **Biopsy**—to determine if the lump is cancerous.

Thyroid ultrasound creates pictures by bouncing sound waves off the gland. This technique is painless and quick. But it cannot determine whether a lump is cancerous. The ultrasound device uses sound waves that people cannot hear. A computer uses the echoes to create a picture called a sonogram. From the picture, the doctor can see:

- *How many nodules are present*
- *How big they are*
- *Whether they are solid or filled with fluid*

Confirmation of cancer requires biopsy, usually using fine needle aspiration. Cells removed from a nodule during biopsy are directly examined in the laboratory with a microscope.

Fine needle aspiration biopsy—in which a few cells are withdrawn from a nodule in a thin, hollow needle—is fast and carries minimal risk. Most people with a thyroid nodule who have a biopsy turn out not to have thyroid cancer. But even noncancerous nodules require medical follow-up. If a diagnosis cannot be made from the biopsy, the doctor may





operate to remove the nodule. A pathologist then checks the tissue for cancer cells.

If thyroid cancer is found, it is treated by removing the thyroid gland. People who undergo surgery will need to take thyroid hormone replacement pills for the rest of their lives.

Unlike many other far more common and threatening cancers, thyroid cancer is generally cured by surgery, often along with postoperative radioiodine treatment.

People who think they may be at risk for thyroid cancer should discuss this concern with their doctor. The doctor may suggest a schedule for checkups.

Key Facts

Scientists know that:

- ***I-131 breaks down rapidly in the atmosphere and environment***
- ***Exposure was highest in the first few days after each nuclear test explosion***
- ***Most exposure occurred through drinking fresh milk***
- ***People received little exposure from eating fruits and leafy vegetables as compared to drinking fresh milk because although I-131 was deposited on fruits and leafy vegetables, the I-131 in fallout was deposited only on the surface; people generally wash or peel fruits and leafy vegetables***
- ***Thyroid cancer is uncommon, usually curable, and approximately 2 to 3 times more common in women***

Reliable information about I-131's impact on human health has been difficult to collect, but scientists think that:

- ***Risk for thyroid cancer increases with exposure, but even among people exposed to I-131, few develop this cancer***
- ***People exposed as children have a higher risk than people exposed as adults***



Taking Care of Yourself

Key steps to estimating personal risk of thyroid cancer, and taking charge of personal thyroid health include:

- *Using the “personal risk profile” described in this brochure (see “Who’s at Risk?”)*
- *Using the dose estimator on the National Cancer Institute’s Web site www.cancer.gov (search keyword: I-131)*
- *Taking this brochure to a health care professional to discuss dose estimates and steps—if any—required for further evaluation*
- *Getting more information by calling the National Cancer Institute’s Cancer Information Service at 1-800-4-CANCER*





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