

## REPORT

Potassium Iodide  
Insurance against a radiation emergency

Find out more about Potassium Iodide Tablets



In 1979, the nuclear power plant at Three Mile Island, Pennsylvania, released radioactive steam and water into the surrounding environment in a near-catastrophic accident. A few years later, in 1986, a reactor exploded at the nuclear power plant in Chernobyl, Ukraine, releasing a radioactive cloud that is thought to have caused more than 2,500 deaths and unfathomable suffering. Today, in the aftermath of terrorist attacks on New York City and the Pentagon, strong concern exists that future attacks could intentionally employ the type of radioactive material that was released accidentally during both of these occasions.

by Melissa Block

While it is unlikely that terrorists have the wherewithal to deliver standard thermonuclear bombs, they may have the resources to build and detonate a “dirty bomb.” A dirty bomb is composed of explosives and a small amount of radioactive material. When the explosives detonate, the radioactive material is dispersed over a wide area, contaminating buildings and people.

Radioactive materials are not as hard to come by as one might imagine. Tens of thousands of sources of these materials exist today. Such sources include the fuel used to power nuclear reactors, food irradiation plants, and isotopes used in X-ray machines and other medical equipment. The U.S. Nuclear Regulatory Commission has received some 1,500 reports of missing devices that contain radioactive materials over the past five years; only 660 of these are accounted for today.[1] Over the past eight years, there have been 175 recorded instances of radioactive materials being smuggled out of the former Soviet Union and other countries. It was also reported that terrorist leader Osama bin Laden attempted to purchase radioactive material on the South African black market as long ago as 1993. Rumors exist that small bombs from the former USSR’s nuclear arsenal may have fallen into the hands of criminals or terrorist sympathizers, who may then have sold these items to terrorist organizations.[2]

Now that terrorists have succeeded in making commercial airliners into weapons of mass destruction, another point of concern has arisen: what if the target had not been the World Trade Center towers, but any one of the 103 currently active commercial nuclear reactors in the U.S.? What if terrorists manage to blow up a food irradiation plant or other places where radioactive substances are kept? The possibilities are both endless and terrifying.

The health consequences of  
radioactivity exposure

Lake Karachay, located near the Chernobyl site in the Ukraine, is so highly contaminated with substances that emit ionizing radiation that standing on its banks for a single hour would cause death. Ionizing radiation causes the electrons that zip in tight orbits around the atoms that make up your body to become dislodged. These renegade electrons are known as free radicals, and they cause damage to whatever lies in their path—most notably, to the DNA, fats and proteins that make up your cells. This is how high doses of radiation destroy living tissues quickly and efficiently.

During acute, concentrated exposure, radiation sickness—characterized by nausea, vomiting, anxiety and disorientation—sets in. If exposure is between one and five Gy (gray)—the equivalent of 100 to 500 rads—the person exposed can probably be saved with appropriate medical care; if the dose is above six Gy/600 rads, even the most heroic medical measures are unlikely to help.



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But what about doses below one Gy—the amount to which most people would be exposed within a 30- to 300-mile radius of a nuclear accident? Many of these people suffer long-term and often non-fatal hazards, including reproductive damage that can create severe physical deformities in their offspring.

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### Determining Your Risk

If you live within 200 miles of a nuclear power reactor, your risk of being exposed to significant doses of Radioactive Iodine (RI) in the case of terrorist attack or accident is high. Here is a listing of U.S. nuclear power plant locations by city and state.

PLANT NAME	LOCATION	PLANT NAME	LOCATION
Arkansas Nuclear 1 and 2	6 mi WNW of Russellville, AR	Millstone 2 and 3	3.2 mi WSW of New London, CT
Beaver Valley 1 and 2	17 mi W of McCandless, PA	Monticello	30 mi NW of Minneapolis, MN
Braidwood 1 and 2	24 mi SSW of Joliet, IL	Nine Mile Point 1 and 2	6 mi NE of Oswego, NY
Browns Ferry 1, 2 and 3	10 mi NW of Decatur, AL	North Anna 1 and 2	40 mi NW of Richmond, VA
Brunswick 1 and 2	2 mi N of Southport, NC	Oconee 1, 2 and 3	30 mi W of Greenville, SC
Byron 1 and 2	17 mi SW of Rockford, IL	Oyster Creek	9 mi S of Toms River, NJ
Callaway	10 mi SE of Fulton, MO	Palisades	5 mi S of South Haven, MI
Calvert Cliffs 1 and 2	40 mi S of Annapolis, MD	Palo Verde 1, 2 and 3	36 mi W of Phoenix, AZ
Catawba 1 and 2	6 mi NW of Rock Hill, SC	Peach Bottom 2 and 3	17.9 mi S of Lancaster, PA
Clinton	6 mi E of Clinton, IL	Perry 1	7 mi NE of Painesville, OH
Columbia Generating Station	12 mi NW of Richland, WA	Pilgrim 1	4 mi SE of Plymouth, MA
Comanche Peak 1 and 2	4 mi N of Glen Rose, TX	Point Beach 1 and 2	13 mi NNW of Manitowoc, WI
Cooper	23 mi S of Nebraska City, NE	Prairie Island 1 and 2	28 mi SE of Minneapolis, MN
Crystal River	7 mi NW of Crystal River, FL	Quad Cities 1 and 2	20 mi NE of Moline, IL
D.C. Cook 1 and 2	11 mi S of Benton Harbor, MI	River Bend 1	24 mi NNW of Baton Rouge, LA
Davis-Besse	21 mi ESE of Toledo, OH	Robinson 2	26 mi from Florence, SC
Diablo Canyon 1 and 2	12 mi WSW of San Luis Obispo, CA	Saint Lucie 1 and 2	12 mi SE of Ft. Pierce, FL
Dresden 2 and 3	9 mi E of Morris, IL	Salem 1 and 2	18 mi S of Wilmington, DE
Duane Arnold	8 mi NW of Cedar Rapids, IA	San Onofre 2 and 3	4 mi SE of San Clemente, CA
Farley 1 and 2	18 mi SE of Dothan, AL	Seabrook 1	13 mi S of Portsmouth, NH
Fermi 2	25 mi NE of Toledo, MI	Sequoyah 1 and 2	9.5 mi NE of Chattanooga, TN
Fitzpatrick	8 mi NE of Oswego, NY	South Texas 1 and 2	12 mi SSW of Bay City, TX
Fort Calhoun	19 mi N of Omaha, NE	Summer	26 mi NW of Columbia, SC
Genoa	20 mi NE of Rochester, NY	Surry 1 and 2	17 mi NW of Newport News, VA
Grand Gulf 1	25 mi S of Vicksburg, MS	Susquehanna 1 and 2	7 mi NE of Berwick, PA

Harris 1	20 mi SW of Raleigh, NC	Three Mile Island	10 mi SE of Harrisburg, PA
Hatch 1 and 2	11 mi N of Baxley, GA	Turkey Point 3 and 4	25 mi S of Miami, FL
Hope Creek 1	18 mi SE of Wilmington, NJ	Vermont Yankee	5 mi S of Battleboro, VT
Indian Point 2 and 3	24 mi N of New York, NY	Vogtle 1 and 2	26 mi SE of Augusta, GA
Kewaunee	27 mi E of Green Bay, WI	Waterford 3	20 mi W of New Orleans, LA
La Salle 1 and 2	11 mi SE of Ottawa, IL	Watts Bar 1	10 mi S of Spring City, TN
Limerick 1 and 2	21 mi NW of Philadelphia, PA	Wolf Creek	13.5 mi NE of Burlington, KS
McGuire 1 and 2	17 mi S of Charlotte, NC		

Radiation exposure also raises cancer risk, presumably due to the DNA damage that is incurred. The risk of developing leukemia rises significantly within two years of exposure to radioactivity, while the risk of developing other cancers rises within 15 years. One of the most significant risks of radiation exposure is damage to the thyroid gland that leads to thyroid cancer.

Radioactive iodine is one of the most common radioactive isotopes. The body can't distinguish between radioactive and benign versions of iodine, which is necessary for thyroid function. Human thyroid glands are designed to concentrate this mineral so that they can make the most of whatever comes in through dietary sources. While other isotopes are dispersed throughout the body, radioactive iodine becomes highly concentrated in the thyroid gland, causing thyroid damage, nodules and eventually, cancer. Radioactive iodine can be blown hundreds of miles by the wind, making the pattern of its distribution after a nuclear accident unpredictable.

In the Chernobyl accident, increased thyroid cancer rates were documented for at least 31 miles from the accident site. The thyroid glands of children in the area were most dramatically affected. Up to 20,000 children who were living in Belarus at the time of the accident are expected to develop thyroid cancer in their lifetimes, and the cancers they will likely develop tend to be more aggressive than spontaneously arising cancers of the thyroid.[3] According to the World Health Organization, somewhere around 50,000 new cases of thyroid cancer will be caused by the fallout from the Chernobyl accident.[4] Other sources say that fallout from nuclear tests performed in Nevada in the 1950s and 1960s is thought to be the cause of 120,000 cases of thyroid cancer.[5]

It doesn't take fallout from an exploding nuclear reactor or atomic bomb to cause damage to the thyroid gland. Very small amounts of radioactive iodine—amounts likely to dissipate over a small area in the event of a dirty bomb detonation, or an extensive area in the event of an attack on a facility containing radioactive substances—if inhaled or swallowed, can cause damage that eventually could lead to cancer or thyroid dysfunction.

Cancer of the thyroid can usually be treated with surgery. Presently in the U.S., 12,000 people are diagnosed with thyroid cancer, and only 1,000 per year end up dying from it. For the remainder of the thyroid cancer survivor's lifetime, however, thyroid replacement drugs are necessary.

**Protect your thyroid gland from radiation damage**

The best protection against thyroid damage and thyroid cancer induced by radioactive iodine exposure is potassium iodide (KI). This simple compound, which is used to iodize salt, protects the thyroid by saturating all of the iodine binding sites in the gland. Potassium iodide is a source of safe, stable iodine that rapidly saturates the thyroid, leaving no room for the binding of radioactive iodine, which then is simply excreted from the body. According to a statement by the FDA, "Potassium iodine is a safe and effective means by which to prevent radioactive iodine uptake by the thyroid gland, under certain specified conditions of use, and thereby obviate the risk of thyroid cancer in the event of a radiation emergency." In some areas around Chernobyl, potassium iodide was distributed within hours of the emergency, and



- 1. Nuclear Power Generating Facilities: Nuclear power generating facilities pose two kinds of threats**
- a. They can suffer accidents that can spread radiation
  - b. They can be the target of terrorist attack.

## 2. Military Installations

## 3. Potential Nuclear Targeted Area Cities:

Cities with a population of 100,000 or more

thyroid cancer rates have been far lower in those areas. Interestingly, potassium iodide has been used as an expectorant to treat asthma, emphysema and bronchitis, and was also used to remedy overactive thyroid. It has also been employed to treat toenail fungus!

In the event of a nuclear emergency, supplies of potassium iodide will quickly

disappear. During the Three Mile Island episode, the government initiated the production of a huge increase in potassium iodide by a pharmaceutical company in anticipation of widespread need. Before the crisis blew over, government spokespersons vowed that a large public stockpile would be created; once the situation was under control, however, the plan to create such a stockpile was swept under the rug.[6] Nuclear power plants maintain their own stockpiles to protect workers, but the industry raises strong opposition to a public potassium iodide stockpiling plan—for fear that such a plan might cast nuclear power as unsafe. Of their own accord, some communities surrounding nuclear power plants have begun their own stockpiles.

### How to use potassium iodide

You can take either potassium iodide (KI) or potassium iodate (KI03) for protection against radioactive iodine. It's best to take it a half-hour to an hour before you come into contact with a source of radioactive iodine. If you can do so, you can be confident that you have prevented 99% of the possible thyroid damage such radiation could cause. When potassium iodide isn't started until two hours post-exposure, about 80% of damage is prevented. If potassium iodide is delayed until eight hours after exposure, it is only 40% protective. For people with diets that are low in iodine, these numbers fall to 65% and 15%, respectively. A diet containing adequate iodine from iodized salt, kelp (kelp tablets typically contain 225 mcg of iodine), and fish (with about 500 mcg per serving) provides stronger baseline protection against radioactive iodine.

Keep potassium iodide where you can easily find it as soon as you hear news of a nuclear emergency. You may want to keep a stash at work and in your car, as well; children can carry some with them to school and activities to take as directed by parents. Even if you can't take it right away, potassium iodide will still help as long as you can get it into your body within three to four hours of exposure.

The maximum dose for adults and children over one year old is 130 mg per day. If you are concerned about giving an adult dose to a small child, keep in mind that the minimum effective dose for children aged three years to 18 years is 65 mg (half a tablet); for children aged one month to three years, it is 32 mg (1/4 of a tablet); and for babies between birth and one month of age, it is 16 mg (1/8 of a tablet). The minimum effective dose will offer complete thyroid protection. Potassium iodide tablets can be crushed and given with liquids to children too young to swallow pills. Most potassium iodide tablets contain 130 mg per tablet with scoring for easier dosing for younger children. Take potassium iodide once daily until radiation exposure is no longer a concern.

Newborn babies should be given as few doses as possible and monitored for hypothyroidism in the aftermath of potassium iodide use. Pregnant and nursing women should also avoid repeated doses when possible because of the risk excess stable iodine can pose to the developing thyroid gland of fetus or newborn. If repeated doses are necessary due to extended, intense exposure, the infant should be monitored for hypothyroidism as well.

You can also give potassium iodide to pets. Gauge the dosage level in terms of the pet's weight. A dog that weighs more than a one-year-old child will get the 130 mg dose, while a smaller animal will get 32 mg or even 16 mg, depending on its weight.

### A Thyroid Primer

The thyroid gland is a butterfly-shaped organ located in the neck. It controls the rate of metabolism — the process by which cells turn carbohydrates, fats and proteins into energy. Low thyroid function causes metabolic rate to slow dramatically, while an overactive thyroid speeds metabolism to a point where the body cannot maintain equilibrium.

Underactive thyroid is a common complaint in the U.S., especially among postmenopausal women; blood tests indicate that one in 10 adults have thyroid hormone levels somewhat below normal. Hypothyroidism causes a wide variety of symptoms that range from unpleasant to devastating, including weight gain, depression, goiter (swelling of the thyroid gland), fatigue, poor digestion, diminished libido, inability to tolerate cold, abnormal heartbeat, hair loss and infertility.

When the thyroid gland becomes overactive, the diagnosis is Graves' disease. Nervousness, wild mood swings, weight loss, heat intolerance, goiter and rapid heartbeat are a few of the symptoms of this disorder, which is far less common than hypothyroidism. Left untreated, Graves' disease can cause fatal heart problems. Treatment involves the use of radioactive iodine and antithyroid drugs to destroy the thyroid gland. For the remainder of the patient's life, thyroid hormone replacement is necessary. Both of these common types of thyroid dysfunction are thought to be the result of autoimmunity, where the immune system turns on the body's own tissues, damaging or destroying them in the process.

The simplest test for thyroid



Potassium iodide not absorbed into the thyroid is quickly eliminated from the body via urine. Adverse reactions have been recorded, more often with higher dosages. Side effects may include a skin rash or salivary gland swelling. Rarely, a set of symptoms called iodism can set in: a burning mouth, sore teeth and gums, symptoms resembling those of a head cold, stomach upset, diarrhea, and a metallic taste in the mouth. Some potassium iodide users may experience goiter or changes in thyroid function.

Maintaining a supply of potassium iodide is one of the least expensive, simplest steps you can take to protect yourself and your family against the long-term consequences of exposure to radiation. It isn't a cure-all; it offers no protection against any other radioactive isotope. To protect yourself against all radiation, you'll need a plan for evacuation or access to a fallout shelter. There is no other way, however, to so quickly and completely protect the thyroid gland, which is one of the organs most commonly damaged by radioactive fallout. Don't think that you can swallow enough iodized salt to protect your thyroid—in order to get 130 mg of potassium iodide, you would need to swallow five cups of iodized salt. Also, be sure to stay away from tincture of iodine or iodine tablets. These substances contain elemental free iodine, which is poisonous if taken in anything but miniscule, highly diluted doses as a water disinfectant.

dysfunction is the basal body temperature test: shake a thermometer to below 95 degrees F and leave it on your nightstand before going to sleep. Just upon waking, hold the thermometer in your armpit for a full 10 minutes, lying still and resting. Record the temperature and date after the 10 minutes are up. Do the same for three consecutive mornings (if you are a premenstrual woman, do this test on the second, third and fourth days of menstruation). If the temperature is between 97.6 and 98.2 degrees, your thyroid is functioning normally. If it is consistently below 97.6, obtain a medical evaluation for low thyroid. If it is above 98.6 and you have symptoms reminiscent of Graves' disease, see a physician for evaluation and treatment.

Source: Pizzorno, Joseph, Total Wellness, Prima Publishing, Rocklin, CA: 1996.

If potassium iodide tablets are completely out of your reach in the event of a nuclear emergency, you can swab 8 ml of 2% iodine tincture on your forearm or abdomen two hours before you come into contact with radioactive iodine.

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