

INFORMATION

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In any nuclear power plant release, evacuation is the primary protective measure. The use of potassium iodide is only a supplement and should never be considered a 'magic bullet' to completely protect you from radiation.

Frequently Asked Questions about Potassium Iodide (KI)

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1. What is potassium iodide (KI)?

KI is a salt, similar to table salt. Its chemical symbol is KI. It is routinely added to table salt to make it “iodized.” KI is approved by the Food and Drug Administration (FDA) as a nonprescription drug for use as a “blocking agent” to prevent the human thyroid gland from absorbing radioactive iodine. KI, if taken in time and at the appropriate dosage, blocks the thyroid gland’s ability to absorb radioactive iodine, and thus could reduce the risk of thyroid cancer. However, KI may not provide people with 100 percent protection against all radioactive iodine. Its effectiveness will depend on a variety of factors, including when a person takes it, how much iodine is already in the person’s thyroid, how fast the person’s body processes it and the amount of radioactive iodine the person is exposed to. Iodized table salt will not provide enough iodine to protect the thyroid and should not be used as a substitute. KI can be in the form of a pill or a supersaturated solution.

2. What does KI do?

KI floods the thyroid gland with nonradioactive iodine and prevents the uptake of radioactive iodine, which is subsequently excreted in urine. When administered in the recommended dose, KI is effective in reducing the risk of thyroid cancer in individuals or populations at risk for inhalation or ingestion of radioactive iodine. Taking KI is a method of shutting down the thyroid absorption of iodine (a process called “blocking”) until the body rids itself of any radioactive iodine.

3. What does the thyroid gland do?

The thyroid is a small gland located in a person’s neck on either side of the breathing tube (trachea). The main function of the thyroid gland is to create, store and release thyroid hormones. These hormones regulate the body’s metabolism.

4. What is the benefit of taking KI during a radiological accident?

When KI is ingested, it is taken up by the thyroid gland. In the proper dosage, and taken at the appropriate time, it will effectively saturate the thyroid gland in such a way that if inhaled or ingested, radioactive iodine will not accumulate in the thyroid gland. The risk of thyroid effects is reduced. Such thyroid effects resulting from radioiodine uptakes due to inhalation or ingestion, or both, could result in acute, chronic and delayed effects. Acute effects from high doses include thyroiditis, while chronic and delayed effects include hypothyroidism, thyroid nodules and thyroid cancer.

KI does not prevent the effects of other radioactive elements. Using KI will protect only the thyroid gland from radioactive iodine. It will not protect other parts of the body from radioactive iodine, and it will not protect a person from other radioactive materials that may be released.

5. Why is iodine important to the thyroid gland?

Most of the iodine in the human body comes from food. The thyroid gland takes iodine from the bloodstream and uses it to make hormones. Without the required amounts of iodine, the thyroid will not be able to make these hormones. The thyroid gland does not discriminate between radioactive and nonradioactive iodine. For decades, it has been known 130 milligrams (mg) of KI was enough iodine to saturate an adult’s thyroid gland for about one day. If 130 mg of KI is taken shortly before radioactive iodine enters the body, the thyroid gland will have been totally saturated, and will not absorb radioactive iodine from the bloodstream. Thus, the thyroid will not absorb and store the radioactive iodine. The radioactive iodine will be eliminated, primarily by way of urine, during a period of a week or two.

6. Where does radioactive iodine come from?

Radioactive iodine is a fission product, one of about 200 different radioisotopes produced when uranium atoms split apart upon being struck by a neutron. The major isotopes of radioactive iodine produced in the fission process have a short half-life. Therefore, they exist only while the nuclear reactor is operating and producing electricity, or for a few days following the reactor shutdown. It is not a concern, for example, in spent fuel from nuclear reactors. Radioactive iodine is also made for medical purposes under controlled conditions.

7. Is radioactive iodine hazardous?

Radioactive iodine, also called radioiodine, can be hazardous if someone is exposed to enough of it. Radioiodine undergoes radioactive decay, releasing both beta and gamma rays. If a person is near radioactive iodine, or if radioactive iodine enters the body, they will be exposed to beta and gamma rays. If radioiodine is removed from the bloodstream and stored in the thyroid gland, the thyroid gland and the rest of the body will receive higher radiation doses than if the radioiodine simply passed through the body. This removal and storage can be prevented by the appropriate use of KI.

8. What are the effects of radioiodine in the thyroid gland?

Radioiodine in the thyroid gland can lead to an increased radiation dose to the thyroid gland and the rest of the body. Radiation to the thyroid gland of a child increases their risk of developing thyroid cancer later in life. Large amounts of radioiodine in the adult thyroid gland can lead to reduced functioning of the gland and an additional radiation dose to the rest of the body.

9. How might a nuclear accident cause thyroid damage?

Some types of radioactive accidents release radioactive iodine. The thyroid gland, which will use any iodine in a person's bloodstream, cannot tell the difference between radioactive and nonradioactive forms of iodine. Because of this, the thyroid would rapidly absorb radioactive iodine just as it does iodine from a person's diet. The radioactive iodine releases energy (radiation) that, in high concentrations, can damage the cells of the thyroid gland. In some people, especially young children, this damage can cause thyroid cancer or other diseases of the thyroid within a few years of the exposure.

10. Are there any beneficial uses of radioactive iodine?

Radioactive iodine has been used during the past half century for diagnostic and therapeutic purposes in medicine. In small amounts, it is used to determine whether the thyroid gland is functioning normally. When tagged to certain pharmaceuticals, it can be used to create images of certain organs of the body. When administered in larger doses, it can lower the activity of an overactive thyroid gland and cause it to function normally. In even higher doses, it has been proven to be a very effective treatment for thyroid cancer.

11. When should I take KI?

Public health officials will tell the public when to take KI. If a nuclear accident occurs, officials will find out which radioactive substances are present before recommending people take KI. If radioactive iodine is not present, then taking KI will not protect people. If radioactive iodine is present, then taking KI will help protect a person's thyroid gland from the radioactive iodine. Taking KI will not protect people from other radioactive substances that may be present along with the radioactive iodine.

The FDA recommends KI be taken as soon as the radioactive cloud containing iodine is near. KI may still have some protective effect even if it is taken three to four hours after exposure to radioactive iodine. Because the radioactive iodine decays quickly, a single dose of KI may be all that is required. The Ohio Department of Health

(ODH) recommends considering the use of KI if the dose to a child's thyroid has the potential to exceed five rem. Public health officials will determine when this is likely and notify the public as to the appropriate action to take.

12. Is KI a “magic bullet” to be used in the event of a nuclear accident?

KI, if taken properly, protects against only internal radiation from radioiodine taken into the body. It will NOT protect against external radiation or internal radiation from radioisotopes other than radioiodine. If taken either before or very soon after a radioiodine intake and if taken in the proper dose, KI will block the uptake of radioiodine by the thyroid.

There are many radioisotopes that can be released to the environment in the event of a severe nuclear accident. Radioactive iodine may be one of them depending on the circumstances of the accident. For example, there was essentially no radioactive iodine released into the environment during the Three Mile Island reactor accident while there was a large amount released from Chernobyl.

13. Does KI protect against other nuclear-related hazards, such as leukemia and other cancers?

No. KI can provide important protection for one organ from radiation due to one radionuclide. It can provide protection only for the thyroid gland from an intake of radioiodine. It doesn't have any value in protecting other organs of the body or in providing protection from radiation from other radioisotopes.

14. Will KI be effective in case of a terrorist attack or dirty bomb?

A “dirty bomb” is a conventional explosive device incorporating radioactive material. It is designed to produce contamination with the radioactive material and instill fear and panic in the public. It is extremely unlikely for radioiodine to be used in a “dirty bomb” due to its short half-life and low radiotoxicity compared to other radioactive materials more likely to be used. Therefore, KI would probably have no protective value from a “dirty bomb.”

15. Are there any hazardous side effects associated with taking KI?

KI is a drug and should be taken only on the advice of public health officials. Usually, side effects occur when people take higher-than-recommended doses. Otherwise, side effects are unlikely because of the low dose and the short time the drug will be taken. As a general rule, the risk of thyroidal side effects is related to dosage and to the presence of an underlying thyroid disease (e.g., goiter, thyroiditis, Graves' disease). The possible side effects of KI are far outweighed by the benefits with regard to prevention of thyroid cancer in susceptible individuals. Possible side effects include skin rashes, swelling of the salivary glands, a metallic taste in the mouth, burning sensation in the mouth and throat, sore teeth and gums, symptoms of a head cold and sometimes stomach upset and diarrhea.

A small number of people have an allergic reaction to iodine, which can cause hazardous side effects. These could be fever and joint pains, swelling of parts of the face and body and at times, severe shortness of breath requiring immediate medical attention. If side effects are severe or you have an allergic reaction, stop taking KI and if possible, call your doctor or a public health authority for instructions.

A rare but potentially serious side effect of administering KI to infants is transient hypothyroidism. Without immediate treatment, transient hypothyroidism in infants may increase the risk of developmental disability. It is important to note the FDA has concluded the benefit of administering KI to infants outweighs the risk, but they should be medically monitored for transient hypothyroidism.

16. Who should not take KI or have restricted use?

The high concentration of iodine in KI can be harmful to some people. People should not take KI if they:

- Have ever had thyroid disease ([such as hyperthyroidism, thyroid nodules, or multinodular goiter](#)).
- Know they are allergic to iodine
- Have certain skin disorders (such as [dermatitis herpetiformis](#) or [urticaria vasculitis](#)).
- Individuals with [Graves' disease](#), and [autoimmune thyroiditis](#) should be treated with caution -- especially if dosing extends beyond a few days.

Note: Of the 7 million adults who took stable iodine in Poland following Chernobyl, only two reported severe adverse reactions. Both individuals had a known allergy to iodine. Based on these data, the FDA concluded even if the risks associated with excess stable iodine are greater to adults than to children, the risk of serious adverse reactions overall is exceedingly small.

17. Should I check with my doctor before taking KI?

KI is available without a prescription. However, if you have any health concerns or questions, you should check with your doctor. Even though there have been minimal side effects (e.g., gastrointestinal effects or rashes) from the use of KI, this substance should be taken only on the advice of health care providers. Again, KI will only help reduce the effects of radioiodine taken into the body and not from other radioactive atoms.

18. Is there an alternative to taking KI pills?

The absolute best protection is to not be exposed to ANY unjustified radiation. This includes radiation from radioiodine and the many other radionuclides that could be released from a nuclear accident. The primary protective action in Ohio's emergency response plan is evacuation and sheltering. Administration of KI is a supplemental action when it is warranted and announced by public health officials.

19. Who needs to take KI after a nuclear radiation release?

The FDA guidance prioritizes groups based on age, which primarily determines the risk for radioiodine-induced thyroid cancer. Those at highest risk are infants and children, as well as pregnant and nursing females and the recommendation is to treat them at the lowest threshold (with respect to predicted radioactive dose to the thyroid). Anyone older than age 18 should be treated at a slightly higher threshold.

20. How long should KI be taken?

Because KI protects for about 24 hours, it should be taken daily until the risk no longer exists. Public health and emergency personnel will inform the public as to the need for a second dose of KI. Repeat dosing is not recommended for pregnant females and newborn children if other protective measures (such as evacuation) are available. ODH primarily recommends evacuation and the use of KI only as a supplement to evacuation.

21. What is the proper dosage of KI?

KI comes in 65 mg tablets. A one-time dose at the levels recommended below is usually all that is required. However, if a person expects to be exposed to radioactive iodine for more than 24 hours, another dose should be taken every 24 hours. People should listen to public health and emergency management officials for recommendations after an accident.

Population	KI dose (mg)	# of 65 mg tablets
Adults over 18 yrs and Pregnant or Breast-Feeding women	130	2
Adolescence Over 12 through 18 yrs and Children over 3 through 12 yrs	65	1

Over 1 month through 3 yrs	32	1/2
Birth through 1 month	16	1/4

*Adolescents approaching adult size (>150 lbs) should receive the full adult dose (130mg).

22. How should fractional doses (e.g., 65 mg) be administered?

KI tablets can be dissolved in liquids and the appropriate volume administered. For example, if a 130-mg tablet were dissolved in eight ounces of liquid, four ounces would contain about 65 mg of KI.

23. How can crushed KI be administered for infants and toddlers?

The KI dosage may be mixed with a half-cup or less of fluid or soft food (baby food, applesauce, or pudding), depending on what the child will eat or drink. The smaller the amount, the better chance of taking the full recommended dose.

24. What if a child receives a full dose?

The FDA’s guidance on dosing KI in radiation emergencies adheres to principles of minimum effective dose, and therefore recommends graded dosing according to age (and thus, in effect, body size). There is ample evidence the recommended doses, as well as higher doses (e.g., up to 130 mg), will effectively block thyroidal uptake of radioactive iodine if taken in advance of exposure.

However, special attention should be paid to KI dosing in infants. Excess iodine intake can lead to iodine-induced transient hypothyroidism. Individuals who are intolerant of KI at protective doses, as well as newborns, pregnant and breast-feeding women should be given priority with regard to other protective measures (e.g., sheltering, evacuation and control of the food supply).

25. Has KI been approved by the Food and Drug Administration (FDA)?

Yes. In 1978, the FDA announced KI is a safe and effective means by which to block uptake of radioactive iodine by the thyroid gland in a nuclear emergency.

26. Can I bring my pets to the reception center?

If you must evacuate, evacuate your pets, too. You should prepare now for the day when you and your pets may have to leave home on short notice. Only service animals (including seeing-eye and hearing-aid) will be allowed inside reception centers in most cases. Because most human shelters will not accept animals, compile a list of places you might be able to take your pet if you must evacuate your home, (e.g., boarding kennels or veterinary hospitals with boarding facilities outside your area, friends or relatives outside the affected area or motels that will accept you and your pet in case of an emergency).

Prepare an emergency kit for your pets with: copies of your pet’s vaccination and medical records, a current photograph, collars and leashes, three-day supply of water and food in moisture-proof containers, bowls, litter and litter box, first-aid kit and a week’s supply of any medication your pet may be taking. Be sure your pet wears a properly fitted collar with a current license tag, rabies tag and identification tag with your name, address and phone number, the animal’s name and the phone number of a relative who lives outside of the area who can be contacted if you cannot be reached. Obtain a sturdy pet carrier for each of your pets. Let your pet become familiar with the carrier now. Favorite toys or blankets will provide comfort to your pet should you be temporarily separated.

27. Can I give KI to my pets?

Potassium Iodide (KI) is not approved for use in animals. The Ohio Department of Agriculture does not recommend giving KI to your pets. Pets can have side effects especially if they ingest too much. In animals, *Plumb's Veterinary Drug Handbook* lists the following adverse effects: excessive tearing, vomiting, anorexia, nasal discharge, muscle twitching, cardiomyopathy, scaly haircoats and dandruff, hyperthermia, decreased milk production and weight gain, coughing, inappetence and diarrhea. It notes that cats are more prone to developing toxicity.

28. What is the shelf life of KI tablets?

As with all drug products, the manufacturer places the expiration date of the drug on either the package or the individually wrapped tablet. The shelf life of Thyrosafe® (the KI product distributed by NRC) is ten years. However, with proper testing shelf-life can be extended.

28. How do I dispose of expired KI?

According to the Ohio Environmental Protection Agency, KI can be treated as solid waste and disposed of in landfills as regular garbage. If you have expired KI in your home, you may dispose of it via your household trash.

29. Are there Web sites which have more information about KI?

<https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/radiological-health-and-safety/resources/ki>

<https://www.fda.gov/drugs/bioterrorism-and-drug-preparedness/radiation-emergencies>

<https://www.nrc.gov/about-nrc/emerg-preparedness/about-emerg-preparedness/potassium-iodide-use.html>

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