



Health Physics Society  
Specialists in Radiation Safety

## Potassium Iodide (KI)



**KI Thyroid Blocking Agent**

*Photo courtesy of [Oak Ridge Associated Universities](#)*

Stable iodine is an important chemical needed by the body to make thyroid hormones. Since iodine is not produced by the body, we get it from various dietary sources. Radioactive iodine is used in medicine and may be released during a nuclear power plant incident. To help mitigate the potential effects of an unplanned intake of radioactive iodine, potassium iodide (KI) may be used.

### *What is potassium iodide?*

Iodine, whether it is radioactive or stable, is metabolized by the body in the same way. And as with many things, when the body has what it needs, it gets rid of the rest. Potassium iodide—also referred to by its chemical name “KI”—is a stable iodine salt that is not radioactive. It saturates the thyroid gland with iodine, therefore effectively blocking radioactive iodine (“radioiodine”) from being absorbed by the thyroid gland and minimizing potential radiation risk. The thyroid gland is the part of the body that is most sensitive to radioactive iodine (CDC 2018).

- KI does not keep radioactive iodine from entering the body and cannot reverse the health effects caused by radioactive iodine once the thyroid is damaged.
- KI only protects the thyroid, not other parts of the body, from radioactive iodine.
- Table salt and foods rich in iodine do not contain enough iodine to block radioactive iodine from getting into your thyroid gland and are therefore not substitutes for KI.
- Only use products that have been approved by the US Food and Drug Administration (FDA).

KI is also available in a medicine form, either pill or liquid.

### *Where does radioactive iodine come from?*

Radioactive iodine is one of about 200 different radioactive isotopes (radionuclides) produced during fission. Fission is the process that creates the energy to operate a nuclear power plant as well as being the source of the energy released by a nuclear weapon. Please note that although the fission process is similar, the comparisons between a nuclear power plant and a nuclear weapon end there.

### *What are the health effects of radioactive iodine?*

Radioactive iodine can affect the thyroid gland in multiple ways. In addition to potentially decreasing thyroid function (sometimes an intentional effect for medical purposes), it can also increase the risk of thyroid cancer. Age is a big factor in determining risk—children are at most risk while older adults are at a much lesser risk. KI administration recommendations are based on this concept. Pregnant or lactating women are also a population of concern due to the potential exposure of the developing fetus/breast-feeding child.

### ***How does KI protect against radioactive iodine?***

The thyroid gland needs iodine to carry out its function of producing hormones. The thyroid gland is constantly removing iodine from the bloodstream. When iodine enters the bloodstream, the thyroid gland cannot tell the difference between radioactive and stable iodine. Therefore, if stable iodine (in the form of KI) is taken shortly (i.e., hours) before or shortly (i.e., hours) after radioactive iodine enters the body, the thyroid gland will absorb the iodine that it needs, including from the stable KI. With stable KI in the thyroid gland, less radioactive iodine will be absorbed and much of the radioactive iodine will be removed from the body in the urine. When taken in the recommended dose, KI is effective in reducing the risk of thyroid cancer in people or populations at risk for inhalation or ingestion of radioiodines (FDA 2016).

### ***Are there any beneficial uses of radioactive iodine?***

Radioactive iodine has been used for the past half century to diagnose and treat different diseases, including cancer. In small amounts, it is used to determine whether or not the thyroid gland is functioning normally. It can be used to create images of certain organs of the body, including the thyroid. When given in larger doses, it can lower the hormones of an overactive thyroid gland and cause it to function normally. In even higher doses, it has been proven to be a very effective cure for thyroid cancer.

### ***How much KI is given?***

If pills are given to block the thyroid from the uptake of radioiodine, the dose for an adult is 130 milligrams per day. If liquid is given, the dose for an adult is 2 milliliters per day. Doses for children and infants vary, so they are not listed here. They can be found at the Radiation Emergency Medical Management website (REMM 2019), the Centers for Disease Control and Prevention website (CDC 2018), and the FDA website (FDA 2001).

### ***Are there any hazardous side effects associated with taking KI?***

There are some known side effects of KI (Mayo Clinic 2019). According to the Radiation Emergency Assistance Center/Training Site: “KI should be taken only when advised by emergency management officials, public health officials, or your doctor. You can get KI without a prescription, but people who are allergic to iodine or have specific health conditions should not take it. The US Food and Drug Administration provides additional details about KI use, dose, and health risks.” (REAC/TS 2019).

### ***Is there an alternative to taking KI pills?***

The primary protective action in state emergency-response plans is evacuation and sheltering. Giving KI is a supplemental, or extra, action when it becomes necessary. If state health officials advise evacuation and/or sheltering in place, this should be done immediately.

### ***Can KI be used to protect against radiation from a “dirty bomb?”***

A “dirty bomb” is a conventional explosive device, or bomb, designed to spread radioactive material when it explodes. Through spreading this radioactive material, a criminal hopes to instill fear and panic. It is highly unlikely that radioiodine would be used in a “dirty bomb.”

Potassium iodide works only to prevent the uptake of radioactive iodine into the thyroid gland. It is not useful for other radioactive elements (FDA 2016), meaning it will not protect against radiation in any other way. Therefore, in a “dirty bomb” that does not use radioiodine, KI should not be taken.

### ***Are we now better prepared to deal with nuclear power plant emergencies?***

We learned a lot from the accidents at Three Mile Island, Chernobyl, and Fukushima. This information has been incorporated into many national, state, and local emergency plans, which are now designed to get people out of harm’s way in a timely fashion and ensure that they receive no or very little radiation exposure. One of the lessons learned from Chernobyl is that administration of KI is an appropriate protective action when the situation requires it.

In the event of any nuclear emergency, the best procedure to follow is to tune in to the emergency radio and television channels and follow the advice given by public health agencies that are in charge of our safety in an emergency.

## *References*

Centers for Disease Control and Prevention. Potassium iodide (KI) [online]. 2018. Available at <https://www.cdc.gov/nceh/radiation/emergencies/ki.htm>. Accessed 3 July 2019.

Mayo Clinic. Iodine and potassium iodide (strong iodide) (oral route): side effects [online]. 2019. Available at <https://www.mayoclinic.org/drugs-supplements/iodine-and-potassium-iodide-strong-iodine-oral-route/side-effects/drg-20062037>. Accessed 3 July 2019.

Radiation Emergency Assistance Center/Training Site (REAC/TS). A guide to understanding radiation and radioactive contamination by REAC/TS physicians and health physicists [online]. Available at <https://orise.orau.gov/reacts/resources/frequently-asked-questions-about-radiation.html>. Accessed 8 October 2019.

Radiation Emergency Medical Management. US Department of Health & Human Services. Potassium iodide (KI) [online]. 2019. Available at <http://www.remm.nlm.gov/potassiumiodide.htm>. Accessed 3 July 2019.

US Food and Drug Administration. US Department of Health & Human Services. Potassium iodide as a thyroid blocking agent in radiation emergencies [online]. 2001. Available at <http://www.fda.gov/downloads/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/ucm080542.pdf>. Accessed 03 July 2019.

US Food and Drug Administration. US Department of Health & Human Services. Frequently asked questions on potassium iodide (KI) [online]. 2016. Available at <https://www.fda.gov/drugs/bioterrorism-and-drug-preparedness/frequently-asked-questions-potassium-iodide-ki>. Accessed 3 July 2019.

## *Resources for More Information*

Fleming & Company, Pharmaceuticals. ThyroShield: consumer package insert [online]. Available at [http://www.thyroshield.com/wp-content/themes/gomobile\\_v1/images/ThyroShieldinsert.pdf](http://www.thyroshield.com/wp-content/themes/gomobile_v1/images/ThyroShieldinsert.pdf). Accessed 3 July 2019.

The Health Physics Society is a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety. Formed in 1956, the Society has approximately 3,500 scientists, physicians, engineers, lawyers, and other professionals. Activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. The Society may be contacted at 950 Herndon Parkway, Suite 450, Herndon, VA 20170; phone: 703-790-1745; fax: 703-790-2672; email: [HPS@BurkInc.com](mailto:HPS@BurkInc.com).