Nuclear Radiation and the Thyroid

WHAT IS THE THYROID GLAND?

The thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid hormones, which are secreted into the blood and then carried to every tissue in the body. Thyroid hormone helps the body use energy, stay warm and keep the brain, heart, muscles, and other organs working as they should.

FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association website at *www.thyroid.org* and at the FDA website *www.fda.gov* (search for Potassium iodide).

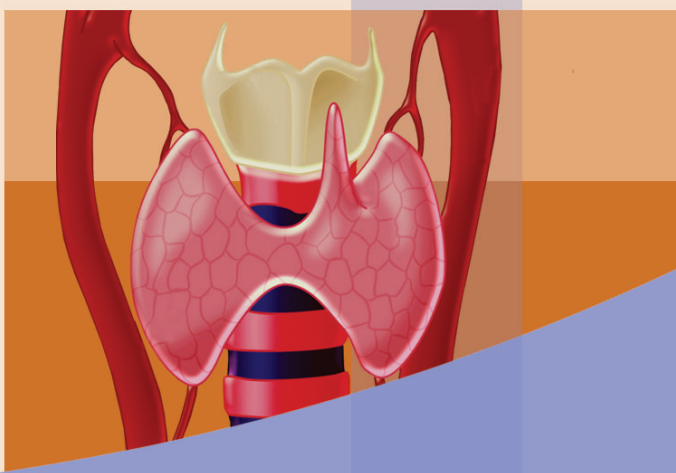
WHY DOES THE THYROID GLAND NEED SPECIAL PROTECTION AFTER A RELEASE OF RADIOACTIVE MATERIAL?

The thyroid gland needs iodine to produce hormones that regulate the body's energy and metabolism. The thyroid absorbs available iodine from the bloodstream. The thyroid gland cannot distinguish between stable (regular) iodine and radioactive iodine and will absorb whatever it can. In babies and children, the thyroid gland is one of the most radiation-sensitive parts of the body.

Most nuclear accidents release radioactive iodine into the atmosphere which can be absorbed into the body. When thyroid cells absorb too much radioactive iodine, it can cause thyroid cancer to develop several years after the exposure. Babies and young children are at highest risk. The risk is much lower for people over age 40. Thyroid cancer seems to be the only cancer whose incidence rises after a radioactive iodine release. Potassium iodide protects only the thyroid, but it is the organ at greatest risk from radioactive iodine.

WHAT IS POTASSIUM IODIDE (KI)?

Potassium iodide (KI) is the same form of iodine used to iodize table salt. KI floods the thyroid with iodine, thus preventing radioactive iodine from being absorbed. If taken at the proper time, KI protects the thyroid from radioactive iodine from all sources - air, food, milk, and water. KI is a non-prescription drug that can be bought over the internet and at some pharmacies. KI is made in pill and liquid forms. KI products approved by the Food and Drug Administration (FDA) are: Iosat Tablets (130 mg), ThyroSafe Tablets (65 mg) and ThyroShield Solution (65 mg/ml). Properly packaged, KI's shelf life is at least 5 years and possibly as long as 11 years. If you take a very old pill, it may not work fully but it won't hurt you.



WHAT IS THE PROOF THAT KI WORKS?

After the 1986 Chornobyl (formerly called "Chernobyl") nuclear accident, shifting winds blew a radioactive cloud over Europe. As many as 3,000 people exposed to that radiation developed thyroid cancer over the next 10 years. Most victims had been babies or young children living in Ukraine, Belarus, or Russia at the time of the accident. The region of excess risk extended up to a 200 mi radius from Chornobyl. Poland, immediately adjacent to Belarus and Ukraine, distributed KI to >95% of their children within 3 days of the accident and does not appear to have had an increase in thyroid cancer.

WHO SHOULD TAKE KI?

Since children are at the highest risk to exposure to radioactive iodine, KI should be available to all children. Also, because of the risk to the developing fetus, pregnant women should also take KI in the event of a nuclear accident. Adults are at a lower risk but still may benefit from KI. In addition to KI, priority should be given to evacuation, sheltering (staying in an unventilated room with the doors and windows closed) and avoiding contaminated food, milk, and water. KI should not take the place of any other protective measure.

WHEN SHOULD KI BE TAKEN?

KI fills the thyroid cells and prevents the gland from absorbing radioactive iodine for approximately 24 hours. People should take one dose a day while they are being exposed to radioactive iodine until the risk no longer exists. KI should be used only under instruction from local health authorities. Not every radioactive release includes the radioactive iodine that can cause thyroid cancer. For example, a "dirty bomb" is not likely to contain radioactive iodine because it has a short half-life. (A "dirty bomb" is a conventional bomb mixed with radioactive material, and designed to explode spewing out the radioactive isotopes and contaminating a wide area.) Health authorities can determine which radioactive isotopes are released during a nuclear event. If radioactive iodine is released, then health authorities will advise on when and how long to take KI.

WHAT ARE THE RECOMMENDED KI DOSES?

The FDA recommends the following doses:

Age	Dose
0 – 1 months	15 mg
1 months – 3 years	30 - 35 mg
3 – 12 years	65 mg
>12 years	130 mg

The easiest way to prepare a 16-mg dose for a newborn 0-1 month is to dissolve a 130-mg pill in 8 oz of a clear liquid and feed the newborn 1 oz of the liquid.

WHO SHOULD NOT TAKE KI?

Millions of people have taken KI but few serious side-effects have been reported. The only people who should not take KI are those who have had a major allergic reaction to iodine. During a nuclear emergency, KI's benefit far outweighs any potential risk. Adults over age 40 do not need KI at all unless they are exposed to extremely high levels of radioactive iodine.

Patients with thyroid disease can safely take the pills in the FDA recommended doses. If taken long enough, KI can cause temporary hypothyroidism (underactive thyroid gland). "Long enough" is different for every person. Prolonged treatment can become a serious problem for very young children. Such children should be seen afterward by a health professional. Patients with Graves' hyperthyroidism or with autonomous functioning thyroid nodules should also be seen.

WHY WORRY SO MUCH ABOUT THYROID CANCER IF MOST PEOPLE SURVIVE IT?

In general, 90% of patients survive thyroid cancer. The post-Chornobyl cancers have been aggressive and have been unusual in affecting children younger than 10 years of age. Thyroid cancer survivors always remain at risk for recurrence and require lifelong medical care. Likewise, the people who were exposed to radioactive iodine from the Chornobyl accident but have not developed thyroid cancer remain at risk for life and must continue to be tested. The demands of regular testing and care for this large population are putting a heavy burden on both patients and health care systems.

HOW SHOULD KI BE INCORPORATED INTO AN OVERALL EMERGENCY PLAN?

KI is an adjunct to evacuation, sheltering (staying in an unventilated room with the doors and windows closed), and avoiding contaminated food, milk, and water. KI should not take the place of any other protective measures.

WON'T HAVING KI PILLS LULL PEOPLE INTO A FALSE SENSE OF SECURITY?

Not likely. Local authorities recommend that people leave the vicinity of a nuclear emergency as quickly as possible. People are being taught that KI is just a supplement to evacuation.

WHY WASTE TIME TAKING A PILL IF YOU'RE BEING TOLD TO EVACUATE?

Nuclear releases are unpredictable and traffic jams are likely to delay speedy evacuation. People should take their KI before they evacuate, following instructions from local health officials.

WHY OFFER KI TO PEOPLE JUST WITHIN 10 OR 20 MILES OF A PLANT? CAN'T RADIATION BE HARMFUL FARTHER AWAY?

The Department of Health and Human Services (HHS) has recommended distribution of KI to individuals residing within 10 miles of a nuclear plant.

The American Thyroid Association (ATA) recommends that KI distribution not be limited to 10 or 20 miles. No one can predict how far a radioactive iodine cloud might spread. After Chornobyl, higher than expected rates of thyroid cancer were found more than 200 miles away from the nuclear plant. Thus, no one can predict how far from a nuclear plant the U.S. should distribute KI if it is to protect every person who might be exposed to radioactive iodine. Because there is no right answer, the American Thyroid Association recommends three levels of coverage, determined by distance from the nuclear plant:

DISTANCE ACTION

- 0 – 50 mi Pre-distribute KI to households, keep stockpile near
- 50 – 200 mi Stockpile KI in local public facilities (hospitals, schools, police and fire stations)
- > 200 mi Make KI available from HHS National stockpile.

WHAT ARE OTHER COUNTRIES DOING?

The World Health Organization endorses KI distribution. France, Ireland, Sweden, and Switzerland not only stockpile KI but predistribute KI to their populations.