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POTASSIUM IODIDE FOR THYROID PROTECTION IN A NUCLEAR ACCIDENT OR ATTACK

Potassium iodide (KI) taken orally before or at the time of exposure can limit or prevent uptake of radioactive iodine by the thyroid gland. Children, adolescents and young adults who as children were exposed to even small amounts of radioiodine from the Chernobyl reactor accident have had a marked increase, beginning 4 years after exposure, in the incidence of thyroid nodules and cancer (www.fda.gov/cder/guidance/4825fnl.htm). For more up-to-date information, visit the CDC website (www.bt.cdc.gov).

POTENTIAL SOURCES OF EXPOSURE — Radioactive iodine is a by-product of nuclear fission. A breach-of-containment nuclear reactor accident at a functioning nuclear power plant would release radioactive iodine and other radionuclides. Radioactive iodine is unlikely to be used as the radioactive material in a "dirty bomb" because it has a short half-life. Detonation of a nuclear weapon would release radioactive iodine, as well as other radioactive isotopes. Grazing cows that feed on radioiodine-contaminated vegetation secrete radioactive iodine in their milk. Human exposure can result from inhalation of iodine particles or aerosols, or from ingestion of contaminated vegetation, dairy products or meat.

MECHANISM OF ACTION — Potassium iodide is readily absorbed within 30-60 minutes after oral administration. It is rapidly concentrated and stored in the thyroid, protecting the gland by competing with radioactive iodine for the iodine active transport system, and by preventing its organification and storage in the thyroid (P Verger et al, *Thyroid* 2001; 11:353). Taken within 12 hours before exposure, potassium iodide can almost completely prevent radioiodine from entering the thyroid. Taken after exposure, the degree of protection falls off to 80% after 2 hours, 40% after 8 hours, and 7% after 24 hours (PB Zanzonico and DV Becker, *Health Phys* 2000; 78:660).

SOURCES OF POTASSIUM IODIDE — Many potassium iodide products are available in the US, especially via the internet. Typically the drug is supplied in 65- or 130-mg tablets. Products from 3 companies have been approved by the FDA. In some states, people who live within 10 miles of a nuclear reactor are eligible to receive free potassium iodide supplied by the US Nuclear Regulatory Commission (www.nrc.gov).

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FDA-APPROVED POTASSIUM IODIDE PRODUCTS

Trade-name	Availability	Tablet size	Packaging	Cost*
<i>IOSTAT</i> (Anbex)	www.nukepills.com 727-784-3483	130 mg	14 tablets	\$ 9.50
<i>Thyro-Block</i> (Medpointe)	www.nitro-pak.com 800-804-4147	130 mg	14 tablets	58.97**
<i>ThyroSafe</i> (Recip US)	www.thyrosafe.com 610-942-8972	65 mg	10 tablets	12.95

* Cost from the distributor. Also available at many pharmacies.

** Sold only in packages of 7 bottles.

DOSAGE — The risk of radioactive-iodine-induced thyroid cancer is greatest for children, adolescents and pregnant women. Adults more than 40 years old have a lower risk. The currently recommended dosage schedule for adults >18 years old is one 130-mg tablet once daily, to be taken as long as there is risk of continued exposure to radioiodine. For administration to children (4-18 years: 65 mg per day; 1 month to 3 years: 32.5 mg; <1 month 16.25 mg), an adult 130-mg tablet can be crushed and dissolved in 4 teaspoonfuls of water, then mixed with 4 additional teaspoonfuls of another liquid such as raspberry syrup, flat soda, orange juice, low-fat white or chocolate milk or water (a total of 8 teaspoons of liquid) to make it more palatable. Using this preparation, the daily dosage is 4 teaspoonfuls of the mixture for children 4-18 years old, 2 teaspoonfuls for children from 1 month to 3 years, and 1 teaspoonful for infants <1 month. The liquid mixture can be kept in the refrigerator for up to 7 days. The 65-mg tablet can also be crushed and mixed with the same volumes of liquid, and then taken in twice the amount (www.fda.gov/cder/drugprepare/kiprep.htm).

ADVERSE EFFECTS — Potassium iodide is well tolerated. Allergic reactions can occur. Iodine-induced hyper- and hypothyroidism occur rarely; a few newborns in Poland treated with potassium iodide after Chernobyl developed transient hypothyroidism. Iodine may also rarely cause parotitis.

CONCLUSION — Potassium iodide tablets, taken once daily, can decrease thyroid uptake of radioactive iodide. Treatment should be started, if possible, before or soon after exposure and continued for the duration of exposure. Children, adolescents and pregnant women are at greatest risk.

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