Japanese Nuclear Disaster:
Medical Bulletin for West Coast residents

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Several people from the west coast of North America have asked me if they should take iodine because of radioactive isotope releases from the damaged nuclear power plants in Japan.

The answer is "no," for North America.

However, children in Japan (within 300 miles or 500 km, up to age 15 to 18) of the plants do need to be treated, I believe, with at least one dose of potassium iodide, especially the younger children. Adults age 18 to 40, especially those with higher exposures, may also be treated, but adults over 40 should be treated only under extraordinary conditions of very high radiation exposure. [1]

The best data concerning protection from the deleterious health effects of exposure to fallout from nuclear plant accidents comes from the Chernobyl accident in 1986 and subsequent studies of health effects.

The most susceptible people are children, especially young children, babies, and fetuses not yet born (pregnant women).

Thyroid cancers in children (usually a very rare disease) increased many-fold after the Chernobyl accident because of exposure to a radioactive isotope of iodine, 131I, which is inhaled or ingested in food or water, especially in fresh milk from cows grazing in fields exposed to the fallout. The appearance of

[1] World Health Organization. *Guidelines for iodine prophylaxis following nuclear accidents.* Geneva,1999. http://www.who.int/ionizing_radiation/pub_meet/Iodine_Prophylaxis_guide.pdf

thyroid cancers is marked and fast in children (within 4-12 years), especially young children.[1]

The data for adult thyroid cancer is ambiguous and still evolving: overall the thyroid glands of adults are far less sensitive to damage by radioactive 131I than the thyroid glands of children. Even among people with high degrees of exposure (who lived in highly contaminated areas or were employed in the clean-up after the accident), some studies have shown slight increases in thyroid cancer or nodules compared to less exposed people, and other studies have shown no difference. Two groups of clean-up workers, one from Estonia and the other from the Russian Federation, are still being followed.

Studies of leukemia in children across Europe and Turkey after the accident did not show increases that could be attributed to radiation exposure. Likewise, studies have not supported any link between the Chernobyl release and leukemia in adults, or in solid tumors in children or adults (other than thyroid cancers). It may take three to five more decades to fully assess the risk, because cancers may emerge slowly after genetic damage is done by ionizing radiation.

Control of exposure includes evacuating people from near release sites, staying indoors without air circulating from the outside during times when airborne radioactive substances are present, avoiding contaminated foods, keeping contaminated foods out of the food supply, and treatment with prophylactic "stable iodine" (meaning the stable and non-radioactive usual isotope).

Food products which are stored for weeks to months before they are eaten, however, are safe, because the 131I, with a half-life of about 8 days, decays to a stable isotope by that time. (Other radioactive isotopes of iodine released in nuclear accidents have even shorter half-lives.)

The isotope decay process is independent of what is done to the milk – it can be canned, dried, or made into cheese, for example, and the timing will be the same – because this is not a chemical process but a nuclear one.

Prophylactic treatment with potassium iodide is protective. The thyroid gland uses iodine to make the body's thyroid hormone. The protective dose of potassium iodide overwhelms the gland and temporarily shuts it down. If this dose is given within hours before or after the exposure, the thyroid gland does not take up the environmental radioactive iodine.

The World Health Organization rewrote its guidance on this topic in 1999, based on cancer data post-Chernobyl and a population-wide administration of single doses of potassium iodide in Poland, which demonstrated the safety of such dosing even for infants and pregnant women/unborn babies.

On the matter of when to take potassium iodide, and whether multiple doses should be used: Dosing with potassium iodide causes temporary hypothyroidism. In fetuses and newborns, this can cause a permanent decrease in intellectual capacity (decrease in IQ). One dose appears to be safe, even in the newborn critical period; if multiple doses were to be given, thyroid function would have to be assessed and treated with replacement hormone. In older adults (over 40), the potential harm from the prophylactic treatment is greater than the potential harm from exposure to 131I, except at very high exposure levels, so prophylaxis should generally not be given.

[1] Moysich KB, Menezes RJ, Michlek AM. Chernobyl-related ionizing radiation exposure and cancer risk: an epidemiologic review. *Lancet Oncology* 2002; 3:269-279. http://download.thelancet.com/pdfs/journals/lanonc/PIIS1470204502007271.pdf?id=4d037fefcb72946c:606a418:12eb9de3864:-19ff1300200963608