With the advent of the recent earthquake off the coast of Japan, the ensuing tsunami, and numerous nuclear reactor cooling system failures, there is concern among the people of the small village of Ashland, OR in the West. The evacuation area around the Fukishima plant was increased to 20 km and literally hundreds of thousands of people were evacuated from the area surrounding the Fukishima power plant. However, the consensus seems to be that at this point there is very little threat to human health at the levels of radiation detected beyond the 20 km area around the plant.

What is our concern?
The jet stream is moving air from Japan across the Pacific Ocean to the west coast of the United States. If current reports are accurate, there is no evidence of high enough levels of radiation from the Japanese nuclear plants to directly affect our health at this time. However, if the situation changes, and a large amount of radioactive material *is* released into the atmosphere, the West Coast of the US would certainly need to take precautions. Again, at the time of this writing there is no immediate threat.

What about Iodine?
The main purpose for taking high doses of potassium iodide during a radiation exposure is to protect the thyroid gland. The thyroid gland has the highest concentration of iodine of any tissue in the body. This is because the thyroid hormones, T3 and T4 (triiodothyronine and thyroxine), are made by combining iodine with tyrosine (an amino acid).

Because the thyroid can't distinguish between radioactive and stable iodine, in the presence of high levels of radioactive iodine (I-129 or I-131), the thyroid will take up the radioactive forms (isotopes) of iodine, store them in tissues, and use them to build thyroid hormones. Where the concentration is highest, the decaying radioactive iodine will release enough radioactive material to damage the surrounding tissue directly, leading to mutation and eventually cancer. A high concentration of radioactive iodine in the thyroid leads to thyroid cancer, as Chernobyl proved all too true.

A simplification looks like this: by preloading the body, and subsequently the thyroid gland with iodine, the thyroid gland is "full", meaning it is not taking up more iodine. This could be considered an "iodine inhibition". In the case of radioactive iodine exposure, there will be diminished uptake of radioactive iodine because all of the iodine "storage sites" are full of stable iodine, which is what the body will use for building thyroid hormones. If exposure is prolonged, the continued intake of iodine should offset concurrent uptake of the radioisotopes.

Because iodine has other physiological effects, the preloading of iodine and subsequent elevation of blood and tissue levels of iodine in the body may protect some of the other iodine rich organs, such as the ovaries and breasts, from the uptake of radioactive isotopes as well.

So Why *Not* take high dose iodine as a preventive measure?

Iodine is an essential nutrient that is important for many physiological mechanisms, and for thyroid health it is essential. The current FDA guideline is for a daily intake of 150 mcg (micrograms). Whether this is enough, considering current environmental conditions, is a subject of debate within the medical community. However, the recommendation is not to exceed 150 mcg per day, due to the observed potential for thyroid issues in sensitive individuals when taking high doses of iodine.

From the EPA website:

"The thyroid cannot tell the difference between radioactive and non-radioactive iodine. It will take up radioactive iodine in whatever proportion it is available in the environment.
If large amounts of radioactive iodine are released during an nuclear accident, large doses of stable iodine may be distributed by government agencies to keep your thyroid gland from absorbing too much radioactive iodine: Raising the concentration of stable iodine in the blood, increases the likelihood that the thyroid will absorb it instead of radioactive iodine. (Note: Large doses of stable iodine can be a health

hazard and should not be taken except in an emergency. However iodized table salt is an important means of acquiring essential non-radioactive iodine to maintain health."

The reason why not to take a radioactive iodine inhibiting dose of iodine, unless necessary, is 2 fold. The first reason involves the fact that in some people, an underlying reactivity exists in the thyroid that could be triggered by the large influx of iodine into the thyroid gland. It's kind of like pushing more fuel into an overheating reactor. The second reason is thyroid *suppression,* which will be addressed briefly below.

Inflammation plays a key role in the induction of the hypersensitivity reaction that can lead to hyperthyroidism or Graves' disease, along with a breakdown of the body's primary free radical quenching system (glutathione). There are several biochemical mechanisms involved in the manufacture of thyroid hormone, and the production of peroxide radicals (H_2O_2) is one of the costs of doing business in an oxygen rich environment. The free radicals can damage surrounding tissues when not properly quenched, leading to more inflammation and oxidative damage.

There are many potential causes for the existence of an underlying "thyroiditis" (inflammation of the thyroid). Some people are allergic, or hypersensitive to particular agents in the environment. A strong correlation has been drawn between celiac disease and the development of what is called auto-immune thyroiditis, a condition in which the body's immune system has lost the ability to clearly distinguish between self and non-self, leading to the destruction of healthy tissue. Other potential endocrine disruptors include the halogens bromine, chlorine and fluorine, and many pesticides. The clinically observed development of a "storm" of activity in the form of cytokines (cell-signaling compounds – many of which are inflammatory) in the thyroid tissue has the medical community acting very cautiously around the intake of iodine.

This issue is one that has a long history and is not yet fully understood, but there are a few precautions we can take to offset potential reactivity when taking a radiation protective dose of iodine. These nutrients are deficient in many cultures for a variety of reasons.

Doses are for an average adult:

Selenium – restores the primary free radical scavenging system (glutathione) in the thyroid
2-400 mcg per day

Magnesium – acts as a calcium channel inhibitor, helping to offset the iodide to iodine conversion reaction by slowing the influx of Ca^+ ions.
4-800mg/day

Sea salt – provides full spectrum of inorganic salts as found in the sea.
¼ tsp 2 x day

Water – "cools the system", and along with salt keeps tissues hydrated
More than you would usually take (60 ozs minimum)

These suggestions are based on the work of Dr Michael Schachter, and his recent presentation at the annual ACAM conference in 2010. (Schachter, 2010) The presentation outlines the history of iodine and sea salt in medicine over the last 150 years. These recommendations hold true for lower doses of iodine as well, such as those used in the management of hypothyroid conditions, i.e sea weed, iosol, iodoral, atomadyne, etc., and should be maintained while using iodine therapy of any kind.

The result of high Iodine intake can also lead to the *suppression* of thyroid function. In fact, high doses of Iodine were the main treatment for hyperthyroidism for part of the 20th century, until the development of more specific goitrogens, such as methimazole, which inhibits the hydrogen peroxidase enzyme system, thereby diminishing thyroid function. The doses of Iodine used for this application are between 300 and

900mg per day, but even in areas of high daily iodine intake from seaweed, thyroid suppression has been reported. (Japan)

Iodine is not the only radiation protective agent we have, and the toolbox of botanical and nutritional medicine is full of additional support, not only in the case of an emergency, but for everyday life. The use of high dose iodine for the inhibition of uptake of radioactive iodine is a special case.

From the WHO: Guidelines for iodine prophylaxis following nuclear accidents - 1999 update

"In Poland stable iodine, as single doses, was given to 10 million children *(11)*. No serious side effects were seen, though gastrointestinal effects and minor skin rash were reported. Of newborn infants receiving 30 mg potassium iodide in their first two days of life, 0.37% (12 infants) showed a transient increase in serum thyroid stimulating hormone (TSH), combined with a decrease in serum free thyroxine (T4). This transient thyroid inhibition has had no known consequences to date. Seven million adults took stable iodine although it had not been recommended. Among these, only two severe adverse reactions were seen, both in persons with known iodine allergy. In summary, the incidence of severe side effects from a single dose of iodine was less than 1 in 10 million in children and less than 1 in a million in adults."

Careful consideration must be taken in cases of:
- past or present thyroid disease (e.g. active hyperthyroidism)
· known iodine hypersensitivity
· dermatitis herpetiformis
· hypocomplementaemic vasculitis.

"To protect against inhaled radioactive iodine, a single dose of stable iodine would generally be sufficient, as it gives adequate protection for one day. This may well be enough to protect from inhaled radioactive iodine present in a passing cloud. In the event of a prolonged release, however, repeated doses might be indicated If intake of radioactive iodine through inhalation is prolonged, the recommended single stable iodine dose (cf. Table 2) will be repeated daily. This would most probably cause no harm. However, in children showing skin reaction to the first dosage, the stable iodine administration should not be given repeated doses."

Table 2. Recommended single dosage of stable iodine
according to age group:

Adults and adolescents -100mg Iodine = 130mg KI = 170 mg KIO3

Children 3-12 yr old – 50mg Iodine = 65mg KI = 85 mg KIO3

Infants 1 month to 3 years – 25mg Iodine = 32mg KI = 42 mg KIO3

Neonates – up to 1 month – 12.5 mg Iodine = 16 mg KI = 21 mg KIO3

"In general, appropriate control of foodstuffs is to be given priority as the countermeasure against ingestion of radioactive iodine. In the exceptional case that this is not possible, or when it would lead to deficiency of essential nutrients such as milk, prophylaxis with daily doses of stable iodine can be continued for a few days, or even weeks, in this group, as necessary."

So, what to have on hand?
There are many iodine products on the market today, and be sure to check the potency of each product so that you can dose accordingly if the need arises.

I carry a product called TriQuench at Jade Mountain Medicine that contains 25 mg of KI (potassium Iodide) per drop. To reach the 130mg per day dose recommended by the WHO, I would have to take 5 drops per day, plus a little additional seaweed or sea veggie caps.

Topical iodine solutions (betadyne, others) should never be consumed internally and are not as consistent with regard to dosing, but if there are no other options, these can be painted on the skin for iodine absorption. Some websites outline general dosing considerations for these products.

The dosing for general thyroid health is a completely different topic.

Basic protocol for radiation protection everyday:

Adaptogens – Natura's Vital Adapt or Power Adapt formulas – 2-4 droppers 2-3 x day

Natura's Cell Guardian formula – Broccoli seed, cabbage sprout, wasabi rhizome, DIM, Selenium, and more – regulates cell behavior – turns on tumor suppressor genes (p53)
2-4 caps 2 x day

Natura's Botanical Treasures formula – Green tea, Resveratrol, Grape seed and skin, etc.
3 caps 3 x day (with each meal)

Cytoredoxin (Integrative therapeutics) – Vit E, C, NAC, Selenium, antioxidants – 1-2 caps 2 x day

Sea Veggie caps (Williams OR) – 1-2 caps 2 x day

Miso soup with seaweed – drink daily

Coconut oil, milk, water

Avocados

Addendum:

Iodine has a half-life of about 8 days

How long to take the high dose of iodine will be dependent on the conditions of the situation, but radioactive iodine is heavy and will settle out of the air rather quickly, ending up on the ground, and into food and water supplies.

10 mGy = 1 Rad (Radiation conversion from milliGray's to Rads)

For more information about Iodine protection from radioactive fallout, google: WHO Guidelines for Iodine Prophylaxis following Nuclear Accidents. (Update 1999)
It provides advice on how to obtain optimal protection of public health in the application of the presently recommended "generic intervention level of 100 mGy (10 Rads)"

To obtain full effectiveness of stable iodine for thyroidal blocking requires that it be administered shortly before exposure or as soon after as possible. However, iodine uptake is blocked by 50% even after a delay of several hours.