

Why, When & How to Use Iodine

Referenced from lecture by David Brownstein, M.D.

“Holistic Medicine for the 21st Century”, for Functional Medicine University.

One of iodine’s main jobs in the body is to maintain normal architecture of the glandular tissue: thyroid, ovaries, uterus, breast, prostate and pancreas etc.. With iodine deficiency, the first thing that happens is that the glandular tissue assumes a cystic appearance. If deficiency continues over a period of time the cysts become hard and nodular; if it continues, they will become hyperplastic; and if it continues, the next stage is hyperplasia → endocrine cancer [ovarian cancer is increasing at epidemic rates, uterine cancer going up; prostate cancer. This is the iodine deficiency continuum.

Other Benefits of Iodine

- Alkalinizing agent → elevate and normalize the pH; particularly when combine it with unrefined salt.
- Necessary for the production of all hormones [adrenals, ovaries, the testicles].
- Necessary for the production of thyroid hormones. Iodine atoms are attached to thyroglobulin.
- Apoptotic properties on cancer cells [only occurs with iodine intake in excess of the RDA]
- No bacteria, virus, fungus, or parasite has been shown to be resistant to iodine.
- detoxifying agent for fluoride & bromide [*goitrogens*], mercury, arsenic, aluminum, lead;
- Mucolytic agent.
- Immune function: WBC’s cannot effectively guard against infection without adequate amounts of iodine
Improves Enterohepatic Circulation

Diseases Associated with Deficiency

ADD	Excess mucous	Keloids	Thyroid disorders
Asthma	Cystoid macular edema	Liver disease	Hemorrhoids
Atherosclerosis	Dental caries	Ovarian cysts	Dupuytren’s Contracture
Biofilms	Diabetes	Parotid duct stenosis	e
Breast disease	H pylori	Peyronie’s	Dry eyes
Endocrine Cancer	Hypertension	Retinitis pigmentosa	atherosclerosis
COPD	Infections	Sebaceous cysts	

Evaluation of Need

Do not assume you need iodine if you are hypothyroid. There are other causes of hypothyroid; stress and functional bowel disorders are the first places to look. Lowered T3 levels, and elevated TSH can be caused by dysbiosis. T3 is activated in the gut mucosa by intestinal sulfatase. Sulfatase is dependent of healthy gut bacteria. External stress, and internal stress such as food Antigen → elevated cortisol → inhibits T4 conversion to active T3.

A study by CHM of over 6,000 patients 96.4% tested low via urine or serum testing. NHANES reports show that iodine levels have declined [up to 50%] in the United States. 96% of the US population was deficient in iodine [1971-2012], and 8 to 10% were severely deficient in iodine [1970-2006]. *You may indeed need iodine based on THESE statistics...*

...And you surely may need iodine based on the following: A study showed that both benign and malignant thyroid nodules have significantly less iodine as compared to normal thyroid tissue. Benign nodules had 56% of the iodine content as compared to normal thyroid tissue, the malignant nodules 3% of the iodine content as compared to normal thyroid tissue. This illustrates the iodine deficiency continuum.

- Thyroid Function** / TPO titers. Too much iodine can cause hyperthyroidism in an autonomously functioning nodule and you either ingest iodine from food or you take iodine as a supplement and that nodule can take up iodine and make thyroid hormone and make people hyperthyroid- *Uncommon but that can occur.*
- Fine-needle aspiration** is standard of care for any thyroid nodule over 1 centimeter
- Pre & post treatment iodine loading Test** [the best measure and functional test]
 - 50 mg of iodine and collect 24 hours of urine
 - Measure how much of that 50 mg is retained by the body and how much is excreted.

- 45 mg excreted after taking 50 milligrams in a healthy person is about the normal levels.
- The more retained → assume the more the body is deficient in iodine.

Blood testing [not recommended]

Skin testing [not accurate]. Rub iodine in the skin and observe for its disappearance → .88% of the iodine evaporated from the skin; 20% of the body's iodine can be stored in the skin.

Supplementation

There is unwarranted fear of using and recommending inorganic, non-radioactive iodine within the range known from the collective experience of three generations of clinicians to be the safest and most effective amounts for treating the symptoms and signs of iodine deficiency [Dr. Guy Abraham]. Whole body iodine sufficiency generally requires higher doses 100 to over 400 times the RDA for iodine. Whole body sufficiency is approximately 1.5-2gm stored in all body tissues combined:

- **Fat tissues:** 700mg
- **Striated tissues:** 650mg
- **Thyroid tissue:** 50mg
- **Breasts:** Minimum of 5mg/day (50kg or 110# woman)
- **Other glandular tissues:** minimum pf 2mg/day [adrenals, thymus, ovaries, hypothalamus]

There are two forms of supplementation - *iodine* & *iodide*. Use both for best result because different tissues have an affinity for iodine or iodide:

Iodine/ oxidized form binds to:

Breast
Prostate
Stomach tissue

Iodide/ reduced form binds to:

Thyroid [contains the largest concentration of I. 50mg adult saturation]
Salivary glands
Skin

Therapeutic Dose

- **12.5 to 50 mg daily** [combined *iodine* & *iodide*] for about 3 to 6 months or longer [sometimes years]. A sick patient or a patient with cancer of the glandular tissue may need the highest 50mg doses to achieve 1.5-2gm sufficient concentrations.
- **3-5mg I/day decreased absorption of radioactive iodine by thyroid below 5%**
- **Brands:**
 - LugoTabs.** 6.5 mg 1-4 daily. 12.5mg daily (5mg iodine/7.5mg iodide)
 - Lugol's 5% Solution** [requires an Rx] 2 - 8 drops a day
 - 2 drops = 5mg of iodine & 7.5mg of iodide
 - 1 drop= 6.25mg (2.5mg iodine /4mg iodide)
 - Lugol's 2.5% Solution** [OTC] 4-16 drops daily [double Logol's 5%]
 - Iodozyme HP** [Biotics]
 - Iodorol**
- **ALWAYS add Unrefined Salt** [not iodized salt] 1 teaspoon daily.
Unrefined salt is integral to use with iodine- can't use one without the other. Salt helps to minimize the detox effects and helps usher that out displaced bromide & fluoride competition. Salt minimizes the problems that you could potentially see with it. *Unrefined* refers to salt with minerals in it that hasn't been bleached and hasn't had the minerals leached: **Selina's Celtic Brand, Redmond's Real Salt, Himalayan Salt**
- **If Auto Immune thyroid add:** Magnesium, B2, B3, Selenium, Vitamin C, Antioxidants

Food Sources

Iodine is uncommon in most foods, mainly in ocean animals & ocean vegetables. Food products are fortified with iodine or iodine is added to the animal feed. Calendula, apricots dandelion, walnut & husk, and black pepper contain iodine. In Chinese medicine the sea vegetables [e.g. hai zao & kun bu] contain iodine. "The formula called *Sargassum Jade Pot Decoction* (Hai Zao Yu Hu Tang), rich in seaweeds, is suggested for simple goiter, hyperthyroidism, and benign thyroid

tumors. A small clinical study of a modified version of this formula with six patients was said to result in five patients cured and one markedly improved". Iodized salt has **74 µg** of iodide per gram. It is an effective way to prevent goiter. However, only 10% of the iodine in *IODIZED* salt is bio available- so it is not a great way to get iodine for whole body iodine sufficiency. We don't know why:

- Competitive inhibition by chloride in the body?
- The bleaching substances
- The ferrocyanide
- Some other toxic elements in it.

	Food	Iodine mcg
	Ready to eat Cereal	87 mcg
	Dairy-based desert	70 mcg
	Fish	57 mcg
<i>FRESH</i> because iodine vaporizes in gaseous form		
	Milk	56 mcg
	Overall diary products	49 mcg
	Eggs	27 mcg
	Bread	27 mcg
	Beans, peas, tuber	17 mcg
	Meat	16 mcg
	Poultry	15 mcg

Underestimated RDA

Need for iodine is based upon *level of deficiency, gender, solubility, bioavailability, absorption, excretion, salt [sodium], and sodium iodine symporter function [see below]*. Such that iodine requirements are individualized, 10 mg, 50 milligrams, 100mg, maybe more – but certainly *not the RDA!* According to Functional Medicine *the RDA is proving inadequate to supply the body's needs in a toxic world. It starts with the Sodium-iodine Symporter which needs TSH to get ioDIDE into the apical membrane of the thyroid. TSH will go up initially in both these instances:*

- **At 100 x RDA:**
 - TSH+ IoDIDE → H₂O₂ [NADPH] + TPO → oxidation to ioDINE → bind to thyroglobulin + calcium + iodinated lipids → organification into the thyroid → Iodine + arachadonic acid + TPO → **thyroid hormones** [MIT, DAT and T₄, T₃].
 - **iodonated lipids** are made which inhibits the over production of hydrogen peroxides [H₂O₂]
 - **iodolactone** are made, key regulator of apoptosis and cellular proliferation in the thyroid. iodolactone is not detected in human tissue when iodine deficiency is present.
 - **Apoptosis of tumor cells requires 100x the RDA! This also requires calcium.**
- **At RDA → Hypothyroid or Autoimmune Thyroid can occur:**

TSH + IoDIDE → H₂O₂ [NADPH] + TPO → oxidation to iodINE → bind to thyroglobulin + calcium + iodinated lipids → organification into the thyroid → Iodine + arachadonic acid + TPO → **thyroid hormones** [MIT, DAT and T₄, T₃]. Even though thyroid hormone is still made at the RDA, it is considered too low by Functional Medicine Standards [even if thyroid hormones are within reference range] because of the following:

 - **NO** iodolactone made → no tumore cell aptosis
 - **NO** idonated lipids made → *over production of peroxide → damages thyroperoxidase / Glutathione Peroxidase from thyrocytes - highly reactive → oxidative damage to thyroid → anti TPO & anti TG- → autoimmune thyroid [Hashimoto's, Grave's]. Treatment:* Iodine +
 - Magnesium counter excess calcium, also stimulates glutathione peroxidase to b/d H₂O₂
 - B₂, B₃ rate limiting cofactors NADPH
 - Antioxidants: vitamin C, Selenium [stimulates glutathione peroxidase to b/d H₂O₂]

Life stage	RDA
Adult male	150mcg/ daily
Adult female	150mcg/ daily
Pregnancy	220mcg/ daily

When detoxification problems develop with iodine

- Vitamin C
- Unrefined salt
- Water/ hydration
- Liver & kidney support
- Exercise
- Cleaner diet
- Sodium iodine Symporter Defect/Damage/inhibitors.** Na/I Symporter transports I across cell membranes against gradient at a rate of 600mcg/ daily in the thyroid gland. Stimulated by TSH. Na/I symporter defect (or Pendrin defect) is defective iodine retention system, where there is normal GI absorption of iodine. Suspected if someone is a Non-responder to ortho-iodo supplementation, and/or has an adverse effects to iodine [headaches, nervous, jittery with the 1st or 2nd doses], and/or the Iodine loading test comes back >90% excretion!

The defect can be due to:

- Rare congenital defect
 - Oxidative damage** by fluoride or perchlorate → Antioxidants
 - Goitrogen binding** → Inhibition of symporteriodide uptake by competition. **goitrogens** binding to iodine receptor. They take iodine out of the thyroid and out of the body. They blocked the uptake of iodine and helped the thyroid and other tissues discharge iodine from the body → more thyroid problems, breast problems, ovarian, uterine, pancreatic, breast.
 - Detoxify** with iodine + unrefined salt to reduce inhibition of the symporter uptake
 - Detoxify** with just unrefined salt.
 - Eliminate Exposure to Goitrogens** [bromine, chlorine, fluoride, and certain medications] **Bromine** [a known goitrogen] is the halogen with the closest molecular weight / size to iodine and can most effectively inhibit iodine uptake in the body. we are getting too much bromide and fluoride [compete with chloride and iodine for receptor binding and absorption. They are non-essential halides or the toxic halides:
 - Brominated vegetable oils and some Gatorade products, Mountain Dew and other soft drinks.
 - Bakery products, breads, pasta, and cereal contain brominated flour.
 - Bromine intake can adversely affect the accumulation of iodine in the thyroid and the skin.
 - High bromide intake results in iodine being eliminated from the thyroid gland and replaced by bromine.
 - Ingestion of bromine has been shown to cause hypothyroidism in animals.
 - The ingestion of bromine has also been shown to brominate thyroglobulin. So instead of T 1, 2, 3 and having one atom of iodine or 2, 3 or 4 atoms of iodine attached to it, in many cases it might be brominated
 - When iodine deficiency is present, the toxicity of bromine is accelerated in the body.
- Low Iodine Diet.** A low-iodine diet contains less than 50 micrograms (mcg) of iodine per day prescribed by a doctor 1 or 2 weeks before a dose of radioactive iodine for a thyroid scan.

Iodine was discovered in 1811. In 1824 Dr. Boussingault observed that miners who went into silver mine and drank the water in the mine, if they had a goiter, the goiter went away. He ascertained it was the salt – eventually he ascertained that the salt that had the iodine in it, got in the water that the miners were drinking that made the goiter go away. He wrote an article that said if people have a goiter they should either drink water that has – from salt that has iodine in it or iodized salt, and it was really the first time that a single item, iodine, was used to treat a specific illness, goiter.

Misconceptions about iodine

- There is enough iodine in salt, and food such that iodine deficiency is a thing of the past.
- iodine can cause iodine induced hypothyroidism. It's iodine deficiency that causes hypothyroidism.
- Iodine can cause brain melting, locusts, frogs, plague, darkness and more.
- Don't give anyone iodine and certainly don't give pregnant women iodine.

Iodine Deficiency

A study by CHM of Over 6,000 patients 96.4% tested low via urine or serum testing. NHANES reports show that iodine levels have declined [up to 50%] in the United States. 96% of the US population was deficient in iodine [1971-2012], and 8 to 10% were severely deficient in iodine [1970-2006]. 72% [1.9 billion] of individuals worldwide are estimated to have inadequate iodine nutrition. Over half of the population of Europe lives in an area of iodine deficiency. One third of the world's population lives in an iodine deficient area. WHO estimates there are 300,000 school-aged children worldwide who are iodine deficient. Deficiency remains a public health problem for many reasons other than the commonly known goiter- swelling of the thyroid. During the NHANES timeframe there has been an increased incidence of:

- Thyroid disease [hypo, autoimmune, cancer], if iodine was responsible for causing autoimmune thyroid disorders those should be going down over the last 40 years, not going up at epidemic rates
- Endocrine/glandular Cancers [breast, prostate, endometrium, pancreas, and ovaries]

Importance of Prenatal Iodine Deficiency

Deficiency is particularly significant issue in women of childbearing age, with the latest NHANES data showing nearly 60% are deficient in iodine; about 40% were moderately low in iodine, 15% from this graph severely low in iodine and then 5 or 7% were super severely low in iodine:

- Iodine deficiency has been linked to including lowered IQ, cretinism, mental retardation, mental impairment, reduced intellectual ability, ADD and autism
- WHO claims iodine deficiency is the world's greatest single cause of preventable mental retardation.
- Decreased childhood survival rate in iodine deficient areas and neonatal mortality declines over 50% when iodine deficiency is rectified. *USA lead the western world in neonatal mortality x over 20 years*
- Delayed neurobehavioral performance and neuro developmental delay in prodigy at 18 months of age.
- Infertility increasing at epidemic rates 1971-2012.

In One Study, "149 women in 6 months postpartum versus 98 controls followed for 12 years. They looked at the urinary iodine at 6 months postpartum in the women and their thyroid function at 12 years follow-up. The results were shown that urinary iodine at 6 months postpartum predicted hypothyroidism 12 years later. And it's easier to see it in this graph. So the women that had the lowest iodine postpartum had the most hypothyroidism 12 years later. it's a linear progression- *The lower the iodine, the more problems there is, the longer the time period goes on*".

Most prenatal vitamins lack adequate iodine; only 28% of prescription prenatal vitamins contain iodine. The average iodine content of iodine containing prenatal vitamins was found to be below the RDA for iodine. And of the prenatal vitamins that do contain iodine, only 15% have more than 150 µg per daily dose.

Why the Deficiency?

- Soil is very deficient in iodine, especially in the Midwestern United States in the Great Lakes Basin and other areas from soil erosion, glaciers, deforestation, poor farming techniques.
- Pesticides and insecticides which contain bromide, fluoride or chlorine

- Drugs contain nitrate perchlorate, thiocyanate that are competitive inhibitors of iodine at the sodium iodine symporter or that taxicab that moves iodine from the bloodstream into the thyroid gland.
- Declining mineral levels in general from soil erosion, poor farming techniques and etc.
- Diets without ocean fish or sea vegetables are notoriously deficient in iodine.
- The longer that fish or vegetable has been out of the ocean, the more iodine leaves that product as a gas – it sublimates into a gaseous phase.
- Inadequate use of iodized salts. Everyone's afraid of using salt these days. It's estimated that less than 50% of US households use iodized salt.
- Low sodium diets,
- Vegan and vegetarian diets, notoriously deficient in iodine
- In the early 1970s for unknown reasons it was mandated that iodine be taken out of flour and bromine, a known goitrogen, be substituted for iodine.
- Underestimated RDA.

Periodic Table

Group 17 /Halides: fluoride, chloride, bromide, **iodine**. Chloride and iodine are necessary for life; fluoride and bromide are considered toxic competitors. Iodine is a rare element; 62nd in abundance of elements of the earth; it's in the bottom third of elements in the terms of abundance. The reduced form of iodine is known as iodide [an extra electron in its outer shell which gives it a full complement of electrons]. Electron in outer shell is unpaired →, the oxidized form. Every cell of the body contains and utilizes oxidized and/or reduced iodine.

Bioavailability, Absorption & Transport

The glands concentrate iodine against the gradient via the **sodium- iodine symporter that** transports iodine at a concentration gradient 20-50 times that of plasma- *an ATP dependent process where 1 iodine atom is transferred along with 2 atoms of sodium into the cell*. To achieve the maximum transport of iodine 600 µg per day across the cell membrane you have to have sufficient iodine in the serum about a 10 to the minus 5 -6 molar concentrations. It is impossible to reach that at the RDA for iodine. But it can be reach at 50 mg/day in a healthy person in about three to six months – longer in a sick person.

Solubility

Iodine is not very soluble in water. In 1829 Dr. Lugol found that when potassium iodide was added to water, it increased the solubility He came up with Lugol's solution. In the 19th century it was widely available at apothecaries and it was the most recommended substance for any condition since the number one cause of death at that time was infection [before antibiotics]. And it was probably the most used medical item before patent medicine took hold and there wasn't a lot of profit in it.

Excretion

Over 98% of iodine ingested orally is excreted through the urine. Molecular weight of iodine + renal clearance of iodine [42.5 liters per day] → blood concentration of iodine should be 17.2 µg per liter if you take in 750 µg per day of iodine.

Gender

Thyroid stores 50 mg at saturation however the breast in a 50 kilogram or 110 pound woman can store minimum of 5 mg per day. And a woman with larger breasts will have an increased requirement. Men have smaller iodine requirements than women because they have smaller breast tissue but the other glandular tissue has a minimum of 2 mg/day.

<http://restorativemedicine.org/books/fundamentals-of-naturopathic-endocrinology/professionals/treatments-for-thyroid-diseases-with-chinese-herbal-medicine/traditional-chinese-herb-formulas-used-in-china/>