The Great Iodine Debate

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Iodine is critical to human health. It forms the basis of thyroid hormones and plays many other roles in human biochemistry. While the thyroid gland contains the body's highest concentration of iodine, the salivary glands, brain, cerebrospinal fluid, gastric mucosea, breasts, ovaries and a part of the eye also concentrate iodine. In the brain, iodine is found in the choroid plexus, the area on the ventricles of the brain where cerebrospinal fluid (CSF) is produced, and in the substantia nigra, an area associated with Parkinson's disease.

Iodine is essential to normal growth and development. Iodine deficiency in utero and during growth can result in cretinism, a condition of severely stunted physical and mental growth due to prolonged nutritional deficiency of iodine or from untreated congenital deficiency of thyroid hormones (hypothyroidism). The condition is characterized by short stature, delayed bone maturation and puberty, infertility, neurological impairment and cognitive impairment ranging from mild to severe. Iodine deficiency also causes goiter, the gradual enlargement of the thyroid gland. Both conditions have led to public health campaigns of iodine administration in many countries. The addition of iodine compounds to table salt or water represents the first attempt to provide nutrient supplementation via "fortification" of common foods.

Iodine in Public Health Campaigns

In the past, endemic cretinism due to iodine deficiency was especially common in areas of southern Europe around the Alps. It was described by ancient Roman writers and often depicted by medieval artists. The earliest Alpine mountain climbers sometimes came upon whole villages of cretins. In the late eighteenth and early nineteenth centuries, several travellers and physicians described alpine cretinism from a medical perspective, often attributing the cause to "stagnant air" in mountain valleys or "bad water."

More mildly affected inland areas of Europe and North America in the nineteenth century were referred to as "goiter belts." The degree of iodine deficiency was milder and manifested primarily as thyroid enlargement rather than severe mental and physical impairment. In Switzerland, where the soil is poor in iodine, cases of cretinism were abundant and even considered hereditary. As the variety of food sources dramatically increased in Europe and North America and the populations became less completely dependent on locally grown food, the prevalence of endemic goiter diminished.

Only in the early twentieth century did scientists discover the relationship of cretinism with lack of iodine and thyroid deficiency. The addition of iodine to salt or drinking water is credited with the reduction or elimination of cretinism and

goiter, although cretinism still remains a serious problem in many rural sections of China.

In coastal areas, the action of ocean waves makes iodine gas. Once airborne, iodine combines with water or air and enters the soil. Plant and animal foods grown on soil containing iodine will take up iodine so that it becomes available in the food. It can also be absorbed through the skin from air in seacoast areas, which may explain why many report improved health after a visit to an oceanside resort, and why individuals with severe allergies to iodine risk a reaction if they venture too close to the sea.

Iodine and Breast Health

Japanese women have very low rates of breast cancer and consume high levels of iodine. This observation has led to the theory that high iodine levels in the Japanese diet, rich in seaweed and seafood, provide protection against breast cancer and other diseases of the breast. Proponents of this theory note that today one in seven American women (almost 15 percent) will develop breast cancer during her lifetime. Thirty years ago, when iodine consumption was twice as high as it is now (480 mcg per day) one in twenty women developed breast cancer. Thirty years ago, consumption of iodized salt was higher than it is today; in addition a form of iodine was used as a dough conditioner in making bread, and each slice of bread contained 0.14 mg of iodine. In 1980, bread makers started using bromide as a conditioner instead, which competes with iodine for absorption into the thyroid gland and other tissues in the body. Iodine was also more widely used in the dairy industry as a teat cleaner thirty years ago than it is now. According to this argument, 15 percent of the U.S. adult female population suffers from moderate to severe iodine deficiency.[1]

The correlation of iodine deficiency with breast cancer is strengthened by reports in the scientific literature. Women with a history of breast cancer are almost three times more likely to develop thyroid cancer than women with no such history, and there is a geographic correlation between the incidence of goiter and breast cancer.[2] Demographic studies show that a high intake of iodine is associated with a low incidence of breast cancer, and a low intake with a high incidence of breast cancer.[3]

Animal studies show that iodine prevents breast cancer, arguing for a causal association in these epidemiological findings. The carcinogens nitrosomethylurea and DMBA cause breast cancer in more than 70 percent of female rats. Those given iodine, especially in its molecular form as I_2, have a statistically significant decrease in the incidence of cancer.[4] Other evidence adding biologic plausibility to the hypothesis that iodine prevents breast cancer includes the finding that the ductal cells in the breast, the ones most likely to become cancerous, are equipped with an iodine pump (the sodium iodine symporter, the same one that the thyroid gland has) to soak up this element.[5]

Similar findings apply to fibrocystic disease of the breast. In animal studies, female rats fed an iodine-free diet develop fibrocystic changes in their breasts, and iodine in its elemental form (I_2) cures it.[6]

As far back as 1966, Russian researchers showed that iodine effectively relieves signs and symptoms of fibrocystic breast disease. Seventy-one percent of 167 women suffering from fibrocystic disease experienced a beneficial healing effect when treated with 50 mg potassium iodide during the intermenstrual period.[7]

A 1993 Canadian study likewise found that iodine relieves signs and symptoms of fibrocystic breast disease in 70 percent of patients. This report is a composite of three clinical studies, two case series done in Canada of 696 women

treated with various types of iodine, and one in Seattle. The Seattle study was a randomized, double-blind, placebo-controlled trial of 56 women designed to compare 3-5 mg of elemental iodine (I_2) to a placebo (an aqueous mixture of brown vegetable dye with quinine). Investigators followed the women for six months and tracked subjective and objective changes in their fibrocystic disease.[8]

An analysis of the Seattle study showed that iodine had a highly statistically significant beneficial effect on fibrocystic disease. Iodine reduced breat tenderness, nodularity, fibrosis, turgidity and number of macrocysts compared to controls. This 36-page report[9] was submitted to the Food and Drug Administration (FDA) in 1995, seeking the agency's approval to carry out a larger randomized controlled clinical trial on iodine for treating fibrocystic breast disease. FDA declined to approve the study, because "iodine is a natural substance, not a drug." But the FDA has now decided to approve a similar trial sponsored by Symbollon Pharmaceuticals.

Other Benefits

Iodine may be helpful in treating other cancers because it induces apoptosis, programmed cell death. Apoptosis is essential to growth and development (fingers form in the fetus by apoptosis of the tissue between them) and for destroying cells that represent a threat to the integrity of the organism, like cancer cells and cells infected with viruses. In one experiment, human lung cancer cells with genes spliced into them that enhance iodine uptake and utilization underwent apoptosis and shrank when given iodine, both when grown in vitro outside the body and implanted in mice.[10] Some practitioners predict a wider use for iodine in treating cancer.

Iodine may have other benefits - for which more study is needed. Evidence indicates that increased iodine consumption replaces and therefore helps detox other halogens, such as fluoride and bromide, and even toxic metals like lead, aluminum and mercury.[11] One theory is that liberal amounts of iodine in the diet can protect against the harmful effects of fluoridated water.[12] Iodine supports the immune system and protects against abnormal growth of bacteria in the stomach.[13]

In addition to the thyroid and mammary glands, other tissues possess an iodine pump (the sodium-iodine symporter) which allows iodine concentration. Thus, it is logical to conclude that iodine plays an important role in these organs—the stomach mucosa, salivary glands, ovaries, thymus gland, skin, brain, joints, arteries and bone.

A History of Iodine Therapy

Iodine was discovered in 1811 and shortly thereafter entered the *materia medica*. It was used in large amounts until the mid-1900s for treating various dermatologic conditions, chronic lung disease, fungal infestations, tertiary syphilis and even arteriosclerosis.[14] The Nobel laureate Dr. Albert Szent Györgi (1893-1986), the physician who discovered vitamin C, wrote: "When I was a medical student, iodine in the form of KI [potassium iodide] was the universal medicine. Nobody knew what it did, but it did something and did something good. We students used to sum up the situation in this little rhyme:

If ye don't know where, what, and why Prescribe ye then K and I."[15]

According to the 11th edition of the *Encyclopedia Britannica*, published in 1911, the pharmacological action of compounds containing potassium iodide, "is as obscure as their effects in certain diseased conditions are consistently

brilliant. Our ignorance of their mode of action is cloaked by the term deobstruent, which implies that they possess the power of driving out impurities from the blood and tissues. Most notably is this the case with the poisonous products of syphilis. In its tertiary stage—and also earlier—this disease yields in the most rapid and unmistakable fashion to iodides, so much so that the administration of these salts is at present the best means of determining whether, for instance, a cranial tumor be syphilitic or not." (Perhaps what the iodides did was remove toxic mercury from the bodies of syphilitics who had been treated with mercury-based medicines!)

Sarah Pope, our Tampa/St. Petersburg chapter leader, reports that her father, a pediatrician, routinely gave Lugol's solution (a combination of iodine and potassium iodide) to treat congestion in the lungs and sinuses. The theory was that the iodide drops would thin the mucus and make coughing more productive. The dose was five drops in water, continued for several days. In his professional experience, the remedy cleared congestion and, in the case of asthmatics, dilated the bronchial tubes and assisted breathing. This author received the same remedy as a child—the taste of iodine brings back memories of being sick and in bed, and receiving the drops in orange juice.

The decline in the use of iodine in medicine began in 1948 when researchers Wolff and Chaikoff published a landmark paper on the thyroid effects of increasing amounts of potassium iodide, injected into rats. The authors stated: "Organic binding of iodine within the glands can be almost completely blocked by raising the level of plasma inorganic iodine (PII) above a certain critical level, which for the rat amounts to about 20 to 35 percent."[16] This effect became known as the Wolff-Chaikoff (W-C) effect. According to the conventional view, high levels of intracellular iodide suppress the transcription of thyroid peroxidase (TPO) enzyme, along with NADPH oxidase, leading to a reduction in the synthesis of thyroid hormone, thyroxin.[17] As proof of the W-C effect, the textbooks point to the fact that large amounts of potassium iodide can remedy hyperthyroidism. Another apparent confirmation is the thyroid-suppressing effect of several iodine-containing drugs, of which the most famous is amiodarone, which can cause both under- and overactivity of the thyroid. In a trial that compared amiodarone with other medications for the treatment of atrial fibrillation, biochemical hypothyroidism (as defined by a TSH level of 4.5-10 mU/L) occurred in 25.8 percent of the amiodarone-treated group as opposed to 6.6 percent of the control group (taking placebo or sotalol). Overt hypothyroidism (defined as TSH greater than 10 mU/L) occurred at 5.0 percent compared to 0.3 percent.[18]

Over time, these observations led to a decline in the use of iodine in medicine. While health officials came to a general agreement that iodine deficiency caused, in increasing order of severity, goiter and hypothyroidism, mental retardation and cretinism, authorities in the U.S. and Europe agreed upon a low Reference Daily Intake (RDI), formerly called the Recommended Dietary Allowance (RDA), of 100-150 mcg per day. This amount will prevent goiters and other overt signs of deficiency but may not be adequate to prevent other conditions of iodine deficiency, and is much lower that the amounts formerly given routinely to patients.

Critics of the W-C effect note that the standard dose of potassium iodide was 1 gram until the mid-1900s, which contains 770 mg of iodine, over five thousand times more than the RDI. For many years physicians used potassium iodide in doses starting at 1.5 to 3 gm and up to more than 10 grams a day, on and off, to treat bronchial asthma and chronic obstructive pulmonary disease, apparently with good results and few side effects. Even today, dermatologists treat certain skin conditions, including fungal eruptions, beginning with an iodine dose of 900 mg a day, followed by weekly increases up to 6 grams a day as tolerated.

But the general use of iodine and iodine compounds in medicine has waned, as has its use as an additive in the food supply. Today's medical establishment is wary of iodine as are public health officials. Thyroidologists cite the W-C

effect and warn that TSH (thyroid stimulating hormone) blood levels can rise with an iodine intake of one milligram or more.

In a 2000 review paper on use of iodine as a water disinfectant, author Joe Hollowell notes that studies indicate marked individual sensitivity to iodine; the most vulnerable to adverse effects are those with underlying thyroid disease and previous low iodine intake. Problems from consumption of iodized water—including both hypothyroidism and hyperthyroidism—usually resolve after consumption is discontinued. A safe dose is 1-2 grams per day, and most can tolerate much higher amounts without problems.[19]

The Challenge

A challenge towards the reigning attitudes to iodine compounds came in 1997, when Dr. Guy Abraham, a former professor of obstetrics and gynecology at UCLA, mounted what he calls the Iodine Project. He had his company, Optimox Corporation, make Iodoral, the tablet form of Lugol's solution (which combines iodine and potassium iodide), and he engaged two family practice physicians, Dr. Jorge Flechas (in 2000) in North Carolina and Dr. David Brownstein (in 2003) in Michigan to carry out clinical studies with high doses of the iodine compound.[20] The project's hypothesis is that maintaining whole body sufficiency of iodine requires 12.5 mg a day, an amount similar to what the Japanese consume and over eighty times the RDI of 150 mcg. The conventional view is that the body contains 25-50 mg of iodine, of which 70-80 percent resides in the thyroid gland. Dr. Abraham concluded that whole body sufficiency exists when a person excretes 90 percent of the iodine ingested. He devised an iodine-loading test where one takes 50 mg iodine/potassium iodide and measures the amount excreted in the urine over the next twenty-four hours. He found that the vast majority of people retain a substantial amount of the 50 mg dose. Many require 50 mg per day for several months before they will excrete 90 percent of it. His studies indicate that, given a sufficient amount, the body will retain much more iodine than originally thought, 1,500 mg, with only 3 percent of that amount held in the thyroid gland.

According to Abraham, more than 4,000 patients in this project take iodine in daily doses ranging from 12.5 to 50 mg, and in those with diabetes, up to 100 mg a day. According to these physicians, iodine at these doses does indeed reverse fibrocystic disease; allows diabetic patients to use less insulin and hypothyroid patients to use less thyroid medication; resolves symptoms of fibromyalgia; and stops migraine headaches. They report that the side effects of iodine, including hypo- or hyperthyroidism, allergies, swelling of the salivary glands and thyroid, occur in less than 5 percent.[21] Urine tests confirm that iodine at these doses removes the toxic halogens fluoride and bromide from the body.[22]

They believe that iodism, an unpleasant brassy taste, runny nose, and acne-like skin lesions, is caused by the bromide that iodine extracts from the tissues. Symptoms subside on a lower dose of iodine.

In 2005, Dr. Abraham published a long paper challenging the Wolff-Chaikoff effect. "The W-C effect is supposedly the inhibitory effect of peripheral inorganic iodide (PII) levels equal to or greater than 0.2 mg/L (10-6M) on the organification of iodide by the thyroid gland of rats, resulting supposedly in hypothyroidism and goiter. These rats never became hypothyroid and thyroid hormones were not measured in their plasma. Nevertheless, the W-C effect, which did not even occur in the rats, was extrapolated to humans. The correct interpretation of the results obtained in rats from the W-C experiments is: Iodide sufficiency of the thyroid gland was achieved when serum inorganic iodide levels reached 10-6M . . . . These law-abiding rats refused to become hypothyroid and instead followed their normal

physiological response to the iodide load. They were unjustly accused of escaping from the W-C effect. Labeling these innocent rats as fugitives from the W-C effect was a great injustice against these rodents.

"To the disgrace and stupidity of the medical profession, U.S. physicians swallowed the W-C forgery uncritically, which resulted in a moratorium on the clinical use of inorganic, non-radioactive iodine in effective amounts. However, this moratorium did not include toxic organic iodine-containing drugs and radioiodide. The iodophobic mentality prevented further research on the requirement for inorganic, non-radioactive iodine by the whole human body, which turns out to be 100-400 times the very recently established RDA. . . Prior to World War II and the W-C publication, U.S. physicians used Lugol solution safely, effectively and extensively in both hypo- and hyperthyroidism."[23]

Abraham cites a 1970 paper which evaluated the effect of Lugol's solution, administered at five drops (30 mg iodine/iodide) three times a day in five thyrotoxic patients. Following a well-designed protocol, they reported, "It is concluded that the rapid decrease in T4 secretion induced by iodine is not the result of an acute sustained inhibition of T4 synthesis (the Wolff-Chaikoff effect), but rather results from an abrupt decrease in the fractional rate of thyroid T4 release."[24]

Abraham thus argues that in hyperthyroidism, iodine/iodide in Lugol's at a daily dose of 90 mg induced a physiological trend toward normalization of thyroid function, "a beneficial effect, not the fictitious W-C effect as proposed by Wolff and Chaikoff. It is amazing that the W-C effect, which is still mentioned in iodophobic publications, has never been confirmed in rats by other investigators and has never been demonstrated in any animal species.

"In 1948, there was already evidence that the W-C effect, if it was for real in rats (and it was not), did not occur in humans. The Lugol's solution and saturated solution of potassium iodide (SSKI) were used extensively in medical practice for patients with asthma. The recommended daily amount was 1,000-2,000 mg. This amount was used in patients with asthma, chronic bronchitis, and emphysema for several years. Hypothyroidism and goiter were not common in this group of patients. Those amounts of iodine would have resulted in serum inorganic iodine levels 100 times higher than the serum inorganic iodide levels of 10-6M claimed by Wolff and Chaikoff to result in the W-C effect."

According to Abraham, iodine in amounts considered "excessive" by endocrinologists today represent only 3 percent of the average daily intake of iodide by 60 million mainland Japanese, a population with a very low incidence of cancer overall, and in particular of the female reproductive organs.

According to Abraham, "Medical iodophobia resulted in the thyroid hormone thyroxine replacing iodine in iodine deficiency-induced simple goiter and hypothyroidism. Thyroxine has been the most prescribed drug in the U.S. for several years. So, the manufacturers of thyroxine benefited tremendously from this deception. It also resulted in the destruction of the thyroid gland by means of radioiodide in patients with hyperthyroidism caused by iodine deficiency, although this condition had previously been treated successfully with Lugol solution. The radioablation of the thyroid gland with radioiodide resulted in 90 percent of these patients becoming hypothyroid within the first year and eventually joining the ever-increasing thyroxine-consuming population. "Supplying thyroid hormones to iodine-deprived individuals masks the iodine deficiency and can result in zombie-like effect. The patients are capable of performing physical work but are not able to think and reason at maximum capacity. An even greater negative effect is realized if iodine deprivation is combined with goitrogen saturation, using the potent goitrogens bromide, fluoride and perchlorate in the food and water supply.

"Iodine is involved in many vital mental and physical functions, and yet whole body sufficiency for iodine has never been determined. Why? Medical textbooks discuss inorganic, non-radioactive iodine only in relation to the most severe deficiencies of this essential element: cretinism, hypothyroidism and endemic goiter. Based on an iodine/iodide loading test developed by the author to assess whole body sufficiency for iodine, the amounts of iodine needed for whole body sufficiency and optimal physical and mental health are 250-1,000 times higher that the amount of iodine needed to control cretinism, hypothyroidism and endemic goiter."

Thus, according to Abraham and his colleagues, the Wolff-Chaikoff effect is of no clinical significance. An elevated TSH, when it occurs during treatment with Lugol's solution, is "subclinical." This means that no signs or symptoms of hypothyroidism accompany its rise. Some people taking milligram doses of iodine, usually more than 50 mg a day, develop mild swelling of the thyroid gland without symptoms. Abraham believes that the vast majority of people, 98 to 99 percent, can take iodine in doses ranging from 10 to 200 mg a day without any clinically adverse effects on thyroid function.

The Debate

With Abraham's work, and its popularization by physicians such as Jorgas and Brownstein, many health-conscious individuals began taking Lugol's solution regularly, even without medical supervision. A challenge to this practice came from Dr. Alan Gaby in an editorial published in the *Townsend Letter for Doctors and Patients*, August/September 2005.[25]

"Recently, a growing number of doctors have been using iodine supplements in fairly large doses in their practices," wrote Gaby. "The treatment typically consists of 12 to 50 mg per day of a combination of iodine and iodide, which is 80 to 333 times the RDA of 150 mcg (0.15 mg) per day. Case reports suggest that iodine therapy can improve energy levels, overall well-being, sleep, digestive problems and headaches. People with hypothyroidism who experienced only partial improvement with thyroid hormone therapy are said to do better when they start taking iodine. In addition, fibrocystic breast disease responds well to iodine therapy, an observation that has been documented previously. The reported beneficial effects of iodine suggest that some people have a higher-than-normal requirement for this mineral, or that it favorably influences certain types of metabolic dysfunction.

"While iodine therapy shows promise, I am concerned that two concepts being put forth could lead to overzealous prescribing of this potentially toxic mineral. First is the notion that the optimal dietary iodine intake for humans is around 13.8 mg per day, which is about 90 times the RDA and more than 13 times the 'safe upper limit' of 1 mg per day established by the World Health Organization. Second is the claim that a newly developed iodine-load test can be used as a reliable tool to identify iodine deficiency."

Gaby takes issue with the argument that the optimal human requirement is 13.8 mg per day, by noting that "the idea that Japanese people consume 13.8 mg of iodine per day appears to have arisen from a misinterpretation of a 1967 paper. In that paper, the average intake of seaweed in Japan was listed as 4.6 g (4,600 mg) per day, and seaweed was said to contain 0.3 percent iodine. The figure of 13.8 mg comes from multiplying 4,600 mg by 0.003. However, the 4.6 g of seaweed consumed per day was expressed as wet weight, whereas the 0.3 percent-iodine figure was based on dry weight. Since many vegetables contain at least 90 percent water, 13.8 mg per day is a significant overestimate of iodine intake. In studies that have specifically looked at iodine intake among Japanese people, the mean dietary intake (estimated from urinary iodine excretion) was in the range of 330 to 500 mcg per day, which is at least 2.5-fold lower than 13.8 mg per day."

Regarding the other argument in support of a high iodine requirement, namely that it takes somewhere between 6 and 14 mg of oral iodine per day to keep the thyroid gland fully saturated with iodine, ". . . it is not clear that loading the thyroid gland or other tissues with all the iodine they can hold is necessarily a good thing. . . Our thyroid glands have developed a powerful mechanism to concentrate iodine, and some thyroid glands (or other tissues) might not function as well after a sudden 90-fold increase in the intake of this mineral. . . relatively small increases in dietary iodine intake have been reported to cause hypothyroidism or other thyroid abnormalities in some people."

As for the observation that iodine supplementation "promotes the urinary excretion of potentially toxic halogens such as bromide and fluoride. While that effect might be beneficial for some people, it is not clear to what extent it would shift the risk-benefit ratio of megadose iodine therapy for the general population."

Abraham and colleagues promote the use of the iodine-load test, in which the patient ingests 50 mg of a combination of iodine and iodide and the urine is collected for the next twenty-four hours. The patient is considered to be iodine-deficient if less than 90 percent of the administered dose is excreted in the urine, on the premise that a deficient person will retain iodine in the tissues, rather than excrete it in the urine. According to the literature of a laboratory that offers it, 92-98 percent of patients who have taken the iodine-load test were found to be deficient in iodine.

According to Gaby, "the validity of the test depends on the assumption that the average person can absorb at least 90 percent of a 50-mg dose. It may be that people are failing to excrete 90 percent of the iodine in the urine not because their tissues are soaking it up, but because a lot of the iodine is coming out in the feces. There is no reason to assume that a 50-mg dose of iodine, which is at least 250 times the typical daily intake, can be almost completely absorbed by the average person. While this issue has not apparently been studied in humans, cows fed supraphysiological doses of iodine (72 to 161 mg per day) excreted approximately 50 percent of the administered dose in the feces."

Gaby expressed concerns about iodine toxicity: "Fairly modest increases in iodine intake have been reported to cause thyroid dysfunction, particularly hypothyroidism. In a study of 33 Japanese patients with hypothyroidism, the median serum TSH level decreased from 21.9 mU/L to 5.3 mU/L (indicating an improvement in the hypothyroidism), and one-third became euthyroid, when the patients stopped eating seaweed and other high-iodine foods for 1-2 months. In a survey of 3,300 children aged 6-12 years from five continents, thyroid glands were twice as large in children with high dietary iodine intake (about 750 mcg per day), compared with children with more normal iodine intake. While the significance of that finding is not clear, it suggests the possibility of iodine-induced goiter. In addition, there is epidemiological evidence that populations with 'sufficient' or 'high normal' dietary iodine intake have a higher prevalence of autoimmune thyroiditis, compared with populations with deficient iodine intake. In a study of children in a mountainous area of Greece with a high prevalence of goiter, public-health measures taken to eliminate iodine deficiency were followed by a three-fold increase in the prevalence of autoimmune thyroiditis. In addition, modest increases in dietary iodine have been suspected to cause hyperthyroidism in some people, an effect that is known to occur with larger doses of iodine.

"Other well-known side effects of excessive iodine intake include acne, headaches, allergic reactions, metallic taste in the mouth and parotid gland swelling. While the doses of iodine reported to cause those side effects have often been higher than those currently being recommended, some people appear to be especially sensitive to the adverse effects of iodine." Gaby concludes: "The possibility that high-dose iodine/iodide can relieve certain common conditions is intriguing. Considering the positive anecdotal reports, an empirical trial of iodine/iodide therapy, based on the clinical picture, seems reasonable. The case has not been made, however, that the average person should markedly increase

his or her iodine intake in an attempt to saturate the tissues with iodine. Nor has the case been made that the iodine-load test can provide reliable guidance regarding the need for iodine therapy. Thyroid function should be monitored in patients receiving more than 1 mg of iodine per day."

Subsequent counter arguments by Drs Abraham and Brownstein and rebuttals by Dr. Gaby focused on the amount of iodine in the Japanese diet and the safety of ingesting large amounts. An important point made by Abraham and Brownstein is that the requirement for iodine depends on the goitrogen load. Bromine, now very prevelant in the food supply, is a goitrogen, and may increase our need for iodine. They also claim that many of the toxic effects reported in the literature were due to radioactive forms of iodine. Finally, they dispute the assertion that the values of iodine in seaweed consumed by the Japanese were computed in dry weight. "The average daily intake of iodine by mainland Japanese in 1963 was 13.8 mg, based on information supplied by the Japanese Ministry of Health, which used only dry weight in their calculations, confirmed by a phone interview of one of us (GEA) on June 21, 2005, with officials of this organization."[26]

Abrahams and Brownstein also defended the urine test for iodine loading, noting studies showing that organic iodine is not excreted in the feces. They also cited their own clinical experience. "Our experience at the Center for Holistic Medicine has shown that patients with the lowest urinary iodide levels on the loading tests are often the most ill. Many of these patients with very low urine iodide levels following the loading test have severe illnesses such as breast cancer, thyroid cancer or autoimmune thyroid disorders. All of these conditions have been shown in the literature to be associated with iodine deficiency. Positive clinical results were seen in most of these patients after supplementation of orthoiodosupplementation within the range of 6.25-50 mg of iodine/iodide (1/2 to 4 tablets of Lugol in tablet form)."[27]

In response, Gaby noted that "all but one of the references I cited discussed the adverse effects of inorganic iodine" and that while Dr. Lugol did use high doses of his combination iodine/potassium iodide compound, "they were recommended primarily to treat infections (iodine is a broad-spectrum antimicrobial agent) and hyperthyroidism, not as routine nutritional support for the average person." Finally, he notes a review article, published in 2000, in which the authors state that in the 1920s and 1930s, when potassium iodide (KI) was widely used, many patients died of KI-induced side effects, particularly pulmonary edema and associated heart failure.[28]

Conclusions

It is axiomatic that there are no uncomplicated issues in the field of diet and health - and the subject of iodine is no exception. What conclusions can we draw from these conflicting assertions about iodine, especially supplementation containing iodide?

Let's start by looking at the RDI of 100-150 mcg iodine per day. Most would argue that this intake is too low. Yet it is in line with what Weston Price reports in primitive diets. In preliminary analyses, he found a range of 24-32 mcg daily for the northern American Indians and 131-175 daily for the Inuit.[29] Apparently the Inuit of the far north do not eat seaweed.[30] Unfortunately, Price did not carry out more extensive measurements, especially among those he reported to eat seaweed—the Gaelic peoples of the Outer Hebrides and the Andean Indians of Peru.

It appears to be very difficult to estimate the iodine intake in diets that contain seaweed. Based on the reported values in seaweed, some have claimed levels of 12 mg (12,000 mcg) in Japanese diets,[31] leading Abraham and

Brownstein to propose that "only mainland Japanese consume adequate amounts of iodine and that 99 percent of the world population are deficient in inorganic, non-radioactive iodine; that is, they have not reached whole body sufficiency for that essential element."[32]

However, a published analysis of iodine intake in Japan found a range of 45-1921 mcg per day,[33] and Weston Price found healthy peoples consuming iodine amounts in the lower end of this range. Furthermore, without seaweed, it would be very difficult to exceed 1,000 mcg per day, based on values found in typical traditional foods (see chart, page 47). For example, one meal of cod, one meal of shellfish including the 20 grams of the hepatopancreas, and one meal of mussels, plus additional meat, vegetables and legumes would supply about 1,000 mcg iodine; diets based on meat, even organ meats, would supply considerably less.

The late distinguished researcher Emmanual Cheraskin and his colleagues conducted a survey of reported total number of clinical symptoms and signs (as judged from the Cornell Medical Index Health Questionnaire) and correlated the findings with average iodine consumption. An intake of approximately 1,000 mcg per day correlated with the lowest number of reported symptoms, that is, the highest level of health.[34]

Abraham and Brownstein argue that the human iodine requirement is 1,500 mcg per day (1.5 mg) which is difficult to achieve without using seaweed, iodized salt or supplementation. They argue that because of widespread bromide and fluoride toxicity, most people today require between 5 and 50 mg per day, amounts only possible with supplementation; they do note that such supplementation should only be taken under the supervision of a physician to monitor iodine status.[35]

We cannot ignore the many reports of improved health using various types of iodine supplementation—whether through tincture of iodine on the skin, the atomidine protocol recommended by Edgar Cayce or use of iodine/potassium iodide compounds as proposed by Drs. Abraham and Brownstein. Increased exposure to goitrogenic mercury, bromides and fluoride compounds, and soy products ubiquitous in the food supply, coupled with declining levels of thyroid-supporting nutrients such as selenium and vitamin A in modern diets, may explain why some people need much higher levels of iodine than those found in traditional diets. Dr. Brownstein is to be credited with alerting the public to the dangers of bromides increasingly used in processed foods, sodas, vegetable oils, breads and even replacing iodine in teat washes for dairy cows, as well as in thousands of consumer products.

The Abraham protocol does carry a risk of adverse reactions and should be carried out under the supervision of a physician with experience in using it. As these physicians point out, consuming iodine in milligram doses should be coupled with a complete nutritional program that includes adequate amounts of selenium and magnesium, and, they claim, omega-3 fatty acids, and with careful supervision of detoxing reactions. According to Dr. Brownstein, chloride increases renal clearance of bromide and the use of salt or ammonium chloride shortens the time required for bromide detoxification. He recommends oral administration of sodium chloride (6-10 gm per day) or intravenous sodium chloride for increasing the renal clearance of bromide.[31]

Dr. Gaby's call for a careful study should not be ignored. Not every physician reports the sterling results described by doctors using the Abraham protocol, and some individuals—including this author—have experienced adverse reactions to Lugol's solution. The study should include a control group and groups using other iodine therapies, such as tincture of iodine on the skin, the atomidine protocol or even oral supplementation with elemental iodine rather than the iodine/potassium iodine combination. Comparison of the iodine-load urine test with the blood test for iodine status in

relation to various symptoms of thyroid deficiency is another area begging for further research. Studies involving even a small number of individuals would be helpful in providing further answers to the great iodine debate.

SIDEBARS

Food Sources of Iodine

PLANT FOODS: Any food grown near the sea is likely to contain iodine, but especially rich sources include asparagus, garlic, lima beans, mushrooms, strawberries, spinach, pineapple and leafy greens. Coconut products, which always grow near the ocean, are good sources of iodine. Blackstrap molasses also provides iodine.

SEAFOOD: Iodine levels vary widely in fish and shellfish, but all seafoods contain some iodine. In published reports, cod, haddock, whiting, oysters and mussels test high. The hepatopancreas (yellow "butter" or "mustard") in lobster tested as an extremely rich source and it is likely that the hepatopancreas of other saltwater shellfish would contain high levels of iodine as well.

BUTTER: Butter from cows pastured on iodine-rich soil will contain iodine. Look for butter from farms located near the ocean, or that have used seaweed or fish meal as a soil amendment. The cows should also be fed sea salt. The combination of iodine with selenium and vitamin A in butter make this traditional fat an ideal food for the thyroid gland.

SEAWEED: Levels of iodine in seaweed vary widely according to species and how the seaweed is dried. One study found a huge range of 2-817 mcg iodine per 100 grams. Iodine content is reduced when seaweed is dried in the sun, and iodine may vaporize during cooking and humid storage conditions. Some Asian seaweed dishes contain in excess of 1,100 mcg iodine (*Thyroid* Oct 2004, 14(10):836-841). Seaweed contains lignans, phytoestrogens that can depress thyroid function. This may explain why thyroid problems (except for goiter) are common among the Japanese, even though they eat a lot of seaweed.

SALT: Five grams (one teaspoon) of unrefined sea salt, a conservative estimate of the amount typically consumed in a day, provides only about 3 mcg iodine; iodized salt provides over 1,500 mcg iodine per five grams. The FDA's Tolerable Upper Intake Level (UL) for adults is 1,100 mcg per day; thus, it is possible to greatly exceed the UL by using iodized salt.

Mysteries of the Goiter Belts

The use of iodine supplementation in the goiter belts of the world—and these areas of endemic goiter and associated problems exist in a great many countries—represents one of the first public health initiatives involving treatment of the general population through the addition of a nutrient (in this case iodine) to water or food. "Mass prophylaxis" with iodine was pioneered by two countries, the U.S. and Switzerland. The first controlled experiment took place in the early 1920s in Akron, Ohio, where 5000 school girls took 0.2 g of sodium iodide daily in their drinking water for a period of ten days in the spring and autumn while an equal number of controls drank untreated water. Of those taking the iodide who began the experiment with a normal thyroid, none developed goiter, whereas 50 percent of the controls developed goiter. Following this study, several cities in the Great Lakes region started to add iodide to central water supplies and iodized salt entered the food supply. In Switzerland, many cantons introduced iodized salt, and those districts where it was used experienced a decline almost to zero in the incidence of goiter (http://whqlibdoc.who.int/monograph/WHO_MONO_44_(p443).pdf).

In spite of these successes, mass iodine supplementation programs met with much resistance, especially as side effects emerged. While the programs almost completely eliminated goiter, the prevalence of autoimmune thyroiditis increased in areas with iodated water or in those using iodized salt. For example, a threefold increase in autoimmune thyroiditis was noted once iodine deficiency was eliminated in an area of endemic goiter in northwestern Greece, an association confirmed in clinical settings. In one study, dietary restriction of iodine reversed hypothyroidism in twelve of twenty-two patients; seven of the patients with reversed hypothyroidism were re-fed iodine and became hypothyroid again (Anthony P Weetman, *Autoimmune Diseases in Endocrinology*, pp 50-51).

In addition, further epidemiological studies have cast doubt on the simple association of goiter with iodine deficiency. Recently British researchers compared the distribution of endemic goiter in England and Wales with the distribution of environmental iodine. Despite a very clear goiter belt through the west of England and Wales, they found no patterning in the environmental iodine distribution and concluded that the presence of endemic goiter is no indicator of how iodine is distributed in the environment or vice versa (Stewart AG and others. The Illusion of Environmental Iodine Deficiency. *Environmental Geochemistry and Health* 25:165-170, 2003). Early observations of goiter belts in Switzerland recorded strange distribution patterns, with villages completely free of goiter next to villages where goiter and cretinism affected many people, and even the promoters of mass iodine supplementation have noted that iodine supplementation works best in conjunction with an improvement of general nutrition.

Like all things in nature, the relationship of iodine status to thyroid health is resistant to simplified explanations. Many other nutrients contribute to thyroid health besides iodine, and numerous environmental and industrial toxins can depress thyroid function. And the body's ability to use iodine almost certainly has a genetic component. The moral: be wary of one-size-fits-all solutions and if you choose to supplement with iodine, be carefully observant of any side effects.

Forms of Iodine

IODINE (I_2): Elemental iodine is available in a formulation called Thyactin by TriMedica, described as a "stabilized colloidal iodine preparation."

IODIDE (I-): Elemental iodine is unstable so it usually combines with another element, such as potassium or sodium. Salt is iodized using potassium or sodium iodide. Potassium iodide (KI) is available in tablet form in doses ranging from 0.23 to 130 mg. Lugol's solution contains 6.3 mg of molecular iodine/iodide per drop; Iodoral tablets contain 12.5 mg iodine/iodide each. Both Lugol's solution and Iodoral are one-third molecular iodine (5%) and two-thirds potassium iodide (10%). Most formulations of tincture of iodine are a combination of iodine and sodium iodide. Supersaturated potassium iodide (SSKI) contains 19–50 mg of iodide per drop. SSKI tablets are recommended in case of nuclear accident, to protect the thyroid gland from radioactive iodine, but otherwise should be avoided.

IODATE: Iodine in combination with oxygen, such as potassium iodate (KIO_3), is considered inferior to potassium iodide in terms of protection against radioactive iodine.

ENDOGENOUS ORGANIC IODINE COMPOUNDS: In food and in the body, iodine is usually bound with protein compounds. The main iodine-containing compounds in the body are the thyroid hormones thyroxine (T4, four iodine atoms joined to tyrosine) and triiodothyronine (T3, three iodine atoms joined to tyrosine).

SYNTHETIC ORGANIC IODINE COMPOUNDS: Drugs such as Amiodarone (an antiarrhythmic medication) contain

iodine. The simplest organoiodine compound is iodomethane, used as a soil fumigant. More complex iodate compounds include nonylphenoxypolyethoxyethanol-iodine (C17H28I2O2) or Byacin, used as a germicide, as in teat washes.

DETOXIFIED IODINE: Sold as Atomidine, the manufacturing method is called a "modified detoxification process" which involves a stage in which electricity is run through the iodine in saline solution to produce a solution containing free iodine (see sidebar on Atomidine, page 43).

NASCENT IODINE: Similar to Atomidine, although requiring more electricity and a longer time to produce. The diatomic bond of the iodine molecule is broken and retains a high amount of electromagnetic energy. According to the manufacturer, "once in contact with fluids of the body, the charged atom of iodine starts a process of relaxation where it gradually loses energy over two to three hours."

Iodine on the Skin

The application of iodine to the skin as a way of iodine supplementation has been a common practice for over one hundred years. In 1932, researchers from the College of Pharmacy at Rutgers University carried out experiments on dogs and rabbits. They determined that, in fact, free iodine does penetrate through unbroken skin, although about 88 percent of the iodine applied evaporates from the surface within three days. Colloidal iodine (I2 in aqueous solution) was found to evaporate more quickly than tincture of iodine (I2 in alcoholic solution), and tincture of iodine evaporated more rapidly than Lugol's solution (iodine plus potassium iodide). The authors concluded: ". . . iodine which penetrates through the skin is removed only slowly from within this area into the body, thus forming an iodine depot in the skin for several days. In this prolonged retention of iodine within the skin, we see a favorable condition for a possible local prophylactic and therapeutic action." More recent studies, these involving humans, indicate that application of iodine to the skin is not effective in preventing the uptake of radioactive iodine by the thyroid gland; however, it is a slow but effective way to provide iodine supplementation, increasing serum levels at about 10-40 percent compared to oral ingestion (Abrahams, GE. The bioavailability of iodine applied to the skin. www.optimox.com).

Holistic practitioners have also applied iodine to the skin as a way to assess whole body iodine status—the so-called skin iodine patch test. The published data throws doubt on the effectiveness of the iodine patch test as a diagnostic aid. Many factors play a role in the disappearance of the yellow color of iodine from the surface of the skin including ambient temperatures and atmospheric pressure—the iodine will disappear faster in Denver than it will in Los Angeles. And in some people the iodine is reduced to iodide by the skin, which will result in the disappearance of the yellow color because iodide is white. Nevertheless, many have reported that the iodine applied to the skin remains longer after following the practice for several weeks, indicating a kind of saturation effect.

Unfortunately, we have no clinical trials on the use of iodine on the skin, but holistic practitioners have reported good results. For example, from Geoffrey Morell, ND: "A female patient with nodules on the thyroid gland and scheduled to have it removed applied tincture of iodine to the skin for over sixty days, at which point the stain remained for twenty-four hours. Upon reporting to the hospital for the operation, she was told that the nodules had disappeared and the operation was no longer necessary. In another case, a woman saw her visible goiter disappear after many weeks using tincture of iodine on the skin."

The inefficient uptake of iodine from the skin and slow release can be seen as an advantage for those wishing to safely improve their iodine status without medical supervision. This treatment does not seem to provoke a

detoxification reaction that often occurs with oral ingestion of Lugol's.

Iodine applied to the skin is an excellent treatment for pre-malignant lesions, dark moles, keloid scars and other oddities of the skin. According to Dr. David Derry, ". . . iodine's ability to trigger natural cell death (apoptosis) makes it effective against all pre-cancerous skin lesions and likely many cancerous lesions. The local site is replaced with normal skin." He recommends topical iodine for insect bites as well (iodine4health.com/special/measurement/derry_measurement.htm).

For skin application, use mild tincture of iodine or Lugol's solution, both available on the Internet.

Atomidine

Atomidine is a stable compound of iodine in a saline solution "that liberates the element in an atomic or nascent state on contact with an excess of solvent, such as the fluids of the body." The use of Atomidine was popularized by Edgar Cayce, the so-called Sleeping Prophet, who gave medical diagnoses and suggested treatments in a trance. He often recommended the use of Atomidine, produced by Schieffelin & Company in New York, which he referred to as "iodine with the poisons taken out," for a variety of conditions including thyroid and other glandular problems, sore throat, gum problems and infection (www/iodinesource.com/Excerpts.asp). A typical treatment consisted of "one drop in half a glass of water each morning for five days before the morning meal, leave off ten days, and then take again" or "three to five drops in water morning and evening." He also recommended Atomidine for use as a gargle, as a douche and in topical preparations. (One intriguing ointment recipe called for adding 10 drops tincture of Benzoin, 5 drops Atomidine and 3 drams powdered snuff to 1 ounce 'Oil of Butterfat'.")

A theme running through Cayce's writings was the use of Atomidine as a gentle way of "cleansing or purifying the body," alternating with days when Atomidine was not used. He issued the same precautions for foods containing iodine, especially seafood, which he said should be consumed occasionally but not everyday. In one reading he indicated that seaweed could be toxic because of its high iodine content.

A paper published in the 1930s to promote Atomidine, written by the Schieffelin & Company, is posted on the internet (www.mnwelldir.org/docs/history/atomidine.htm). According to the report, Atomidine should be diluted when taken "and never given after a starchy meal." The paper cites many cases of improvement when Atomidine is given for gum problems, as an antiseptic after surgery, gastrointestinal problems, urinary tract infections, high blood pressure, goiter, malaria and tropical fevers, venereal disease, infections of eye, ear, nose and throat, bronchitis and asthma.

Iodine Loading Protocol

Developed by Drs. Guy Abraham and David Brownstein, the protocol involves giving 50 mg iodine/iodide per day as Iodorol® and monitoring the excretion of iodine in the urine. The high levels of iodine/iodide are necessary to replace bromine and fluorine (and also chlorine) that have built up in the tissues, due to years of toxic exposure.

The iodine/iodide loading test is based on the concept that the normally functioning human body has a mechanism to retain ingested iodine until whole body sufficiency for iodine is achieved. During supplementation with iodine, the body progressively adjusts the excretion of iodine to balance the intake. As the iodine content in the body increases, the percentage of the iodine retained decreases, showing up as an increased amount of iodide excreted in the 24-hour urine collection. When whole body sufficiency for iodine is achieved, the absorbed iodine/iodide is excreted as iodide in the urine.

In the U.S. population, the percent of iodine load excreted in the 24-hour urine collection prior to supplementation with iodorol averages 40 percent. After three months of supplementation with 50 mg iodine/iodide per day, (four tablets of Iodoral) most non-obese subjects not exposed to excess goitrogens achieve whole body iodine sufficiency, arbitrarily defined as 90 percent or more of the iodine load excreted in the 24-hour urine collections.

In addition to monitoring iodine excretion, Brownstein and colleagues also monitor urinary excretion of bromide and fluoride, goitrogenic halogens that the iodide gradually replaces over the course of supplementation. To facilitate the excretion of bromine, Dr. Brownstein recommends a combination of vitamin C, unrefined salt and magnesium, including baths of Epsom salts and sea salt. The patient is advised to avoid all sources of bromine, including fire retardant in carpet, clothing and mattresses, and bromide-treated breads, baked goods and grains. Bromine and chlorine are used extensively in materials in automobiles of recent vintage—in the seats, armrests, door trim, shift knobs—so avoidance of riding in cars with the windows closed is important.

Dr. Brownstein reports numerous benefits from the protocol including reduced need for thyroid medications, reduced allergies, increased energy, reduced fibromyalgia, weight loss, clearing of ovarian cysts and reduction of hypothyroid symptoms such as brain fog. In his experience, side effects including metallic taste in mouth, sneezing, excess saliva and frontal sinus pressure occur in less than 5 percent of patients.

For ongoing thyroid protection, it is important to avoid sources of bromide, fluoride and chloride (including environmental perchlorates, often found in drinking water). That means drinking purified or filtered water instead of tap water, consuming organic food (conventional produce and grains are treated with bromide-, chloride- or fluoride-containing pesticides and fumigants), avoiding bromated breads and consuming plenty of unrefined sea salt along with an iodine-rich diet.

Sources: http://www.optimox.com/pics/Iodine/loadTest.htm#6; http://iodine4health.com; http://iodine4health.com/ortho/brownstein_ortho.htm.

Report from Germany

"Here in Germany we are suffering from an epidemic of autoimmune thyroid disease due to the government's huge campaign to iodize our salt and water. The food industry uses iodized salt for all products. Animal feed and milk is iodized. The German government claims that the earth has no iodine and that natural foods do not contain enough iodine. Even food for fresh water fish is iodized.

"The German thyroid league admits that iodization has caused a rise in autoimmune diseases of the thyroid. About ten million Germans are affected. Doctors tell us about studies showing that these patients should not eat iodized food as it makes their disease worse. Thyroid illnesses are painful and hard to heal. The thyroid gland controls our body's metabolism. Also, the eyes can be destroyed. The standard therapy is to remove or radiate the sick gland. Then the patient needs thyroid hormones to survive.

"The sad thing is that most people don't even know that what they eat is iodized. In Germany iodized salt in packaged food has to be declared but iodine in salt in restaurants or in bread is not labeled.

"The German iodization program is not popular with the public at all. We had it during the Third Reich and it took quite a lot of government campaigning to bring back mass iodization, a public relations campaign to convince people that iodine is healthy and has no dangers at all. Government officials say that people can choose iodized or noniodized

salt but no one mentions the hidden salt. In the Third Reich they called it "silent iodization," to avoid any resistance.

"I have run a self help group for thyroid patients for years now and it is a very difficult situation for patients to not have enough food! It is even difficult to get all the information we need.

"We hear a lot of discussion about fluoride in the water but I am surprised that there is none about iodine. In Germany they sell salt with iodine and fluorine—both affect the metabolism and can damage the thyroid gland. Natural salt has the advantage of giving us minerals we need and in a way that our body can handle instead of the low quality chemistry added to food or water. I know that the healthy thyroid gland needs more than iodine. It also needs vitamins A and C, and many other minerals. A natural diet can offer more benefit for our heatlh and fewer dangers and side effects. The tragedy is that the WHO has started to ban natural foods. In India, Himalayan salt was banned and iodized salt then sold five times as much as natural salt. Poor people can't afford the natural salt and so many didn't have any salt at all anymore. The German media reported on protests in India and I don't know whether natural salt is allowed again.

"Here in Germany, thousands of thyroid patients are signing a petition asking the Bundestag to change the law, and to require iodization labels on packages."

-Ute Aurin

Reaction to Iodoral

"Three articles appeared recently in The Original Internist concerning clinical research with the use of iodine/iodide in megadoses. Our medical group, consisting of three MDs and one ND/Acupuncturist decided that we should try to find out whether any one of us was iodine-deficient. Our practice is in the Great Lakes region that was described as the 'Goiter Belt' by David Brownstein. We therefore followed Brownstein's recommendation for the iodine/iodide loading test. Five individuals within our office took the test and, by the criteria outlined, we were all iodine-deficient.

"Three of us, two MDs and our Laboratory Director, then proceeded to take the 50 mg of Iodoral a day with the intention of repeating the iodine/iodide loading test after three months of treatment. After about six weeks of continuous treatment, I experienced dysphagia [difficulty swallowing], resulting in lower chest pain on swallowing both food and fluids. This was particularly marked with hot fluids, a totally new experience for me. I told the Laboratory Director that I was going to discontinue taking the Iodoral since I had concluded that it was the potential cause. To my surprise, she told me that she had experienced exactly the same symptom and had also discontinued the treatment. The other two MDs who took the treatment did not experience this symptom. Some four weeks after discontinuation of the Iodoral, we both continue to experience the same kind of dysphagia, although it is much milder. We can only conclude that we experienced some esophagitis though this has not been proved by further study.

"If this is indeed a toxic effect of the Iodoral, we concluded that it needed to be drawn to the attention of the CAM medical community. If the conclusions are correct, we should expect to hear that other 'guinea pigs' have experienced something similar. The question remains in our minds as to whether the test outlined by Brownstein is an accurate determination of chronic iodine deficiency. It may well be that iodine has a sensitive dose relationship like that which is so well known with selenium, for example, and with other minerals. The question, put so eloquently recently by Alan Gaby is whether we are embarking on a strategy that can be toxic for some while beneficial for those sick individuals reported by Brownstein and his co-author, Guy Abraham. Indeed, as Gaby questioned later, of the 4,000 patients treated by the Michigan Clinic, how many were carefully monitored in detail for potential side effects? Since

gastroesophageal reflux (GER) is mentioned in a drug commercial as a common affliction, it might be that some patients who are being treated with high-dose iodine would never conclude that GER might be related to the iodine consumption. It might not be recognized as a side effect even by a physician, since it is so remote from any expected or predicted symptom."

-Derrick Lonsdale MD, FAAP, FACN, Westlake, Ohio *The Townsend Letter for Doctors and Patients*, April 2006

Iodine Content of Foods

SOURCE	IODINE CONTENT mcg/100 g	IODINE CONTENT per typical serving
Dried Kelp	62,400	3120[2]
Iodized Salt	7,600	1520[3]
Saltwater fish[1]	330	330
Blackstrap Molasses	158	24
Catfish	118	118
Beans, dried	115	58
Seafoods	66	66
Spinach	56	28
Vegetables	30	15
Milk and Milk Products	14	14
Eggs[4]	13	13
Seal Meat	3	3
Seal Blubber	12	12
Seal Kidney	5	5
Seal Liver	10	10
Whale Meat	1	1
Whale Blubber	15	8
Cod Flesh	74	74
Cod Liver	32	32
Wild Fowl	5	5

Caribou[5]	0.4	0.4
Oysters	46	46
Mussels	107	107
Lobster Hepatopancreas[6]	2,250	450
Uniodized sea salt[7]	50	3[3]

1. Haddock, whiting, herring

2. Assumed serving of 5 g dried kelp (*Nutrition in Japan*, 1964. Nutrition Section, Bureau of Public Health, Ministry of Health and Welfare, Tokyo, Japan, March 1965).

3. Daily intake if 5 g iodized salt consumed.

4. These 11 values from Ensminger AH and others. *The Concise Encyclopedia of Foods and Nutrition*. CRC Press, 1995, p 587.

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How Much Iodine?

FDA: The Dietary Reference Intake (DRI) is set at 150 mcg per day for men and women with a Tolerable Upper Intake Level (UL) of 1,100 mcg per day. This amount would be greatly exceeded by those using even modest amounts of iodized salt.

TRADITIONAL DIETS: Iodine levels in traditional diets varied widely. Weston Price reports 131-175 mcg for the Inuit (about the level of the DRI) and 25-34 mcg for Canadian Indians (considered very low, although they did not exhibit thyroid problems). Based on the reported values in seaweed, some have claimed levels of 12 mg (12,000 mcg) in Japanese diets, although a published analysis of iodine intake in Japan found a range of 45-1921 mcg per day (*J Nutr Sci Vitaminol* (Tokyo). 1988 Oct;32(5):487-95). Without seaweed, it would be very difficult to exceed 1,000 mcg per day, based on values found in typical traditional foods (see chart, page 47).

CHERASKIN RECOMMENDATIONS: In a study of reported daily iodine intake versus reported total number of clinical symptoms and signs (as judged from the Cornell Medical Index Health Questionnaire), an intake of approximately 1,000 mcg per day correlated with the lowest number of reported symptoms, that is, the highest level of health.

ABRAHAM/BROWNSTEIN RECOMMENDATIONS: Abraham and Brownstein argue that the iodine requirement is 1,500 mcg per day (1.5 mg), which is difficult to achieve without using a species of seaweed high in iodine, iodized salt or supplementation. They believe that because of widespread bromide and fluoride toxicity, most people today actually

require between 5 and 50 mg per day, amounts only possible with supplementation, which should only be taken under the supervision of a physician to monitor iodine status.

Commercial Vegetable Oils and the Thyroid Gland

Although Dr. Weston Price found healthy populations groups that consumed fairly low levels of iodine, studies indicate that in modern times, most people do best at the upper end of the scale, taking in around 1,000 mcg per day. Often overlooked in this discussion are the many factors in the modern diet that depress thyroid function and increase our need for iodine—not only exposure to halogens like fluroide, chloride and bromide, but also deficiencies in vitamin A, vitamin B_6, selenium and magnesium. Reduced exposure to halogens and abundant intake of these key nutrients probably reduces our requirements for iodine.

Another modern dietary factor that interferes with thyroid function is the consumption of omega-6 fatty acids from commercial vegetable oils—by some estimates these omega-6 fatty acids contribute 20 percent of calories in "civilized" diets. As pointed out by Stephen Guyenet in his Whole Health Source blog, omega-6 fatty acids may suppress thyroid signaling. He cites studies showing that corn oil greatly suppresses the liver's response to T4 when compared to lard, safflower oil suppresses the liver's response to T3 when compared to beef tallow, and linoleic acid suppresses the response of brown fat and the liver to T3. The liver is one of the main sites of thyroid hormone-responsive heat production. In fact, in the 1970s researchers were considering omega-6 lineleic acid as a treatment for hyperthyroidism.

Thus it is likely that those who avoid commercial vegetable oils and minimize omega-6 consumption, while emphasizing intake of nutrient-dense animal fats like butter and cod liver oil, would have iodine requirements much lower than 1,000 mcg per day, and would be able to meet their iodine requirements with a diet of whole foods, especially one containing sea food.

Source: Omega-6 Linoleic Acid Suppresses Thyroid Signaling, December 19, 2008. http://wholehealthsource.blogspot.com/2008/12/omega-6-linoleic-acid-suppresses.html.

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