

Iodine: Are we deficient in this Crucial mineral?

Dr Nyjon K. Eccles BSc MBBS MRCP PhD

Iodine is the agent which arouses (kindles) and keeps going the flame of life. With the aid of our thyroid, in which the iodine is manifesting, it can either damp this flame or kindle it to a dissolute fire.

Scholz 1990.

Are you tired all the time?

Do you think you're just working too hard?

You have dry skin (you may not sweat when hot) and/or brittle nails?

You have muscle aches and pains?

You have been struggling to lose weight while doing all the "right" things?

You find your mind in a fog more often than you used to (poor memory)?

You feel depressed?

You are prone to headaches?

You have been losing hair?

You feel cold when others are comfortable or warm (cold hands and feet)?

If you're a woman, you have been diagnosed with fibrocystic breast disease, breast cancer, or polycystic ovarian syndrome?

You are prone to oedema (water retention)?

If you have answered "yes" to three or more of these questions you might be IODINE DEFICIENT!

Iodine is a natural chemical element, like oxygen, hydrogen and iron. It occurs in a variety of chemical forms, the most important being iodide, iodate and elemental iodine. It is present in fairly constant amounts in seawater but its distribution over land and fresh water is uneven. Deficiency is especially common in mountainous areas (e.g., Himalayas, Andes, Alps) and areas of frequent flooding, but many other areas are also deficient (e.g., Central Africa, Central Asia, much of Europe).

Signs of iodine deficiency are many: lack of energy, dry skin, feeling cold, lack of appetite, inability to lose weight, breast fibroids, gastric reflux (heartburn, indigestion, acid stomach), polycystic ovary syndrome, depression, losing hair, and brain fog to name a few.

Iodine intake in Western populations has declined due mostly to dietary changes and health trends. Average urine iodine levels dropped from 321 µg/L in the 1970's to 160 µg/L in the 2000's (100 µg/L is the current cut off for detecting iodine deficiency). Iodine is essential for thyroid hormone production and appears to be required for maintaining the health of many other tissues (i.e., the breast and reproductive tissues), so a further drop in iodine intake can be expected to increase health problems. Accurate diagnosis may often be overlooked because the symptoms overlap with those of other illnesses,

It is anticipated that a further decline will occur due to recommendations to reduce sodium intake to 1.5 g a day from a previous RDI of 2.3 g/day. For example, one gram of iodized salt in the US contains 77 µg iodine and assuming the use of iodized salt and daily consumption of the RDI, 62 µg of iodine is lost a day. Reduction of salt intake from processed foods is not likely to have much impact on iodine levels since iodized salt is not commonly used in these foods. However, a reduction in the use of iodized salt at home for cooking and seasoning (most buy iodized, some without knowing) will more likely contribute to loss of iodine in the diet. Banishment of the salt shaker may also have had an adverse effect on the intake of non-palatable green vegetables...and certainly, blinded taste tests have suggested this.

The WHO estimates that 2 billion people worldwide including 285 million children of school age are iodine deficient despite major national and international efforts to improve intake through iodized salt. It is known that deficiencies of selenium, vitamin A and iron may exacerbate the effects of iodine deficiency. Along with magnesium and selenium, iodine is one of the most deficient minerals in our bodies. Iodine deficiency has substantial effects on growth and development and is the most common cause of preventable mental impairment worldwide. Mild deficiency impairs cognition in children where moderate to severe deficiency in a population reduces IQ by 10-15 points. Iodine intake can vary substantially within a region and country because of variations in the natural iodine content of food and water (Pedersen et al, 1999).

It is estimated that about 45% of the population of continental Europe has evidence of iodine deficiency although iodine status in several countries is not documented (Zimmerman et al, 2011) and no data is available for the UK population. That said, a recent UK study in a cohort of 810 school girls (aged 14-15 from 9 UK centres, Aberdeen, Belfast, Birmingham, Cardiff, Dundee, Exeter, Glasgow, London and Newcastle) demonstrated that 51% had evidence of mild deficiency, 16% moderate deficiency and 1% had severe deficiency. Greatest deficiency was seen in Belfast (Vanderpump et al, 2011). Experts say the problem stems from children drinking less milk, which is a common source of iodine. Women of childbearing age are most at risk - even mild deficiency can harm a baby's developing brain. Dr Vanderpump told a meeting of the Society for Endocrinology: "Our data suggest the UK is now iodine deficient, warranting a full investigation of the UK iodine status. We need to look into this now to decide whether public health bodies need to step in." The World Health Organization has made iodine-deficiency a global priority and has been campaigning for at-risk countries to add iodine to their salt, a campaign which has been very successful. A recent study conducted on pregnant women in Northern Paris showed 50% of subjects had iodine deficiency (Luton et al, 2011). In order for pregnant women to produce enough thyroid hormones to meet both her own and her baby's requirements, a 50% increase in iodine intake is recommended. There is unequivocal evidence that severe iodine deficiency in pregnancy impairs brain development in the child. Further research published in the Medical Journal of Australia 2011 shows Aboriginal people in the Northern Territory have "moderately" severe levels of Iodine Deficiency.

It would seem that iodine deficiency might in fact be a widespread problem.

Review of Iodine Functions?

Controlling the Metabolic Rates: Iodine is required by the body for the synthesis of the thyroid hormones, thyroxine (T4 - containing 4 iodine atoms) and triiodothyronine (T3 - containing 3 iodine atoms). These hormones play an important part in the controlling of the basic metabolic rate (BMR). Also, these hormones help regulate the heart rate, blood pressure, temperature and body weight. Thyroid hormones are essential for life as they regulate key biochemical reactions, especially protein synthesis and enzymatic activities, in target organs such as are the developing brain, muscle, heart, pituitary and kidney; thus iodine is critically important to the developing foetus.

Maintaining Energy Levels: Iodine aids in the proper utilization of calories thereby ensuring optimum levels of energy in the body. This mechanism also prevents the storage of excess amounts of calories as fats in the body. Constipation and fatigue are the other conditions brought about by iodine deficiency. Thyroid hormone regulates mitochondrial protein synthesis through the stimulation of synthesis of mitochondrial protein synthesis modulators,

Healthy Weight Maintenance: Iodine deficiency can lead to the malfunctioning of the thyroid gland, which in turn, can cause an abnormal gain in the body weight due to deposition of excess calories as fats.

Healthy Brain Function: Iodine is found in large amounts in the brain (including the parts of the brain associated with Parkinson's disease) and the ciliary body of the eye, a possible factor in glaucoma. Iodine deficiency can also cause depression, frustration and poor levels of perception. In some serious cases, mental retardation often gets associated with cretinism characterized by physical malformations. Mild to moderate maternal iodine deficiency has also been associated with an increased risk for attention deficit hyperactivity disorder in children [30]. Underproduction of thyroxine, specifically, is known to weaken neural connections in the brain. And without sufficient levels of triiodothyronine, the body is unable to cope with increasing exposure to the inorganic toxins that are found in a seemingly unlimited number of everyday diets and living environments.

Healthy Cardiovascular System: The occurrence of iodine deficiency in cardiovascular disease is frequent. The thyroid hormone deficiency can be characterized with decreased myocardial contractility and increased peripheral vascular resistance as well as with the changes in lipid metabolism (Molinar et al, 1998)

Maintaining Foetal Health: Deficiency of iodine seems to cause more damage in developing embryos and in fact, in pregnant women iodine deficiency causes abortions and stillborns (Dunn & Delange, 2001). Pregnant women need adequate amounts of iodine to lower the possibilities of stillbirths. Iodine is also important in preventing neurocognitive conditions like cretinism in babies. It is known for promoting abilities like speech, hearing, motion and growth in babies. It is not cretinism alone that holds risks from deficiency, but the very survival of the infant itself. Adequate iodine may also provide protection from infection and vaccine damage. In a study done on 617 infants between the ages of 6 weeks and six months, in an iodine deficient area, it was shown that with the addition of 100 mg of iodine oil to the diet of newborns, that the death rate of infants was markedly lower than for those without any supplementation. (Cobra et al, 1997)

Maintaining the Health of the Reproductive System: Iodine supports the growth and the maturity of the genital organs.

Breast and Uterus Protection: Fibrocystic breast disease is related to excess estrogen production and is known to most women simply as having "lumpy breasts". Iodine decreases breast tissue sensitivity to estrogen. It has been found that patients who are treated for low thyroid hormone have decreased breast pain and breast nodules. This suggests that low thyroid hormone or iodine deficiency may be a factor in fibrocystic breast disease. Iodine encourages healthy estrogen metabolism; encouraging preferentially the formation of non-toxic metabolites (i.e. 2-hydroxy metabolites rather than toxic 4- and 16-hydroxy metabolites). Lugol's solution is an iodine-in-water solution used by the medical profession for 200 years. One drop (6.5 mg per drop) of Lugol's daily in water, orange juice or milk has been reported to gradually eliminate fibrocystic disease of the breast. Women with goiters (a visible, non-cancerous enlargement of the thyroid gland) owing to iodine deficiency have been found to have a three times greater incidence of breast cancer. A high intake of iodine is associated with a low incidence breast cancer, and a low intake with a high incidence of breast cancer. (Dr. Donald Miller Jr, <http://www.lewrockwell.com/miller/miller-arch.html>). In an in-house study by Dr Miller, 60 cancer patients (various types) were given the iodine-loading test and then measured for urinary excretion. All 60 patients were found to be seriously deficient in body stores of iodine and some had great excesses of bromine. Drs. Abraham, Flechas and Brownstein tested more than 4,000 patients taking iodine in daily doses ranging from 12.5 to 50 mg, and in those with diabetes, up to 100 mg a day. These investigators found that "iodine does indeed reverse fibrocystic disease; their diabetic patients require less insulin; hypothyroid patients, less thyroid medication; symptoms of fibromyalgia resolve, and patients with migraine headaches stop having them."

Iodine also has a remarkable healing effect on ovarian cysts," says Dr. Robert Rowen. Though few know it swollen ovaries is a condition analogous to goitre, when the thyroid swells in response to iodine deficiency. Goitres often also result in a hormonal imbalance leading to hypothyroidism. In the case of Polycystic Ovary Syndrome (PCOS) the starvation of the ovaries causes them to become cystic, swollen and eventually unable to regulate the synthesis of their hormones leading to

imbalances and infertility. Russian studies when investigating Fibrocystic breast disease also discovered that the greater the iodine deficiency the greater the number of cysts in the ovaries (Vishniakova & Murav'eva, 1966). Since 1928, the iodine concentration in the ovary has been known to be higher than in every other organ except the thyroid. Dr. Browstein has found in his research with high doses of iodine that cysts on the ovaries became smaller and began to disappear. He also found that libido in women and men increased. It would seem that in sufficient amounts iodine can not only adjust a dysfunctional thyroid, it can assist with a host of glandular imbalances. An intake of 150 µg/day of iodine will prevent goitres and the other recognized iodine deficiency disorders, but not breast disease. Prevention of breast disease requires higher doses of iodine.

Aids Detoxification: it has very specific protective effects against several common poisons like fluoride, bromide, and to a lesser extent it helps eliminate lead and mercury from the body. When one combines the intake of iodine with other minerals. Iodine in combination with selenium increased the activities of type 1 deiodinase (D1) and glutathione peroxidase (Department of Nutrition and Food Hygiene, 2006).

Anti-septic: Every 17 minutes, every drop of blood in our body flushes through our thyroid, and if our thyroid has an adequate supply of iodine, blood-borne bacteria and viruses are killed off as the blood passes through it. Iodine is thought to be the best antibiotic, antiviral and antiseptic of all time. The antiseptic properties of iodine are used to sterilize every surface and material in hospitals. Iodine is an excellent microbicide with a broad range of action that includes almost all of the important health-related microorganisms, such as enteric bacteria, enteric viruses, bacterial viruses, fungi and protozoan cysts (Web Ref1). The minimum number of iodine molecules required to destroy one bacterium varies with the species. When bacteria are treated with iodine, the inorganic phosphate uptake and oxygen consumption by the cells immediately ceases (Web Ref 2). Iodine is effective "for standard pathogens such as Staphylococcus, but also iodine has the broadest range of action, fewest side effects and no development of bacterial resistance." Some doctors have reported that it is excellent for the treatment of mononucleosis. Iodine is able to penetrate quickly through the cell walls of microorganisms. Iodine kills single celled organisms by combining with the amino acids tyrosine or histidine when they are exposed to the extra-cellular environment. All single cells showing tyrosine on their outer cell membranes are killed instantly by a simple chemical reaction with iodine that denatures proteins.

Anti- Candida: One of the greatest benefits of high iodine intake is its effectiveness in killing Candida and other fungi and microbes. Both iodine and fungi have an affinity for the mucous membranes. By keeping the mucous membranes healthy iodine greatly helps to overcome autoimmune diseases, sinus problems, asthma, lung cancer, and other lung problems, and also intestinal diseases, including inflammatory conditions and cancers. Use of iodine as an antimicrobial agent is 4 x 6 to 8 drops of Lugol's solution for 3 weeks, (Web Ref 3) . However, the FDA recently banned Lugol's solution.

Assisting in Programmed Cell Death: Iodine assists in the process of programmed cell death or apoptosis. This process allows the elimination of cancer cells or diseased cells which might cause harm to the individual. Researchers believe that this anti-cancer function of iodine may well prove to be it's most important benefit apart from thyroidal influence.

General Hormone Support: Iodine may have a generalized adjunctive effect on many hormone receptors in the body. The absence of iodine causes a hormonal dysfunction that can be seen with practically every hormone inside the body.

What are the Sources of Iodine?

The daily recommended intake of iodine is between 110 and 130 mcg for infants up to 12 months, 90 mcg for children up to eight years, 120 mcg for children up to 13 years, 150 mcg for adults, 220 mcg for pregnant women and 290 mcg for lactating mothers. The thyroid gland needs no more than 70 mcg/day to synthesize the requisite daily amounts of thyroid hormones. However, 60 million mainland Japanese consume a daily average of 13.8 mg of elemental iodine, and they are one of the healthiest nations based on overall well being and cancer statistics (Abraham, 2005). It is likely that the benefits outside of thyroid support require a greater daily intake.

Iodine can be obtained from plant as well as animal sources. The various sources include: iodized table salt, shellfish, sardines, tuna, oyster, salmon, cod, shrimp, sea bass, kelp, and seaweed. Dairy products also contain iodine. Other good sources are plants grown in iodine-rich soil. It is rare for diets of natural foods to supply more than 2,000 mcg of iodine/day, and most diets supply less than 1,000 mcg of iodine/day. People living in the northern coastal regions of Japan, whose diets contain large amounts of seaweed, have been found to have iodine intakes ranging from 50,000 to 80,000 mcg (50-80 mg) of iodine/day (Hetzel & Clugston,1999).

Food	Serving	Iodine (mcg)
Salt (iodized)	1 gram	77
Cod	3 ounces*	99
Shrimp	3 ounces	35
Fish sticks	2 fish sticks	35
Tuna, canned in oil	3 ounces (1/2 can)	17
Milk (cow's)	1 cup (8 fluid ounces)	56
Egg, boiled	1 large	29
Navy beans, cooked	1/2 cup	35
Potato with peel, baked	1 medium	63
Turkey breast, baked	3 ounces	34
Seaweed	1 ounce, dried	Variable; may be greater than 18,000 mcg (18 mg)

From: <http://pi.oregonstate.edu/infocenter/minerals/iodine/>

Since 1993 the World Health Organization (WHO) has conducted a global programme of salt iodisation to boost dietary levels and prevent deficiency, largely in the developing world. Many European countries, including Switzerland and Denmark, have also signed up to the WHO programme. In the UK, however, it is not compulsory for manufacturers to add iodine to salt.

Most people are also unaware that dairy products and eggs contain significant levels of iodine. In an effort to reduce fat consumption, less milk is consumed today than it was 50 years ago. Gallon per person consumption of milk dropped from 30 in 1968 to 19 in 2008. Since milk is one of the primary sources of dietary iodine, decreased consumption equals less dietary iodine. Additionally, a recent health trend to reduce cholesterol has many using egg whites instead of whole eggs, removing the high iodine yolk (about 25 µg iodine/yolk).

Too much iodine can have a negative impact on the thyroid gland and cause you to become hypo or hyperthyroid. Severe iodine deficiency or underlying thyroid disorders can be worsened by a sudden increase in iodine, so it is best to slowly increase iodine intake to levels that are optimal for healthy thyroid hormone production. It is a good thing to test your urinary iodine levels to get a handle on your daily iodine intake if you suspect a deficiency or excess of iodine.

The increasing presence of fluoride in the environment can disrupt iodine metabolism. Fluoride exposure can come from multiple obvious and not-so-obvious sources. In addition to dental hygiene products and drinking water, many breakfast cereals, juices from concentrate, soda and other processed foods contain alarming levels. Fluoride-containing pesticide use means that the environment is being flooded with fluoride by conventional agriculture. That fluoride's can depress thyroid function is not a new discovery. Research since the 1930s, supports that relationship is well established, Publication of *The Case Against Fluoride: How Hazardous Waste Ended Up in Our Drinking Water and the Bad Science and Powerful Politics That Keep It There* is a signal event in the 65-year story of fluoridation. Four chapters are devoted to explaining, in turn, how fluoride harms the brain, the endocrine system (especially the thyroid gland), bone, and kidneys.

One of the primary sources of fluoride exposure is not fluoridated drinking water but non-organic foods, due to the high amounts of fluoride-based pesticide residues on these foods. Non-organic foods may account for as much as one-third of the average person's fluoride exposure.

Conventional medicine's response to hypothyroidism typically does not pay attention to causes and prescribes synthetic thyroxine hormone in an attempt to balance out the health equation with another unnatural substance. It is worthy of note that the leading thyroid drug was number 7 on JAMA's (Journal of American Medical Association) list of 'most commonly prescribed' in 2006; one year later it was number 4).

Testing for Iodine Levels

Urinary iodine excretion is thought to be the most reliable marker of iodine intake over days (WHO, 2007). Urinary iodine reflects dietary iodine intake directly because people excrete more than 90% of dietary iodine in the urine (WHO, 2007) Spot urine iodine measurements are a useful indicator of iodine status within populations [WHO, 2007, 2011]. However, 24-hour urinary iodine or multiple spot urine measurements are more accurate for individuals (WHO, 2001). The most accurate way to determine iodine sufficiency is to do an iodine loading test. This involves an adult taking 50mg of iodine and then monitoring excretion of iodine over a 24-hour period. Iodine sufficiency is indicated by 90% or more being excreted in the urine.

According to the WHO, a median urinary iodine concentration of 150–249 mcg/L indicates adequate iodine nutrition during pregnancy, while values less than 150 mcg/L are considered insufficient [WHO,2007, Zimmerman et al, 2010].

Despite the general medical dependence upon special hormone tests, such as TSH, Thyroxine (T4) and tri-iodothyronine (T3), **temperature also appears to be a useful addition for assessing thyroid function.** The oral temperature before getting out of bed in the morning should be 97.6 degrees Fahrenheit or higher. Mid-afternoon the temperature should be 98.6. Temperature is the simplest measure of basal metabolic rate, the key function of the thyroid gland, Women before menopause measure in the first half of the cycle before ovulation and best in the first week after the start of a new period. The temperature should be 36.5°C (97.6°F) or higher, otherwise the thyroid is likely to be under-active. However, be sure that you do not have a raised temperature due to a healing reaction or an infection.

Supplementing Iodine

Iodine made its leap into medical history when a Swiss physician, Dr Jean François Condet announced that iodine could reduce goitres (enlarged thyroids). At this moment, modern medical science was born because for the first time we have a specific disorder that is relieved by a specific treatment. It is most ironic to note that the very first step of allopathic medicine was into nutritional not chemical medicine with iodine being a mineral from the sea. Celtic sea salt and Himalayan crystal salt (mined from the Himalayan mountains) are also rich in minerals.

The Nobel laureate Dr. Albert Szent Györgi (1893—1986), the physician who discovered vitamin C, writes: "When I was a medical student, iodine in the form of KI 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"*

Iodine is present in unrefined sea salt together with 80 other different minerals. On this basis it seems prudent to incorporate this into the diet in place of refined table salt. The best sources of iodine may be protein bound. Look for kelp or seaweed supplements. It's best to start iodine supplementation slowly and build up to a higher dose. One of the criticisms often directed at seaweed and kelp sources of iodine is the potential lack of standardised doses. However, standardised extracts are in fact available harvested from a blend of marine algae, This allows iodine supplementation while avoiding the dangers of excessive salt intake.

Iodine is a powerful primary nutrient with broad medicinal effects and a hundred years ago it was used universally by most doctors. From 1900 to the 1960s almost every single U.S. physician used Lugol (iodine) supplements in his or her practice for both hypo and hyperthyroid, as well as many, many other conditions all with excellent results. In fact, iodine was considered a panacea for all human ills. Iodine is safe with a track record of 180 years of use in medicine. Published data confirms its safety even when used in pulmonary patients in amounts four orders of magnitude greater than the US RDA [RDA ref]. When patients take between 12.5 to 50 mg of iodine per day, it seems that the body becomes increasingly more responsive to thyroid hormones (Abraham et al, 2002) Optimal intake of iodine in amounts two orders of magnitude greater than iodine levels needed for goitre control may be required for iodization of hormone receptors (Abraham et al,2002; Miller, 2006).

Iodine therapy is not as completely free from side effects but compared to medical treatments, thyroid drugs, iodine is very safe. Simply proceed with caution, follow directions vigilantly, and carefully monitor your results. It is always best to use a high quality iodine supplement and to start with low dosages and work the dosages up slowly.

Drug interactions

Amiodarone, a medication used to prevent abnormal heart rhythms, contains high levels of iodine and may affect thyroid function. Medications used to treat hyperthyroidism, such as propylthiouracil (PTU) and methimazole, may increase the risk of hypothyroidism. Additionally, the use of lithium in combination with pharmacologic doses of potassium iodide may result in hypothyroidism. Further, the use of pharmacologic doses of potassium iodide may decrease the anticoagulant effect of warfarin (coumarin) Food & Nutrition Board, 2007, Delange 1998).

References

Abraham, G.E., Flechas, J.D., Hakala, J.C., Orthiodosupplementation: Iodine sufficiency of the whole human body. *The Original Internist*, 9:30-41, 2002.

Cobra et al. 1997, Infant Survival Is Improved by Oral Iodine Supplementation; *The Journal of Nutrition* Vol. 127 No. 4 April, pp. 574-578

De Benoist B, McLean E, Andersson M, Rogers L. Iodine deficiency in 2007; global progress since 2003. *Food Nutr Bull* 2008; 29: 195-202

Delange F. Risks and benefits of iodine supplementation. *Lancet*. 1998;351(9107):923-924.
Department of Nutrition and Food Hygiene, School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430030, People's Republic of China. [Biol Trace Elem Res](#). 2006 Summer;111(1-3):229-38.

Dominique Luton¹, Corinne Alberti⁴, Edith Vuillard², Guillaume Ducarme¹, Jean François Oury², Jean Guibourdenche³. Iodine Deficiency in Northern Paris Area: Impact on Fetal Thyroid Mensuration, *Nutrients* **2011**, 3(2), 265-273;

Dunn JT, Delange F (2001) Damaged reproduction: the most important consequence of iodine deficiency. *J Clin Endocrinol Metab* 8:2360-3

Food and Nutrition Board, Institute of Medicine. Iodine. Dietary reference intakes for vitamin A, vitamin K, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. Washington, D.C.: National Academy Press; 2001:258-289

Hetzel BS, Clugston GA. Iodine. In: Shils M, Olson JA, Shike M, Ross AC, eds. *Modern Nutrition in Health and Disease*. 9th ed. Baltimore: Williams & Wilkins; 1999:253-264

International Council for Control of Iodine Deficiency Disorders, World Health Organization, United Nations Children's Fund,. Assessment of iodine deficiency disorders and monitoring their elimination. Department of Nutrition for Health and Development, World Health Organization, 1211 Geneva 27, Switzerland, WHO/NHD/01.1 Second edition, 2001.

Miller, D. 2006. <http://www.lewrockwell.com/miller/miller20.html>

Molnar I, Magyari M, Stief L. *Orv Hetil*. Iodine deficiency in cardiovascular diseases; 1998, 30;139(35):2071-3.

Pedersen KM, Laurberg P, Nohr S, Joergensen A, Ahdersen S. Iodine in drinking water varies more than 100-fold in Denmark: importance for iodine content of infant formulas, *Eur J Endocrinol* 1999; 140: 400-403

RDA Ref. The RDA limits for vitamins and minerals were established after World War II. One of the last essential elements included in the RDA system was iodine, established in 1980 and confirmed in 1989. The RDA for iodine was based on the amount of iodine/iodide needed to prevent goiter, extreme stupidity and hypothyroidism. The optimal requirement of the whole human body for iodine has never been studied. Therefore, the optimal amount of this element for physical and mental wellbeing is unknown. Based on demographic studies, the mainland Japanese consumed an average of 13.8 mg daily and they are one of the healthiest people on planet earth. One tablet of Iodoral contains 12.5 mg iodine/iodide, an amount very close to the 13.8 mg average intake of mainland Japanese.

The Case Against Fluoride: How Hazardous Waste Ended Up in Our Drinking Water and the Bad Science and Powerful Politics That Keep It There [Paperback]. Paul Connett (Author), James Beck (Author), H. Spedding Micklem (Author), 2010.

Web Ref1: Microbiological Efficacy Activity of PVP-Iodine versus Bacteria, Yeasts and Molds, Actinomycetes and Rickettsia. <http://www.ispcorp.com/products/pharma/content/brochure/pvpiodine/antiact.html>

Web Ref 2. STERILIZATION ACTION OF CHLORINE AND IODINE ON BACTERIA AND VIRUSES IN WATER SYSTEMS; JOHNS HOPKINS UNIV BALTIMORE MD SCHOOL OF HYGIENE AND PUBLIC HEALTH; Final rept. 1 Jul 1962-30 Jun 1966; <http://stinet.dtic.mil/oai/oai?&verb=getRecord&metadataPrefix=html&identifier=AD0476804>

Web Ref 3: Ultimate Cleanse (www.health-science-spirit.com/ultimatecleanse.html)

WHO Secretariat, Andersson M, de Benoist B, Delange F, Zupan J. Prevention and control of iodine deficiency in pregnant and lactating women and in children less than 2-years-old: conclusions and recommendations of the Technical Consultation. *Public Health Nutr.* 2007 Dec;10(12A):1606-1611.

World Health Organization. United Nations Children's Fund & International Council for the Control of Iodine Deficiency Disorders. *Assessment of iodine deficiency disorders and monitoring their elimination.* 3rd ed. Geneva, Switzerland: WHO, 2007.

WHO global database on iodine deficiency. Geneva, Switzerland: World Health Organisation. <http://www.who.int/vmnis/database/iodine/en/> (accessed May 17, 2011)

Zimmerman MB, Andersson M. Prevalence of iodine deficiency in Europe in 2010. *Ann Endocrinol (Paris)* 2011; published online April 19. DOI:10.1016/j.ando.2011.03.023.