

The Effects Of Fluoride On The Thyroid Gland

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9-9-4

There is a daunting amount of research studies showing that the widely acclaimed benefits on fluoride dental health are more imagined than real. My main concern however, is the effect of sustained fluoride intake on general health. Again, there is a huge body of research literature on this subject, freely available and in the public domain.

But this body of work was not considered by the York Review when their remit was changed from "Studies of the effects of fluoride on health" to "Studies on the effects of fluoridated water on health." It is clearly evident that it was not considered by the BMA (British Medical Association), British Dental Association (BDA), BFS (British Fluoridation Society) and FPHM, (Faculty for Public Health and Medicine) since they all insist, as in the briefing paper to Members of Parliament - that fluoridation is safe and non-injurious to health.

This is a public disgrace, I will now show by reviewing the damaging effects of fluoridation, with special reference to thyroid illness.

It has been known since the latter part of the 19th century that certain communities, notably in Argentina, India and Turkey were chronically ill, with premature ageing, arthritis, mental retardation, and infertility; and high levels of natural fluorides in the water were responsible. Not only was it clear that the fluoride was having a general effect on the health of the community, but in the early 1920s Goldemberg, working in Argentina showed that fluoride was displacing iodine; thus compounding the damage

and rendering the community also hypothyroid from iodine deficiency.

Highly damaging to the thyroid gland

This was the basis of the research in the 1930s of May, Litzka, Gorlitzer von Mundy, who used fluoride preparations to treat over-active thyroid illness. Their patients either drank fluoridated water, swallowed fluoride pills or were bathed in fluoridated bath water; and their thyroid function was as a result, greatly depressed. The use in 1937 of fluorotyrosine for this purpose showed how effective this treatment was; but the effectiveness was difficult to predict and many patients suffered total thyroid loss. So it was given a new role and received a new name, Pardinon. It was marketed not for over-active thyroid disease but as a pesticide. (Note the manufacturer of fluorotyrosine was IG Farben who also made sarin, a gas used in World War II).

This bit of history illustrates the fact that fluorides are dangerous in general and in particular highly damaging to the thyroid gland, a matter to which I shall return shortly. While it is unlikely that it will be disputed that fluorides are toxic - let us be reminded that they are Schedule 2 Poisons under the Poisons Act 1972, the matter in dispute is the level of toxicity attributable to given amounts; in today's context the degree of damage caused by given concentrations in the water supply. While admitting its toxicity, proponents rely on the fact that it is diluted and therefore, it is claimed, unlikely to have deleterious effects.

They could not be more mistaken

It seems to me that we must be aware of how fluoride does its damage. It is an enzyme poison. Enzymes are complex protein compounds that vastly speed up biological chemical reactions while themselves remaining unchanged. As we speak, there occurs in all of us a vast multitude of these reactions to maintain life and produce the energy to sustain it. The chains of amino acids that make up these complex proteins are linked by simple compounds called amides; and it is with these that fluorine molecules react, splitting and distorting them, thus damaging the enzymes and their activity. Let it be said at once, this effect can occur at extraordinary low concentrations; even lower than the one part per million which is the dilution proposed for fluoridation in our water supply.

The body can only eliminate half

Moreover, fluorides are cumulative and build up steadily with ingestion of fluoride from all sources, which include not just water but the air we breathe and the food we eat. The use of fluoride toothpaste in dental hygiene and the coating of teeth are further sources of substantial levels of fluoride intake. The body can only eliminate half of the total intake, which means that the older you are the more fluoride will have accumulated in your body. Inevitably this means the ageing population is particularly targeted. And even worse for the very young there is a major element of risk in baby formula made with fluoridated water. The extreme sensitivity of the very young to fluoride toxicity makes this unacceptable. Since there are so many sources of fluoride in our everyday living, it will prove impossible to maintain an average level of 1ppm as is suggested.

What is the result of these toxic effects?

First the immune system. The distortion of protein structure causes the immune proteins to fail to recognise body proteins, and so instigate an attack on them, which is Autoimmune Disease. Autoimmune diseases constitute a body of disease processes troubling many thousands of people: Rheumatoid Arthritis, Systemic Lupus Erythematosus, Asthma and Systemic Sclerosis are examples; but in my particular context today, thyroid antibodies will be produced which will cause Thyroiditis resulting in the common hypothyroid disease, Hashimoto's Disease and the hyperthyroidism of Graves' Disease.

Musculo Skeletal damage results further from the enzyme toxic effect; the collagen tissue of which muscles, tendons, ligaments and bones are made, is damaged. Rheumatoid illness, osteoporosis and deformation of bones inevitably follow. This toxic effect extends to the ameloblasts making tooth enamel, which is consequently weakened and then made brittle; and its visible appearance is, of course, dental fluorosis.

The enzyme poison effect extends to our genes; DNA cannot repair itself, and chromosomes are damaged. Work at the University of Missouri showed genital damage, targeting ovaries and testes. Also affected is inter uterine growth and development of the foetus, especially the nervous system. Increased incidence of Down's Syndrome has been documented. Fluorides are mutagenic. That is, they can cause the uncontrolled proliferation of cells we call cancer. This applies to cancer anywhere in the body; but bones are particularly picked out. The incidence of osteosarcoma in a study reporting in 1991 showed an unbelievable 50% increase. A report in 1955 in the New England Journal of Medicine showed a 400% increase in cancer of the thyroid in San Francisco during the period their water was

fluoridated.

My particular concern is the effect of fluorides on the thyroid gland

Perhaps I may remind you about thyroid disease. The thyroid gland produces hormones which control our metabolism - the rate at which we burn our fuel. Deficiency is relatively common, much more than is generally accepted by many medical authorities: a figure of 1:4 or 1:3 by mid life is more likely. The illness is insidious in its onset and progression. People become tired, cold, overweight, depressed, constipated; they suffer arthritis, hair loss, infertility, atherosclerosis and chronic illness. Sadly, it is poorly diagnosed and poorly managed by very many doctors in this country.

What concerns me so deeply is that in concentrations as low as 1ppm, fluorides damage the thyroid system on 4 levels.

1. The enzyme manufacture of thyroid hormones within the thyroid gland itself. The process by which iodine is attached to the amino acid tyrosine and converted to the two significant thyroid hormones, thyroxine (T4) and liothyronine (T3), is slowed.

2. The stimulation of certain G proteins from the toxic effect of fluoride (whose function is to govern uptake of substances into each of the cells of the body), has the effect of switching off the uptake into the cell of the active thyroid hormone.

3. The thyroid control mechanism is compromised. The thyroid stimulating hormone output from the pituitary gland is inhibited by fluoride, thus reducing thyroid output of thyroid hormones.

4. Fluoride competes for the receptor sites on the thyroid gland which respond to the thyroid stimulating hormone; so that less of this hormone reaches the thyroid gland and so less thyroid hormone is manufactured. These damaging effects, all of which occur with small concentrations of fluoride, have obvious and easily identifiable effects on thyroid status. The running down of thyroid hormone means a slow slide into hypothyroidism. Already the incidence of hypothyroidism is increasing as a result of other environmental toxins and pollutions together with wide spread nutritional deficiencies.

141 million Europeans are at risk

One further factor should give us deep anxiety. Professor Hume of Dundee, in his paper given earlier this year to the Novartis Foundation, pointed out

that iodine deficiency is growing worldwide. There are 141 million Europeans are at risk; only 5 European countries are iodine sufficient. UK now falls into the marginal and focal category. Professor Hume recently produced figures to show that 40% of pregnant women in the Tayside region of Scotland were deficient by at least half of the iodine required for a normal pregnancy. A relatively high level of missing, decayed, filled teeth was noted in this non-fluoridated area, suggesting that the iodine deficiency was causing early hypothyroidism which interferes with the health of teeth. Dare one speculate on the result of now fluoridating the water?

Displaces iodine in the body

These figures would be worrying enough, since they mean that iodine deficiency, which results in hypothyroidism (thyroid hormone cannot be manufactured without iodine) is likely to affect huge numbers of people. What makes it infinitely worse, is that fluorine, being a halogen (chemically related to iodine), but very much more active, displaces iodine. So that the uptake of iodine is compromised by the ejection, as it were, of the iodine by fluorine. To condemn the entire population, already having marginal levels of iodine, to inevitable progressive failure of their thyroid system by fluoridating the water, borders on criminal lunacy.

I would like to place a scenario in front of those colleagues who favour fluoridation. A new pill is marketed. Some trials not all together satisfactory, nevertheless, show a striking improvement in dental caries. Unfortunately, it has been found to be thyrotoxic, mutagenic, immunosuppressive, cause arthritis and infertility in comparatively small doses over a relatively short period of time.

Do you think it should be marketed?

Fluoridation of the nation's water supply will do little for our dental health; but will have catastrophic effects on our general health. We cannot, must not, dare not, subject our nation to this appalling risk.

Dr Barry Durrant-Peatfield

obtained his Medical degrees in 1960 at Guy's Hospital London. He left the NHS in 1980 to specialise in thyroid illnesses drawing inspiration from the work of infamous Dr Broda Barnes, at the Foundation that bears his name, Connecticut, USA. He has been a medical practitioner for over forty years specialising in metabolic disorders during which time he became a leading authority in the UK for thyroid and adrenal management. For over twenty years he also ran a successful private clinic and became a nation-wide leading authority on thyroid and adrenal dysfunction, but clashed with

establishment medicine in the management of thyroid illness. He is the author of *The Great Thyroid Scandal* (see opposite page), he currently lectures at nutritional colleges in London as well as conducting his own teaching seminars. Barry will shortly be opening a diagnostic clinic in the UK for thyroid and adrenal disorders where he will provide advice on diagnosis and treatment with special interests in nutritional aspects. For further information contact: Dr B Durrant- Peatfield 36A High St, Mersham, Redhill Surrey, RH1 3EA.

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Sarin: (GB: isopropyl methylphosono-fluoridate) is a colorless, odorless volatile liquid, soluble in water, first synthesized at IG Farben in 1938. It kills mainly through inhalation.

Cyclosarin (GF) and Thiosarin are variants. Pennsylvania Department of Health

<http://www.dsf.health.state.pa.us/health/cwp/view.asp?a=171&q=233740>

Sarin: (GB: $\text{CH}_3\text{-P}(=\text{O})(\text{-F})(\text{-OCH}(\text{CH}_3)_2)$)

Source: A FOA Briefing Book on Chemical Weapons

<http://www.opcw.org/resp/html/nerve.html> Gerhard Schrader, a chemist at IG Farben, was given the task of developing a pesticide. Two years later a phosphorus compound with extremely high toxicity was produced for the first time.

IG Farben: "...the board of American IG Farben had three directors from the Federal Reserve Bank of New York, the most influential of the various

Federal Reserve Banks. American IG Farben. also had interlocks with Standard Oil of New Jersey, Ford Motor Company, Bank of Manhattan (later to become the Chase Manhattan Bank), and AEG. (German General Electric) Source: Moody's Manual of Investments; 1930, page 2149."

http://reformed-theology.org/html/books/wall_street/chapter_02.htm

At a later date, Namaste will be publishing a more in-depth article outlining the devastating affects that fluoride, aspartame and MSG have on the endocrine system.

Dr Durrant-Peatfield wiill be answering frequently asked questions on thyroid illness in Namaste's next issue. Send your questions to us preferably by

email to: info@namastepublishing.co.uk

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By The Fluoride Action Network

It has been established that fluoride has the ability to alter your endocrine function, yet this fact is being ignored by the agencies and associations that continue to promote the practice of water fluoridation.

According to a 2006 report by the National Research Council of the National Academies¹, fluoride is "an endocrine disruptor in the broad sense of altering normal endocrine function."

This altered function can involve your thyroid, parathyroid, and pineal glands, as well as your adrenals, pancreas, and pituitary.

Your thyroid gland and its associated hormones are responsible for maintaining your body's overall metabolic rate, and for regulating normal growth and development. As all metabolically active cells require thyroid hormone for proper functioning, disruption of this system can have a wide range of effects on virtually every system of your body. Thyroid dysfunction is considered among the most prevalent of endocrine diseases in the United States.

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Historical Use of Fluoride as a Medical Intervention for Hyperthyroid

Up until the 1970s, scientists in Europe prescribed fluoride to reduce the basal metabolism rate in patients with an over-active thyroid gland. One published clinical study from this period reported that doses of just 2 to 3 milligrams of fluoride—a dose that many, if not most, Americans now receive on a regular basis—were sufficient to reduce thyroid activity in hyperthyroid patients.

The use of fluoride as an anti-thyroid treatment was prompted by research beginning in the 1800s² linking fluoride ingestion to goiter, a swelling of the thyroid gland resulting from a hypothyroid condition.

In its 2006 report *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*, the National Research Council (NRC) reported that "several lines of information indicate an effect of fluoride on thyroid function."

Every "Like" Helps Support This Cause

Specifically, the report discussed research showing that:

"fluoride exposure in humans is associated with elevated TSH concentrations, increased goiter prevalence, and altered T4 and T3 concentrations" with "similar effects on T4 and T3...reported in experimental animals."

In addition, the NRC discussed research linking fluoride to impacts on parathyroid activity, impairment of glucose tolerance, and possibly the timing of sexual maturity.

In light of these findings, the NRC panel recommended that the "effects of fluoride on various aspects of endocrine function should be examined further, particularly with respect to a possible role in the development of several diseases or mental states in the United States"³. Despite this, proponents of fluoridation continue to ignore the scientific literature concerning the detrimental effects that fluoride has on the endocrine system.

Surprisingly Tiny Amounts of Fluoride Can Change Your Thyroid Function

Altered thyroid function is associated with fluoride intakes as low as 0.05-0.1 mg fluoride per kilogram body weight per day (mg/kg/day), or 0.03 mg/kg/day with iodine deficiency. Increased prevalence of goiter (>20 percent) is associated with fluoride intakes of 0.07-0.13 mg/kg/day, or 0.01 mg/kg/day with iodine deficiency.⁴

For a 70 kg (154 pound) adult, this means that 3.5 mg fluoride per day (or 0.7 mg fluoride per day with iodine deficiency) could result in thy-

roid dysfunction. The most recent exposure analysis by the U.S. Environmental Protection Agency² estimates that the average American adult is consuming nearly 3 mg fluoride on a daily basis, and some are routinely ingesting 6 mg per day or more.

Even more concerning, however, are the doses of fluoride in children.

For a 14 kg (30 pound) child, fluoride intakes greater than 0.7 mg per day (or 0.14 mg per day with iodine deficiency) puts the child at risk for endocrine dysfunction. The EPA (2010) estimates children within this weight range (1-3 year-olds) consume over 1.5 mg fluoride each day, or *more than twice the amount necessary to induce altered thyroid function*, even with an adequate iodine intake.

These chronic exposures could have profound and life-long effects on the intellectual, social, sexual and overall physical development of children.

Numerous studies have found a relationship between relatively low to moderate levels of fluoride exposure and reduced IQ in children⁶. Even fluoride levels of less than 1.0 mg/L have been associated with reduced IQ and increased frequency of hypothyroidism in children experiencing iodine deficiency⁷.

Iodine Deficiency, Fluoride, and Thyroid Disease

Iodine is necessary for proper functioning of your thyroid gland. As your body cannot produce its own iodine, it must be obtained from your diet. Iodine is sequestered into your thyroid gland, where it is incorporated into the thyroid hormones thyroxine (T4) or triiodothyronine (T3). In healthy individuals these hormones are precisely regulated by thyroid-stimulating hormone (TSH), and are required by all metabolically active cells in your body.

Iodine deficiency is known to be responsible for a variety of disorders—including hypothyroidism, goiter, and disturbances of physical and mental development. According to recent research, "normal" dietary intake of iodine is 100-150 mcg per day, however greater amounts of iodine are recommended for pregnant and lactating women, as studies have shown that the most detrimental effects of iodine deficiency occur during fetal and neonatal growth.

The primary sources of iodine are saltwater fish and seaweed, with grains providing trace amounts. An estimated 2.2 billion people worldwide are at risk for iodine deficiency⁸. Many countries have introduced iodine supplements into the food supply to combat deficiencies, such as has been done with table salt in the United States, where iodine deficiency is generally no longer considered a problem.

However, data suggest that iodine intakes have decreased over the past few decades⁹. Although this decline may have stabilized in recent years¹⁰, more than 11 percent of all Americans—and more than 15 percent of American women of child-bearing age—presently have urine iodine levels less than 50 mcg/L¹¹, indicating moderate to severe iodine deficiency. An additional 36 percent of reproductive-aged women in the U.S. are considered mildly iodine deficient (<100 mcg/L urinary iodine).

Considering the importance of iodine for proper functioning of your thyroid gland, and the importance of your thyroid gland for proper functioning of your entire body, any disturbances to this delicate balance must be seriously considered. Your thyroid gland may be the most sensitive tissue in your body to fluoride¹², with more fluoride accumulating in your thyroid than many other soft tissues¹³.

Fluoride may directly or indirectly interfere with proper functioning of your thyroid gland, with potential actions including fluoride's ability to:

- Mimic thyroid-stimulating hormone (TSH)
- Disrupt sensitive G-proteins, which serve as the building blocks of your body's hormone receptors
- Damage the cells of your thyroid gland
- Damage your DNA¹⁴
- Disrupt conversion from the inactive form of the thyroid hormone (T4) to the active form (T3)

Inadequate diet—including deficiencies in iodine, calcium and protein—can play a key role in fluoride-induced thyroid dysfunction. For someone with a deficient diet and/or an already compromised thyroid gland, any of the detrimental effects of fluoride exposure on the thyroid system, and thus the entire body, will likely be compounded. In fact, in one 2005 study, Gas'kov et al.¹⁵ determined that even an increased intake of iodine would not be sufficient to counter the adverse effects of excessive fluoride exposure on the thyroid gland in children.

When the function of your thyroid gland is suppressed, your body cannot produce or maintain adequate levels of T3 and T4, resulting in a condition known as hypothyroidism.

Hypothyroidism is Pervasive Among Women

According to PubMed Health, women over the age of 50 are at the highest risk for developing hypothyroidism, or under-active thyroid. Nearly 4 percent of the U.S. population (over 11 million people) have overt hypothyroidism.¹⁶ Perhaps an additional 10 percent of the general population (21 million people) have subclinical hypothyroidism, which is considered a strong risk factor for later development of overt hypothyroidism.

It is important to understand that even these surprisingly large numbers likely vastly underreport the number of women that are affected as

they rely on outdated criteria to diagnose hypothyroidism.

The frequency of hypothyroidism tends to increase with age—one 2010 study estimates that up to 20 percent of older age groups have some form of hypothyroidism. Synthroid and Armour, both pharmaceuticals used to treat hypothyroidism, were the 7th and 73rd top selling drugs in the United States in 2009, with over 24 million combined units sold.

Symptoms of hypothyroidism are numerous, and may include:

fatigue, loss of energy, general lethargy	cold intolerance
muscle and/or joint pain	decreased sweating
depression	puffiness
weight gain	coarse or dry skin and hair
hair loss	sleep apnea
carpal tunnel syndrome	forgetfulness, impaired memory, inability to concentrate
weakness in extremities	bradycardia (reduced heart rate)
menstrual disturbances	decreased appetite
impaired fertility	constipation
fullness in the throat, hoarseness	increased risk of heart disease
increased "bad" cholesterol (LDL)	decreased hearing
emotional instability	blurred vision
mental impairment	

Despite a higher incidence in older populations, the rate of primary (neonatal) congenital hypothyroidism has increased by nearly 75 percent over the past two decades in the United States, now affecting 1 in every 2,370 births¹⁷. Untreated neonatal hypothyroidism can lead to mental retardation, growth retardation, and heart problems. Children with congenital or juvenile hypothyroidism have been reported to have delayed eruption of teeth and/or enamel defects, although the connection between these findings and the impact of fluoride on the thyroid has not been studied¹⁸.

Also extremely concerning is the inverse relationship between the severity of subclinical hypothyroidism in pregnant women and the reduced IQ of their children¹⁹. Maternal subclinical hypothyroidism has also been proposed as a cause or contributor in the development of autism²⁰.

Fluoride's potential to impact the thyroid gland highlights, yet again, the need for a precautionary approach to the indiscriminate use of fluorides. The deliberate addition of fluoride to public drinking water supplies is particularly problematic, as it exposes your *entire body*—not just your teeth—to a biologically-active substance, without regard to individual need or sensitivity, and thereby violates key principles of modern pharmacology.

Important! The producers of this powerful film are allowing a full and FREE preview through August 13th in celebration of Fluoride Awareness Week (Aug 7 - 13)! You can support Fluoride Action Network by purchasing the Professional Perspectives DVD at a special price of \$10 during Fluoride Awareness Week.

What You Can Do TODAY!

The Fluoride Action Network has a game plan to END water fluoridation in both Canada and the United States, and this Fluoride Awareness Week will hopefully bring us a lot closer to that goal by spreading mass awareness.

We're pleased to report that during Fluoride Awareness Week, yet another city, Philomath in Oregon, decided to remove fluoride from their water supply! Proof again that there is hope for change in your city, and you CAN make it happen.

Our fluoride initiative is primarily focused on Canada since 60 percent of Canada is already non-fluoridated. If we can get the rest of Canada to stop fluoridating their water, we believe the U.S. will be forced to follow.

Please, join the anti-fluoride movement in Canada, New Zealand and the United States by contacting the representative for your area below.

If you are a mom and want to see an end to water fluoridation, you can also contact a new group called "**Moms Against Fluoridation**" by sending an email to: info@MomsAgainstFluoridation.org.

Contact information for Canadian Communities:

1. If you live in **Ontario, Canada**, please join the ongoing effort by contacting Diane Sprules at diane.sprules@cogeco.ca.
2. The point-of-contact for **Toronto, Canada** is Aliss Terpstra. You may email her at aliss@nutrimom.ca.

Contact information for American Communities:

We're also going to address three US communities: New York City, Austin, and San Diego:

1. **New York City, NY:** With the recent victory in Calgary, New York City is the next big emphasis. The anti-fluoridation movement has a great champion in New York City councilor Peter Vallone, Jr. who introduced legislation on January 18 "prohibiting the addition of fluoride to the water supply."

A victory there could signal the beginning of the end of fluoridation in the U.S.

If you live in the New York area I beg you to participate in this effort as your contribution could have a MAJOR difference. Remember that one person can make a difference.

The point person for this area is Carol Kopf, at the New York Coalition Opposed to Fluoridation (NYSCOF). Email her at NYSCOF@aol.com. Please contact her if you're interested in helping with this effort.

2. **Austin, Texas:** Join the effort by contacting Rae Nadler-Olenick at either: info@fluoridefreeaustin.com or fluoride.info@yahoo.com, or by regular mail or telephone:

POB 7486
Austin, Texas 78713

3. **San Diego, California:** Contact Patty Ducey-Brooks, publisher of the Presidio Sentinel at pbrooks936@aol.com .

Contact Information for New Zealand Communities:

1. **New Zealand:** Contact Mary Byrne if you would like to be involved in stopping fluoridation in New Zealand. Mary would like to hear from you! Email her at: mbyrne64@yahoo.co.nz

In addition, you can:

- Tell the EPA you expect them to uphold their duty to protect you and your children from this toxic food fumigant.
- Make a generous tax-deductible [donation to the Fluoride Action Network](#), to help them fight for your rights to fluoride-free food and water.
- Check out [FAN's Action Page](#), as they are working on multiple fronts to rid our food and water supplies of fluoride.
- For timely updates, join the [Fluoride Action Network Facebook page](#).

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Join the Fight to Get Fluoride Out of Drinking Water

There's no doubt about it: *fluoride should not be ingested*. Even scientists from the EPA's National Health and Environmental Effects Research Laboratory have classified fluoride as a "chemical having substantial evidence of developmental neurotoxicity." Furthermore, according to the Centers for Disease Control and Prevention (CDC), 41 percent of American adolescents now have dental fluorosis—unattractive discoloration and mottling of the teeth that indicate overexposure to fluoride. Clearly, children are being overexposed, and their health and development put in jeopardy. *Why?*

At least when it comes to topical application, you have a choice. You can easily buy fluoride-free toothpaste and mouthwash. But you're stuck with whatever your community puts in the water, and it's very difficult to filter out of your water once it's added. Many do not have the resources or the knowledge to do so.

The only real solution is to stop the archaic practice of water fluoridation in the first place. Fortunately, the Fluoride Action Network has a game plan to END water fluoridation, both in the United States and Canada. Clean pure water is a prerequisite to optimal health. Industrial chemicals, drugs and other toxic additives really have no place in our water supplies. So, please, support the anti-fluoride movement by making a donation to the Fluoride Action Network today.

[+] Comments (117)

Thank you! Your purchases help us support these charities and organizations.

THYROID

"The effects of fluoride on various aspects of endocrine function should be examined, particularly with respect to a possible role in the development of several diseases or mental states in the United States. Major areas of investigation include . . . thyroid disease (especially in light of decreasing iodine intake by the U.S. population)." (National Research Council 2006).

THYROID

The thyroid gland, which regulates the body's metabolic rate, plays an exquisitely important role in human health. Because all metabolically active cells require thyroid hormone for proper functioning, thyroid disruption can have a wide range of effects on virtually every system of the body. Chemicals that interfere with thyroid function must be treated with great caution. According to the U.S. National Research Council, and as discussed below, there is substantial evidence that fluoride exposure can impact thyroid function in some individuals. (NRC 2006).

Fluoride Was Once Prescribed as an Anti-Thyroid Drug

When people think of fluoride being prescribed for medicinal purposes, they generally think of fluoride supplementation to reduce tooth decay. Fluoride, however, has also been prescribed as a drug to reduce the activity of the thyroid gland. Up through the 1950s, doctors in Europe and South America prescribed fluoride to reduce thyroid function in patients with over-active thyroids (hyperthyroidism). (Merck Index 1968). Doctors selected fluoride as a thyroid suppressant based on findings linking fluoride to goitre, and, as predicted, fluoride therapy did reduce thyroid activity in the treated patients. (McClaren 1969; Galletti 1958; May 1937). Moreover, according to clinical research, the fluoride dose capable of reducing thyroid function was notably low – just 2 to 5 mg per day over several months. (Galletti & Joyet 1958). This dose is well within the range (1.6 to 6.6 mg/day) of what individuals living in fluoridated communities are now estimated to receive on a regular basis. (DHHS 1991).

Fluoride & Hypothyroidism

Based on fluoride's anti-thyroid effects in hyperthyroid patients, concerns have arisen about whether current fluoride exposures could be contributing to the increased prevalence of under-active thyroid (clinical and/or subclinical hypothyroidism) in the United States and other nations. Supporting this possibility are a number of studies from China, India, and Russia that have found alterations in thyroid hormones, including reduced T3 and increased TSH, in populations exposed to elevated levels of fluoride in the workplace or in the water. (NRC 2006; Susheela 2005; Mikhaillets

1996; Yao 1996; Bachinskii 1985; Yu 1985).

In clinical hypothyroidism, the thyroid gland fails to produce sufficient quantities of the hormones triiodothyronine (T3) and thyroxine (T4). These hormones are required by all metabolically active cells, and their reduced presence can thus produce a range of ill effects, including fatigue, muscle/joint pain, depression, weight gain, menstrual disturbances, impaired fertility, impaired memory, and inability to concentrate. When T3 and T4 levels begin to fall, the pituitary gland responds by increasing production of "Thyroid Stimulating Hormone" (TSH) as a means of getting the thyroid to produce more T3 and T4.

In subclinical hypothyroidism, the TSH level is elevated, but the T3 and T4 hormones are still within the normal range. Although subclinical hypothyroidism used to be regarded as largely inconsequential, it is increasingly considered a "clinically important disorder." (Gencer 2012). Some studies have found, for example, that subclinical hypothyroidism in pregnant women results in reduced IQ in offspring, (Klein 2001; Haddow 1999), and a recent study in the *Journal of the American Medical Association* found that adults with subclinical hypothyroidism had a significantly higher rate of coronary heart disease. (Rodondi 2010).

Thyroid Hormone Levels Based on Severity of Dental Fluorosis (Hosur 2012). Studies investigating fluoride's impact on thyroid hormone levels have produced divergent findings, but are consistent with fluoride having an anti-thyroid effect under certain circumstances. (NRC 2006). The most common thyroid effect associated with fluoride exposure appears to be an increase in TSH levels, with or without a corresponding effect on T3 or T4. (Susheela 2005). One of the most recent studies, for example, found a trend towards higher TSH in children based on the severity of their dental fluorosis, but without a significant effect on either T3 or T4. (Hosur 2012, see figure). These and other findings indicate that fluoride can contribute to a subclinical, if not clinical, hypothyroid condition. It remains difficult to predict the toxic dose, however, as it appears to depend, in part, on the nutritional and health status of the individual, particularly the adequacy of iodine intake. (NRC 2006).

Fluoride Exacerbates the Impact of Iodine Deficiency

A consistent body of animal and human research shows that fluoride exposure worsens the impact of an iodine deficiency. (Gas'kov 2005; Hong 2001; Wang 2001; Zhao 1998; Xu 1994; Lin 1991; Ren 1989; Guan 1988). Iodine is the basic building block of the T3 and T4 hormones and thus an adequate iodine intake is essential for the proper functioning of the thyroid gland. When iodine intake is inadequate during infancy and early childhood, the child's brain can suffer permanent damage, including mental retardation. (Iodine deficiency is the leading cause of mental retardation throughout the world.)

In China, researchers have repeatedly found that an iodine deficiency coupled with

fluoride exposure produces a significantly more damaging effect on neurological development than iodine deficiency alone. (Hong 2001; Xu 1994; Lin 1991; Ren 1989). The studies, which utilize childhood intelligence as the metric for assessing neurological health, have found that fluoride levels as low as 0.9 ppm can worsen the IQ effect of iodine deficiency. (Lin 1991). This concentration is within the purported "optimal" range of fluoride that is added to water in water fluoridation programs (0.7-1.2 ppm). While many studies have found an association between fluoride and reduced IQ among children with adequate iodine intake, (Choi 2012), an iodine deficiency will lower the threshold at which fluoride damages the brain. (Xu 1994; Guan 1988). An iodine deficiency will also lower the threshold for other forms of fluoride toxicity as well, including dental fluorosis. (Zhao 1998; see also Pontigo-Loyola 2008).

Iodine Deficiency Remains a Public Health Concern in the U.S.

Despite the widespread availability of iodized salt, iodine deficiency has re-emerged as a public health concern in the United States. (CDC 1998). More than 11% of all Americans, and more than 15% of American women of child-bearing age, presently have urine iodine levels less than 50 mcg/L (Caldwell et al., 2008), indicating moderate to severe iodine deficiency. An additional 36% of reproductive-aged women in the U.S. are considered mildly iodine deficient (<100 mcg/L urinary iodine). Fluoride's ability to worsen the effects of an iodine deficiency could thus be highly relevant to populations in the U.S. The National Research Council has therefore called upon the scientific community to begin investigating the interactive effects of fluoride and iodine in U.S. populations. So far, no such research has been conducted.

Fluoride & Goitre

Studies dating back to the 19th century have implicated fluoride as a possible cause of goitre. Goitre (aka goiter) is an enlargement of the thyroid gland that in some cases can produce visible swelling in the neck. Although the main cause of goitre is iodine deficiency, it can also be caused by other things, including hypothyroidism and goitrogens (substances that cause goitre). Studies that have examined human populations with adequate intake of iodine have reported mixed results about fluoride's ability to produce goitre. (NRC 2006; Burgi 1984; McLaren 1969). The research has been more consistent, however, where the examined populations had either excessive iodine intakes, or deficient iodine intakes. (Gas'kov 2005; Hong 2001; Wang 2001; Xu 1994; Yang 1994; Lin 1986). Most of this latter research, however, was initially published in either Russian or Chinese and was only recently translated into English by the Fluoride Action Network. Accordingly, previous reviews of fluoride/goitre research (e.g., NRC 2006) were not able to take these studies into account. As such, the evidence linking fluoride to goitre for populations with excessive, or deficient, iodine exposure is stronger than previously recognized. Read more.

Fluoride, Thyroid, & Dogs

An investigation by the Environmental Working Group found that commercial dog food contains very high levels of fluoride (due, in part, to the presence of fluoride-rich bone particles). Since dogs have been found to suffer a high incidence of hypothyroidism, the relationship between fluoride contamination and thyroid disease in dogs deserves further attention, particularly since it was fluoride's production of goiter in dogs that first prompted the idea that fluoride could be an anti-thyroid agent. (Maumene 1854).

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Fluoride in Drinking Water: A Scientific Review of EPA's Standards (2006)

Overview

Excerpted from a 500+ page study ↗
.....**Effects on the Endocrine System**

The endocrine system, apart from reproductive aspects, was not considered in detail in recent major reviews of the health effects of fluoride (PHS 1991; NRC 1993; Locker 1999; McDonagh et al. 2000a; WHO 2002; ATSDR 2003). Both the Public Health Service (PHS 1991) and the World Health Organization (WHO 2002) mentioned secondary hyperparathyroidism in connection with discussions of skeletal fluorosis, but neither report examined endocrine effects any further. The Agency for Toxic Substances and Disease Registry (ATSDR 2003) discussed four papers on thyroid effects and two papers on parathyroid effects and concluded that "there are some data to suggest that fluoride does adversely affect some endocrine glands." McDonagh et al. (2000a) reviewed a number of human studies of fluoride effects, including three that dealt with goiter and one that dealt with age at menarche. The following section reviews material on the effects of fluoride on the endocrine system—in particular, the thyroid (both follicular cells and parafollicular cells), parathyroid, and pineal glands. Each of these sections has its own discussion section. Detailed information about study designs, exposure conditions, and results is provided in Appendix E.

THYROID FOLLICULAR CELLS

The follicular cells of the thyroid gland produce the classic thyroid hormones thyroxine (T4) and triiodothyronine (T3); these hormones modulate a variety of physiological processes, including but not limited to normal growth and development (Larsen et al. 2002; Larsen and Davies 2002; Goodman 2003). Between 4% and 5% of the U.S. population may be affected by deranged thyroid function (Goodman 2003), making it among the most prevalent of endocrine diseases (Larsen et al. 2002). The prevalence of subclinical thyroid dysfunction in various populations is 1.3-17.5% for subclinical hypothyroidism and 0.6-16% for subclinical hyperthyroidism; the reported rates depend on age, sex, iodine intake, sensitivity of measurements, and definition used (Biondi et al. 2002). Normal thyroid function requires sufficient intake of iodine (at least 100 micrograms/day [$\mu\text{g}/\text{d}$]), and areas of endemic iodine deficiency are associated with disorders such as endemic goiter and cretinism (Larsen et al. 2002; Larsen and Davies 2002; Goodman 2003). Iodine intake in the United States (where iodine is added to table salt) is decreasing (CDC 2002d; Larsen et al. 2002), and an estimated 12% of the population has low concentrations of urinary iodine (Larsen et al. 2002).

The principal regulator of thyroid function is the pituitary hormone thyroid-stimulating hormone (TSH), which in turn is controlled by positive input from the hypothalamic hormone thyrotropin-releasing hormone (TRH) and by negative input from

T4 and T3. TSH binds to G-protein-coupled receptors in the surface membranes of thyroid follicular cells (Goodman 2003), which leads to increases in both the cyclic adenosine monophosphate (cAMP) and diacylglycerol/inositol trisphosphate second messenger pathways (Goodman 2003). T3, rather than T4, probably is responsible for the feedback response for TSH production (Schneider et al. 2001). Some T3, the active form of thyroid hormone, is secreted directly by the thyroid along with T4, but most T3 is produced from T4 by one of two deiodinases (Types I and II) in the peripheral tissue (Schneider et al. 2001; Larsen et al. 2002; Goodman 2003). T3 enters the nucleus of the target cells and binds to specific receptors, which activate specific genes.

Background

An effect of fluoride exposure on the thyroid was first reported approximately 150 years ago (Maumené 1854, 1866; as cited in various reports). In 1923, the director of the Idaho Public Health Service, in a letter to the Surgeon General, reported enlarged thyroids in many children between the ages of 12 and 15 using city water in the village of Oakley, Idaho (Almond 1923); in addition, the children using city water had severe enamel deficiencies in their permanent teeth. The dental problems were eventually attributed to the presence in the city water of 6 mg/L fluoride, and children born after a change in water supply (to water with <0.5 mg/L fluoride) were not

1 Type I deiodinase, along with Type III, is also responsible for deactivating T4 and T3 by removing th atoms (Schneider et al. 2001; Larsen et al. 2002; Goodman 2003).

so affected (McKay 1933); however, there seems to have been no further report on thyroid conditions in the village.

More recently, Demole (1970) argued that a specific toxicity of fluoride for the thyroid gland does not exist, because (1) fluoride does not accumulate in the thyroid; (2) fluoride does not affect the uptake of iodine by thyroid tissue; (3) pathologic changes in the thyroid show no increased frequency in regions where water is fluoridated (naturally or artificially); (4) administration of fluoride does not interfere with the prophylactic action of iodine on endemic goiter; and (5) the beneficial effect of iodine in threshold dosage to experimental animals is not inhibited by administration of fluoride, even in excessive amounts. Bürgi et al. (1984) also stated that fluoride does not potentiate the consequences of iodine deficiency in populations with a borderline or low iodine intake and that published data fail to support the hypothesis that fluoride has adverse effects on the thyroid (at doses recommended for caries prevention). McLaren (1976), however, pointed out the complexity of the system, the difficulties in making adequate comparisons of the various studies of fluoride and the thyroid, and evidence for fluoride accumulation in the thyroid and morphological and functional changes (e.g., changes in activity of adenyl cyclase), suggesting that analytical methods could have limited the definitiveness of the data to date. His review suggested that physiological or functional changes might occur at fluoride intakes of 5 mg/day.

Although fluoride does not accumulate significantly in most soft tissue (as compared to bones and teeth), several older studies found that fluoride concentrations in thyroid

tissue generally exceed those in most other tissue except kidney (e.g., Chang et al. 1934; Hein et al. 1954, 1956); more recent information with improved analytic methods for fluoride was not located. Several studies have reported no effect of fluoride treatment on thyroid weight or morphology (Gedalia et al. 1960; Stolc and Podoba 1960; Saka et al. 1965; Bobek et al. 1976; Hara 1980), while others have reported such morphological changes as mild atrophy of the follicular epithelium (Ogilvie 1953), distended endoplasmic reticulum in follicular cells (Sundström 1971), and "morphological changes suggesting hormonal hypofunction" (Jonderko et al. 1983).

Fluoride was once thought to compete with iodide for transport into the thyroid, but several studies have demonstrated that this does not occur (Harris and Hayes 1955; Levi and Silberstein 1955; Anbar et al. 1959; Saka et al. 1965). The iodide transporter accepts other negatively charged ions besides iodide (e.g., perchlorate), but they are about the same size as iodide (Anbar et al. 1959); fluoride ion is considerably smaller and does not appear to displace iodide in the transporter.....

This study goes on for another 100 pages explaining the negative effects on the endocrine system from fluoride exposure in animal and human studies.