

Artificial Water Fluoridation

Off to a poor start / fluoride injures the newborn

Sheldon Thomas
Director
Clear Water Legacy Inc.

January 1, 2015

Artificial Water Fluoridation

Injury to the Newborn

On December 3, 2011, Mr. Neil Johnston, a faculty member in McMaster University's department of medicine, shared his thoughts about early childhood development in his Hamilton Spectator published article, 'A Champion for Each Pregnant Woman'.

Mr. Johnston is not new to the study of the human condition. As a skilled epidemiologist, he was a valued contributor to the Hamilton Spectator's award-winning 'Code Red' and 'BORN' projects.

'Code Red' established that poverty and poor health are intrinsically linked. 'BORN' examined the determinants of health among mothers and babies across the province.

He wrote, "There is no magic formula that will guarantee to every child a life with no wants and perfect health, but it is in the interest of all of us to provide every child born in Ontario with the best possible chance of lifetime health and the ability to learn. It is also natural justice."

Mr. Johnston then listed the sensible precautions that should be taken to lessen the chances of poor birth outcomes that can include compromised early childhood development:

"Effective prenatal care including good maternal nutrition, avoidance of stress and fetal exposure to harmful substances, provision of effective medical and nursing care, along with a well-managed birth, are more likely than not to improve the chances that healthy children will be born."

As he eloquently noted, it is "natural justice" that children be offered the best chance for a lifetime of health.

The City of Hamilton, which is home to McMaster University, is on board. The corporate mission statement calls for Hamilton to become one of the best places in Canada to raise a child. Eliminating threats to early childhood development would be a very good place to start.

No doctor or public health agency anywhere would contest Mr. Johnston's description of essential birth-friendly health care, and all would echo his warning against "fetal exposures to harmful substances".

We trust our medical professionals to warn us of those harmful substances. We also publicly fund several health research institutes to study substances that give indication of being harmful to *anyone's* health.

The Canadian Institutes of Health Research (CIHR) has 13 separate publically-funded research institutes under its umbrella. One would anticipate that the full force of the CIHR would be turned to examine *any* perceived threat to childhood development.

Our young are particularly vulnerable to intrauterine toxins that can injure the fetus, and later to environmental contaminants that can cause harm in the early years of childhood.

It is the prevailing belief that Public Health insulates our children from harm with protective policies, close surveillance of perceived health threats, and scientific analysis of all contaminants suspected of being injurious.

Evidence indicates, however, that despite many prior warnings of physical and mental injuries that could result, an ill-considered public health policy has been implemented and allowed to fly under the medical radar for 70 years.

This policy enables the introduction of a toxin into the bloodstreams of pregnant women. This toxin can be present at the moment of conception. It is one of those “harmful substances” that Mr. Johnston warned of. And it is no secret that this toxin can find its way into the delicate confines of the womb.

In 1944, major public health agencies on both sides of the border conceived, introduced and then began to vigorously promote a health policy that their own medical predecessors had warned could be devastating for human beings. ¹ Devastating, especially, to the very young.

That disputed public health policy is Artificial Water Fluoridation (AWF).

AWF is the addition of synthetic fluoride chemicals into drinking water to release fluoride ions, artificially elevating the concentrations of fluoride above the levels naturally found in source water.

The addition of these chemicals creates a medication that is claimed to strengthen teeth and reduce dental caries. This medication is then carried by water pipes and arbitrarily supplied to every user of the drinking water system.

Everyone is prescribed the medication whether they want it or not.

Everyone gets it even though no properly designed, double-blind, randomized control trial (RCT) has ever been conducted to prove that this crude medication is safe, or that it effectively reduces caries.

Everyone is being advised to drink the medication for a lifetime, regardless of age, sex, race, unique sensitivities, or medical condition.

And *no one* monitors the ones who ingest this medication, so the benefits or harms of taking what the USFDA classifies as an ‘unproven drug’⁴³ remain a complete unknown.

The quest for answers

In its September 2008 response to Environmental Petition 245 filed under Section 22 of the Auditor General Act, Health Canada was caused to admit that it “does not conduct research on the chemistry of fluoride species”.

For better than 70 years an army of seasoned toxicologists, neuro-pharmacologists and biochemists have loudly shouted their opposition to AWF, even in the face of harsh professional ostracism.

Seemingly unimpressed, Health Canada has not engaged the publically-funded CIHR or any other resource to study the list of fluoridating chemicals to confirm if they are either safe for use, or effective as the primary ingredients of a medication purported to save teeth.

In the same petition, Health Canada responded to the question, 'Which government agency is responsible for disclosing all sources of and quantifying potential and historically-based exposures to fluoride?'

The answer provided: "There is no federal agency responsible for such data."

In the absence of data, no federal agency, including Health Canada, can monitor the many non-drinking water fluoride sources to enable accurate measurement of the total fluoride exposure of individual Canadians.

Quite simply, after 70 long years, there is no one to reveal if any of us is getting too much. At any stage of life.

On May 15, 2014, Health Canada's Access to Information and Privacy Division opened file A-2014-00168 to respond to a series of questions asked by an Edmonton resident.

The 9 questions submitted asked for the release of any old or new studies done in Canada, or done anywhere else in the world, that would prove the use of hydrofluorosilicic acid (a common fluoridating chemical) to be safe for use, or to be effective in preventing dental caries.

The response: "After a **thorough** search for the requested information, no records were located which respond to your request." (emphasis added)

Though Health Canada is well aware that most fluoridating communities use hydrofluorosilicic acid (a decidedly non-pharmaceutical chimney-wash category 1 chemical waste), it apparently cannot lay its hands on *any* evidence that proves the chemical to be safe to add into drinking water, or that its use creates a medication that is protective of teeth.

Health Canada does not *know* that AWF is safe, as *to know* requires that it conduct very high quality studies to prove that its recommended 'optimum concentration' of 0.7 mg/l of fluoride is safe .. *for all*.

Health Canada has determined, without the benefit of toxicology studies or clinical trials, that 0.7 mg/l is the concentration of fluoride in drinking water that is protective of teeth.

0.7 mg/l apparently also sidesteps the more severe stages of dental fluorosis that warrant the 'adverse health effect' designation.

While trying to defend its 'optimum concentration' recommendation, Health Canada is ignoring one of the basic principles of toxicology, that 'The *dose* makes the poison'.

A doctor will recommend a certain strength of medicine (concentration) and will then advise the patient of how much (the dosage) of that medication to take daily.

A doctor will take into account a number of determinants before recommending a medicine's dosage, such as patient age, sex, body weight, current health conditions, and conflicts with other medications currently being taken.

The doctor wants the dosage to be correct. Too high a dose could make the medicine poisonous to the patient. To further guard against that possibility, the doctor will monitor the patient's progress on the medication.

Health Canada is endorsing a water fluoridation policy that places municipal councilors into the roles of doctors, causing them to agree to prescribe an unproven dental medication community-wide while having no control of the dosage that their citizens will receive on any given day.

Councillors are being encouraged to do what no doctor is allowed to do .. prescribe an untested medicine, to all persons regardless of age, need or medical condition, with no control of dosage, and with nothing in place to measure the health effects of those taking the medicine.

Describing 0.7 mg/l of fluoride in drinking water to be an 'optimum' concentration implies that 0.7 mg/l is also optimally *safe*. That assurance rings hollow without the necessary studies to measure the toxicity of fluoride dosages that can be reached by drinking 2, 4 or 10 liters of fluoridated water a day.

As toxicologists will remind, 'The toxicity of any particular chemical depends on .. the *amount* of which enters an individual's body.' 59

Health Canada does not *know* that AWF is effective in reducing caries. The weak studies and incomplete trials from the late 40's and early 50's established nothing.

If Canadians are being asked to risk significant health harm by drinking fluoridated water, there has to be an unequivocal *and massive* benefit as the upside to taking such a risk.

Canadians need to see Health Canada's stable of research institutions at work conducting high quality studies that check all the boxes of the scientific method.

Instead, Health Canada defends AWF not by conducting primary research, but by embarking on weight-of-evidence literature reviews.

Relying upon the strength of selected subject matter articles to place it *in the know*, Health Canada ignores the findings of the 2000 University of York Review 44, an "exceptional literature review conducted by an independent group to the highest international scientific standards" 62 to study the effects of AWF on humans.

The authors of York Review concluded, "Given the level of interest surrounding the issue of public water fluoridation, it is surprising to find that little high quality research has been undertaken."

Further, in both its full report and in its paper published in the British Medical Journal, the York panel stated that there was not enough evidence to conclude that fluoridation was safe, or that it was particularly effective. 62

Which begs the question: With so little high quality research about, and with scarce evidence of safety or efficacy, what is Health Canada using to justify its strong endorsement of AWF?

Successive Health Canada reviews of AWF have all arrived at the same conclusion:

"The weight of evidence from all currently available studies does not support a link between exposure to fluoride in drinking water at 1.5 mg/L and any adverse health effects, including those related to cancer, immunotoxicity, reproductive/developmental toxicity, genotoxicity and/or neurotoxicity, or intelligence quotient deficit." 45

By use of default statements such as the one above, Health Canada attempts to assure Canadians that, by the 'weight of its evidence', AWF causes no harm.

In stark contrast, by the 'weight of evidence assembled by others', AWF is decidedly *not* proven safe, and concern continues to grow over the health harm that AWF may be causing.

Both the 2000 York Review panel and the panel of fluoride researchers assembled by the NRC in 2003 were in agreement that the safety of AWF was far from established. Both panels urged further studies to investigate apparent links between AWF and a variety of debilitating health effects.

To date, Health Canada has not sponsored a single high quality study to answer the many questions about fluoride harm. What is holding the department back? Canadians reasonably expect Canada's federal health department to first prove AWF safe before endorsing the practice. Health Canada has the means to investigate fluoridation safety.

Rather than mobilize resources to prove AWF safe, Health Canada appears to have taken the position that AWF is safe until such time that others establish, beyond all doubt, that it is not.

'Others', however, are not encouraging Canadians to drink fluoridated water. Health Canada is. Who, then, *should* be in the labs trying to uncover the facts about fluoridated water's toxicity?

In a modern scientific world, how can the safety of a health measure go unresolved for so long? Medical science has long been capable of conducting animal studies and clinical trials to ensure the safety of a drug or to test the benefit of a proposed medical intervention.

Where is the carved-in-stone proof that fluoride exposure will not scar a child even before the drawing of first breath?

In October of 2012, Dr. John Kelton, dean and vice president of the Faculty of Health Sciences at McMaster University and dean of the Michael DeGroote School of Medicine, wrote a moving article that described the unselfish mentorship and tireless contributions of former dean Dr. J. Fraser Mustard, who passed away a year earlier.

Dr. Mustard was one of the founding faculty members of the McMaster Medical School. Toward the latter part of his career he became a staunch advocate for early childhood development.

In his article, Dr. Kelton wrote of the posthumous honour that was bestowed upon Dr. Mustard with the creation of the Fraser Mustard Institute for Human Development at the University of Toronto.

To quote Dr. Kelton, the new institute "... will pull together a multidisciplinary team of researchers to tackle the issues from the first 2000 days of a child's life in order to maximize their potential".

It would benefit *all* children if the 280 days of gestation were also included in the 2000.

Perhaps it will be the researchers at the Fraser Mustard Institute for Human Development that will finally put AWF in the cross-hairs of modern scientific examination to learn of fluoride's effects on the young.

A multitude of highly-credentialed researchers elsewhere can direct them to the hundreds of human and animal studies already done, should the Institute decide to get underway.

Fluoride corrupts from the womb

Evidence suggests strongly that AWF could visit irreversible harm upon fetuses and the newborn. Every child that is born into a fluoridated community could enter the world physically and/or mentally injured to some degree. ²

If fluoride is in a pregnant woman's bloodstream, it is established that it will pass through the placenta to target the fetus. The fetus is defenseless. Its immune system is still a tender work in progress. And it takes full gestation to develop a reasonably protective blood-brain barrier.

Research emerging from China indicates that the fetal brain is one of the organs at risk from fluoride poisoning. Numerous studies have found evidence of significant neurological damage.

53 and 27 'HUMAN STUDIES'

The USEPA's National Health and Environmental Effects Research Laboratory recently classified fluoride as a "chemical having substantial evidence of developmental neurotoxicity". ³

This modern research seems to echo an old warning. In the 1960s, the FDA banned the use of prenatal fluoride supplements based on its concern about possible "untoward effects on the fetus". ⁵⁴

In July 2012, a Harvard University team of researchers released the results of its meta-analysis review of 27 studies linking fluoride to cognitive impairment.

To quote the Harvard findings:

"Fluoride may be a developmental neurotoxicant that affects brain development in children at exposures much below those that cause toxicity in adults." ⁴

An important observation of the Harvard study is that children may be far less tolerant of fluoride than are adults. That is understandable as, related to body mass, children and infants are known to consume more water than adults.

The average infant's daily consumption of six ounces of formula or breast milk per kilogram of body weight is equivalent to an adult male drinking 50 eight-ounce glasses of milk a day. ⁵

"Children form a unique subgroup within the population who require special consideration in risk assessment. Children are not little adults. Their tissues and organs grow rapidly, developing and differentiating. These development processes create windows of great vulnerability to environmental toxicants."

Landrigan PJ. Risk assessment for children and other sensitive population. *Ann N Y Acad Sci* 1999; 895:1-95

Safe for all?

The 'optimal' concentration of fluoride in drinking water, deemed *safe for all* by AWF promoters, may well be having a more toxic effect upon the young.

In 2003, the US EPA recognized that there was new information surfacing about the health effects of AWF. It commissioned the National Research Council (NRC) of the National Academies to conduct a thorough review of existing studies and literature. The NRC assembled a balanced panel of 12 pre-eminent fluoride research experts who examined 1077 studies related to fluoride toxicity. The exhaustive review took over 3 years to complete.

The NRC published its report in 2006, titled 'Fluoride in Drinking Water: A Scientific Review of EPA Standards'. The 500 page report pointed to serious knowledge gaps and urgently pressed for accelerated research to investigate the strong indicators of AWF health harm.

The report left no doubt that the review panel considered “ .. kidney patients, diabetics, seniors and **babies** as 'susceptible sub-populations' that are especially vulnerable to harm from ingested fluorides”. 6

The NRC report also issued several warnings:

“It is apparent that fluorides have the ability to interfere with the functions of the brain .. more research is needed to clarify fluoride’s biochemical effects on the brain.” p 222

“Down’s syndrome is a biologically plausible outcome of fluoride exposure.” p 197

“More studies are needed on fluoride concentrations in soft tissues (e.g., brain, thyroid, kidney) following chronic exposure.” p 102

“Fluoride appears to have the potential to initiate or promote cancers, particularly of the bone, but the evidence to date is tentative and mixed” p 336

Dr. Kathleen Thiessen, one of the co-authors of the report, stated that even though the overall evidence of fluoride’s links to cancer was ‘mixed’, it was compelling enough that *all 12 members* of the expert panel agreed that fluoride could, in some way, be causative of cancers.

Health Canada does not recognize the NRC report as being useful. The NRC’s warnings are unheeded, and the research engine of the Canadian Institutes of Health Research is not turned on to the greater examination of fluoride health harm.

Pregnancy / who talks about fluoride?

In fairness to young mothers-to-be, how many can be expected to know that the fluoride in the water they drink prior to and throughout their pregnancy could interfere with their child’s earliest development?

What health professional will warn them that when bathing their newborn in fluoridated water the child's skin will take up fluoride and pass it directly into the bloodstream? 7

New mothers make it their maternal mission to bathe their young, and bathe them often. If there is fluoride in the water, all of those warm bubbly baths will lead to increased dermal absorption of the chemical. 7

For most new mothers, bath times are special. Bathing baby is an important opportunity for play and bonding. There is not supposed to be anything threatening about this mother/child moment.

AWF proponents will deny, of course, that there is anything threatening about the bathwater.

No warnings, no concerns

None of the standard pregnancy literature offers *any* warning about fluoride intake.

A typical obstetrician (OB) will counsel a pregnant woman about diet and rest, will discourage smoking and insist upon a moratorium on alcohol. OBs might also advise reducing tea consumption to two cups a day to avoid excessive caffeine intake.

The Public Health Agency of Canada recommends that pregnant women have no more than 300 mg of caffeine daily as it may cross the placenta, increasing the risk of miscarriage or low birth weight. 48

But no mention is made of the fact that a typical cup of tea can contain fluoride in concentrations high enough to substantially elevate the serum fluoride levels of a pregnant woman. Fluoride crosses the placenta, too. 53

A 1995 Canadian study reported the average fluoride content in tea to be 4.57 mg/l. 46 Another study done by a large international infant medical group (www.babycenter.com) cites a cup of black tea to contain 7.8 mg/l of fluoride. 47

Even using the more conservative Canadian number, a cup of tea contains **3 times** Health Canada's 1.5 mg/l MAC (maximum allowable concentration) of fluoride permitted in drinking water. Exceeding the 1.5 mg/l MAC places water consumers at risk of developing adverse health effects.

By drinking two 250 ml cups of 4.47mg/l tea a pregnant woman consumes 2.2 mg of fluoride. That's if she follows her OB's advice and doesn't drink more.

As most tea drinkers are *habitual* tea drinkers, cutting back may be hard. Made even harder by the common belief that tea is a healthier beverage.

Unfortunately, if the will to cut back isn't there, greater levels of fluoride in the bloodstream is the consequence.

The numbers above should cause concern among OBs .. a concern strong enough to issue a warning to cease the consumption of tea altogether during pregnancy. OBs should issue the same warning about fluoridated water.

At Health Canada's 0.7 mg/l 'optimal' concentration of fluoride in drinking water a pregnant woman can be expected to ingest a daily **dosage** of 1.4 mg fluoride, drinking recommended quantities.

Health Canada advises to "drink regularly" but makes no recommendation regarding the *ideal quantity* of water to be consumed every day for good health. ⁵⁰ That recommendation is left to others, like the U.S. Institute of Medicine ⁵⁵, and other dietary and health organizations. ⁵²

Women are being urged to drink 8 (250 ml) cups of water every day just to maintain normal metabolism (men 13 cups). ⁵² They are being told that it is unhealthy *not* to. Statistics Canada reveals that our drinking water intake is close to those recommended figures.

A Canadian woman over the age of 19 typically consumes 2 liters of water daily. ⁴⁹ A *pregnant* woman can be expected to drink substantially more, due to her increased blood volume, increased body temperature, increased urination frequency and volume, and decreased renal threshold - all normal physiological changes in pregnancy in the second and third trimesters. ⁵¹

Pregnant women in fluoridated communities who drink the recommended amount of tap water might unwittingly elevate the fluoride in their bloodstreams to levels that are threatening to the physical and mental development of their fetuses. They'll do it every day, and they'll do so until they are convinced not to.

Obstetricians, like the pediatricians who follow, seem to know little about the ill-effects of fluoride. That is understandable as the chapter on 'How Ingested Fluoride Affects Human Bodily Tissue' does not appear anywhere in medical school textbooks.

It appears, also, that obstetricians and pediatricians in-training are not told what all biochemists seem to know .. that fluoride is an enzyme killer. Discussing AWF, Dr. James Sumner, Nobel Prize winner for his work in enzyme chemistry, stated, "We need to go slowly, here. Everybody knows that fluorine and fluorides are very poisonous substances, and we use them in enzyme chemistry to poison enzymes, those vital agents in the body."

Enzymes are very large protein molecules that act as catalysts to more than 10,000 chemical reactions that occur in our bodies. Without them, the chemical reactions required to maintain the body simply would not occur fast enough. ⁸ Enzyme specialist Dr. Anthony Cichoke stated, "During every moment of our lives, enzymes keep us going. You couldn't breathe, turn the pages of a book, read its words, eat a meal, taste the food, or hear a telephone ring without enzymes." ⁹

Thousands of enzymes are necessary to drive the requisite cell reactions that take place every second that we are alive. To ensure normal fetal development, it is even important that certain enzyme-producing genes 'switch on, or off' at the right times. ¹⁰

The fetus must evolve and emerge with *all* of these enzymes intact to promote normal growth.

In the delicate confines of the womb, where the toolbox-for-life is first stocked, where every nutrient and chemical matters, the presence of a cellular toxin like fluoride can be devastating to the formation and performance of enzymes.

With fluoride in the fetal bloodstream, normal growth may not be possible at all.

DNA damage and genetic interference

One of the most troubling findings by researchers is that fluoride appears to cause chromosome damage, and also inhibits the enzymes that are responsible for DNA repair.

In 1977, at Austria's Siebersdorf Research Center, Dr. W. Klein and colleagues found that even low doses of fluoride inhibited DNA repair enzyme activity *by 50 percent*, and caused genetic and chromosome damage. ¹¹

A similar study conducted at the University of Missouri confirmed these results. ¹² Several other studies, some dating back to the early 70's, implicate fluoride in genetic interference. ¹³

Chromosomes are structures within a cell which contain the genetic information that is passed on from one generation to the next.

Deoxyribonucleic acid (DNA) is the 'blue print' of the cell wherein there is all the information required for the cell to grow. ⁶⁰

'Genes' are sections of the DNA strand that carry the genetic code.

One of the most important discoveries in biology was the realization that genes are responsible for the production of unique proteins in cells. ¹⁴

Based upon the configuration of the protein molecule, some cells are assigned to form the cornea of an eyeball. Others will head off to create the heart muscle. Some will create bone and marrow and build the skeleton. There are more than 200 specialized cell types that exist in our bodies.

All of this cellular activity is intricate beyond words and truly miraculous. But this complicated biological symphony can lose its rhythm when potent toxins permeate the cells.

Growing evidence points to fluoride as being one of those toxins.

Are we messing with the building blocks?

Parents pass along their chromosomes to their children at conception. If the parents are genetically healthy, and they transfer their complete DNA, their offspring will be as strong as they, with a chance to become stronger.

It is hoped that every child's gene pool *will* become strengthened, the very definition of evolution.

DNA damage is not uncommon. Life is tough and there are lots of stressors. Luckily, the body can rebuild injured DNA, if the damage is not too severe. A DNA repair process is constantly at work as it responds to damage in the DNA structure.

However, when normal repair processes fail, *irreparable* DNA damage can occur, leading to genetic error. Cells can be left with potentially harmful mutations in the cell's genome. ¹⁶ The cell may stop performing as it was intended. It may, instead, begin to perform in a manner quite unintended.

The DNA repair capability of a cell is vital to the integrity of its genome, to normal cell function and to the normal function of its larger organism. This is becoming better understood as many genes that were initially thought to influence life span have turned out to be involved in DNA damage repair. ¹⁶

*“Failure to correct molecular cell damage can introduce mutations into the genomes of the offspring and **thus influence the rate of evolution**”.* ¹⁶

A startling statement, and too easy to categorize as ‘over the top’. But is it, really?

It’s important to revisit Dr. Klein’s 1977 study wherein his team made two separate findings:

- fluoride causes chromosome and genetic damage, and
- fluoride reduces *by half* the body’s natural ability to repair that damage, once done.

Evidence is strong in literature that fluoride is a mutagen, a chemical capable of inducing chromosomal aberrations. Even Environment Canada ¹⁷ and the National Research Council of Canada ¹⁸ consider fluoride capable of genetic obstruction.

Further evidence suggests that fluoride leaves chromosomes altered and dysfunctional. Those same altered and dysfunctional parental chromosomes can be passed along to offspring and become a part that child’s DNA.

A step backward for the species?

Turning a deaf ear to a noisy issue

There should be just enough of the biochemist in every obstetrician and pediatrician that they should at least *wonder* about the possible fetal and infant health effects ushered in by AWF. It is hard to accept that they are not reasonably aware of the stiff opposition to fluoridation. This is a hotly debated topic in all states, provinces and territories.

OBs and PEDs are the medical specialists in fetal and early childhood care. We look to them to solve the obstacles that can confront a healthy birth, and we look to their knowledge to guard infants and children as they develop.

How is it, then, that few childhood health specialists are warning of fluoride?

If OBs and PEDs really wanted to learn about how fluoride affects the fetus and the infant, they can take some notes from Mother Nature.

As testament to the natural genius of evolution, once born, an infant is protected from its mother’s systemic levels of fluoride by the act of breast feeding.

Regardless of the amount of fluoride retained in the mother's system, very little is passed along to the infant in breast milk.

The fluoride concentration in human milk typically ranges from 0.007 to 0.011 mg/liter, better than 100 times lower than the amount added to public water supplies. 19

New mothers who do *not* breast feed their infants leave them fully exposed to the systemic harm that results from serving baby formula prepared with fluoridated water.

In an admission to fluoride harm, the Centers for Disease Control (CDC) and the American Dental Association (ADA) now caution mothers *against* mixing infant formula with fluoridated water. Health Canada, which normally adopts positions taken by the CDC and the ADA, oddly *failed* to endorse the precautionary language of the two American agencies.

Health Canada stubbornly maintains that AWF is safe for all ages, and presents harm to none. The only side effect that it admits to is "mild fluorosis, a barely-noticeable mottling of the teeth that only a dentist would notice."

See no evil

The warnings against fluoride exposure are simply not forthcoming from the largest and most influential medical associations. These associations tightly control the information that is *and is not* shared with the street-side medical practitioners.

When it comes to AWF, some associations actually discourage independent thinking among their membership. 20

Doctors and dentists are being *told* what to think of fluoridation. Some dental and medical associations state openly that members who question the benefits of AWF will be regarded as lacking the level of professionalism and loyalty that is required of membership. No membership .. short career.

Warnings from those who *have* seen

Look where some of the fluoridation warnings are coming from today:

- a petition for the abandonment of water fluoridation signed by over 5000 enlightened doctors, dentists and health professionals who have researched the literature on fluoride harm
- 14 Nobel prize winning chemists and pharmacologists who know fluoride intimately, 56 and,
- 1500 scientists and research professionals at the United States Environmental Protection Agency (USEPA) whose leadership, in June 2000, made an appeal to the US Senate for a fluoride moratorium, and asked for funding for urgent new studies to examine fluoride health harm. 58

The North American medical community appears to ignore any message that is contrary to the promotion of fluoridation, regardless of the credentials of the messenger.

A case in point is a report that was issued by City of Toronto Public Health, in May, 2002.

The report is titled, 'Literature Review of Low Birth Weight, Including Small for Gestational Age and Preterm Birth'.²¹ It was written to capture the health department's concerns about Toronto's rates of preterm births and low birth weight deliveries.

Toronto Public Health summarized:

- "In addition, the intrauterine milieu affects the health of an individual not only during fetal life but also throughout the postnatal stages of life."

(No argument)

- "Adverse intrauterine environment results in either low birth weight (LBW) or preterm birth."

(The presence of cytoplasmic fluoride in the womb would undoubtedly create an 'adverse intrauterine environment'. Recall also that the FDA banned the use of prenatal fluoride supplements in the '60s out of concern for low birth weight (LBW) deliveries.)

- "Preterm birth is of significant public health importance because of its association with an increase in mortality and childhood morbidities such as developmental problems, cerebral palsy, learning difficulties, and an increased risk of sudden infant deaths."

(The enzyme killing, cell-disrupting properties of fluoride can be expected to play havoc with the normal growth and development of the fetus. There is every reason to suspect that fluoride exposure could contribute to preterm birth and all of the problems listed above)

In their report, Toronto Public Health had stated all of the right things.

The study also described 19 possible determinants of preterm birth and low birth weights. Determinants included low maternal pre-pregnancy weight, maternal medical conditions, heavy caffeine use, marijuana use, and even *eating licorice*.

Not listed were the fluoride exposures that impact pregnant women.

Not considered was the possible fetal harm caused by a pregnant woman's consumption of fluoridated water and by her additional exposure to fluoride from other dietary and environmental sources.

Fluoride intake was not even mentioned in the report as a subject for further study.

One can only conclude that Toronto Public Health considered a licorice treat during pregnancy to be more of a threat to fetal development than consumption of water that contained a known cellular poison.

Examination of modern studies vs old promotions

Let's examine some studies that evidence fluoride harm, studies that *could* be protective of Canadian children, if they could get past Health Canada's 'deny-all-about-fluoride' scientific filter.

Fluoride and the brain

Fluoride's ability to damage the brain at all stages of life represents one of the most active areas of research on fluoride toxicity today.

Human studies conducted in China on fluoride's effects upon fetal development revealed unanticipated results. 22, 23, 24, 25

The results suggest that the accumulation of fluoride in fetal brain tissue can disrupt the synthesis of certain neurotransmitters and receptors in nerve cells, leading to delayed cell maturation.

Stated simply, the presence of fluoride in brain tissue will delay and compromise early brain development and performance. 8 The higher the concentration of fluoride measured in a pregnant woman's blood serum, the greater likelihood of damage to fetal cerebral development. 22, 23, 24, 25, 26

Behaviour and intelligence

In the late 1980s, celebrated neuro-pharmacologist Dr. Phyllis Mullinex began to prepare a toxicology study to measure how drinking fluoridated water could affect laboratory rats.

Over the course of a few years she designed and put to use a revolutionary computer pattern recognition system that was described by other scientists as 'nothing short of elegant' in its ability to study fluoride's effects on the neuromotor functions of rats.

Much to her surprise, she observed strange behavior in the offspring of laboratory rats given fluoride in their water. Their newborn displayed mannerisms associated with hyperactivity. And they remained hyperactive for life. 26

As well as hyperactivity, the weanlings also displayed behavior-specific changes more related to learning disabilities.

"Their behavior was consistent with interrupted hippocampal development (a brain region generally linked with memory)".

Dr. Mullinex stated plainly that her rat study flagged the potential for similar motor dysfunction, IQ deficits and/or learning disabilities in humans. 26

Her study indicated that exposure to fluoride at drinking water concentrations could impair the brain development of a human fetus just as it did her test animals, and could diminish both motor skills and intelligence. 26

In 1995, her study was accepted for publication in the prestigious 'Journal of Neurotoxicology and Teratology'. Only the highest quality studies are published there.

Three days after publication, she was fired by the Forsyth Dental Institute, the employer that years earlier had hired her with specific instructions to study the toxicity of fluoridated water. In her letter of dismissal, Forsyth cited that her work was not 'dentally related'.

Though one of the most celebrated neuro-pharmacologists in the world, Dr. Mullinex saw her laboratory disassembled, her animals destroyed, and her research funding erased. All for reporting findings that were dangerous to the promotion of AWF.

In excess of 100 animal studies ⁶¹ and over 40 human studies now support the findings of Dr. Mullinex.

Those studies consistently establish a link between fluoride exposure and impairment of learning and memory processes among fluoride-exposed subjects.

42 human studies are listed in this document under reference # 27, HUMAN STUDIES, with their conclusions highlighted.

ADHD unheard of before water fluoridation

Today, Attention Deficit Hyperactivity Disorder (ADHD) is one of the most commonly-diagnosed behavioral problems in children, characterized by difficulty in sustaining attention, impulsivity and hyperactivity.

Prior to the introduction of AWF in 1944, doctors were generally aware that some children were more impulsive and 'fidgety' than others, but their numbers were low. And it was thought by many that this elevated behavior would pass with maturity.

By 1956, a short 12 years after AWF was broadly adopted, the number of inattentive and hyperactive children had grown to the point that a drug was introduced to combat their unruly behaviour .. *Ritalin*

By the mid-80's there were 500,000 children in the US diagnosed with this 'behavioural syndrome'. ²⁸ It was about this time that doctors gave it a name .. 'Attention Deficit Hyperactivity Disorder', ADHD.

By the year 2000, the number of ADHD diagnosed children had climbed to *7 million*. ²⁸

The National Institutes of Health (NIH) estimates that as many as 20 percent of children suffer from ADHD. *Ritalin* is still their primary drug, and they are cruelly branded as '*Ritalin kids*'. By some estimates, approximately 30-70 percent of children who manifest symptoms of ADHD will carry those symptoms into adulthood. ²⁹

By the time Dr. Mullinex published the findings of her animal study in 1995, doctors, psychologists and drug companies had already invested 40 years of effort toward managing the mushrooming numbers of hyperactive human offspring. Her study had offered an impartial look at what AWF might have been doing to children across all of those years.

For that service to humanity, Dr. Mullinex was banished into the research wilderness.

Dental fluorosis / a bio-marker of fluoride poisoning

The severity of dental fluorosis is determined by the fluoride intake in the first 4 years. The greatest damage is done by the fluoride ingested or absorbed in the first year when the still-developing kidneys are least capable of filtering fluoride from the bloodstream. 30, 31, 32, 33, 34, 35

“Infants and toddlers are especially at risk for dental fluorosis of the front teeth since it is during the first 3 years of life that the permanent front teeth are the most sensitive to the effects of fluoride”, states Dr. Hardy Limeback, BSc, PhD, DDS, professor emeritus and former Head of Preventive Dentistry at the University of Toronto.

Due to their small size, infants receive up to 400% more fluoride (per pound of body weight) than adults consuming the same concentration of fluoride in water.

The very young also tend to retain as much as 85% of ingested fluoride 36, likely because young and growing bones are metabolically active, highly vascular and accumulate fluoride faster and greater than older bones. 37

Individual studies offer competing results, but it's accepted that fluoridated water can contain more than 200 times more fluoride than breast milk (1000 ppb in fluoridated tap water vs 5-10 ppb in breast milk). 38

Babies drinking fluoridated formula *receive the highest dosage of fluoride among all age groups in the population* (0.1-0.2+ mg/kg/day), whereas a breast-fed infant receives the lowest. 23

“More than 50% of infants are currently formula-fed by 1 month of age, and these infants are likely to be continuously exposed to high intakes of fluoride for 9 or 10 months.” 39

The earlier use of the word ‘poisoning’ is appropriate.

‘Fluorosis’ describes a degraded bodily condition (damaged tooth enamel) caused by excessive fluoride in the bloodstream.

Fluoridated water does not poison dramatically. It does not cause immediate and startling physical symptoms, except in the *very* fluoride-sensitive.

Fluoride poisons our children slowly, subtly, over months and years. Parents will be unaware that it is happening.

Few MDs are capable of diagnosing fluoride poisoning. And dentists will not accept, much less warn, that dental fluorosis is an indicator that fluoride harm may be ongoing in parts of the body beyond the oral cavity.

Dental fluorosis is most often seen as pale white streaks or patches on the smooth surfaces of the front permanent teeth, particularly the uppers. This pale ‘mottling’ is as a result of the enamel surface becoming porous in those areas.

With more severe dental fluorosis, enamel pitting and chipping usually occurs, accompanied by *very* unattractive discoloration and staining.

A case was made earlier promoting breast feeding to minimize infant exposure to fluoride's cytotoxic effects. Breast feeding across the first year is also the best way to minimize dental *and* skeletal fluorosis.

Fluorosis / more than just the teeth at risk

While *dental* fluorosis is a clearly visible indicator of excessive fluoride intake, *skeletal* fluorosis, the uptake of fluoride into the bones, is not readily apparent at all. But it is far more threatening to health.

Fluoride is a bone seeker, attracted to the large calcium reserves of the skeleton. Fluoride ions are taken up rapidly by replacing hydroxyl ion in bone. 40

Skeletal fluorosis describes fluoride-induced abnormalities in bone. Bone structural quality degrades to poor, with reduced mechanical strength and increased risk of fracture. 40

Fluoride promoters point to fluoride uptake into bone as a good thing, in that it creates greater bone *density*. Greater bone *density* does not equate to better bone *quality*.

It wasn't nature's plan to have fluoride ions insert themselves into the place of hydroxyl ions in bone.

A fluoride-altered bone loses much of its natural elasticity, its ability to flex but not break. As well, fluoride-altered bone isn't as impact resistant as is natural bone.

Fluoride-altered bone is, simply, more brittle than natural bone and more prone to fracture under loading stresses. 57

Skeletal fluorosis is not confined only to adults but also afflicts newborns, infants and children and may develop within six months of exposure to high intakes of fluoride. 41

"The transplacental transport of fluoride to the growing fetus may cause fetal/neonatal skeletal fluorosis." 40

Infants who drink mainly powdered formula reconstituted with fluoridated water are likely to be a high-risk group for developing both skeletal fluorosis and hip fractures in old age. 42

It is *extremely* unsettling to think that fluoride can induce skeletal fluorosis so early in a child's development. Right from the outset, the entire hard-tissue supportive infrastructure of the body can be compromised.

Understandably, few can bring themselves to imagine that *this* kind of harm can be generated by an established and highly promoted public health policy.

It is beyond belief that public health could enact, and then allow to endure, a health policy that could result in *this* kind of injury.

Regardless of beliefs, major public health agencies *knew* at the very introduction of water fluoridation in 1945 that this kind of injury was possible.

Public health ***was specifically warned***, in the October 1944 'Journal of the American Dental Association', that bone damage could be just one of the harmful results of implementing a policy of AWF. 1

That warning, and all others like it, ¹ was then roundly ignored by coordinated medical and dental agencies that would not be dissuaded.

With no supportive science, no proof of safety or efficacy, and only warnings against, Artificial Water Fluoridation was born.

Conclusion

Article 25 of the Universal Declaration of Human Rights has been interpreted to include that ‘we have the right to live free of reasonably preventable suffering’.

AWF injures our young. Their suffering *can* be prevented as easily as turning off a fluoride chemical feed pump.

For that to happen, traditional health authorities must admit that AWF is a failed experiment. The practice does not singularly prevent cavities as advertised, and compelling evidence both suggests and demonstrates that AWF can cause substantial bodily harm.

Existing and emerging evidence points to AWF as being injurious to both the fetus, infant and toddler. Fluoride interferes with the many biological processes that need to unfold to properly fortify a child for life.

The general public needs to know what the new evidence reveals about AWF. Skillfully examining the new evidence would seem to be the default role of traditional public health agencies. Canadian health agencies seem strangely unwilling to step up onto that particular stage.

Public Health is demonstrating an unwillingness or inability to accept that AWF may be causing a cascade of injuries throughout the body.

Because of its intransigent support of AWF, Health Canada, and the local public health agencies and medical officers of health that it influences, may be condemning children to be born with irreversible mental and physical short-comings.

Is it worth doing some well-designed toxicology studies and thorough RCTs to prove that the statement immediately above is wrong?

Would that kind of legitimate, gold-standard research not help deliver to all children the ‘natural justice’ described by Mr. Johnston at the beginning of this paper?

Lastly, were he here today, how would pioneering child development advocate Dr. J. Fraser Mustard answer the second question?

References

1. **The Journal of the American Dental Association wrote (in 1936)**, "Fluoride at the 1 ppm [part per million] concentration is as toxic as arsenic and lead... There is an increasing volume of evidence of the injurious effects of fluorine, especially the chronic intoxication resulting from the ingestion of minute amounts of fluorine over long periods of time."

The Journal of the American Medical Association" noted (in its September 18, 1943 issue), "Fluorides are general protoplasmic poisons, changing the permeability of the cell membrane by certain enzymes."

Journal of the American Dental Association, October 1944, "We do know that the use of drinking water containing as little as 1.2 to 3.0 parts per million of fluorine will cause such developmental disturbances in bones as osteosclerosis, spondylosis and osteopetrosis, as well as goiter, and we cannot afford to run the risk of producing such serious systemic disturbances in applying what is at present a doubtful procedure intended to prevent development of dental disfigurements."

2. Li J, Yao L, Shao Q-L. (2004). Effects of high-fluoride on neonatal neurobehavioural development. *Chinese Journal of Endemiology* 23:464-465.

Guo Z, et al. (2001). Study on neurobehavioral function of workers occupationally exposed to fluoride. *Industrial Health and Occupational Disease* 27:346-348.

Yu Y, et al. (1996). Changes in neurotransmitters and their receptors in human fetal brain from an endemic fluorosis area. *Chinese Journal of Endemiology* 15:257-259.

Du L. (1992). The effect of fluorine on the developing human brain. *Chinese Journal of Pathology* 21(4):218-20.

Han H, et al. (1989). The effects of fluorine on human fetus. *Chinese Journal of Control of Endemic Diseases* 4:136-138.

3. Building a Database of Developmental Neurotoxicants: Evidence from Human and Animal Studies
*W. Mundy*¹, *S. Padilla*¹, *T. Shafer*¹, *M. Gilbert*¹, *J. Breier*^{1,2}, *J. Cowden*¹, *K. Crofton*¹, *D. Herr*¹, *K. Jensen*¹, *K. Raffaele*³, *N. Radio*⁴, and *K. Schumacher*⁵.
¹Neurotoxicology Div. U.S. EPA, RTP, NC 27711; ²Curriculum in Toxicology, Univ. of N.C. at Chapel Hill, Chapel Hill, NC, 27514; ³NCEA/ORD, U.S. EPA

4. Developmental Fluoride Neurotoxicity: A Systematic Review and Meta-Analysis / Anna L. Choi, Guifan Sun, Ying Zhang, Philippe Grandjean

5. Bearer, C.F., "Environmental Health Hazards: How Children Are Different from Adults," *The Future of Children: Critical Issues For Children and Youths*, Vol. 5, No. 2 - Summer/Fall 1995, -
http://www.futureofchildren.org/pubs-info2825/pubs-info.htm?doc_id=70953

6. National Research Council info on kidney patients and others as fluoride-susceptible groups - see p. 350 ff at: http://www.nap.edu/openbook.php?record_id=11571&page=351

7. Is Your Bathtub a Toxic Dump? by Andreas Schuld & George Glasser, Earth Island Journal, Summer 2001 / George Glasser is a Florida-based researcher, author and activist. Andreas Schuld is the head of Parents of Fluoride Poisoned Children [www.bruha.com]. From an edited version of a report to the US Senate Committee on Environment and Public Works on June 13, 2000.
8. The Case Against Fluoride, chapter 12 'Fluoride's Chemistry, Biochemistry and Physiology', pg 117
9. Dr. Cichoke is the author of over 300 articles and 11 books including The Complete Books of Enzyme Therapy; The Back Pain Bible; and Enzymes: Nature's Energizers. Watch for two new books: FAQs: All About Enzymes and The Secrets of Native American Herbal Formulas.
10. 'The TET1 enzyme steers us through fetal development and fights cancer', Professor Kristian Helin, BRIC and Centre for Epigenetics, University of Copenhagen / TET1 enzyme controls the activity of genes. Published in the journal *Nature*.
11. Klein W et al. DNA repair and environmental substances. Zeitschrift fur Angewandte Bader-und Klimaheilkunde, 1977; 24 (3).
12. Mohamed A, Chandler ME. Cytological effects of sodium fluoride on mice. Fluoride. 1982; 15 (3): 110-118.
13. Mohamed AH, Chandler ME. (1982). 'Cytological effects of sodium fluoride on mice'. Fluoride 15: 110-118. "Cytological studies on bone marrow cell chromosomes and spermatocytes showed that 1-200 ppm F (as sodium fluoride) was able to induce chromosomal changes in a dose-dependent manner. The frequency of the induced chromosomal damage was significantly higher in each treatment than in the controls. The observed abnormalities included translocations, dicentric, ring chromosomes, and bridges plus fragments, or fragments by themselves. There was a significant correlation between the amount of fluoride in the body ash and the frequency of the chromosomal abnormalities."
- Voroshilin SI, et al. (1973). 'Cytogenetic effect of inorganic fluorine compounds on human and animal cells in vivo and in vitro'. Genetika 9: 115-120.
- "On the grounds of the results obtained during our experiments F compounds are able to produce certain changes in chromosomes from somatic cells of animals treated in vivo by them... Most of the aberrations observed in the case of bone marrow cells were chromatid-type aberrations...
- We entertain the opinion that the main damage to chromosomes during our experiments with F compounds also took part during the S-phase ... These **data enable us to consider as sufficiently established the conclusion that inorganic fluorine compounds may present a mutagenic danger to human beings.**"
- Fluoride interferes with DNA repair, damages chromosomes,** and induces higher cancer death rates yet another morbid characteristic of aging." John Yiamouyiannis, Ph.D., Biochemistry and By John R. Lee, M.D. 'Fluoride - The Aging Factor'
- "The extent of DNA damage in the fluoride + selenium + zinc group was significantly slighter than that in the fluoride group ($P < 0.05$). **It suggested that fluoride and selenium could induce DNA damage in pallium neural cells of rats respectively.**"
- SOURCE: Chen J, Chen X, Yang K. (2000). [Effects of selenium and zinc on the DNA damage caused by fluoride in pallium neural cells of rats]. Wei Sheng Yan Jiu. 29: 216-7.

An article in Mutation Research says that a study by Proctor and Gamble, the very company that makes Crest toothpaste, did research showing that 1 ppm fluoride causes genetic damage. Mutation Research, Vol. 223, pp. 191-203.

14. LaTrobe University / 'Biochemistry: Chromosomes, Genes and DNA', Aug., 1997 www.latrobe.edu.au

15. Nobelprize.org The official website of the Nobel Prize / 'DNA-RNA-Protein Introduction'

16. **DNA Repair** is a peer-reviewed scientific journal that covers cellular responses to DNA damage. Published monthly since January 2002, the journal publishes original research papers, short reviews, and book reviews concerning DNA repair, cell cycle regulation, cell death, and other biological responses to genetic damage.

17. "Fluoride (as sodium fluoride) should be considered capable of inducing chromosomal aberrations, micronuclei, and sister-chromatid exchanges *in vitro* in mammalian cells, although the results from such studies have been inconsistent."

SOURCE: Environment Canada. (1993). Inorganic Fluorides: Priority Substances List Assessment Report. Government of Canada, Ottawa.

18. "Fluoride has displayed mutagenic activity in studies of vegetation, insects, and mammalian oocytes. There is a high correlation between carcinogenicity and mutagenicity of pollutants, and fluoride has been one of the major pollutants in several situations where a high incidence of respiratory cancer has been observed. For these reasons, the relation between airborne fluoride and incidence of lung cancer needs to be investigated."

SOURCE: Marier J, Rose D. (1977). Environmental Fluoride. National Research Council of Canada. Associate Committee on Scientific Criteria for Environmental Quality. NRCC No. 16081.

19. According to the Institute of Medicine (IOM, 1997, page 292), "The fluoride concentration in human milk ranges from 0.007 to 0.011 mg/liter (Ekstrand et al., 1984; Esala et al. 1982; Spak et al., 1982).

20. 'alPHA' Association of Local Public Health Agencies, 'Drinking Water Fluoridation', February 10, 2011, Novotel Toronto Centre, Toronto / "Health unit staff and officials need to be aware of the key messages and in support of the public health view of fluoridation. There is no place for personal views on fluoridation".

21. 'Literature Review of Low Birth Weight, Including Small for Gestational Age and Preterm Birth' May 2002, Toronto Public Health document, Authors Dr. Prakeshkumar Shah Dr. Arne Ohlsson MBBS, MD, MRCP, MRCPCH, DCH MD, MSc, FRCPC, FAAP, Evidence Based Neonatal Care and Outcomes Research Department of Pediatrics, Mount Sinai Hospital Room 775A, 600 University Avenue Toronto

22. "Fifteen therapeutically aborted fetuses at the 5th-8th gestation month from the endemic fluorosis area were compared with those from the non-endemic area. Stereological study of the brains showed that the numerical density of volume of the neurons and the undifferentiated neuroblasts as well as the nucleus-cytoplasm ratio of the neurons were increased. The mean volume of the neurons was reduced. The numerical density of volume, the volume density and the surface density of the mitochondria were significantly reduced. **The results showed that chronic fluorosis in the course of intrauterine fetal life may produce certain harmful effects on the developing brain of the fetus.**"

SOURCE: Du L. (1992). [The effect of fluorine on the developing human brain]. Chung-hua Ping Li Hsueh Tsa Chih. 21:218-20.

23. "The levels of neurotransmitters and receptors in brain tissue of aborted fetuses from areas of endemic fluorosis were tested. The results showed that in 10 subjects from a high fluoride area ranging in age from 5 to 7 months, the levels of norepinephrine, 5-hydroxytryptamine, and α 1-receptor were lower and the level of epinephrine higher as compared with levels seen in the control fetuses from a non-fluorosis endemic area; each of these results was statistically significant ($P < 0.05$). Other monoamine neurotransmitters and metabolic products, such as dopamine, 5-hydroxy-indole acetic acid, and 3,4-dihydroxybenzoic acid showed no significant differences ($P > 0.05$). **The results suggest that the accumulation of fluoride in the brain tissue can disrupt the synthesis of certain neurotransmitters and receptors in nerve cells, leading to neural dysplasia or other damage.**"

SOURCE: Yu Y, et al. (1996). Changes in neurotransmitters and their receptors in human foetal brain from an endemic fluorosis area. Chinese Journal of Endemiology 15:257-259.

24. "The effects of excessive fluoride intake during pregnancy on neonatal neurobehavioural development and the neurodevelopment toxicity of fluoride were evaluated. Ninety-one normal neonates delivered at the department of obstetrics and gynecology in five hospitals of Zhaozhou County, Heilongjiang province, China were randomly selected from December 2002 to January 2003. The subjects were divided into two groups (high fluoride and control) based on the fluoride content in the drinking water of pregnant women. The results showed that the urinary fluoride levels of mothers from the high fluoride group were higher than those of the control group. There were significant differences in the neonatal behavioral neurological assessment score and neonatal behavioral score between the subjects in endemic areas and the control group. There were also significant differences in the non-biological visual orientation reaction and biological visual and auditory orientation reaction between the two groups. **It is concluded that fluoride is toxic to neurodevelopment. Excessive fluoride intake during pregnancy can cause adverse effects on neonatal neurobehavioural development.**"

SOURCE: Li J, Yao L, Shao Q-L. (2004). Effects of high-fluoride on neonatal neurobehavioural development. Chinese Journal of Endemiology 23:464-465.

25. "Fluoride can pass through the blood-brain barrier and accumulate in brain tissue, thus in our study the brain tissue of the fetuses from the fluoride endemic area showed higher fluoride levels than the control. The mechanisms involved are not yet clear. Besides increased amounts of fluoride, the brain tissue of the endemic subjects also showed nerve cells with swollen mitochondria, expanded granular endoplasmic reticula, grouping of the chromatin, damage to the nuclear envelope, a lower number of synapses, fewer mitochondria, microtubules, and vesicles within the synapses, and damage to the synaptic membrane. **These changes indicate that fluoride can retard the growth and division of cells in the cerebral cortex. Fewer mitochondria, microtubules, and vesicles within the synapses could lead to fewer connections between neurons and abnormal synaptic function, influencing the intellectual development after birth. These questions await further research.**"

SOURCE: Han H, et al. (1989). The effects of fluorine on human fetus. Chinese Journal of Control of Endemic Diseases 4:136-138.

26. Mullenix PJ; Denbesten PK; Schunior A; Kernan WJ, Toxicology Department, Forsyth Research Institute, Boston, MA 02115, USA. 'Neurotoxicity of sodium fluoride in rats', Neurotoxicol Teratol (NAT), 1995 Mar-Apr; 17 (2): 169-77

JOURNAL TITLE: Neurotoxicity of Sodium Fluoride in Rats

"Still unexplored, however, is the possibility that fluoride exposure is linked with subtle brain dysfunction. This is the first study to demonstrate that central nervous system output is vulnerable to fluoride, that the effects on behavior depend on the age at exposure and that fluoride accumulates in brain tissues. Of course behaviors per se do not extrapolate, but a generic behavioral pattern disruption as found in this

rat study can be indicative of potential for motor dysfunction, IQ deficits and/or learning disabilities in humans. Substances that accumulate in brain tissue potentiate concerns about neurotoxic risk."

Dr. Phyllis J. Mullenix, Toxicology Department, Forsyth Research Institute, Boston, MA

27. 42 HUMAN STUDIES - Fluoride's impact on the brain

- Choi A, et al. (2014). Association of lifetime exposure to fluoride and cognitive functions in Chinese children: A pilot study. *Neurotoxicology & Teratology* [Epub ahead of print].

"Results of our pilot study showed that moderate and severe dental fluorosis was significantly associated with deficits in WISC-R digit span. Children with moderate or severe dental fluorosis scored significantly lower in total and backward digit span tests than those with normal or questionable fluorosis. **These results suggest a deficit in working memory.** Scores on other tests did not show significant relationships with indices of fluoride exposure."

"Results of our field study raise a concern about the safety of elevated systemic exposure to fluoride from high concentrations in the drinking water. **While topical fluoride treatment confers benefits of reducing caries incidence, the systemic exposure should not be so high as to impair children's neurodevelopment especially during the highly vulnerable windows of brain development in utero and during infancy and childhood and may result in permanent brain injury.** We are planning a larger scale study to better understand the dose-effect relationships for fluoride's developmental neurotoxicity in order to characterize the appropriate means of avoiding neurotoxic risks while securing oral health benefits."

- Bai Z, et al. (2014) Investigation and analysis of the development of intelligence levels and growth of children in areas suffering fluorine and arsenic toxicity from pollution from burning coal. *Chinese Journal of Endemiology* 33(2):160-163.

"The children's urinary fluoride and urinary arsenic levels versus intelligence [quotients] were both negatively correlated ($r=-0.560$, -0.353 , all $P<0.05$)."

"Exposures to fluorine and arsenic are deleterious to the development of intelligence and the development of growth in children"

- Singh VP, et al. (2014). A correlation between serum vitamin, acetylcholinesterase activity and IQ in children with excessive endemic fluoride exposure in Rajasthan, India. *European Academic Journal* 2(4):5857-5869.

"We observed reduced AChE activity in [the high fluoride area] which may be directly correlate[d] with the reduced intelligence score of the subjects."

- Karimzade S, et al. (2014). Investigation of intelligence quotient in 9-12-year-old children exposed to high- and low-drinking water fluoride in West Azerbaijan province, Iran. *Fluoride* 47(1):9-14.

"The IQ of the 19 children in the high-F region was lower (mean±SD: 81.21±16.17), than that of the 20 children in the low-F region (mean±SD: 104.25±20.73, $p=0.0004$). In the high-F region, 57.8% had scores indicating mental retardation (IQ <70) or borderline intelligence (IQ 70-79), while this figure was only 10% in the low-F region."

"The study found that children residing in a region with a high drinking water F level had lower IQs compared to children living in a low drinking water F region ($p<0.001$). The differences could not be attributed to confounding educational, economic, social, cultural, and general demographic factors."

- Trivedi MH, et al. (2012). Assessment of groundwater quality with special reference to fluoride and its impact on IQ of schoolchildren in six villages of the Mundra Region, Kachchh, Gujarat, India. *Fluoride* 45(4):377-83.

“The average IQ score of the 34 students drinking the high F water was significantly lower ($p < 0.05$) than among the 50 students drinking the low F water.

“The present investigation concludes that the three villages of Chhasara, Gundala, and Mundra, are F-contaminated villages. Because of high F concentrations in the [groundwater], children in these villages have greater exposure to F that may lead in to low IQ as compared to the nearby villages of Baroi, Zarpara, and Pragpar, which have low F in their [groundwater].”

- Zhang X. (2012). Studies of relationships between the polymorphism of COMT gene and plasma proteomic profiling and children’s intelligence in high fluoride areas. Master’s Dissertation, Huazhong University of Science & Technology, May 2012.

“In summary, we found that negative correlations exist between child IQ and both blood serum and urine fluoride concentrations in areas with fluoride poisoning.”

- Seraj B, et al. (2012). Effect of high water fluoride concentration on the intellectual development of children in Makoo/Iran. *Journal of Dentistry, Tehran University of Medical Sciences*. 9(3): 221-29

“The mean IQ scores decreased from 97.77 ± 18.91 for the normal fluoride group to 89.03 ± 12.99 for the medium fluoride group and to 88.58 ± 16.01 for the high fluoride group ($P = 0.001$).”

“Since all potentially confounding factors were adjusted, the difference in IQ scores may reveal the potential effect of high fluoride exposure on the intellectual development of children.”

- Saxena S, et al. (2012). Effect of fluoride exposure on the intelligence of school children in Madhya Pradesh, India. *Journal of Neurosciences in Rural Practice* 3(2):144-49.

“Reduction in intelligence was observed with an increased water fluoride level ($P < 0.000$). The urinary fluoride level was a significant predictor for intelligence ($P < 0.000$).”

- Ding Y, et al. (2011). The relationships between low levels of urine fluoride on children’s intelligence, dental fluorosis in endemic fluorosis areas in Hulunbair, Inner Mongolia, China. *Journal of Hazardous Materials* 186(2-3):1942-46.

Children’s IQ was inversely related to urinary fluoride content, ($p < 0.0001$). Each increase in 1 mg/L of urine F was associated with 0.59 point decrease in IQ ($p = 0.0226$).

“In conclusion, our study suggested that low levels of fluoride exposure in drinking water had negative effects on children’s intelligence and dental health and confirmed the dose-response relationships between urine fluoride and IQ scores as well as dental fluorosis.”

- Poursalami HR, et al. (2011). Intelligence quotient of 7 to 9 year-old children from an area with high fluoride in drinking water. *Journal of Dentistry and Oral Hygiene* 3(4):61-64.

Average IQ of High F group (91.37 ± 16.63) is significantly lower than average IQ of Low-F group (97.80 ± 15.95), $p < 0.05$

“Based on the findings, chronic exposure to high levels of fluoride can be one of the factors that influence intellectual development.”

- Eswar P, et al. (2011). Intelligent quotients of 12-14 year old school children in a high and low fluoride village in India. *Fluoride* 44:168-72.

63.2% of children in high F area had IQ less than 90, versus 47.7% of children in low F village. (p=0.06).

“Though there was a trend in our study towards lower IQ in a greater number of children from high F village than in the low F village, probably the small sample size of the present study failed to establish a statistically significant difference.”

- Shivaprakash PK, et al. (2011). Relation between dental fluorosis and intelligence quotient in school children of Bagalkot district. *J Indian Soc Pedod Prev Dent.* 29(2):117-20.

Children with dental fluorosis had lower IQ (66.63±18.09) than those without dental fluorosis (76.36±20.84), p < 0.05. Children with mild dental fluorosis had lower IQ (66.73) than those without dental fluorosis (75.89), p < 0.05.

“Previous studies had indicated toward decreased intelligence in children exposed to high levels of fluoride and our study also confirmed such an effect.”

- Li F, et al. (2009). The impact of endemic fluorosis caused by the burning of coal on the development of intelligence in children. *Journal of Environmental Health* 26(4):838-40 - IQ decreased with increasing F level in urine (p < 0.01) – IQ was significantly reduced among children with severe fluorosis as compared to children without fluorosis (p < 0.05) – A trend (albeit not statistically significant) for IQ to decrease with increasing severity of dental fluorosis (NS) and with increasing severity of the region’s fluoride poisoning.

“High exposure to fluoride most definitely has an adverse effect on the development of intelligence in children, in particular on the capability of abstract inference.”

- Rocha-Amador D, et al. (2007). Decreased intelligence in children and exposure to fluoride and arsenic in drinking water. *Cadernos de Saude Publica* 23(Suppl 4):S579-87.

Both fluoride in urine, and fluoride in water, were significantly correlated with IQ, and this correlation remained significant after controlling for lead exposure, socioeconomic status, mother’s education, malnutrition, and transferrin. (2) Fluoride’s effect on IQ was larger than the effect from arsenic.

“We found that exposure to F in urine was associated with reduced Performance, Verbal and Full IQ scores before and after adjusting for confounders. The same pattern was observed for models with F in water as the exposure variable. . . . **The individual effect of F in urine indicated that for each mg increase of F in urine a decrease of 1.7 points in Full IQ might be expected.”**

- Wang SX, et al. (2007). Arsenic and fluoride exposure in drinking water: children’s IQ and growth in Shanyin county, Shanxi province, China. *Environmental Health Perspectives* 115(4):643-7.

Average IQ in high-arsenic area (95.1±16.6) is significantly lower than IQ in control area (104.8±14.7). p < 0.05 – The average IQ in high-fluoride area (100.5±15.8) is also significantly lower than average IQ in control area (104.8±14.7). p < 0.05 – Significantly more children with IQ lower than 70 (mental retardation) in high-F area (4%), medium-arsenic area (3.3%), and high-arsenic area (8.3%) as compared to control (0%).

“This study indicates that exposure to fluoride in drinking water is associated with neurotoxic effects in children.”

- Trivedi MH, et al. (2007). Effect of high fluoride water on intelligence of school children in India. *Fluoride* 40(3):178-183.

Average IQ is lower in High-F area (91.72 ± 1.13) than in Low-F area (104.44 ± 1.23), $p < 0.001$. High F area has 28.09% of children with IQ below normal (over twice the percentage found in lower F area).

“In agreement with other studies elsewhere, these findings indicate that children drinking high F water are at risk for impaired development of intelligence.”

- Fan Z, et al. (2007). The effect of high fluoride exposure on the level of intelligence in children. *Journal of Environmental Health* 24(10):802-03.

Average IQ in High-F area (96.11 ± 12.00) is lower than Low-F area (98.41 ± 14.75), although difference is not statistically significant. No child in High-F area has outstanding or excellent intelligence. The respective rates in the Low-F area are 2.7% and 5.4%, respectively.

“Exposure to high levels of fluoride is likely to cause a certain level of harm to a child’s level of intelligence.”

- Seraj B, et al. (2006). [Effect of high fluoride concentration in drinking water on children’s intelligence]. [Study in Persian] *Journal of Dental Medicine* 19(2):80-86.

“In the high fluoride area the mean IQ of children (87.9 ± 11) was significantly lower than in the low fluoride area (98.9 ± 12.9) ($P = 0.025$).”

“Based on the findings of this study, exposure of children to high levels of fluoride may carry the risk of impaired development of intelligence.”

- Wang S, et al. (2005). The effects of endemic fluoride poisoning caused by coal burning on the physical development and intelligence of children. *Journal of Applied Clinical Pediatrics* 20(9):897-898 (republished in *Fluoride* 2008; 41:344-348).

Children from high F (endemic) areas had lower IQ than those from lower F (control) area ($p < 0.01$). Negative correlation between urine F and IQ ($p < 0.01$).

“High fluoride burden has a definite effect on the intellectual and physical development of children.”

- Xiang Q, et al. (2003a). Effect of fluoride in drinking water on children’s intelligence. *Fluoride* 36: 84-94. – Xiang Q, et al. (2003b). Blood lead of children in Wamiao-Xinhua intelligence study. *Fluoride* 36: 198-199.

Mean IQ of high F village (92.02 ± 13.00) is lower than low F village (100.41 ± 13.21), $p < 0.01$.

Higher drinking water F is significantly associated with higher rates of mental retardation (IQ < 70) and borderline intelligence (IQ = 70-79), $p < 0.05$. Children’s IQs are not related to urinary iodine, family income, or parent’s education level.

“In endemic fluorosis areas, drinking water fluoride levels greater than 1.0 mg/L may adversely affect the development of children’s intelligence.”

- Li Y, et al. (2003). Effects of endemic fluoride poisoning on the intellectual development

of children in Baotou. *Chinese Journal of Public Health Management* 19(4):337-338 (republished in *Fluoride* 2008; 41:161-64).

Average IQ of children in endemic area (92.07) somewhat lower than that of control area (93.78), NS. Rate of children with low IQ (<69) greater in endemic area (10.38%) than in control area (4.24%) ("high statistical significance", but no p value given).

"In our study, we found that the average IQ of children in a fluoride endemic area was somewhat lower than the control, but the result was not statistically significant ($p > 0.05$). The percentage of children with fluorosis, however, was higher as compared to the control, and this was very significant statistically."

- Shao Q, et al. (2003). Study of cognitive function impairment caused by chronic fluorosis. *Chinese Journal of Endemiology* 22(4):336-38.

Significantly lower operation score on IQ test in high F area (48-54) versus low F area (52-59), $p < 0.01$. Lower total IQ score in high F area (78-100, average) than in low F area (109-118, average-high), although not statistically significant. High F subjects have significantly lower scores on several of the performance tests (speech fluency, recognition, similarity, $p < 0.01$, and digit span, $p < 0.05$), and this correlates with elevated levels of oxidative stress.

"The results suggest that some cognitive function limitations exist in those suffering from chronic fluoride poisoning, and its biologic basis may be related to the levels of SOD and NO [indices of oxidative stress]."

- Wang X, et al. (2001). Effects of high iodine and high fluorine on children's intelligence and thyroid function. *Chinese Journal of Endemiology* 20(4):288-90.

Average IQ is lower in High-F area than in Low-F area (76.67 ± 7.75 vs. 81.67 ± 11.97), although the difference does not reach statistical significance. The rate of extremely low and borderline IQ is higher in the High F areas than in the Low F areas (16.67% vs. 10% and 36.67% vs. 16.67, respectively), although these differences do not reach statistical significance.

"High iodine and high fluorine have certain influence on children's intelligence and thyroid function."

- Hong F, et al. (2001). Research on the effects of fluoride on child intellectual development under different environments. *Chinese Primary Health Care* 15(3):56-57 (republished in *Fluoride* 2008; 41(2):156-60).

Average IQ of High F/Low I group (68.38 ± 19.12) and Low F/Low I group (75.53 ± 6.92) is lower than control group (82.79 ± 8.98), $p < 0.01$. IQ of High F/Low I group is lower than Low F/Low I group, $p < 0.01$. Significant interaction exists between High Fluoride and Low Iodine, $p < 0.01$. (D) IQ ranking of high F groups show significant deficits compared to control, $p < 0.01$.

"The IQ results of this study show no significant difference between the average IQs of those children from the high fluoride only areas and the high fluoride/high iodine areas, however the result from the high fluoride/low iodine group show statistically significant differences as compared to that of the low fluoride/low iodine group. In short, it appears that the presence or lack of iodine is a more significant factor in both the prevalence of goiter and average IQ."

- Lu Y, et al (2000). Effect of high-fluoride water on intelligence of children. *Fluoride* 33:74-78.

Average IQ of children from High F village (92.27 ± 20.45) is lower than children from Low F village (103.05 ± 13.86), $p < 0.005$. More “retarded” ($IQ < 70$) and “borderline” intelligence ($IQ = 70-79$) children in high F group (21.6%) than in low F group (3.4%), $p < 0.005$. Significant inverse relationship exists between urinary F and IQ.

“The findings of this study thus replicate those of earlier studies and suggest that a real relationship exists between fluoride exposure and intelligence.”

- Zhang J, et al. (1998). The effect of high levels of arsenic and fluoride on the development of children’s intelligence. *Chinese Journal of Public Health* 17(2):119.

No **difference in IQ** among the 4 to 8 year olds, a slight (non-significant) reduction in IQ among the 9 year olds (who were exposed to fluoride during fetal development), and **a significant reduction among the 10 year olds (who were exposed during fetal development and their first year of life)**.

“Even though there were differences in the results from the 10 year-old subjects from the normal comparative group, in contrast to subjects from the high fluoride high arsenic group and the high fluoride group, these results might not be overtly representative as less number of subjects from the high fluoride group has been tested.”

- Yao Y, et al. (1997). Comparative assessment of the physical and mental development of children in endemic fluorosis area with water improvement and without water improvement. *Literature and Information on Preventive Medicine* 3(1):42-43.

Children in fluorosis area (without water improvement) have lower average IQ than children in fluorosis area (with water improvement) for all age groups, $p < 0.01$. **Children in fluorosis area without water improvement have lower average IQ than children in non-fluorosis area for all age groups**, $p < 0.01$. Children born prior to water improvement program in fluorosis area with water improvement have lower average IQ than children in non-fluorosis area, $p < 0.05$. No significant difference in intelligence exists between children born after water improvement and children in non-fluorosis area.

“These results show that water improvement and defluoridation can improve the mental and physical development of children in a fluorosis area.”

- Yao Y, et al. (1996). Analysis on TSH and intelligence level of children with dental Fluorosis in a high fluoride area. *Literature and Information on Preventive Medicine* 2(1):26-27.

Average IQ of children with dental fluorosis in high-fluorosis area and light-fluorosis areas is lower than children in non-fluorosis area, $p < 0.01$. Average IQ of children with dental fluorosis from high-fluorosis area is lower than those from light-fluorosis area, $p < 0.05$. Rate of high IQ (> 120) is lower in high-fluorosis area (3.85%) and light-fluorosis area group (6.91%) than non-fluorosis area (10.74%) (no p value given).

“The results of the intelligence tests show that a high level of fluoride influences children’s IQ, which is consistent with some previous data. It is worth mentioning that the higher the degree of dental fluorosis, the more negative the impact on the children’s intelligence level. This is an issue which merits utmost attention.”

- Zhao LB, et al. (1996). Effect of high-fluoride water supply on children’s intelligence. *Fluoride* 29: 190-192.

Children in High-F village have significantly lower average IQ (97.69 ± 13.00) than children in lower-F village (105.21 ± 14.99), $p < 0.01$.

“The results of this study indicate that intake of high-fluoride drinking water from before birth has a significant deleterious influence on children’s IQ in one of two similar villages.”

- Wang G, et al. (1996). A study of the IQ levels of four- to seven-year-old children in high fluoride areas. *Endemic Diseases Bulletin* 11(1):60-6 (republished in *Fluoride* 2008; 41:340–43).

Average Total IQ in High F group (95.64 ± 14.34) is lower than in control group (101.23 ± 15.84), $p < 0.05$. Average Performance IQ in High F group (94.33 ± 14.76) is lower than in Control group (101.77 ± 18.12), $p < 0.01$. Average Verbal IQ is not significantly different. In High F area, children with below-normal head circumference have lower average IQ (89.07 ± 15.69) than those with normal head circumference (97.13 ± 8.06), $p < 0.01$.

“The results show that a high fluoride intake has a clear influence on the IQ of preschool children, manifesting itself primarily as damage to performance intelligence.”

- Duan J, et al. (1995). A comparative analysis of the results of multiple tests in patients with chronic industrial fluorosis. *Guizhou Medical Journal* 18(3):179-180.

Average IQ of workers with industrial fluorosis was significantly lower (68 to 72) than fluoride-exposed workers without industrial fluorosis (84.5), and IQ of fluoride-exposed workers without fluorosis (84.5) was significantly lower than IQ of non-exposed workers (99.4).

“It may be determined that industrial fluorine poisoning has gradually progressive effects on the normal function and metabolism of the adult brain and other aspects of the nervous system. With the progression of the course of fluorosis, neurological damage gradually worsens, with the degree of damage closely related to the length of exposure to fluorine, nail fluorine content, and other factors. **Damage from high concentrations of fluorine not only affects bones and ligaments, tendons, and other soft tissue, but is also quite widespread throughout the entire nervous system.** This is of major significance for worker protection and other areas.”

- Li XS, et al. (1995). Effect of fluoride exposure on intelligence in children. *Fluoride* 28:189-192.

Average IQ of children in severe (80.3 ± 12.9) and medium (79.7 ± 12.7) fluorosis areas is lower than the slight (89.7 ± 12.7) and non-fluorosis (89.9 ± 10.4) areas, $p < 0.01$.

“A high fluoride intake was associated with a lower intelligence.”

- Xu Y, et al. (1994). The effect of fluorine on the level of intelligence in children. *Endemic Diseases Bulletin* 9(2):83-84.

Children in areas with high-fluoride and low-iodine have significantly lower IQs than children in areas with high-fluoride and high-iodine, $p < 0.01$. More children have low IQ (< 69) in areas with High F/High I (10.53%), High F only (7.32%), and High F/Low I (12.82%) than in control group (1.61%)

“The number of children whose level of intelligence is lower is significantly increased in regions of high fluoride/iodine, regions of high fluoride only, regions of high fluoride/low iodine, against their respective comparative groups. . . .

This could be demonstrative of the fact that fluoride acts to increase the toxicity and worsen the occurrence of thyroid swelling.”

- Li Y, et al. (1994). Effects of high fluoride intake on child mental work capacity: Preliminary investigation into the mechanisms involved. *Journal of West China University of Medical Sciences* 25(2):188-91 (republished in *Fluoride* 2008; 41:331-35).

Children with dental fluorosis in mid-exposure group (HiF2) have reduced short-term mental capacity ($p < 0.05$), reduced mental capacity index ($p < 0.01$), and reduced NLF scores ($p < 0.01$) as compared to children with no fluorosis and children with lower exposure. Children with dental fluorosis in high-exposure group (HiF3) have reduced short-term mental capacity ($p < 0.01$), reduced mental capacity index ($p < 0.01$), and reduced NLF scores ($p < 0.01$) as compared children with no fluorosis and children with low exposure.

“As shown in this study, the mental work capacity (MWC) of the two groups of children with grade 3 dental fluorosis was lower than the two groups with no dental fluorosis. . . . This indicates that early, long-term exposure to excess fluoride causes deficits in memory, attention, and reaction time, but 12–13 year-old children with only recent exposure show no major effects.

Studies [on human fetuses] have already shown that the developing brain is one of the ripest targets for disruption by fluoride poisoning. Given that before six years of age the human brain is in its fastest stage of development, and that around seven and eight basic structural development is completed, therefore the brain is most vulnerable to damage from excess fluoride intake before this age.

- Yang Y, et al. (1994). The effects of high levels of fluoride and iodine on intellectual ability and the metabolism of fluoride and iodine. *Chinese Journal of Epidemiology* 15(4):296-98 (republished in *Fluoride* 2008; 41:336-339).

Children in high F/high iodine area have lower IQ (76.67+7.75) than those in low F area (81.67+11.97), although the difference is not statistically significant. Greater percentage of children have moderately low IQ (≤ 79) in High F/High Iodine area (76.67%) than in control area (36.67%), $p < 0.01$.

“An excess of fluoride and a lack of iodine in the same environment has been shown to have a marked effect on child intellectual development, causing a more significant intellectual deficit than lack of iodine alone.”

- An J, et al. (1992). The effects of high fluoride on the level of intelligence of primary and secondary students. *Chinese Journal of Control of Endemic Diseases* 7(2):93-94.

Children in the High-F villages have significantly lower IQs at each age group studied: 7-10 ($p < 0.02$); 11-13 ($p < 0.01$); 14-16 ($p < 0.03$); 7-16 ($p < 0.01$). Significantly more children in High-F villages have “critical state” IQ, $p < 0.01$. (C) When children within the High-F villages are stratified into highest-F (5.2-7.6 mg/L), and lowest-F levels (2.1-3.2 mg/L), the children in the higher-F areas had significantly lower IQ than the lower-F areas ($p < 0.05$).

“The results show that the level of intelligence of primary and secondary students from the high fluoride area and that of primary and secondary students from the non-high fluoride area had very significant differences, proving that high fluoride has adverse effects on the mental development of students. The higher the water fluoride is, the lower the level of IQ.”

- Lin Fa-Fu; et al (1991). The relationship of a low-iodine and high-fluoride environment to

sub-clinical cretinism in Xinjiang. *Endemic Disease Bulletin* 6(2):62-67 (republished in *Iodine Deficiency Disorder Newsletter* Vol. 7(3):24-25).

Children from the High F/Low Iodine area have significantly lower IQs (IQ=71) than children from the Low F/Low Iodine area (IQ=77-79; $p < 0.05$), and control area (IQ=96); $p < 0.01$.

“The significant differences in IQ among these regions suggests that fluoride can exacerbate central nervous lesions and somatic developmental disturbance caused by iodine deficiency.”

- Guo X, et al. (1991). A preliminary investigation of the IQs of 7-13 year old children from an area with coal burning-related fluoride poisoning. *Chinese Journal of Endemiology* 10(2):98-100 (republished in *Fluoride* 2008; 41(2):125–28).

Children from endemic fluorosis area have lower average IQ (76.7) than children in non-endemic area (81.4), $p < 0.05$. A greater percentage (30%) of children in endemic area have low IQ (≤ 69) than in non-endemic area (11.5%), $p < 0.05$.

“In summary, although diminished intellectual ability can result from a multitude of factors (both innate and acquired) that influence neural development and cell division in the cerebrum, the comparison conducted in this study of two areas where the other environment factors are basically the same **shows clear differences in IQ, and it [is] probable that this difference is due to a high fluoride environment.**”

- Chen YX, et al. (1991). Research on the intellectual development of children in high fluoride areas. *Chinese Journal of Control of Endemic Diseases* 6(Suppl):99-100 (republished in *Fluoride* 2008; 41:120–24).

Average IQ of children in High-F village (100.24 ± 14.52) significantly lower than children in lower-F village (104.03 ± 14.96), $p < 0.01$.

“The results of this study indicate that there is significant difference between the intellectual ability of the 7–14 year old children from the [fluorosis] endemic area and those of the control, and moreover that the average IQ of the children from the endemic area is clearly lower.”

- Sun M, et al. (1991). Measurement of intelligence by drawing test among the children in the endemic area of Al-F combined toxicosis. *Journal of Guiyang Medical College* 16(3):204-06.

Children from endemic fluorosis area had lower IQ than those from non-endemic area at all ages except ≤ 7 ($p < 0.05$)

“From these results, it can be concluded that excessive consumption of fluorine and aluminum in the early stage of development directly impacts the development of the human brain, which causes the delayed intellectual development seen in children living in the endemic areas.”

- Qin LS, Cui SY. (1990). Using the Raven’s standard progressive matrices to determine the effects of the level of fluoride in drinking water on the intellectual ability of school-age children. *Chinese Journal of the Control of Endemic Diseases* 5(4):203-04 (republished in *Fluoride* 2008; 41:115–19).

Children in High F (21.17%) and Low F (23.03%) areas had lower average IQ scores than children in normal F area (28.14%), $p < 0.01$.

“All of these findings serve to indicate that both high and low fluoride can affect the normal development and function of the cerebrum as well as the entire nervous system causing a decrease in intellectual ability.”

- Ren D, et al. (1989). A study of the intellectual ability of 8-14 year-old children in high fluoride, low iodine areas. *Chinese Journal of Control of Endemic Diseases* 4(4):251 (republished in *Fluoride* 2008; 41:319-20).

Average IQ of children in the High Fluoride/Low Iodine group (IQ=64.8) significantly lower than the children in the Low Fluoride/Low Iodine group (IQ = 85.0), $p < 0.01$. - The percentage of children with low IQ (<69) significantly greater in High F/Low Iodine group (40.6%) than in Low Fluoride/Low Iodine group (13.6%), $p < 0.01$.

From the results it is evident that disrupted child intellectual development is among the effects on the human body from a harmful environment containing both high fluoride and low iodine, and this disruption is clearly much more serious than the effects of iodine deficiency alone.”

28. Attention Deficit Hyperactivity Disorder. NIH Publication No. 3572, National Institute of Mental Health (NIMH), Margaret Strock et al., 1996. Article by Dr. Al Sears, M.D., a practicing physician with extensive experience in the fields of complementary and natural healthcare.

29. Attention Deficit Hyperactivity Disorder. NIH Publication No. 3572, National Institute of Mental Health (NIMH), Margaret Strock et al., 1996

30. "Fluoride intakes during each of the first 4 years were individually significantly related to fluorosis on maxillary central incisors, with the first year most important ($P < 0.01$), followed by the second ($P < 0.01$), third ($P < 0.01$), and fourth year ($P = 0.03$)."

SOURCE: Hong L, Levy SM, et al. (2006). Timing of fluoride intake in relation to development of fluorosis on maxillary central incisors. *Community Dentistry and Oral Epidemiology* 34(4):299-309.

31. "It appears that, at least under some circumstances, high intakes of fluoride during the early months of life may make the difference between developing or failing to develop dental fluorosis. A study conducted in Sweden of 12- and 13-year-old children who had lived since birth in a community with 1.2 ppm of fluoride in the drinking water demonstrated that dental fluorosis was less common in those who had been breast-fed during the first 4 months of life than in those who had been fed powdered formulas reconstituted with tap water (Forsman, 1977). A somewhat similar study in the United States demonstrated that among 7- to 13-year-old children (most of them living in a community with fluoride concentration of the drinking water 1 mg/L), the prevalence of mild enamel fluorosis was significantly greater in those who had been fed concentrated liquid formula diluted with tap water during the first 3 months of life than in those who had been breast-fed during this time (Walton and Messer, 1981). It seems reasonable to conclude that the lower prevalence of fluorosis of the permanent teeth of individuals who were breast-fed during the early months of life is related to the low fluoride concentrations of human milk - concentrations less than 7 $\mu\text{g/L}$ regardless of the concentration of fluoride in the women's drinking water."

SOURCE: Ekstrand J, et al. (1994). Absorption and retention of dietary and supplemental fluoride by infants. *Advances in Dental Research* 8:175-80.

32. "The findings indicate that early mineralising teeth (central incisors and first molars) are highly susceptible to dental fluorosis if exposed to fluoride from the first and – to a lesser extent – also from the 2nd year of life."
SOURCE: Bardsen A, Bjorvatn K. (1998). Risk periods in the development of dental fluorosis. *Clinical Oral Investigations* 2:155-160.
33. "Our data suggest that the fluoride contribution of water used to reconstitute infant feedings is a major determinant of primary tooth fluorosis."
SOURCE: Marshall TA, et al. (2004). Associations between Intakes of Fluoride from Beverages during Infancy and Dental Fluorosis of Primary Teeth. *Journal of the American College of Nutrition* 23:108-116.
34. "There was a strong association between mild-to-moderate fluorosis on later forming enamel surfaces and infant formula use in the form of powdered concentrate (OR=10.77, 95% CI 1.89-61.25)."
SOURCE: Pendry DG, Katz RV. (1998). Risk factors for enamel fluorosis in optimally fluoridated children born after the US manufacturers' decision to reduce the fluoride concentration of infant formula. *American Journal of Epidemiology* 148:967-74.
35. "Breastfeeding of infants should be encouraged, both for the many documented, general health benefits and the relative protection against ingestion of excessive fluoride from high quantities of fluoridated water used to reconstitute concentrated infant formula early in infancy."
SOURCE: Levy SM, Kiritsy MC, Warren JJ. (1995). Sources of fluoride intake in children. *Journal of Public Health Dentistry* 55: 39-52.
36. *JOURNAL OF THE ROYAL SOCIETY OF MEDICINE*, Volume 88, September 1995, 'The role of fluoride toothpastes in the prevention of dental caries', William H Bowen, BDS, PhD
37. Teotia SPS, Teotia M. Endemic skeletal fluorosis in children: Evidence of secondary hyperparathyroidism. In: *Clinical Aspects of Metabolic Bone Disease* (Eds. Boy Frame, Parfitt and Howard Duncan), Excerpta Medica, Amsterdam, 1973, pp. 232-238.
38. "Infant formulas reconstituted with higher fluoride water can provide 100 to 200 times more fluoride than breastmilk, or cow's milk."
SOURCE: Levy SM, Guha-Chowdhury N. (1999). Total fluoride intake and implications for dietary fluoride supplementation. *Journal of Public Health Dentistry* 59: 211-23.
39. Fomon SJ, Ekstrand J. (1999). Fluoride intake by infants. *Journal of Public Health Dentistry*, 59(4):229-34.
40. 4th International Workshop on Fluorosis Prevention and Defluoridation of Water / Highlights of Forty Years of Research on Endemic Skeletal Fluorosis in India, S P S Teotia *, M Teotia and K P Singh
41. Teotia M, Teotia SPS and Kunwar KB. Endemic skeletal fluorosis. *Arch. Dis.Child.* 1971; 46:686-91.
42. SOURCE: Diesendorf M, Diesendorf A. (1997). Suppression by medical journals of a warning about overdosing formula-fed infants with fluoride. *Accountability in Research* 5:225-237.
43. Dec 21, 2000 letter from Melinda K. Plaisier, Associate Commissioner for Legislation, Food and Drug Administration, Rockville MD., to The Honorable Ken Calvert, Chairman, Subcommittee on Energy and Environment, Committee on Science, House of Representatives Washington, D.C.

- 43b. "To date, FDA has approved no fluoride-containing supplements as prescription or over-the-counter drugs." SOURCE: Robert Moore, Food & Drug Administration, November 17, 2005
44. Sept. 2000 'A Systematic Review of Public Water Fluoridation', McDonagh et al, NHS Centre for Reviews and Dissemination, University of York
45. Health Canada, 'Guidelines for Canadian Drinking Water Quality / Technical Guideline: Fluoride' Dec. 2010
46. Dabeka WD, McKenzie AD - "Survey of lead, cadmium, fluoride, nickel, and cobalt in food composites and estimation of dietary intakes of these elements by Canadians in 1986-1988" Journal of AOAC International 78:4, 897-909 (1995)
47. BabyCenter Editorial Team w/ Medical Advisory Board
<http://www.babycenter.com/refcap/674.html#3>
48. Public Health Agency of Canada 'Healthy Pregnancy: Caffeine and Pregnancy' 2014/01/31
49. Statistics Canada, November 2008, 'Beverage Consumption of Canadian Adults'
50. Health Canada, 2012/09/18, 'Food and Nutrition/Questions and Answers for Educators/Canada Food Guide', Q: 'Why is there no specific recommended intake of water?'
51. The Merck Manual Professional Edition 'Physiology of Pregnancy', November 20103
52. Canadian Society for Exercise Physiology (csep.ca)
53. NEUROTRANSMITTER AND RECEPTOR CHANGES IN THE BRAINS OF FETUSES FROM AREAS OF ENDEMIC FLUOROSIS Yanni Yu, Wenxiu Yang, Zhong Dong, et al Chinese Journal of Endemiology, June 2008
As noted by Yu (1996), "when norepinephrine levels drop the ability to maintain an appropriate state of activation in the central nervous system is weakened."
Studies of fluoride-treated animals have reported similar effects, including lower levels of norepinephrine. (Kaur 2009; Li 1994).
54. <http://fluoridealert.org/articles/fda-1966/>
<http://fluoridealert.org/articles/kelly-statement/>
55. Institute of Medicine, Feb. 11, 2004 'Dietary Reference Intakes: Water, Potassium, Sodium, Chloride, and Sulfate' "... men should drink three litres (13 cups) of water each day and women need 2.2 litres (nine cups). Children, aged one to three years, need one litre (four cups) daily. Children, four to eight, require 1.3 litres (5.5 cups). Teenagers need to drink more - about 1.8 litres (seven cups) for girls and 2.6 litres (10.5 cups) for boys."
56. <http://www.nofluoride.com/presentations/nobel%20prize%20winners.pdf>
57. "The bones are subject to easy fracture."
SOURCE: Blood DC, Henderson JA, Radostits OM, eds. (1979). Veterinary Medicine: A Textbook of the Diseases of Cattle, Sheep, Pgs and Horses. 5th Edition. Lea & Febiger, Philadelphia.

“The bone was brittle and shattered easily when cut on a band saw.”

SOURCE: Krook L, Maylin GA. (1979). Industrial fluoride pollution. Chronic fluoride poisoning in Cornwall Island cattle. *Cornell Veterinarian* 69(Suppl 8): 1-70.

“fluorotic specimens had a lower tensile strength and strain but a higher compressive strength and strain than the non-fluorotic ones.”

SOURCE: Evans FG, Wood JL. (1976). Mechanical properties and density of bone in a case of severe endemic fluorosis. *Acta Orthopaedica Scandinavica* 47: 489-495.

58. In 1997, 1500 scientists, engineers, and lawyers of the Environmental Protection Agency (EPA) joined in the release of a cautionary statement regarding fluoride: "Our members' review of the body of evidence over the last eleven years, including animal and human epidemiological studies, indicates a causal link between fluoride/fluoridation and cancer, genetic damage, neurological impairment, and bone pathology.”

59. Jan 2005, ‘The Dose Makes the Poison--Or Does It?’ Nancy Trautmann How should the degree of toxicity of substances be determined? There are two opposing views:

- “the dose makes the poison” maintains that all chemicals are toxic at high enough doses
- the counterargument is that chemical sensitivity varies considerably, depending on species and life stages.

To protect human and environmental health in spite of this uncertainty, some governments adhere to the Precautionary Principle.

Nancy Trautmann, Ph.D., directs Cornell University’s [Environmental Inquiry program](#), which focuses on enriching secondary science through helping students and teachers design and conduct environmental science research projects. She is lead author of the Cornell Science Inquiry Series, published by the National Science Teachers Association. *Assessing Toxic Risk*, one of the titles in this series, provides directions for assessing chemical toxicity using bioassay protocols similar to those used by professional scientists. Trautmann received her M.S. in 1980 and her Ph.D. in 2006 from Cornell.

<http://www.dnr.cornell.edu/cals/dnr/people/academic-staff.cfm>

60. <http://www.rnasociety.org/about/what-is-rna/> The RNA Society 9659 Rockville Pike, Bethesda, Maryland (301) 634-7166

61. <http://fluoridealert.org/studies/brain04/> ‘Fluoride’s Direct Effects on Brain: Animal Studies’ Fluoride Action network

62. <http://fluoridealert.org/content/sheldon-york-review/> “The review did not show water fluoridation to be safe. The quality of the research was too poor to establish with confidence whether or not there are potentially important adverse effects in addition to the high levels of fluorosis. The report recommended that more research was needed.”

“Whilst there is evidence that water fluoridation is effective at reducing caries, the quality of the studies was generally moderate and the size of the estimated benefit, only of the order of 15%, is far from “massive”.

“There was little evidence to show that water fluoridation has reduced social inequalities in dental health.”

“The review team was surprised that in spite of the large number of studies carried out over several decades there is a dearth of reliable evidence with which to inform policy.”

SOURCE: Prof Trevor A. Sheldon, DEPARTMENT OF HEALTH STUDIES Innovation Centre, York Science Park, University Road, York YO10 5DG

