

P. Anthony Chapdelaine, Jr., MD, MSPH

General and Alternative Medicine

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2/28/05

Mr. Daniel G. Stockin, MPH
Senior Operations Officer
The Lillie Center, Inc.
P.O. Box 1951
Brentwood, TN 37067

Dear Mr. Stockin:

As a Nashville-area physician who is board-certified in Preventive Medicine, I am sending this letter to document my support of efforts to stop the senseless fluoridation of drinking water in Tennessee.

There are many reasons why I do not support fluoridation:

1. Silicofluoride (hydrofluoric acid) is a carcinogenic industrial waste, a toxin and former rat and cockroach poison, that industry rids itself of at a profit, rewarding the American Dental Association for its supporting its use.
2. Fluoride is a poison that accumulates in the bones, causing symptoms that are often misdiagnosed as arthritis, when in fact the fluoride is causing the painful first stages of skeletal fluorosis.
3. Fluoride crosses the placental barrier affecting the fetus, likely affecting the developing brain. It is more toxic than lead and almost as toxic as arsenic according to the reference text, Clinical Toxicology of Commercial Products. Fluoride is known to negatively affect the fast-growing tissues of newborns. Our most vulnerable citizens, the very young, receive an unmonitored amount of fluoride from water, baby formula, baby foods and other products.
4. The largest comparative study done on fluoridated versus non-fluoridated communities showed no statistical difference in cavity rates. Dental fluorosis in communities spiking their water supply with fluoride adds additional dental health costs that non-fluoride communities avoid.
5. There is no margin-of-safety for fluoride, and its use has been banned in Europe where children's teeth are as healthy as those of fluoride-exposed US children.
6. The EPA concluded that the public water supply shouldn't be used "as a vehicle for disseminating this toxic and prophylactically useless ... substance," while the FDA classifies fluoride as a prescription drug. Communities that contaminate their water supplies with fluoride are mass-medicating their citizens using a known carcinogenic toxin.

I am not surprised that many physicians still support fluoridation. We were taught that fluoride is a healthy additive, and the sheer weight of years of its use has made us deem it not worthy for re-examination. Researchers who demonstrate fluoride's toxicity find difficulty in publishing their research and in obtaining grants, making it impossible for physicians to even learn about the problems with fluoride. Federal health agencies have known these facts for many years, and kept them secret.

But more and more physicians like myself are seeing that when we *personally* examine the studies from both here and abroad, the evidence is overwhelming that fluoridation harms our bodies. Besides, why do we continue to drink fluoridated water when even the dental and public health agencies now admit it works to prevent cavities in the mouth? Why swallow it systemically, over the course of our entire lives, when its cavity-fighting action is admitted to work *topically*? I don't advise my patients to swallow sunscreen, so why would I support them swallowing a topically-acting tooth protective agent, especially when it is a *cumulative* poison?

I whole-heartedly support our water agencies stopping the addition of fluoride to our water supplies.

Sincerely,

Anthony Chapdelaine, MD, MSPH

GARY ODOM
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HEALTH AND HUMAN RESOURCES
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Anthony Chaplain, M.D.
229 Ward Circle, Suite B-12
Brentwood, TN 37027

Dear Dr. Chaplain:

I am writing to ask for your assistance. I was approached late last year by a firm that has raised many thought provoking questions regarding the public policy of fluoridating our public water supplies.

Tennessee has largely supported the idea of fluoridation since the 1950s; however, some cities and water agencies across the United States are now rethinking the safety of adding fluoride to water as a means to help prevent cavities in children. Countries such as Scotland and Sweden have rejected fluoridation. United States cities such as Honolulu and Colorado Springs have also declined or stopped fluoridation. The EPA's Washington, DC headquarters union of professionals is now strongly against fluoridation and urges cities not to implement fluoridation programs.

Enclosed are some of the reference materials that have been provided by Mr. Daniel G. Stockin, MPH. Mr. Stockin is Senior Operations Officer for the Lillie Center, Inc. which is based in Brentwood, Tennessee. He has 17 years of experience in public health and significant experience in environmental health hazard management and risk assessment. His firm, the Lillie Center, Inc., is a public health and environmental health services firm.

Mr. Stockin originally wanted me to hold a public hearing regarding new data suggesting that fluoridation of our public water supplies constitutes a hazardous public policy for our citizens. He made this request following several meetings where he presented me with the information I have attached for your review. Instead of a formal public hearing, I suggested that we first hold a stakeholders meeting involving individuals of varying expertise who could contribute to a serious discussion regarding this issue.

I have also included a list of individuals who have been invited to attend this stakeholders meeting. The meeting is scheduled for June 3rd in Legislative Plaza Room 30. First, I would appreciate your attendance at this meeting. If you, or a representative of your organization, cannot participate, please let me know as soon as possible. Second, I would appreciate you bringing any reference material you may have in support of fluoridating, or not fluoridating, public water supplies.

Page 2: June 3, 2005 Stakeholders Meeting

It is my plan to give Mr. Stockin approximately one hour to present his arguments substantiating his position. It is then my plan to have questions and rebuttals. It is my hope that enough information can be generated during this meeting to either clearly substantiate our current public policy or proceed with a broader level of legislative involvement.

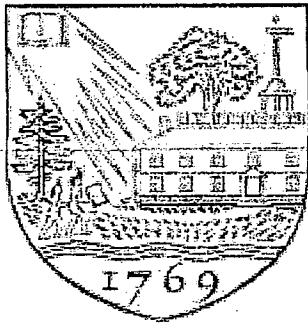
I hope you can participate in this important meeting. If you have any questions, please do not hesitate to contact my office.

Sincerely,

A handwritten signature in black ink that reads "Gary Odom". The signature is written in a cursive, slightly slanted style.

Gary Odom
State Representative

ROGER D. MASTERS



Research Professor
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Abstracts of Selected Publications

Association of Silicofluoride Treated Water with Elevated Blood Lead (*Neurotoxicology*, Masters, RD., Coplan, MK, Hone, BT and Dykes, JE (2000) 21:101-110.)

Abstract: Previous epidemiological studies have associated silicofluoride-treated community water with enhanced child blood lead parameters. Chronic, low-level dosage of silicofluoride (SiF) has never been adequately tested for health effects in humans. We report here on a statistical study of 151,225 venous blood lead (VBL) tests taken from children ages 0-6 inclusive, living in 105 communities of populations from 15,000 to 75,000. The tests are part of a sample collected by the New York State Department of Children's Health, mostly from 1994-1998. Community fluoridation status was determined from the CDC 1992 Fluoridation Census. Covariates were assigned to each community using the 1990 U.S. Census. Blood lead measures were divided into groups based on race and age. Logistic regressions were carried out for each race/age group, as well as above and below the median of 7 covariates to test the relationship between known risk factors for lead uptake, exposure to SiF-treated water, and VBL >10µg/dL. RESULTS: For every age/race group, there was a consistently significant association of SiF treated community water and elevated blood lead. Logistic regressions above and below the median value of seven covariates show an effect of silicofluoride on blood lead independent of those covariates. The highest likelihood of children having VBL>10µg/dL occurs when they are both exposed to SiF treated water and likely to be subject to another risk-factor known to be associated with high blood lead (e.g., old housing). Results are consistent with prior analyses of surveys of children's blood lead in Massachusetts and NHANES III. These data contradict the null hypothesis that there is no difference between the toxic effects of SiF and sodium fluoride, pointing to the need for chemical studies and comprehensive animal testing of water treated with commercial grade silicofluorides.

Why EPA's Headquarters Professionals' Union Opposes Fluoridation

National Treasury Employees Union - Chapter 280

May 1, 1999

Why EPA's Headquarters Professionals' Union Opposes Fluoridation

by Dr. J. William Hirzy

Senior Vice President, NTEU Chapter 280

The following documents why our union, formerly National Federation of Federal Employees Local 2050 and since April 1998 Chapter 280 of the National Treasury Employees Union, took the stand it did opposing fluoridation of drinking water supplies. Our union is comprised of and represents the approximately 1500 scientists, lawyers, engineers and other professional employees at EPA Headquarters here in Washington, D.C.

The union first became interested in this issue rather by accident. Like most Americans, including many physicians and dentists, most of our members had thought that fluoride's only effects were beneficial - reductions in tooth decay, etc. We too believed assurances of safety and effectiveness of water fluoridation. For a history of how drinking water fluoridation began, see "Fluoride, Teeth and the Atomic Bomb", by investigative reporters Joel Griffiths and Chris Bryson.

Then, as EPA was engaged in revising its drinking water standard for fluoride in 1985, an employee came to the union with a complaint: he said he was being forced to write into the regulation a statement to the effect that EPA thought it was alright for children to have "funky" teeth. It was OK, EPA said, because it considered that condition to be only a cosmetic effect, not an adverse health effect. The reason for this EPA position was that it was under political pressure to set its health-based standard for fluoride at 4 mg/liter. At that level, EPA knew that a significant number of children develop moderate to severe dental fluorosis, but since it had deemed the effect as only cosmetic, EPA didn't have to set its health-based standard at a lower level to prevent it. We tried to settle this ethics issue quietly, within the family, but EPA was unable or unwilling to resist external political pressure, and we took the fight public with a union amicus curiae brief in a lawsuit filed against EPA by a public interest group. The union has published on this initial involvement period in detail (1).

Since then our opposition to drinking water fluoridation has grown, based on the scientific literature documenting the increasingly out-of-control exposures to fluoride, the lack of benefit to dental health from ingestion of fluoride and the hazards to human health from such ingestion. These hazards include acute toxic hazard, such as to people with impaired kidney function, as well as chronic toxic hazards of gene mutations, cancer, reproductive effects, neurotoxicity, bone pathology and dental fluorosis. First, a review of recent neurotoxicity research results.

In 1995, Mullenix and co-workers (2) showed that rats given fluoride in drinking water at levels that give rise to plasma fluoride concentrations in the range seen in humans suffer neurotoxic effects that vary according to when the rats were given the fluoride - as adult animals, as young animals, or through the placenta before birth. Those exposed before birth were born hyperactive and remained so throughout their lives. Those exposed as young or adult animals displayed depressed activity. Then in 1998, Guan and co-workers (3) gave doses similar to those used by the Mullenix research group to try to understand the mechanism(s) underlying the effects seen by the Mullenix group. Guan's group found that several key chemicals in the brain - those that form the membrane of brain cells - were substantially depleted in rats given fluoride, as compared to those who did not get fluoride.

Another 1998 publication by Varner, Jensen and others (4) reported on the brain- and kidney damaging effects in rats that were given fluoride in drinking water at the same level deemed "optimal" by pro-fluoridation groups, namely 1 part per million (1 ppm). Even more pronounced damage was seen in animals that got the fluoride in conjunction with aluminum. These results are especially disturbing because of the low dose level of fluoride that shows the toxic effect in rats - rats are more resistant to fluoride than humans. This latter statement is based on Mullenix's finding that it takes substantially more fluoride in the drinking water of rats than of humans to reach the same fluoride level in plasma. It is the level in plasma that determines how much fluoride is "seen" by particular tissues in the body. So when rats get 1 ppm in drinking water, their brains and kidneys are exposed to much less fluoride than humans getting 1 ppm, yet they are experiencing toxic effects. Thus we are compelled to consider the likelihood that humans are experiencing damage to their brains and kidneys at the 'optimal' level of 1 ppm.

In support of this concern are results from two epidemiology studies from China (5,6) that show decreases in I.Q. in children who get more fluoride than the control groups of children in each study. These decreases are about 5 to 10 I.Q. points in children aged 8 to 13 years. Another troubling brain effect has recently surfaced: fluoride's interference with the function of the brain's pineal gland. The pineal gland produces melatonin which, among other roles, mediates the body's internal clock, doing such things as governing the onset of puberty. Jennifer Luke (7) has shown that fluoride accumulates in the pineal gland and inhibits its production of melatonin. She showed in test animals that this inhibition causes an earlier onset of sexual maturity, an effect reported in humans as well in 1956, as part of the Kingston/Newburgh study, which is discussed below. In fluoridated Newburgh, young girls experienced earlier onset of menstruation (on average, by six months) than girls in non-fluoridated Kingston (8). ~~From a risk-assessment perspective, all these brain effect data are particularly compelling and disturbing because they are convergent.~~ We looked at the cancer data with alarm as well. There are epidemiology studies that are convergent with whole-animal and single-cell studies (dealing with the cancer hazard), just as the neurotoxicity research just mentioned all points in the same direction. EPA fired the Office of Drinking Water's chief toxicologist, Dr. William Marcus, who also was our local union's treasurer at the time, for refusing to remain silent on the cancer risk issue (9). The judge who heard the lawsuit he brought against EPA over the firing made that finding - that EPA fired him over his fluoride work and not for the phony reason put forward by EPA management at his dismissal. Dr. Marcus won his lawsuit and is again at work at EPA. Documentation is available on request.

The type of cancer of particular concern with fluoride, although not the only type, is osteosarcoma, especially in males. The National Toxicology Program conducted a two-year study (10) in which rats and mice were given sodium fluoride in drinking water. The positive result of that study (in which malignancies in tissues other than bone were also observed), particularly in male rats, is convergent with a host of data from tests showing fluoride's ability to cause mutations (a principal 'trigger' mechanism for inducing a cell to become cancerous) (e.g. 11a, b, c, d and data showing increases in osteosarcomas in young men in New Jersey 12, Washington and Iowa 13) based on their drinking fluoridated water. It was his analysis, repeated statements about all these and other incriminating cancer data, and his requests for an independent, unbiased evaluation of them that got Dr. Marcus fired.

Bone pathology other than cancer is a concern as well. An excellent review of this issue was published by Diesendorf et al. in 1997 (14). Five epidemiology studies have shown a higher rate of hip fractures in fluoridated vs. non-fluoridated communities (15a, b, c, d, e). Crippling skeletal fluorosis was the endpoint used by EPA to set its primary drinking water standard in 1986, and the ethical deficiencies in that standard setting process prompted our union to join the Natural Resources Defense Council in opposing the standard in court, as mentioned above.

Regarding the effectiveness of fluoride in reducing dental cavities, there has not been any double-blind study of fluoride's effectiveness as a caries preventative. There have been many, many small scale, selective publications on this issue that proponents cite to justify fluoridation, but the largest and most comprehensive study, one done by dentists trained by the National Institute of Dental Research, on over 39,000 school children aged 5-17 years, shows no significant differences (in terms of decayed, missing and filled teeth) among caries incidences in fluoridated, non-fluoridated and partially fluoridated communities (16). The latest publication (17) on the fifty-year fluoridation experiment in two New York cities, Newburgh and Kingston, shows the same thing. the only significant difference in dental health between the two communities as a whole is that fluoridated Newburgh, N.Y. shows about twice the incidence of dental fluorosis (the first, visible sign of fluoride chronic toxicity) as seen in non-fluoridated Kingston. John Colquhoun's publication on this point of efficacy is especially important (18). Dr. Colquhoun was Principal Dental Officer for Auckland, the largest city in New Zealand, and a staunch supporter of fluoridation - until he was given the task of looking at the world-wide data on fluoridation's effectiveness in preventing cavities. The paper is titled, "Why I changed My Mind About Water Fluoridation." In it Colquhoun provides details on how data were manipulated to support fluoridation in English speaking countries, especially the U.S. and New Zealand. This paper explains why an ethical public health professional was compelled to do a 180 degree turn on fluoridation.

Further on the point of the tide turning against drinking water fluoridation, statements are now coming from other dentists in the pro-fluoride camp who are starting to warn that topical fluoride (e.g. fluoride in tooth paste) is the only significantly beneficial way in which that substance affects dental health (19, 20, 21). However, if the concentrations of fluoride in the oral cavity are sufficient to inhibit bacterial enzymes and cause other bacteriostatic effects, then those concentrations are also capable of producing adverse effects in mammalian tissue, which likewise relies on enzyme systems. This statement is based not only on common sense, but also on results of mutation studies which show that fluoride can cause gene mutations in mammalian and lower order tissues at fluoride concentrations

estimated to be present in the mouth from fluoridated tooth paste (22). Further, there were tumors of the oral cavity seen in the NTP cancer study mentioned above, further strengthening concern over the toxicity of topically applied fluoride.

In any event, a person can choose whether to use fluoridated tooth paste or not (although finding non-fluoridated kinds is getting harder and harder), but one cannot avoid fluoride when it is put into the public water supplies. So, in addition to our concern over the toxicity of fluoride, we note the uncontrolled - and apparently uncontrollable - exposures to fluoride that are occurring nationwide via drinking water, processed foods, fluoride pesticide residues and dental care products. A recent report in the lay media (23), that, according to the Centers for Disease Control, at least 22 percent of America's children now have dental fluorosis, is just one indication of this uncontrolled, excess exposure. The finding of nearly 12 percent incidence of dental fluorosis among children in un-fluoridated Kingston New York (17) is another. For governmental and other organizations to continue to push for more exposure in the face of current levels of over-exposure coupled with an increasing crescendo of adverse toxicity findings is irrational and irresponsible at best. Thus, we took the stand that a policy which makes the public water supply a vehicle for disseminating this toxic and prophylactically useless (via ingestion, at any rate) substance is wrong. We have also taken a direct step to protect the employees we represent from the risks of drinking fluoridated water. We applied EPA's risk control methodology, the Reference Dose, to the recent neurotoxicity data. The Reference Dose is the daily dose, expressed in milligrams of chemical per kilogram of body weight, that a person can receive over the long term with reasonable assurance of safety from adverse effects. Application of this methodology to the Varner et al.(4) data leads to a Reference Dose for fluoride of 0.000007 mg/kg-day. Persons who drink about one quart of fluoridated water from the public drinking water supply of the District of Columbia while at work receive about 0.01mg/kg-day from that source alone. This amount of fluoride is more than 100 times the Reference Dose. On the basis of these results the union filed a grievance, asking that EPA provide un-fluoridated drinking water to its employees.

The implication for the general public of these calculations is clear. Recent, peer-reviewed toxicity data, when applied to EPA's standard method for controlling risks from toxic chemicals, require an immediate halt to the use of the nation's drinking water reservoirs as disposal sites for the toxic waste of the phosphate fertilizer industry (24).

This document was prepared on behalf of the National Treasury Employees Union Chapter 280 by Chapter Senior Vice-President J. William Hirzy, Ph.D.

END NOTE LITERATURE CITATIONS

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Excerpt from:

Hileman B. (1988). Fluoridation of water. Questions about health risks and benefits remain after more than 40 years. *Chemical and Engineering News*. August 1, 1988, 26-42. (See article)

"Although skeletal fluorosis has been studied intensely in other countries for more than 40 years, virtually no research has been done in the U.S. to determine how many people are afflicted with the earlier stages of the disease, particularly the preclinical stages. **Because some of the clinical symptoms mimic arthritis, the first two clinical phases of skeletal fluorosis could be easily misdiagnosed.** Skeletal fluorosis is not even discussed in most medical texts under the effects of fluoride; indeed, a number of texts say the condition is almost nonexistent in the U.S. Even if a doctor is aware of the disease, the early stages are difficult to diagnose. "

Excerpt from:

Kilborn LG, et al. (1950). Fluorosis with report of an advanced case. *Canadian Medical Association Journal*. 62: 135-141.

"Apparently [skeletal fluorosis] is rare on the North American continent, but a few cases have been reported... **It is quite possible that endemic centres [of skeletal fluorosis] exist but that the cause of the disabling spondylitis or other joint affections has not been determined, and a diagnosis of chronic arthritis has resulted.** Few cases in Canada or the United States will be found to be as dramatic as that recorded here from Southwest China, but by calling attention to the advanced stage of this condition help may be afforded to the

diagnosis of early cases."

Excerpt from:

Singh A, et al. (1963). Endemic fluorosis. Epidemiological, clinical and biochemical study of chronic fluoride intoxication in Punjab. *Medicine*. 42: 229-246.

In the early stages of skeletal fluorosis, the "only complaints are vague pains noted most frequently in the small joints of hands and feet, the knee joints and those of the spine. Such cases are frequent in the endemic area and may be misdiagnosed as rheumatoid or osteoarthritis. Such symptoms may be present prior to the development of definite radiological signs."

Excerpt from:

Kumar SP, Harper RA. (1963). Fluorosis in Aden. *British Journal of Radiology*. 36: 497-502.

"The ligamentous calcification [of skeletal fluorosis] is often periarticular and shows as **osteoarthritis** of the spine and hip joints as well as of the sacro-iliac joints."

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"Another frequent finding was the **calcification of ligaments and muscle attachments**... During the survey, those being x-rayed were asked whether they had body pains. Approximately three quarters of those later found to have radiological evidence of skeletal involvement did complain of pains mainly in the back, chest, and legs."

Hip Fractures and Fluoridation in Utah's Elderly Population

Christa Danielson, MD; Joseph L Lyon, MD; Marione Egger, PhD; Gerald K. Goodenough, MD

Objective. -To test the effect of water fluoridated to 1 ppm on the incidence of hip fractures in the elderly.

Design. -Ecological cohort.

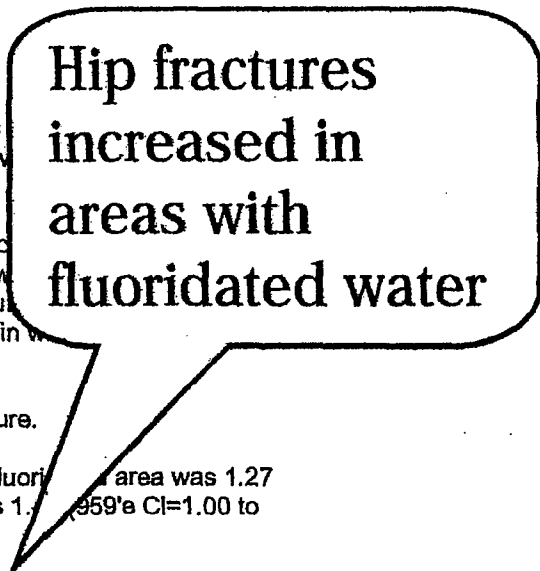
Setting. -The incidence of femoral neck fractures in patients was compared in three communities in Utah, one with and two fluoridated to 1 ppm.

Patients. -All patients with hip fractures who were 65 years of age or older during a 7-year period in the three communities, excluding (1) those with other hip fractures, (2) those in whom the hip fracture was anything but a femoral neck fracture, (3) those in whom metastatic disease was present, or (4) those in whom there was a second fracture (n=246).

Outcome Measure. -Rate of hospital discharge for hip fracture.

Results. -The relative risk for hip fracture for women in the fluoridated area was 1.27 (95% confidence interval (CI)=1.08 to 1.46) and for men was 1.81 (95% CI=1.00 to 1.81) relative to the nonfluoridated areas.

Conclusions. - We found a small but significant increase in the risk of hip fracture in both men and women exposed to artificial fluoridation at 1 ppm, suggesting that low levels of fluoride may increase the risk of hip fracture in the elderly.



Hip fractures increased in areas with fluoridated water

HIP fractures, or fractures of the femoral neck, are a major public health problem. In the United States, the cost of hip fracture is approximately \$7 billion annually, and hip fracture is the second most common cause of admission to nursing homes, accounting for approximately 60,000 admissions each year.

50 Reasons to Oppose Fluoridation

Updated April 12, 2004

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- 1) Fluoride is not an essential nutrient (NRC 1993 and IOM 1997). No disease has ever been linked to a fluoride deficiency. Humans can have perfectly good teeth without fluoride.
- 2) Fluoridation is not necessary. Most Western European countries are not fluoridated and have experienced the same decline in dental decay as the US (See data from World Health Organization in [Appendix 1](#), and the time trends presented graphically at <http://www.fluoridealert.org/who-dmft.htm>). The reasons given by countries for not fluoridating are presented in [Appendix 2](#).)
- 3) Fluoridation's role in the decline of tooth decay is in serious doubt. The largest survey ever conducted in the US (over 39,000 children from 84 communities) by the National Institute of Dental Research showed little difference in tooth decay among children in fluoridated and non-fluoridated communities ([Hileman 1989](#)). According to NIDR researchers, the study found an average difference of only 0.6 DMFS (Decayed Missing and Filled Surfaces) in the permanent teeth of children aged 5-17 residing in either fluoridated or unfluoridated areas (Brunelle and Carlos, 1990). This difference is less than one tooth surface! There are 128 tooth surfaces in a child's mouth. This result was not shown to be statistically significant. In a review commissioned by the Ontario government, Dr. David Locker concluded:

"The magnitude of [fluoridation's] effect is not large in absolute terms, is often not statistically significant and may not be of clinical significance" (Locker 1999).
- 4) Where fluoridation has been discontinued in communities from Canada, the former East Germany, Cuba and Finland, dental decay has not increased but has actually decreased (Maupome 2001; Kunzel and Fischer, 1997, 2000; Kunzel 2000 and Seppa 2000).
- 5) There have been numerous recent reports of dental crises in US cities (e.g. Boston, Cincinnati, New York City) which have been fluoridated for over 20 years. There appears to be a far greater (inverse) relationship between tooth decay and income level than with water fluoride levels.
- 6) Modern research (e.g. [Diesendorf 1986](#); [Colquhoun 1997](#), and [De Liefde, 1998](#)) shows that decay rates were coming down before fluoridation was introduced and have continued to decline even after its benefits would have been maximized. Many other factors influence tooth decay. Some recent studies have found that tooth decay actually increases as the fluoride concentration in the water increases (Olsson 1979; Retief 1979; Mann 1987, 1990; Steelink 1992; Teotia 1994; Grobleri 2001; Awadia 2002 and Ekanayake 2002).
- 7) The Centers for Disease Control and Prevention (CDC 1999, 2001) has now acknowledged the findings of many leading dental researchers, that the mechanism of fluoride's benefits are mainly TOPICAL not SYSTEMIC. Thus, you don't have to swallow fluoride to protect teeth. As the benefits of fluoride (if any exist) are topical, and the risks are systemic, it makes more sense, for those who want to take the risks, to deliver the fluoride directly to the tooth in the form of toothpaste. Since swallowing fluoride is unnecessary, there is no reason to force people (against their will) to drink fluoride in their water supply. This position was recently shared by Dr. Douglas Carnall, the associate editor of the British Medical Journal. His editorial appears in [Appendix 3](#).

8) Despite being prescribed by doctors for over 50 years, the US Food and Drug Administration (FDA) has never approved any fluoride product designed for ingestion as safe or effective. Fluoride supplements are designed to deliver the same amount of fluoride as ingested daily from fluoridated water (Kelly 2000).

9) The US fluoridation program has massively failed to achieve one of its key objectives, i.e. to lower dental decay rates while holding down dental fluorosis (mottled and discolored enamel), a condition known to be caused by fluoride. The goal of the early promoters of fluoridation was to limit dental fluorosis (in its mildest form) to 10% of children (NRC 1993, pp. 6-7). A major US survey has found 30% of children in optimally fluoridated areas had dental fluorosis on at least two teeth (Heller 1997), while smaller studies have found up to 80% of children impacted (Williams 1990; Lalumandier 1995 and Morgan 1998). The York Review estimates that up to 48% of children in optimally fluoridated areas worldwide have dental fluorosis in all forms and 12.5% with symptoms of aesthetic concern (McDonagh, 2000).

10) Dental fluorosis means that a child has been overdosed on fluoride. While the mechanism by which the enamel is damaged is not definitively known, it appears fluorosis may be a result of either inhibited enzymes in the growing teeth (Dan Besten 1999), or through fluoride's interference with G-protein signaling mechanisms (Matsuo 1996). In a study in Mexico, Alarcon-Herrera (2001) has shown a linear correlation between the severity of dental fluorosis and the frequency of bone fractures in children.

11) The level of fluoride put into water (1 ppm) is up to 200 times higher than normally found in mothers' milk (0.005 – 0.01 ppm) (Ekstrand 1981; Institute of Medicine 1997). There are no benefits, only risks, for infants ingesting this heightened level of fluoride at such an early age (this is an age where susceptibility to environmental toxins is particularly high).

12) Fluoride is a cumulative poison. On average, only 50% of the fluoride we ingest each day is excreted through the kidneys. The remainder accumulates in our bones, pineal gland, and other tissues. If the kidney is damaged, fluoride accumulation will increase, and with it, the likelihood of harm.

13) Fluoride is very biologically active even at low concentrations. It interferes with hydrogen bonding (Emsley 1981) and inhibits numerous enzymes (Waldbott 1978).

14) When complexed with aluminum, fluoride interferes with G-proteins (Bigay 1985, 1987). Such interactions give aluminum-fluoride complexes the potential to interfere with many hormonal and some neurochemical signals (Strunecka & Patocka 1999, Li 2003).

15) Fluoride has been shown to be mutagenic, cause chromosome damage and interfere with the enzymes involved with DNA repair in a variety of cell and tissue studies (Tsutsui 1984; Caspary 1987; Kishi 1993 and Mihashi 1996). Recent studies have also found a correlation between fluoride exposure and chromosome damage in humans (Sheth 1994; Wu 1995; Meng 1997 and Joseph 2000).

16) Fluoride forms complexes with a large number of metal ions, which include metals which are needed in the body (like calcium and magnesium) and metals (like lead and aluminum) which are toxic to the body. This can cause a variety of problems. For example, fluoride interferes with enzymes where magnesium is an important co-factor, and it can help facilitate the uptake of aluminum and lead into tissues where these metals wouldn't otherwise go (Mahaffey 1976; Allain 1996; Varner 1998).

17) Rats fed for one year with 1 ppm fluoride in their water, using either sodium fluoride or aluminum fluoride, had morphological changes to their kidneys and brains, an increased uptake

of aluminum in the brain, and the formation of beta amyloid deposits which are characteristic of Alzheimers disease (Varner 1998).

18) Aluminum fluoride was recently nominated by the Environmental Protection Agency and National Institute of Environmental Health Sciences for testing by the National Toxicology Program. According to EPA and NIEHS, aluminum fluoride currently has a "high health research priority" due to its "known neurotoxicity" (BNA, 2000). If fluoride is added to water which contains aluminum, than aluminum fluoride complexes will form.

19) Animal experiments show that fluoride accumulates in the brain and exposure alters mental behavior in a manner consistent with a neurotoxic agent (Mullenix 1995). Rats dosed prenatally demonstrated hyperactive behavior. Those dosed postnatally demonstrated hypoactivity (i.e. under activity or "couch potato" syndrome). More recent animal experiments have reported that fluoride can damage the brain (Wang 1997; Guan 1998; Varner 1998; Zhao 1998; Zhang 1999; Lu 2000; Shao 2000; Sun 2000; Bhatnagar 2002; Chen 2002, 2003; Long 2002; Shivarajashankara 2002a, b; Shashi 2003 and Zhai 2003) and impact learning and behavior (Paul 1998; Zhang 1999, 2001; Sun 2000; Ekambaram 2001; Bhatnagar 2002).

20) Five studies from China show a lowering of IQ in children associated with fluoride exposure (Lin Fa-Fu 1991; Li 1995; Zhao 1996; Lu 2000; and Xiang 2003a, b). One of these studies (Lin Fa-Fu 1991) indicates that even just moderate levels of fluoride exposure (e.g. 0.9 ppm in the water) can exacerbate the neurological defects of iodine deficiency.

21) Studies by Jennifer Luke (2001) showed that fluoride accumulates in the human pineal gland to very high levels. In her Ph.D. thesis Luke has also shown in animal studies that fluoride reduces melatonin production and leads to an earlier onset of puberty (Luke 1997).

22) In the first half of the 20th century, fluoride was prescribed by a number of European doctors to reduce the activity of the thyroid gland for those suffering from hyperthyroidism (over active thyroid) (Stecher 1960; Waldbott 1978). With water fluoridation, we are forcing people to drink a thyroid-depressing medication which could, in turn, serve to promote higher levels of hypothyroidism (underactive thyroid) in the population, and all the subsequent problems related to this disorder. Such problems include depression, fatigue, weight gain, muscle and joint pains, increased cholesterol levels, and heart disease.

It bears noting that according to the Department of Health and Human Services (1991) fluoride exposure in fluoridated communities is estimated to range from 1.6 to 6.6 mg/day, which is a range that actually overlaps the dose (2.3 - 4.5 mg/day) shown to decrease the functioning of the human thyroid (Galletti & Joyet 1958). This is a remarkable fact, particularly considering the rampant and increasing problem of hypothyroidism in the United States (in 1999, the second most prescribed drug of the year was Synthroid, which is a hormone replacement drug used to treat an underactive thyroid). In Russia, Bachinskii (1985) found a lowering of thyroid function, among otherwise healthy people, at 2.3 ppm fluoride in water.

23) Some of the early symptoms of skeletal fluorosis, a fluoride-induced bone and joint disease that impacts millions of people in India, China, and Africa, mimic the symptoms of arthritis (Singh 1963; Franke 1975; Teotia 1976; Carnow 1981; Czerwinski 1988; DHHS 1991).

According to a review on fluoridation by Chemical & Engineering News, "Because some of the clinical symptoms mimic arthritis, the first two clinical phases of skeletal fluorosis could be easily misdiagnosed" (Hileman 1988). Few if any studies have been done to determine the extent of this misdiagnosis, and whether the high prevalence of arthritis in America (1 in 3 Americans have some form of arthritis - CDC, 2002) is related to our growing fluoride exposure, which is highly plausible. The causes of most forms of arthritis (e.g. osteoarthritis) are unknown.

24) In some studies, when high doses of fluoride (average 26 mg per day) were used in trials to treat patients with osteoporosis in an effort to harden their bones and reduce fracture rates, it actually led to a HIGHER number of fractures, particularly hip fractures (Inkovaara 1975; Gerster 1983; Dambacher 1986; O'Duffy 1986; Hedlund 1989; Bayley 1990; Gutteridge 1990. 2002; Orcel 1990; Riggs 1990 and Schnitzler 1990). The cumulative doses used in these trials are exceeded by the lifetime cumulative doses being experienced by many people living in fluoridated communities.

25) Nineteen studies (three unpublished, including one abstract) since 1990 have examined the possible relationship of fluoride in water and hip fracture among the elderly. Eleven of these studies found an association, eight did not. One study found a dose-related increase in hip fracture as the concentration of fluoride rose from 1 ppm to 8 ppm (Li 2001). Hip fracture is a very serious issue for the elderly, as a quarter of those who have a hip fracture die within a year of the operation, while 50 percent never regain an independent existence (All 19 of these studies are referenced as a group in the reference section).

26) The only government-sanctioned animal study to investigate if fluoride causes cancer, found a dose-dependent increase in cancer in the target organ (bone) of the fluoride-treated (male) rats (NTP 1990). The initial review of this study also reported an increase in liver and oral cancers, however, all non-bone cancers were later downgraded – with a questionable rationale – by a government-review panel (Marcus 1990). In light of the importance of this study, EPA Professional Headquarters Union has requested that Congress establish an independent review to examine the study's results (Hirzy 2000).

27) A review of national cancer data in the US by the National Cancer Institute (NCI) revealed a significantly higher rate of bone cancer in young men in fluoridated versus unfluoridated areas (Hoover 1991). While the NCI concluded that fluoridation was not the cause, no explanation was provided to explain the higher rates in the fluoridated areas. A smaller study from New Jersey (Cohn 1992) found bone cancer rates to be up to 6 times higher in young men living in fluoridated versus unfluoridated areas. Other epidemiological studies have failed to find this relationship (Mahoney 1991; Freni 1992).

28) Fluoride administered to animals at high doses wreaks havoc on the male reproductive system - it damages sperm and increases the rate of infertility in a number of different species (Kour 1980; Chinoy 1989; Chinoy 1991; Susheela 1991; Chinoy 1994; Kumar 1994; Narayana 1994a, b; Zhao 1995; Elbetieha 2000; Ghosh 2002 and Zakrzewska 2002). While studies conducted at the FDA have failed to find reproductive effects in rats (Sprando 1996, 1997, 1998), an epidemiological study from the US has found increased rates of infertility among couples living in areas with 3 or more ppm fluoride in the water (Freni 1994), and 2 studies have found a reduced level of circulating testosterone in males living in high fluoride areas (Susheela 1996 and Barot 1998).

29) The fluoridation program has been very poorly monitored. There has never been a comprehensive analysis of the fluoride levels in the bones, blood, or urine of the American people or the citizens of other fluoridated countries. Based on the sparse data that has become available, however, it is increasingly evident that some people in the population – particularly people with kidney disease - are accumulating fluoride levels that have been associated with harm to both animals and humans, particularly harm to bone (see Connett 2004).

30) Once fluoride is put in the water it is impossible to control the dose each individual receives. This is because 1) some people (e.g. manual laborers, athletes, diabetics, and people with kidney

disease) drink more water than others, and 2) we receive fluoride from sources other than the water supply. Other sources of fluoride include food and beverages processed with fluoridated water (Kiritsy 1996 and Heilman 1999), fluoridated dental products (Bentley 1999 and Levy 1999), mechanically deboned meat (Fein 2001), teas (Levy 1999), and pesticide residues on food (Stannard 1991 and Burgstahler 1997).

31) Fluoridation is unethical because individuals are not being asked for their informed consent prior to medication. This is standard practice for all medication, and one of the key reasons why most of western Europe has ruled against fluoridation (see [appendix 2](#)).

As one doctor aptly stated, "No physician in his right senses would prescribe for a person he has never met, whose medical history he does not know, a substance which is intended to create bodily change, with the advice: 'Take as much as you like, but you will take it for the rest of your life because some children suffer from tooth decay.' It is a preposterous notion."

32) While referenda are preferential to imposed policies from central government, it still leaves the problem of individual rights versus majority rule. Put another way -- does a voter have the right to require that their neighbor ingest a certain medication (even if it's against that neighbor's will)?

33) Some individuals appear to be highly sensitive to fluoride as shown by case studies and double blind studies (Shea 1967, Waldbott 1978 and Moolenburg 1987). In one study, which lasted 13 years, Feltman and Kosel (1961) showed that about 1% of patients given 1 mg of fluoride each day developed negative reactions. Can we as a society force these people to ingest fluoride?

34) According to the Agency for Toxic Substances and Disease Registry (ATSDR 1993), and other researchers (Juncos & Donadio 1972; Marier & Rose 1977 and Johnson 1979), certain subsets of the population may be particularly vulnerable to fluoride's toxic effects; these include: the elderly, diabetics and people with poor kidney function. Again, can we in good conscience force these people to ingest fluoride on a daily basis for their entire lives?

35) Also vulnerable are those who suffer from malnutrition (e.g. calcium, magnesium, vitamin C, vitamin D and iodide deficiencies and protein poor diets) (Massler & Schour 1952; Marier & Rose 1977; Lin Fa-Fu 1991; Chen 1997; Teotia 1998). Those most likely to suffer from poor nutrition are the poor, who are precisely the people being targeted by new fluoridation programs. While being at heightened risk, poor families are less able to afford avoidance measures (e.g. bottled water or removal equipment).

36) Since dental decay is most concentrated in poor communities, we should be spending our efforts trying to increase the access to dental care for poor families. The real "Oral Health Crisis" that exists today in the United States, is not a lack of fluoride but poverty and lack of dental insurance. The Surgeon General has estimated that 80% of dentists in the US do not treat children on Medicaid.

37) Fluoridation has been found to be ineffective at preventing one of the most serious oral health problems facing poor children, namely, baby bottle tooth decay, otherwise known as early childhood caries (Barnes 1992 and Shiboski 2003).

38) The early studies conducted in 1945 -1955 in the US, which helped to launch fluoridation, have been heavily criticized for their poor methodology and poor choice of control communities (De Stefano 1954; Sutton 1959, 1960 and 1996; Ziegelbecker 1970). According to Dr. Hubert Arnold, a statistician from the University of California at Davis, the early fluoridation trials "are especially rich in fallacies, improper design, invalid use of statistical methods, omissions of contrary data, and just plain muddleheadedness and hebetude." In 2000, the British

Government's "York Review" could give no fluoridation trial a grade A classification – despite 50 years of research (McDonagh 2000, see [Appendix 3](#) for commentary).

39) The US Public Health Service first endorsed fluoridation in 1950, before one single trial had been completed (McClure 1970)!

40) Since 1950, it has been found that fluorides do little to prevent pit and fissure tooth decay, a fact that even the dental community has acknowledged (Seholle 1984; Gray 1987; PHS 1993; and Pinkham 1999). This is significant because pit and fissure tooth decay represents up to 85% of the tooth decay experienced by children today (Seholle 1984 and Gray 1987).

41) Despite the fact that we are exposed to far more fluoride today than we were in 1945 (when fluoridation began), the "optimal" fluoridation level is still 1 part per million, the same level deemed optimal in 1945! (Marier & Rose 1977; Levy 1999; Rozier 1999 and Fomon 2000).

42) The chemicals used to fluoridate water in the US are not pharmaceutical grade. Instead, they come from the wet scrubbing systems of the superphosphate fertilizer industry. These chemicals (90% of which are sodium fluorosilicate and fluorosilicic acid), are classified hazardous wastes contaminated with various impurities. Recent testing by the National Sanitation Foundation suggest that the levels of arsenic in these chemicals are relatively high (up to 1.6 ppb after dilution into public water) and of potential concern (NSF 2000 and Wang 2000).

43) These hazardous wastes have not been tested comprehensively. The chemical usually tested in animal studies is pharmaceutical grade sodium fluoride, not industrial grade fluorosilicic acid. The assumption being made is that by the time this waste product has been diluted, all the fluorosilicic acid will have been converted into free fluoride ion, and the other toxics and radioactive isotopes will be so dilute that they will not cause any harm, even with lifetime exposure. These assumptions have not been examined carefully by scientists, independent of the fluoridation program.

44) Studies by [Masters and Coplan](#) (1999, 2000) show an association between the use of fluorosilicic acid (and its sodium salt) to fluoridate water and an increased uptake of lead into children's blood. Because of lead's acknowledged ability to damage the child's developing brain, this is a very serious finding yet it is being largely ignored by fluoridating countries.

45) Sodium fluoride is an extremely toxic substance – just 200 mg of fluoride ion is enough to kill a young child, and just 3-5 grams (e.g. a teaspoon) is enough to kill an adult. Both children (swallowing tablets/gels) and adults (accidents involving fluoridation equipment and filters on dialysis machines) have died from excess exposure.

46) Some of the earliest opponents of fluoridation were biochemists and at least 14 Nobel Prize winners are among numerous scientists who have expressed their reservations about the practice of fluoridation (see [appendix 4](#)).

47) The recent Nobel Laureate in Medicine and Physiology, Dr. Arvid Carlsson (2000), was one of the leading opponents of fluoridation in Sweden, and part of the panel that recommended that the Swedish government reject the practice, which they did in 1971. According to Carlsson:

"I am quite convinced that water fluoridation, in a not-too-distant future, will be consigned to medical history... Water fluoridation goes against leading principles of pharmacotherapy, which is progressing from a stereotyped medication - of the type 1 tablet 3 times a day - to a much more individualized therapy as regards both dosage and selection of drugs. The addition of drugs to the drinking water means exactly the opposite of an individualized therapy" (Carlsson 1978).

48) While pro-fluoridation officials continue to promote fluoridation with undiminished fervor, they cannot defend the practice in open public debate – even when challenged to do so by

organizations such as the Association for Science in the Public Interest, the American College of Toxicology, or the US Environmental Protection Agency (Bryson 2004). According to Dr. Michael Easley, a prominent lobbyist for fluoridation in the US, "Debates give the illusion that a scientific controversy exists when no credible people support the fluorophobics' view" (See [appendix 5](#)).

In light of proponents' refusal to debate this issue, Dr. Edward Groth, a Senior Scientist at Consumers Union, observed that "the political profluoridation stance has evolved into a dogmatic, authoritarian, essentially antiscientific posture, one that discourages open debate of scientific issues" (Martin 1991).

49) Many scientists, doctors and dentists who have spoken out publicly on this issue have been subjected to censorship and intimidation (Martin 1991). Most recently, Dr. Phyllis Mullenix was fired from her position as Chair of Toxicology at Forsythe Dental Center for publishing her findings on fluoride and the brain; and Dr. William Marcus was fired from the EPA for questioning the government's handling of the NTP's fluoride-cancer study (Bryson 2004). Tactics like this would not be necessary if those promoting fluoridation were on secure scientific ground.

50) The Union representing the scientists at US EPA headquarters in Washington DC is now on record as opposing water fluoridation (Hirzy 1999). According to the Union's Senior Vice President, Dr. William Hirzy:

"In summary, we hold that fluoridation is an unreasonable risk. That is, the toxicity of fluoride is so great and the purported benefits associated with it are so small - if there are any at all - that requiring every man, woman and child in America to ingest it borders on criminal behavior on the part of governments."

Conclusion

When it comes to controversies surrounding toxic chemicals, invested interests traditionally do their very best to discount animal studies and quibble with epidemiological findings. In the past, political pressures have led government agencies to drag their feet on regulating asbestos, benzene, DDT, PCBs, tetraethyl lead, tobacco and dioxins. With fluoridation we have had a fifty year delay. Unfortunately, because government officials have put so much of their credibility on the line defending fluoridation, and because of the huge liabilities waiting in the wings if they admit that fluoridation has caused an increase in hip fracture, arthritis, bone cancer, brain disorders or thyroid problems, it will be very difficult for them to speak honestly and openly about the issue. But they must, not only to protect millions of people from unnecessary harm, but to protect the notion that, at its core, public health policy must be based on sound science not political expediency. They have a tool with which to do this: it's called the Precautionary Principle. Simply put, this says: if in doubt leave it out. This is what most European countries have done and their children's teeth have not suffered, while their public's trust has been strengthened.

It is like a question from a Kafka play. Just how much doubt is needed on just one of the health concerns identified above, to override a benefit, which when quantified in the largest survey ever conducted in the US, amounts to less than one tooth surface (out of 128) in a child's mouth? For those who would call for further studies, I say fine. Take the fluoride out of the water first and then conduct all the studies you want. This folly must end without further delay.

Postscript

Further arguments against fluoridation, can be viewed at <http://www.floridealert.org>. Arguments for fluoridation can be found at <http://www.ada.org> and a more systematic presentation of fluoride's toxic effects can be found at <http://www.Slweb.org/bibliography.html>

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DISCUSSION SECTION Letter to the Editor

FLUORIDATION IN EUROPE

I have been engaged in scientific and political work on water fluoridation for 30 years. During this time I have analysed many fluoridation studies, published scientific papers, lectured on this subject at international conferences and congresses, was nominated as an expert in official hearings, and have discussed the problem in panels, in newspapers, on radio, and on television.

I would now like to inform your readers about the present stage of development of water fluoridation mainly in Europe since the resolution of the WHO in 1969:

1. The World Health Assembly (WHA) adopted Resolutions in 1969 (WHA22.30), in 1975 (WHA28.64), and in 1978 (WHA31.50) which recommended that Member States introduce community water fluoridation as a safe, inexpensive and effective measure, and urged Member States to consider fluoridation of public water supplies as part of their national plans for the prevention and control of oral disease; and it suggested that, where community water fluoridation is not feasible, alternative methods of achieving optimum daily intake or application of fluorides should be envisaged.

These Resolutions are promoted by the International Dental Federation (FDI),¹ which prepared the Report by the Director General of the WHO, and backed up by Public Health Officials with their National Dental Organizations.^{2,3} The FDI first recommended water fluoridation in 1951.⁴

2. Scientific analyses of water fluoridation studies and experiments show that none of them can actually prove any caries prophylactic effect of fluoride.⁵⁻⁴⁷ The "caries reductions" reported by dentists were undoubtedly constructed by dentists (e.g. in the 21-cities-study by H T Dean *et al* (1942) or in the Grand Rapids/ Muskegon Study by F A Arnold Jr and J W Knutson *et al* (1950-1962)) or are the result of influences other than those of fluorides. The dentist J W Knutson, Assistant Surgeon General, Chief Dental Officer, US Public Health Service, was engaged as an expert of the WHO in the expert committee 1957⁴⁸ and an Adviser Member of the Health Assembly in 1969.³ In my opinion the dentists in the WHO who recommended water fluoridation as safe, inexpensive, and effective, are not competent in this field of science because the problems are statistical and epidemiological and not problems of dentistry. The dentists in the WHO defend dogmatism instead of relying on facts. It is impossible to prevent and control oral disease by water fluoridation.

3. Whereas the WHO and WHA recommended the introduction of community water fluoridation in 1969, 1975, 1978, water fluoridation was stopped in some of the European Member States of the WHO.⁴⁹ The reason for these cessations of water fluoridation was not a political one, but the consequence of scientific discussion of its effectiveness and side effects. Water fluoridation was stopped in the following States: Federal Republic of Germany⁵⁰ (introduced 1952, stopped 1971); Sweden (introduced 1952, stopped 1971); Netherlands⁵¹⁻⁵³ (introduced 1953, stopped 1976); Czechoslovakia⁴⁹ (introduced 1958, stopped 1988/90); German Democratic Republic⁴⁹ (introduced 1959, stopped 1990 (Spremborg 1993)); Union of Soviet Socialist Republics⁴⁹ (introduced 1960, stopped 1990); Finland⁴⁹ (introduced 1959, stopped 1993); outside Europe: Japan⁴⁹ (introduced 1952, stopped 1972).

In Europe more than 53 million people who had water fluoridation for many years are now free from it.

4. Dentists and WHO experts have predicted a very large caries increase ("a tide of caries") after termination of fluoridation.⁴⁹ Analyses of the data, however, reveal a significant decrease in dental caries (caries decline) after

suspension of water fluoridation in Japan,^{49,54} in the Netherlands,⁵⁵ in Prague,^{49,56} in the German Democratic Republic,⁴⁹ and elsewhere. Never has any real increase in dental caries been observed after water fluoridation was discontinued.

Furthermore, many fluoride tablet measures were stopped also. In Graz²³ (Austria), for instance, the dental caries of children had increased during the fluoride tablet actions in schools since 1956 and decreased after the stop in 1973.

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Distribution and risk assessment of fluoride in drinking water in the west plain region of Jilin province, China.

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The west plain region of Jilin province of northeast China is one of the typical endemic fluorosis areas caused by drinking water for many years. Investigations of hydrogeological and ecoenvironmental conditions as well as endemic fluorosis were conducted in 1998. Results show that the ground water, especially, the water in the unconfined aquifer is the main source of drinking water for local residents. The fluoride concentration in groundwater in the unconfined aquifers is higher than that in the confined aquifer in the west plain of Jilin province. The fluoride concentration in the unconfined aquifer can be used to classify the plain into fluoride deficient area, optimum area and excess area, which trend from west to east. High fluoride ($>1.0 \text{ mg L}^{-1}$) in drinking water resulted in dental and skeletal fluorosis in local residents (children and pregnant women). There exists a positive correlation between fluoride concentration in the drinking water and the morbidities of endemic fluorosis disease ($r_1 = 0.781$, $r_2 = 0.872$). Health risks associated with fluoride concentration in drinking water are assessed. It has been determined that fluoride concentration in excess of 1.0 mg L^{-1} exposes residents to high health risks based on risk identification. The study area is classified into five health risk classes as shown in Figure 4. The risk indexes of this area more than 1.0 are accounted for 68% of the total west plain region.

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